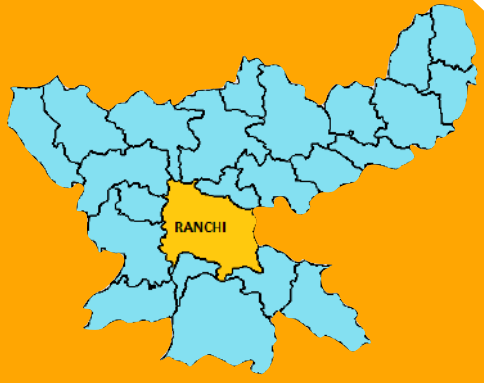
COMPREHENSIVE CLEAN AIR ACTION PLAN

RANCHI

MILLION PLUS CITY



PREPARED BY

JHARKHAND STATE POLLUTION CONTROL BOARD (JSPCB)

SEPTEMBER 2021

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ABBREVIATION	
Jharkhand Bijli Vitran Nigam Limited	JBVNL
Central Pollution Control Board	CPCB
Comprehensive Clean Air Action Plan	CCAAP
Compressed Natural Gas	CNG
Construction and Demolition Waste	C & D
Corporation	Corp
Department of Forest, Environment and Climate Change	DoFECC
Electric Vehicles	EV
End of life	EOL
Environment Protection Control Agency	EPCA
Graded Response Action Plan	GRAP
HC+Nox	Hydrocarbon+ Nitrogen oxides
Indian Council for Medical Research	CMR
Jharkhand State Pollution Control Board	JSPCB
Limited	LTD
Ministry of Environment, Forest and Climate Change	MoEFCC
Ministry of Health and Family welfare	MoFHW
National Air Monitoring Program	NAMP
National Air Quality Index	NAQI
National Ambient Air Quality Standards	NAAQS
National Clean Air Program	NCAP
Nitrozen dioxide	NO2
Operation and Continuous Emission Monitoring System	OCEMS
Particulate Matter	PM10
Particulate Matter	PM
Public Health Foundation of India	PHFI
Sulphur dioxide	SO2
Suspended Particulate Matter	SPM
Pardhan Mantri Ujjwala Yojna	PMUY
Indian Meteorological Department	IMD
District of Science & Technology	DST

EXECUTIVE SUMMARY

Taking cognisance of the deteriorating situation of air quality in Ranchi, the Jharkhand State Pollution Control Board (JSPCB) has taken a formidable step in preparing a Comprehensive Clean Air Action Plan (CCAAP) with a Micro level Plan of Action under the mandates of National Clean Air Program (NCAP) and guidelines of Central Pollution Control Board (CPCB). The plan mentioned here envisages a set of actions for cleaning the air and ensuring overall development of the society and the state.

The Particulate Matter (PM) is a matter of concern considering Ranchi's deteriorating air quality during 2016-2020 with high levels of PM10, though the concentration of SO_2 and NO_2 is within the prescribed standards. It has been observed that since 2016 the concentration of PM10 in the city is decreasing, though in 2020-2021 the concentration was noted at 104.4 mcg/m3, which is still more than 2 times of the national standard.

Similarly, an emission inventory is conducted to identify the sectoral contributions to air pollution that indicates that the transport sector is the highest contributor of PM2.5 with 22% of the total emission load while solid fuel burning for cooking & lighting purposes contributes around 17%. A major proportion of pollution is contributed by outside sources; which is 30% of the total pollution load, therefore a proper airshed management plan is also required. The source profile further indicates that the Dust contributes 15%, while open waste burning has 11% of contribution in the city. DG sets and brick kilns each contribute 2% of the total pollution load, while industries have merely 1% contribution. Therefore, emission inventory places the need for adoption of multi pronged strategies involving all relevant departments and agencies and other important stakeholders for executing an effective plan of actions.

Keeping these insights into consideration, the proposed Comprehensive Clean Air Action Plan (CCAAP) has been prepared under the guideline of CPCB that identifies various sources that contribute to pollution and puts effective mitigation measures in place. It has also taken into consideration several ongoing initiatives of the Jharkhand government and central government. The plan focuses on a result oriented plan of actions in a specific time bound manner with indicating certain line departments and agencies to bring a greater transparency and accountability mechanism during the implementation phase. A carrying capacity assessment and future emission prediction is currently under the process, and once ready it will further strengthen the action plan through an informed decision making and action oriented process. In addition to this,

institutional arrangements like the establishment of Project Management and Audit Unit to ensure timely implementation of policies, measures and action points have also been discussed.

The report is broadly divided into two parts:

Chapter I: It presents air quality trends, public health evidence and an analysis of the challenges of each source of pollution. Also, a brief overview of emission inventory of air pollution such as use of solid fuels in domestic cooking, transport, industries,, construction activities, waste burning, road dust and mining activities is given. Also, information about current policies and programs of each sector is discussed. It also presents the recommendation of the 15th Finance Commission and its aligned objective for clean air related efforts.

Chapter II: It lays out the proposed CCAAP and Graded Response Action Plan for Ranchi in a tabular form. In addition to this, Micro level Action Plan is separately presented as a part of the plan. The plan broadly identifies specific measures in each sector, enlisting the agencies responsible for the implementation of each of the measures with a fixed timeline. The CCAAP also provides short term, medium term, medium to long-term and long-term measures; where short-term measures need to be implemented immediately.

The Comprehensive Clean Air Action Plan (CCAAP) is an exhaustive plan and its implementation requires multi-scale and cross-sectoral coordination. The CCAAP looks for ways to integrate efforts across different departments listed before to take targeted actions recommended and suggested in the action plan. In addition to the regulatory and coordinated role played by the JSPCB, the proposed plan notes an interdepartmental and convergent effort at the state, regional, district and local level with a clear vision of improving air quality and bringing it at par with the mandates of NCAP. This plan meticulously presents the pragmatic and scientifically proven solutions and best practices around the world and India to be implemented in a far sighted manner to achieve the overall aims and objectives of the NCAP to enable Ranchi to take lead in adopting sustainable measures and ensure clean and breathable air in society.

CHAPTER I : INTRODUCTION

Jharkhand has seen a robust growth trajectory in the past two decades for achieving the larger development goals, however rapid pace of industrialisation and urbanisation has led to a manifold increase in the levels of ambient air pollution. As the problem of air pollution has become a health crisis all over the world, continuous high levels of pollution is causing both acute and chronic health effects to the people of all ages and socio-economic backgrounds in the state as well. A report by Lancet journal[1] has predicted that nearly 100.2 deaths per 100,000 in Jharkhand occurred due to the air pollution. Higher pollutants in the air also deteriorates the ecological and aesthetic balance of the region.

Amidst all the worrying facts of air pollution, the National Clean Air Program (NCAP) has been a formidable attempt to create a national framework for air quality management with a time-bound target to bring down the levels of PM2.5 and PM10 by 20-30% by the year 2024. With the recent focus on pollution in tier II cities, the Ministry of Environment, Forest and Climate Change (MoEF&CC) and Central Pollution Control Board (CPCB) have identified the non-attainment cities. Under the NCAP, city-specific action plans have to be developed for cities falling under this list. Recently, the importance of NCAP has increased immensely for cities / regions that are not part of the list but have severe levels of air pollution.

Though from Jharkhand, only Dhanbad was initially mentioned in the list of non-attainment cities but now Ranchi and Jamshedpur have been added in the updated list as a part of Million Plus cities[2]. Therefore, a Comprehensive Clean Air Action Plan has been prepared for Ranchi city with the key objective to evolve a long term action plan having proper action points with specific timelines based on scientific research and inputs and its effective implementation mechanism in order to bring down the pollution levels.

[1] http://ghdx.healthdata.org/gbd-2017

[2] https://cpcb.nic.in/uploads/Non-Attainment_Cities.pdf

1.1 GOAL

The overall goal of the Clean Air Action Plan is to meet the prescribed annual average ambient air quality standards at all locations in Ranchi city within a stipulated time frame.

1.2 TARGET

The global experiences clearly highlight the fact that internationally, the actions had been city specific rather than country oriented and, accordingly, the statistics indicates 35%– 40% $PM_{2.5}$ reduction in five years for cities, such as Beijing and Seoul, whereas cities, such as Santiago and Mexico City have shown 73% and 61% reduction in 22 to 25 years with regard to $PM_{2.5}$ and PM_{10} concentrations, respectively. Recently, a new Lancet study by Peking University School of Public Health on the impact of China's 'Air PollutionPrevention and Control Action Plan (2013–2017) has found that an annual average concentration of $PM_{2.5}$ decreased by 33.3% and PM_{10} levels reduced by 27.8% in the 74 key cities in China where the plan was implemented in the last five years. Sulphur dioxide reduced by 54.1% and CO by 28.2% in five years, but no significant improvements were seen in NO_2 or O_3 concentrations.

TERI and ARAI report (August, 2018) have analysed various interventions and estimated their possible impacts over $PM_{2.5}$ and PM_{10} concentrations in Delhi and NCR. An alternative scenario has been developed considering the interventions which can provide maximum air quality benefits. Taking into account the available international experiences and national studies, the tentative national level target of 20%–30% reduction of $PM_{2.5}$ and PM_{10} concentration by 2024 is proposed under the NCAP. This is keeping 2017 as the base year for the comparison of concentration.

The targets for Ranchi city are kept similar to the targets envisaged under NCAP as described above with a modified timeline by 2025 as interventions will be starting in 2021. The yearly targets will be decided so that the emphasis in the first two years will be largely upon taking up the actions for the institutional strengthening and development of infrastructure in consultation with CPCB & MoEF&CC.

1.3 TIME FRAME

Considering 2020-21 as a base year, this action plan is prepared for a term of next five years (mid-term action plan) to begin which is further extendable up to 20-25 years in long-term after mid-term review of the outcomes.

1.4 OBJECTIVES:

1. To ensure effective implementation of mitigation measures for prevention, control and abatement of air pollution
2. To carry out scientific apportionment studies of air pollution sources, identification of gaps, tracking hot spots and prioritisation of actions for increasing the effectiveness of mitigations
3. To augment and evolve an effective and proficient ambient air quality monitoring network across the city for ensuring a comprehensive and reliable database.
4. To augment public awareness and capacity-building measures encompassing data dissemination and outreach programmes for ensuring trained manpower and robust infrastructure on air pollution.
5. To evaluate the impact of mitigation measures periodically in order to ensure the effectiveness and realignment of the mitigation strategies

1.5 LOCATION, TOPOGRAPHY & ECONOMIC PROFILE OF RANCHI

Ranchi, the capital city of Jharkhand, is an important administrative and industrial center in the state. It is connected through NH-33 and NH-23 and adjoining districts are Ramgarh & Hazaribagh in the North, Gumla and Latehar in the West, Purulia (west Bengal) in the East and Saraikela Kharsawan in the South (Figure 1). The average altitude of Ranchi is 600 meters above the sea level with undulating land features. The tropic of 'cancer' at 231/2o North passes through Ranchi District (at Ormanjhi).

The district experiences pleasant climatic conditions as relative humidity remains low, so the summer season is also not uncongenial. December is the coldest month with minimum temperature of 10.30C and May is the hottest month with maximum

temperature of 37.20C. Average annual rainfall of the district is 1375 mm and more than 80 percent precipitation is received during monsoon months.[3] The district is endowed with mineral resources of Coal, Lime stone, Fireclay, China Clay, Granite, stone and sand and is surrounded by a large & green forest area, which provides many basic raw materials to a large number of industries. Due to the presence of natural and mineral resources the district has been seen as a good place for setting up medium and large-scale industries.

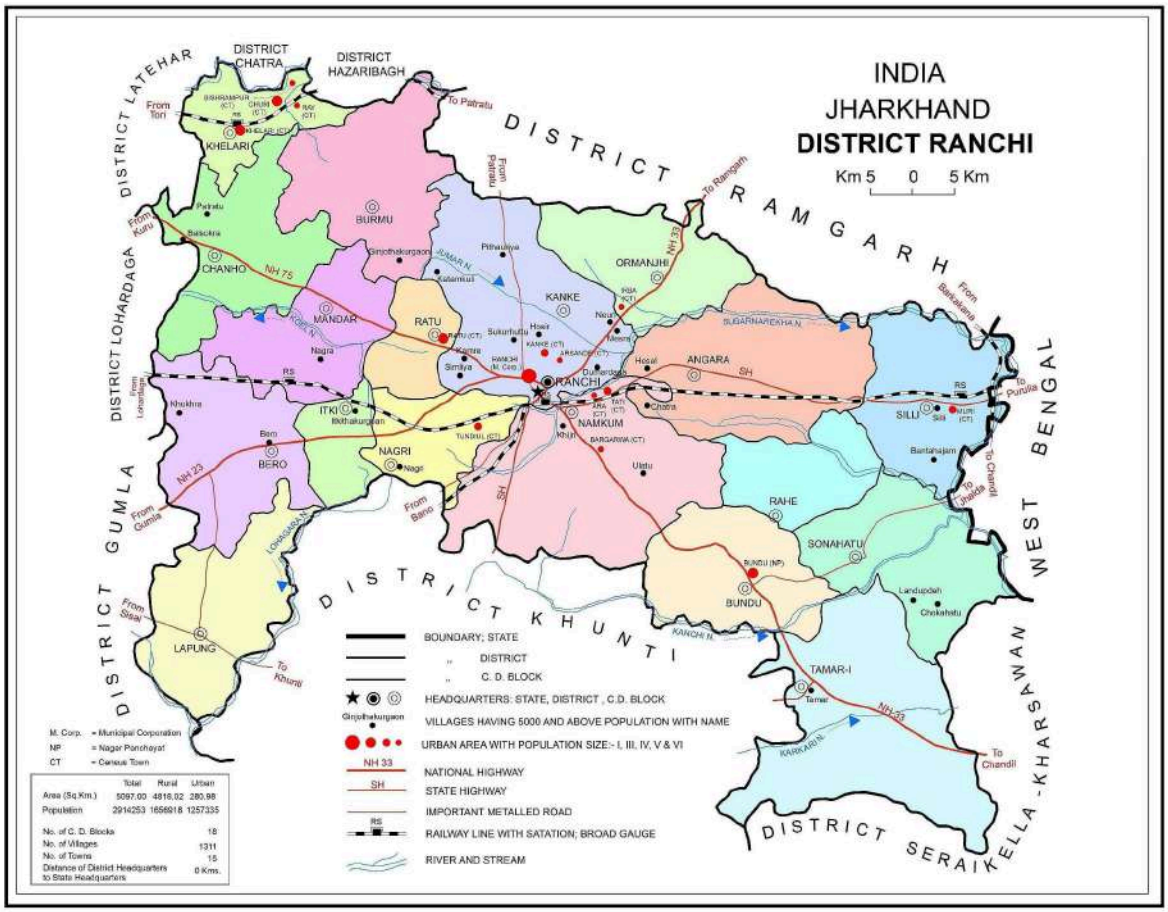


Figure 1 : District Map of Ranchi

[3] https://ranchi.nic.in/hi/%E0%A4%9C%E0%A4%BF%E0%A4%B2%E0%A4%BE

2. TRENDS OF AIR QUALITY

After becoming capital of a new separate state, Ranchi has seen exponential growth in construction and demolition activities, increase in the number of vehicles, roadside encroachments, and expansion of industries which all have collectively resulted in poor air quality problems characterised by PM_{10} and $PM_{2.5}$.

2.1 AIR QUALITY MONITORING

Every policy or program needs to be supported by robust air quality monitoring. The air quality monitors generate air quality data on a routine basis, which helps to assess risks and lead towards implementing the control measures. Ranchi is covered under National Air Monitoring Program (NAMP) through two operating manual ambient air quality stations.[4] In addition to this, one continuous air quality monitor is also installed at Van Bhawan in Ranchi. The Jharkhand State Pollution Control Board (JSPCB) monitors criteria pollutants on a regular basis through the two manual monitors installed at Albert Ekka Chowk and Birsa Chowk in Ranchi (see Table 1 and Figure 2).

Figure 2 : Location of Air Quality Monitoring Station Installed at Ranchi

[4] https://cpcb.nic.in/uploads/Stations_NAMP.pdf

Only three criteria pollutants such as PM_{10}, Sulphur dioxide (SO_2) and Nitrogen dioxide (NO_2) are monitored under NAMP in Ranchi and do not cover all the pollutants listed in the National Ambient Air Quality Standards (NAAQS).

Table 1: Locations of the ambient air quality monitoring stations		
Type	**Station Name**	**Parameters Monitored**
Manual Monitors (2)	(1) Albert Ekka Chowk (2) Birsa Chowk	SO_2, NO_2 & PM_{10}
CAAQMS (1)	Van Bhawan	NA

The status of the current monitoring network, and the fact that Ranchi is the capital city, indicates an urgent need for expansion of air quality monitoring with emphasis on real-time air quality monitoring. The manual monitors have certain limitations. Also, manual air monitor data will not be useful to deal with episodic incidence of smog. In emergency situations, pollution mitigation schemes such as Graded Response Action Plan (GRAP) and issuance of public health advisory is important, which relies predominantly on the real-time monitors.

The required number of minimum stations needed for monitoring trends of the pollutants based on population is recommended in the guidelines for ambient air quality monitoring developed and published by CPCB. Based on the thumb rule proposed by CPCB and district level urban and rural population (2011 census), in the long term the minimum number of air quality monitoring stations required in Ranchi is mentioned in Table 2.

Table 2 : Required Air Quality Monitoring Stations (as per CPCB guideline)						
Population (Census 2011)	**NGT Direction (O.A. No 681/2018. Dated 06.08.20)**		**Existing Status**		**Gap**	
	Minimum No. of manual station under NAMP	**Minimum no of proposed CAAQMS**	**NAMP**	**CAAQMS**	**NAMP**	**CAAQMS**
1,073,427	1-Background 2-Residential/ Commercial	2-Residential 1-Traffic dominant area 1- Commercial 1-Industrial area	02	01	01	04
	03	05	02	01	01	04

Moreover, the low-cost sensor-based air quality monitors and use of satellite air quality data should also be considered. This can help in assessing a much larger area that has not yet been covered by regulatory monitors to generate baseline data for local action.

2.2 AIR POLLUTANTS TRENDS (2016-2020)

The annual concentration of pollutants (PM10, SO2 & NO2) during the period of 2016-2020 was analysed to understand the trends and reduction targets for achieving national ambient air quality standards in Ranchi. Air quality data are referenced from archives available at CPCB and JSPCB. The trend of pollutants over the years enables us to determine a case for a clean air action plan and to set the target. The available long-term data of PM10, NO2 and SO2 from two manual monitoring stations for Ranchi is presented below in graph (Figure 3 and Table 3 & 4). It can be seen that Particulate Matter (PM10) is a major concern for Ranchi's deteriorating air quality in the years between 2016-2021. The city consistently has high levels of PM10, although the concentration of SO2 and NO2 is within the prescribed standards.

Table 3 : Categories of Air Quality Index along with the expected impact

Good (0-50)	Minimal Impact
Satisfactory (51-100)	Minor Breathing discomfort to sensitive people
Moderately Polluted (101-200)	Breathing discomfort to the people with lung, heart disease, children and older adults
Poor (201-300)	Breathing discomfort to people on prolonged exposure
Very Poor (301-400)	Respiratory illness to the people on prolonged exposure
Severe (401-500)	Respiratory effects even on healthy people

Table 4 : Average Air Pollution Trend in Ranchi City

	PM10	SO2	NO2	PM10	SO2	NO2	PM10	SO2	NO2
FY	Albert Ekka Chowk			Birsa Chowk			Annual Average of Ranchi City (μg /m3)		
2016-17	174.28	18.89	36.48	NA		NA	174.28	18.89	36.48
2017-18	139.55	19.10	36.95	NA		NA	139.55	19.10	36.95
2018-19	115.04	17.42	36.00	112.05	16.97	36.00	113.54	17.19	35.62
2019-20	107.87	17.82	37.36	110.94	17.32	36.77	109.40	17.57	37.06
2020-21	104.64	17.13	35.87	104.33	16.70	35.53	104.48	16.91	35.70

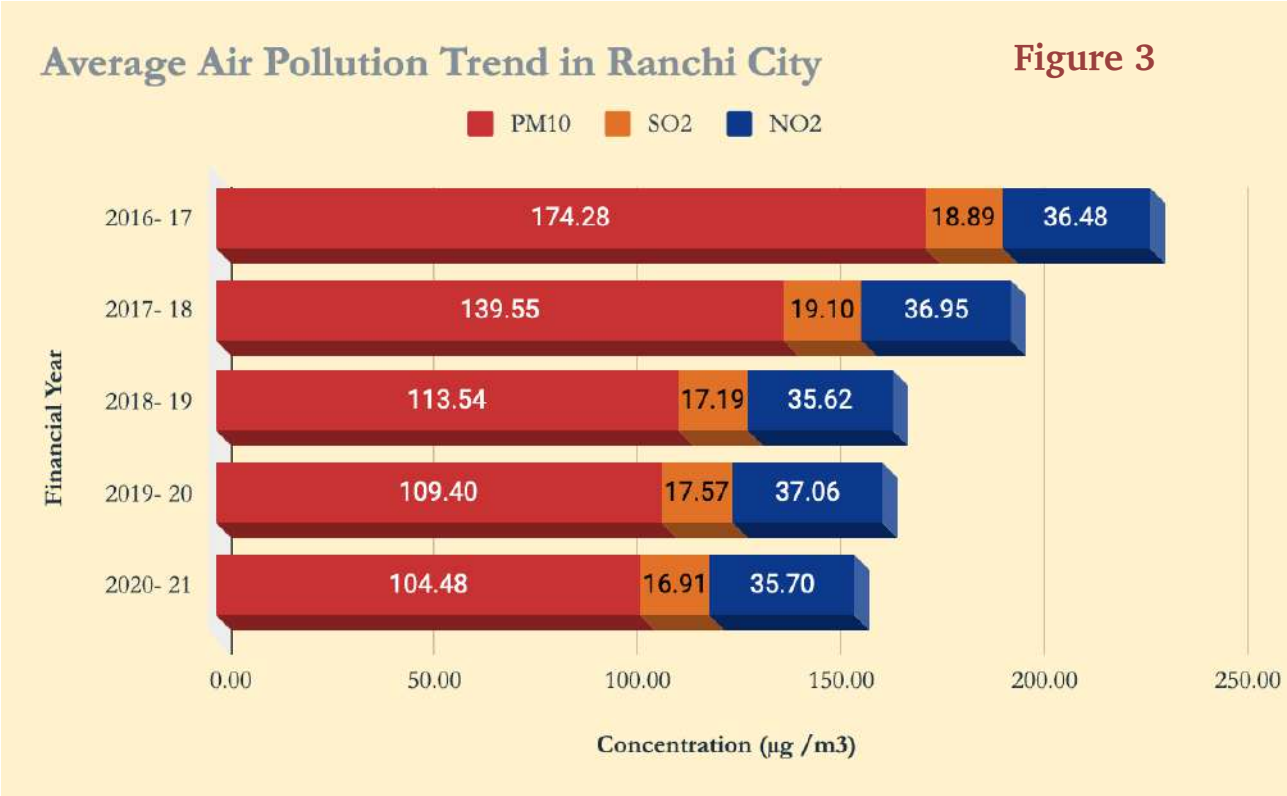

Average Air Pollution Trend in Ranchi City
PM10
SO2
NO2
2016- 17
2017- 18
2018- 19
2019- 20
2020- 21
174.28
18.89
36.48
139.55
19.10
36.95
113.54
17.19
35.62
109.40
17.57
37.06
104.48
16.91
35.70
Financial Year
0.00
50.00
100.00
150.00
200.00
250.00
Concentration (µg /m3)

Figure 3

(A) TRENDS OF MONTHLY CONCENTRATION OF PM10 (2016-2021)

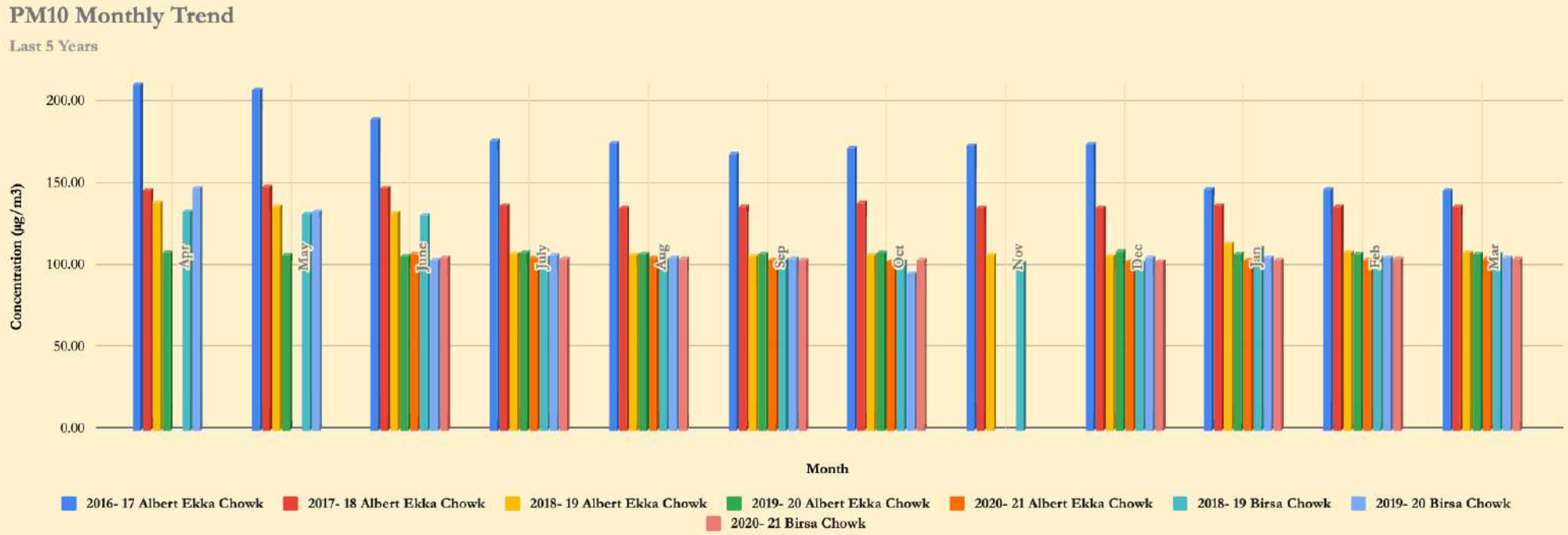
The annual average PM10 concentration during the last five years (2016-2021)[5] has been analysed to understand the long-term trends in Ranchi (see Table 5 and Figure 4). It has been observed that since 2016 the concentration of PM10 in the city has been decreasing. In the year 2020-2021 the PM10 concentration was noted as 104.4 $\mu g/m^3$ and is more than 2 times of the national standard, which is 60 $\mu g/m^3$ [5].

Table 5 : Month wise PM 10 Concentration Trend (2016-2021)

Location	FY	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Albert Ekka Chowk	2016-17	211.3	207.8	189.9	176.8	175.1	168.5	172.5	174.1	174.8	147.0	147.3	146.4
	2017-18	146.4	149.1	147.9	137.4	136.1	136.4	139.0	136.1	135.5	137.0	136.9	136.9
	2018-19	139.0	136.3	133.0	107.9	106.8	106.5	106.9	107.0	106.4	113.7	108.3	108.8
	2019-20	108.3	106.8	106.4	108.2	108.0	107.7	108.3	NA	109.2	107.8	107.9	108.0
	2020-21	NA	NA	108.0	105.4	105.2	103.7	103.4	NA	103.4	103.8	104.1	104.7
Birsa Chowk	2018-19	133.9	132.3	131.5	105.7	104.3	103.6	103.5	102.3	102.7	111.8	105.1	108.0
	2019-20	147.8	133.9	104.3	106.9	105.4	104.6	95.4	NA	105.6	105.4	105.4	105.7
	2020-21	NA	NA	105.3	104.7	104.3	104.2	103.6	NA	103.4	104.1	104.7	104.7

[5] The annual concentration of PM10 for year 2018-2021 is average concentration of two manual monitors installed in Ranchi

Figure 4 : Trend of monthly average concentration of PM10 (2016-2021



(B) TRENDS OF MONTHLY CONCENTRATION OF SO2

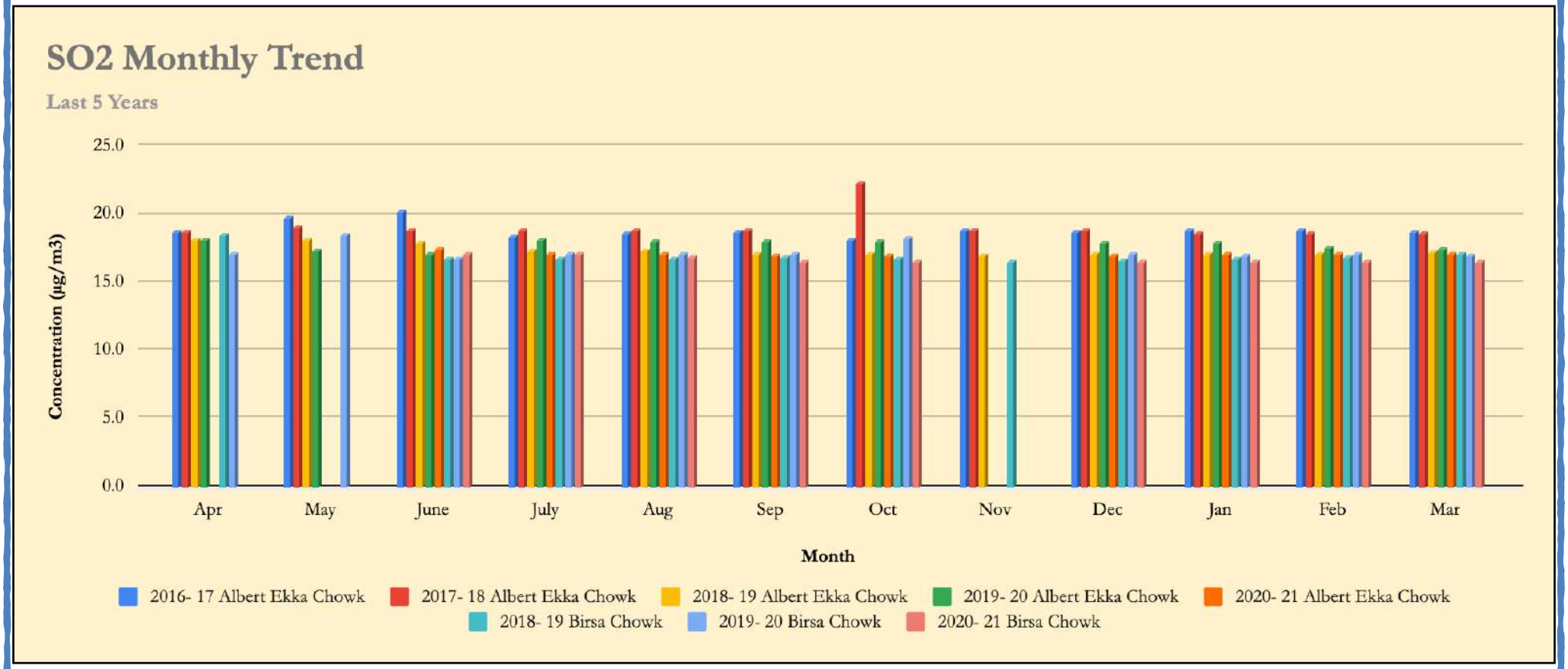
The trend of SO2 in Ranchi for the years during 2016-2021[6] is presented in Table 6. It can be seen from Figure 5 that the SO2 concentrations are below the national standard (50 $\mu g/m^3$) for the entire period. However, a proper check on SO2 concentration is required as it acts as a precursor for particle formation in the atmosphere and it can contribute to the total concentration of particulate matter.

Table: 6 Month wise SO2 Concentration Trend

Location	FY	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Albert Ekka Chowk	2016 - 17	18.7	19.8	20.2	18.4	18.7	18.7	18.1	18.8	18.8	18.8	18.8	18.8
	2017 - 18	18.8	19.1	18.9	18.9	18.9	18.9	22.3	18.8	18.8	18.6	18.6	18.6
	2018 - 19	18.2	18.1	18.0	17.3	17.4	17.2	17.2	17.1	17.1	17.2	17.2	17.3
	2019 - 20	18.2	17.4	17.1	18.2	18.1	18.1	18.1	NA	18.0	18.0	17.6	17.5
	2020 - 21	NA	NA	17.5	17.1	17.1	17.0	17.0	NA	17.0	17.1	17.1	17.1
Birsa Chowk	2018 - 19	18.5	NA	16.8	16.8	16.8	16.9	16.8	16.6	16.7	16.8	16.9	17.2
	2019 - 20	17.1	18.5	16.8	17.2	17.2	17.2	18.3	NA	17.1	17.1	17.1	17.1
	2020 - 21	NA	NA	17.1	17.1	16.9	16.5	16.5	NA	16.5	16.5	16.5	16.5

[6] The annual concentration of SO2 for year 2018-2021 is average concentration of two manual monitors installed in Ranchi

Figure 5 : Trend of monthly average concentration of SO2 (2016-2021)



(C) TRENDS OF MONTHLY CONCENTRATION OF NO2

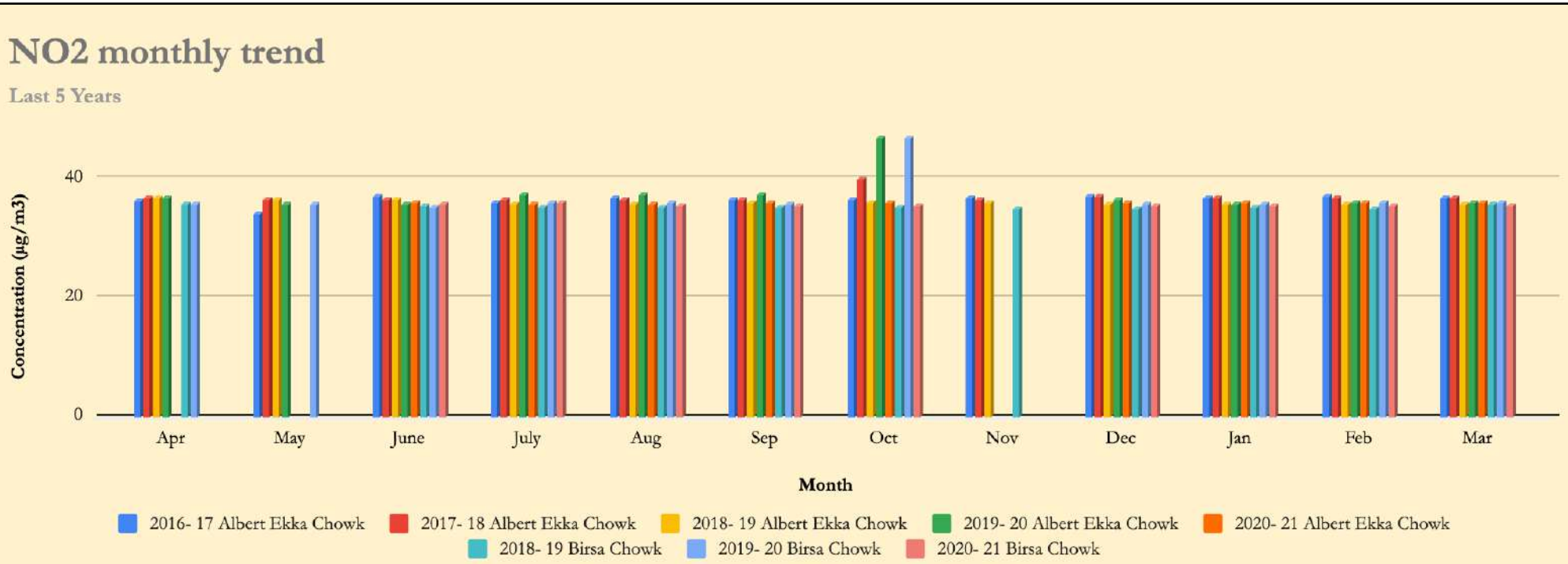
The trend of NO2 concentration in Ranchi is presented below in Figure 6 & Table 7. The annual concentration of NO2 remains within the National Standard (40 $\mu g/m^3$) during 2016-2020[7].

Table 7 : Month wise NO2 Concentration Trend

Location	FY	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Albert Ekka Chowk	2016 - 17	36.3	34	37.1	36	36.9	36.6	36.5	36.8	37	36.8	37	36.8
	2017 - 18	36.8	36.6	36.5	36.5	36.5	36.5	40	36.6	37	36.8	36.8	36.8
	2018 - 19	36.7	36.4	36.6	35.8	35.8	35.9	35.9	36	35.8	35.633	35.7	35.8
	2019 - 20	36.7	35.8	35.8	37.3	37.2	37.4	46.7	NA	36.4	35.844	35.9	35.9
	2020 - 21	NA	NA	36	35.8	35.8	35.9	35.9	NA	35.9	35.855	35.855	35.855
Birsa Chowk	2018 - 19	35.675		35.5	35.2	35.2	35.128	35.133	34.825	35.028	35.133	35.028	35.828
	2019 - 20	35.666	35.675	35.2	35.925	35.862	35.837	46.844	NA	35.733	35.811	35.866	36
	2020 - 21	NA	NA	35.8	35.866	35.411	35.411	35.411	NA	35.411	35.477	35.477	35.477

[7] The annual concentration of NO2 for year 2018-2021 is average concentration of two manual monitors installed in Ranchi

Figure 6 : Trend of monthly average concentration of NO2 (2016-2021)



(D) ANNUAL TREND OF POLLUTANTS (PM 10 & PM 2.5)

In Ranchi, classifying days according to the National Air Quality Index (NAQI) is difficult as ambient air quality monitoring is based on manual monitors. However, the analysis of the average maximum and minimum concentrations (average) of pollutants (PM10, SO2 and NO2) from manual monitors indicate a situation where episodes of smog would have occurred. Most of the time, PM10 concentrations have exceeded the national 24-hour limit. The analysis of the minimum concentration (average value) also shows the value of PM10 and PM2.5 in Table 8. As recommended in the 15th Finance Commission Report, 2019 is considered as a benchmark for annual average concentration of PM10 and PM2.5.

Table 8 : Annual Average 24 hr Concentration of PM10 & PM2.5 (Source: JSPCB)

Name of City	PM10 ($\mu g/m^3$) or RSPM	PM2.5 ($\mu g/m^3$)or FPM
	24 hr (Annual Average)	24hr (Annual Average)
	Year-2019	
Ranchi station Name: Albert Ekka Chowk	159	91
NAAQS 2009	100	60

3. GAPS IN DATABASE AUGMENTATION

3.1 GAPS IN DATA MANAGEMENT OF MONITORING OF POLLUTION SOURCES

A robust data management of various pollution sources with well-defined periodicity is important for preparation of the action plan and also to monitor the impact of various measures for improvement of air quality in the city. Unfortunately, there is a lack of consistent air quality data in most of the cities and Ranchi is no exception to this. A successful monitoring strategy requires equipment, skilled manpower and institutional systems to ensure that data should be accurate, properly analysed and communicated to decision-makers for desired objectives.

It must be noted that an emphatic management of air pollution in developing countries like India is hampered by a lack of expertise, technology, and adequate information. In such a scenario, demonstration/pilot projects including a prototype development for the best available technologies and environmental practices for pollution prevention, minimisation, and mitigation strategies are needed. The experience from around the world demonstrates that abatement of air pollution can be done through multi-pronged strategies involving interventions at institutional, policy, and technical levels.

Air quality monitoring is being done by JSPCB through manual monitoring stations. Presently, the regional offices do not have state of art air quality analysis labs, and also the equipment which is needed for air quality monitoring from point and line sources are not available. The human resource and their capacity for data collection, analysis, and data interpretation are also not available. This plan envisages the establishment of an Air Quality Monitoring Lab along with the trained staff & researchers for periodic monitoring of air pollution in the city for a better data analysis/interpretation.

3.2 SOURCE APPORTIONMENT & CARRYING CAPACITY STUDIES

It is necessary to understand the contribution of different sources of pollution for the planning of source-specific focused interventions for meeting the targets of improvement in the air quality in a time-bound manner. The Comprehensive Source Apportionment Study (CSAS) for Ranchi City is not available which is identified as a gap in the database augmentation. The comprehensive source apportionment & carrying capacity studies will be conducted in due course of time through organisations of repute having ample experience in carrying out such studies and the action points will be prioritised and reviewed on the apportionment of various sources in the City.

4. INSTITUTIONAL ARRANGEMENT FOR PLANNING & IMPLEMENTING MEASURES

4.1 CIVIC AWARENESS & EDUCATIONAL INITIATIVES

The most important initial step is public awareness and their active support for controlling the level of air pollution. Civic awareness towards prevention, control, and mitigation of air pollution combined with specific information sharing on health advisories is essential, which provides communities with the knowledge and tools to take action and help improve air quality in their locality. In addition to these, problem areas can easily be identified and monitored using citizen science methods, empowering communities, and reducing the risks of exposure to air pollution. It has been rightly noted that extensive awareness and outreach programs for various stakeholder groups need to be taken up for the non-attainment cities. Since building public awareness will be vital in supporting the implementation of the action plan, this will be achieved through national portals, media engagement, civil society involvement, curricula reform, and recognitions / awards, etc.

City-specific awareness programs targeting key stakeholders have been initiated which includes awareness generation in public for the prevention of adverse effects of air pollution and sensitisation of the media for the right interpretation of international reports and data. Information Education & Communication activities are being undertaken for the dissemination of air pollution-related information for the awareness of the general public through various social media platforms of departments engaged in the city action plan. It is also planned to engage educational institutions (schools, colleges, etc.) through workshops, seminars, competitions, etc. With air quality rightly ingrained in public health frameworks and local authority jurisdiction, the public can become more involved in reducing local air pollution impacts in their communities.

4.2 TRAINING & CAPACITY BUILDING

One of the major issues, which is a hurdle for effective implementation of air pollution management plans have been observed to be a lack of capacity of in-house capability and adequately trained manpower on air quality issues due to limited manpower and infrastructure in the JSPCB and Urban Local Body (ULB) like Ranchi Municipal Corporation and sheer lack of formal training for various associated stakeholders. The state agencies face a limited number of trained individuals in air quality management,

limited publications designed to provide information on local air quality issues, limited collaboration between government, universities, and other research institutions, lack of a forum for sharing of published local research work on air quality, etc. If this is not set right, all other improvements in infrastructure and processes, etc. would not yield expected results. Therefore, the key areas to focus on are:

- ULB – waste management, plantation schemes, maintenance of roads, dust suppression measures, development of green infrastructure, etc.
- JSPCB – Internal training on the handling of machinery and equipment for sampling and analysis
- Industries – best practices for boiler and furnace operation, retrofitting of DG sets, up-gradation of machinery with cleaner technologies, usage of clean fuel
- Construction projects: control measure for fugitive dust, segregation, handling, and disposal of Construction & Demolition (C&D) waste.

Through this action plan, it is envisaged that extensive capacity-building programs for manpower and infrastructure augmentation in the JSPCB & other line departments/ agencies will be formulated and intensive training, comprising national and international best practices and technological options, of all the associated stakeholders will be organised in the plan period.

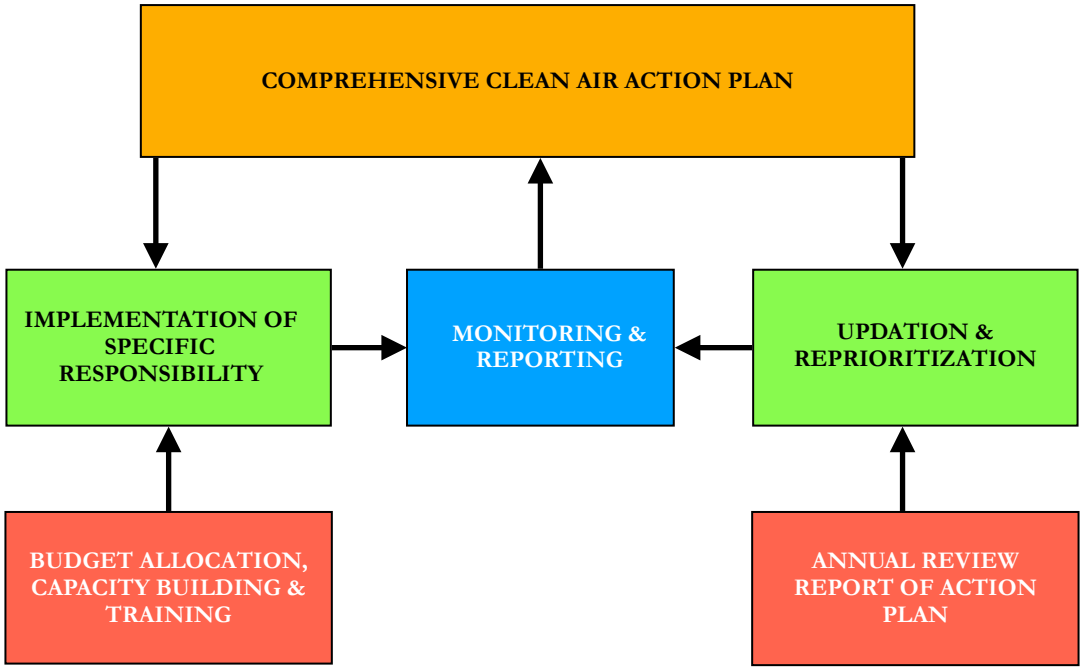
It is also envisaged that online training modules on the subjects of Solid Waste Management, Plastic Waste Management, C&D Waste Management and Operation and maintenance of Air Pollution Control Systems installed in industries and other sources shall be carried out to improve the overall capacity of the human resource for enhancement of clean air actions in the city.

The individuals may also be trained for augmenting their participation/services for monitoring of pollution sources where they may act as skilled personnel. The various aspects on which training shall be provided include sampling and analysis, operation of machinery and equipment related to air quality management and monitoring, etc. All such trained individuals will form a panel through which the trained personnel may be engaged by the concerned department on a pro-rata basis from time to time as per requirement and type of skills.

4.3 MONITORING MECHANISM

According to the National Clean Air Program, the Chief Secretary of the State should head the Steering Committee of the Comprehensive Clean Air Action Plan (CCAAP), with highest-level representation from each department. The State has similarly formulated a comprehensive monitoring mechanism with a well-defined monitoring protocol. The Monitoring mechanism developed by the State is a three-tier in which regular monitoring is being done at the District and the State level. The monitoring at State level is being undertaken by a dedicated Air Quality Monitoring Committee (AQMC) under the Chairmanship of Special Secretary, Environment, Forest & Climate Change. The structure of Monitoring is as detailed below in Figure 7.

Figure 7 : Flowchart of Monitoring of CCAAP



(A) AT STATE LEVEL

The State has developed a monitoring mechanism taking into consideration the requirement of statutes and action plans. The detail of AQMC constituted by the State of Jharkhand is as indicated in Table 9:

Table 9 : Air Quality Monitoring Committee			
Name of Committee	**Chairperson**	**Members**	**Work area**
Air Quality Monitoring Committee	Special Secretary, Dept of Forest , Environment & Climate Change Dept	Member Secretary-JSPCB; Director-Agriculture Dept; Director-State Urban Development Agency; Commissioner - Transport Dept; Director-Industries Dept;	Effective Air Pollution control in the state and maintaining of ambient air quality

(B) THREE TIER MONITORING STRUCTURE

The detail of Three ties monitoring structure constituted by the State of Jharkhand is as follows in Table 10:

Table 10 : Three Tier Monitoring Structure	
State Level	Chief Secretary (Govt of Jharkhand)
AQMC (State Level)	Special Secretary, Dept of Forest, Environment, & Climate Change
District Environment Committee	District Magistrate

4.4 EXECUTIVE AGENCIES

The action plan has outlined the responsibilities for many agencies that are involved to facilitate a cohesive coordination. Following agencies are responsible for implementation of CCAP.

- Transport department
- Urban Local Bodies (e.g. Ranchi Municipal Corporation)
- Jharkhand State Pollution Control Board
- Urban Development and Housing Department
- Department of Mines & Geology
- Department of Industry
- Department of Environment, Forest & Climate Change
- District Administration
- Department of Energy
- Regional Development Authority

5. SOURCE PROFILING AND EMISSION INVENTORY OF RANCHI

The air quality management has two pre-requisite, first the identification and quantification of sources that contribute to pollution levels; and second the evaluation of scenarios for future emissions to assess the effectiveness of mitigation measures to control air quality levels. The Source Apportionment Study helps to identify and quantify the sources of air pollution. It scientifically determines the contribution of various sources of pollution in an area and based on which mitigation measures are planned. The study is also helpful in prioritising some sources or deprioritizing others based on the contribution to overall air pollution. Therefore, an action plan based on the source apportionment study is crucial and will set a direction to achieve the target of clean air

There are two ways to conduct the source apportionment; a top down approach (collecting samples & analysing them in lab) and bottom approach (to use existing data and surveys) as the Figure 8 shows here.

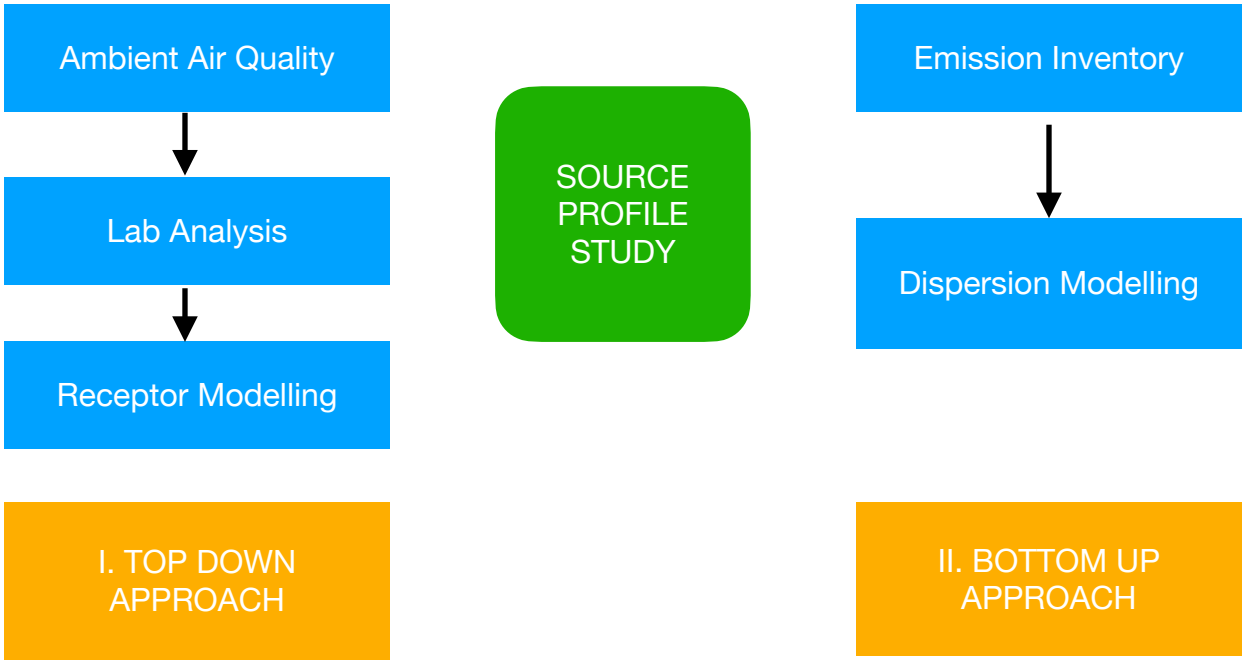


Figure 8: Diagram of process for conducting Source Profile study

Methodological Approach for developing Source Apportionment :

A bottom-up approach has been used to develop the source apportionment of Ranchi, the process is explained in the flowchart below in Figure 9.

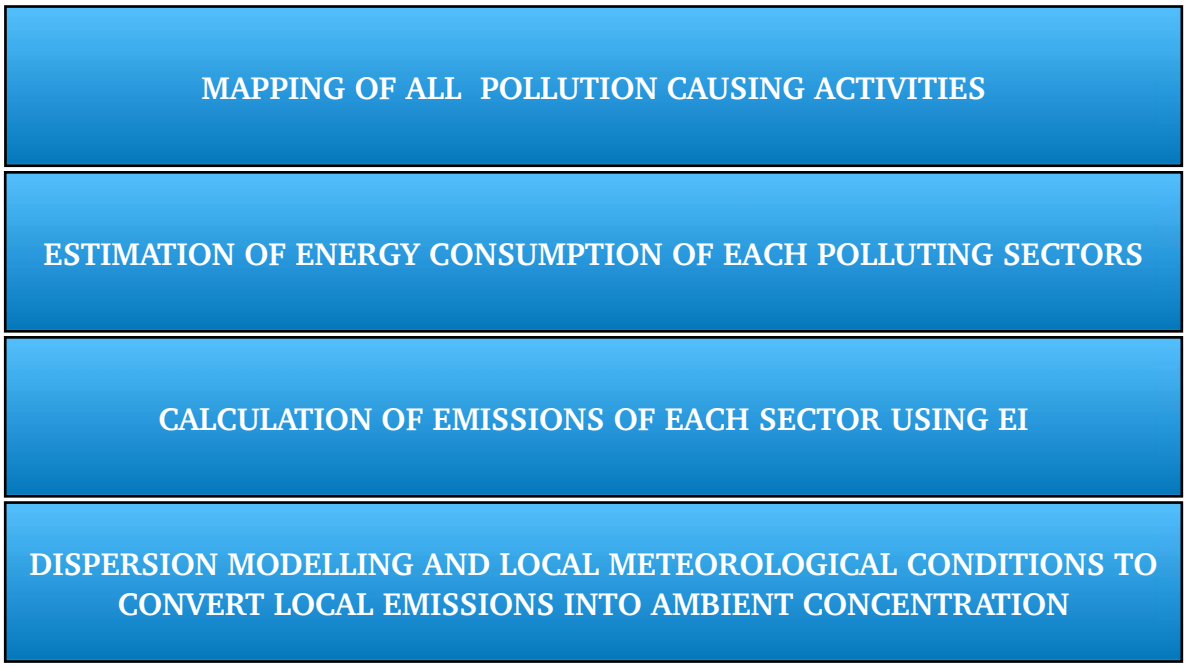


Figure 9: Flowchart of steps employed in source apportionment of Ranchi

An emission inventory is established for all the known sectors of the district and processed through meteorology coupled chemical transport models to ascertain their share of contribution to the air shed. The Emissions Inventory (EI) for Ranchi has been developed for total PM in size fractions of PM2.5. The major sources of air pollution in Ranchi have been identified qualitatively and through assessment of secondary information available. Moreover, meetings, surveys and physical visits have been helpful in assessing the key sources.

After identification of each sector, the energy consumption and emission factor has been assessed. The secondary information has been collated from the pollution control board, census bureau, national sample survey, industries' annual survey, municipal waste management, and publications from academic and non-governmental institutions has been used. For instance, industrial energy consumption has been identified using audits and energy statistics, vehicle population has been analysed using official transport data, and energy use at household level has been computed using the census 2011 data.

A 40 km x 40 km domain was selected to assess the air quality of Ranchi. This domain is separated into a 1 km grid to study spatial variations in emissions and pollution loads. This emissions inventory is based on the available local activity and fuel consumption estimates for the selected urban air-shed (presented in the grid above).

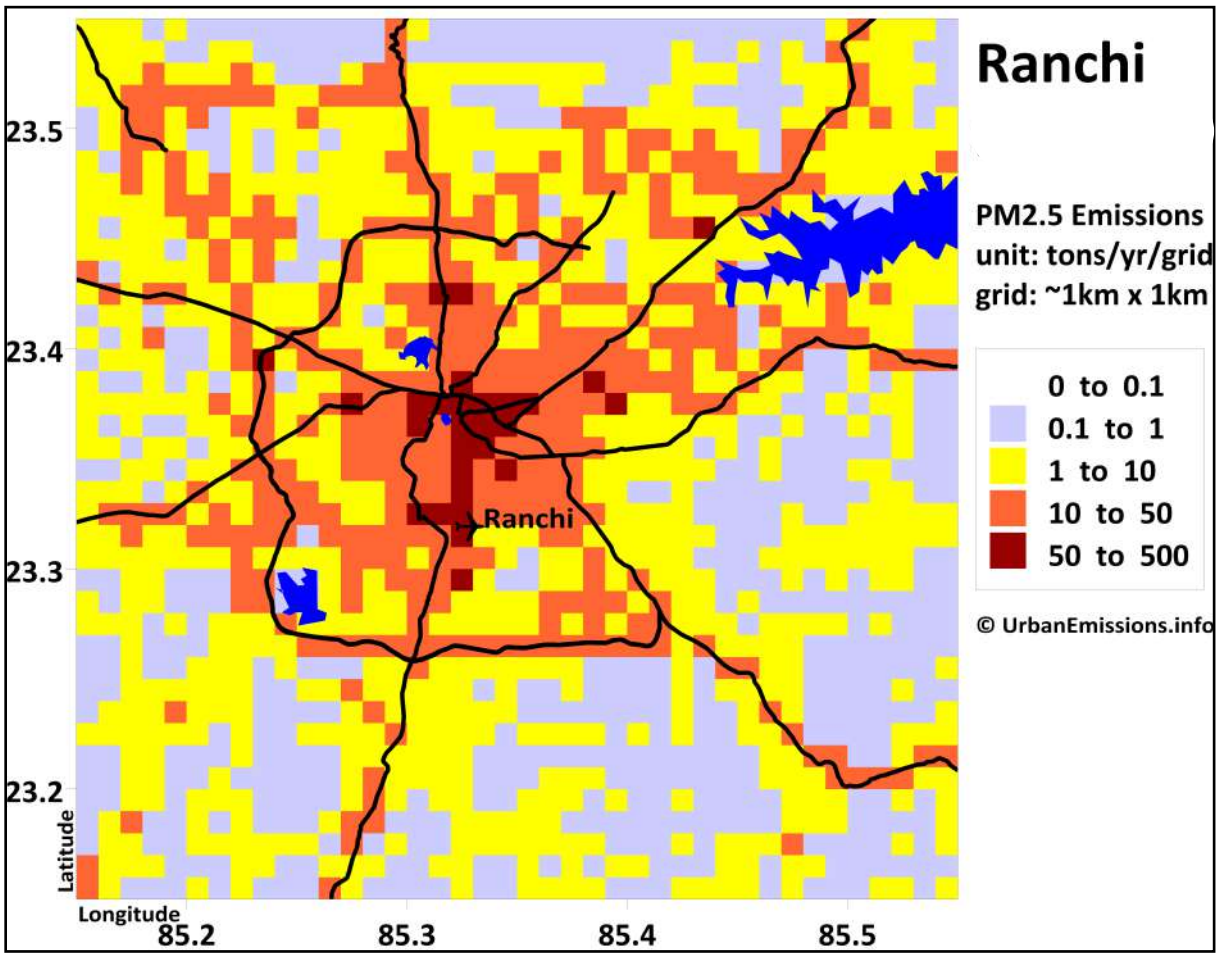


Figure 10 : Gridded PM2.5 Emissions

The emissions inventory was then spatially segregated at a 0.01° grid resolution in longitude and latitude (equivalent of 1 km) to create a spatial map of emissions for pollutants (below is the gridded PM2.5 emissions and the total (shares by sector) emissions.

Ambient PM2.5 concentrations and source contributions were calculated using gridded emissions inventories, 3D meteorological data (from WRF), and the CAMx regional chemical transport model. The model simulates concentrations at 0.01° grid resolution and sector contributions.

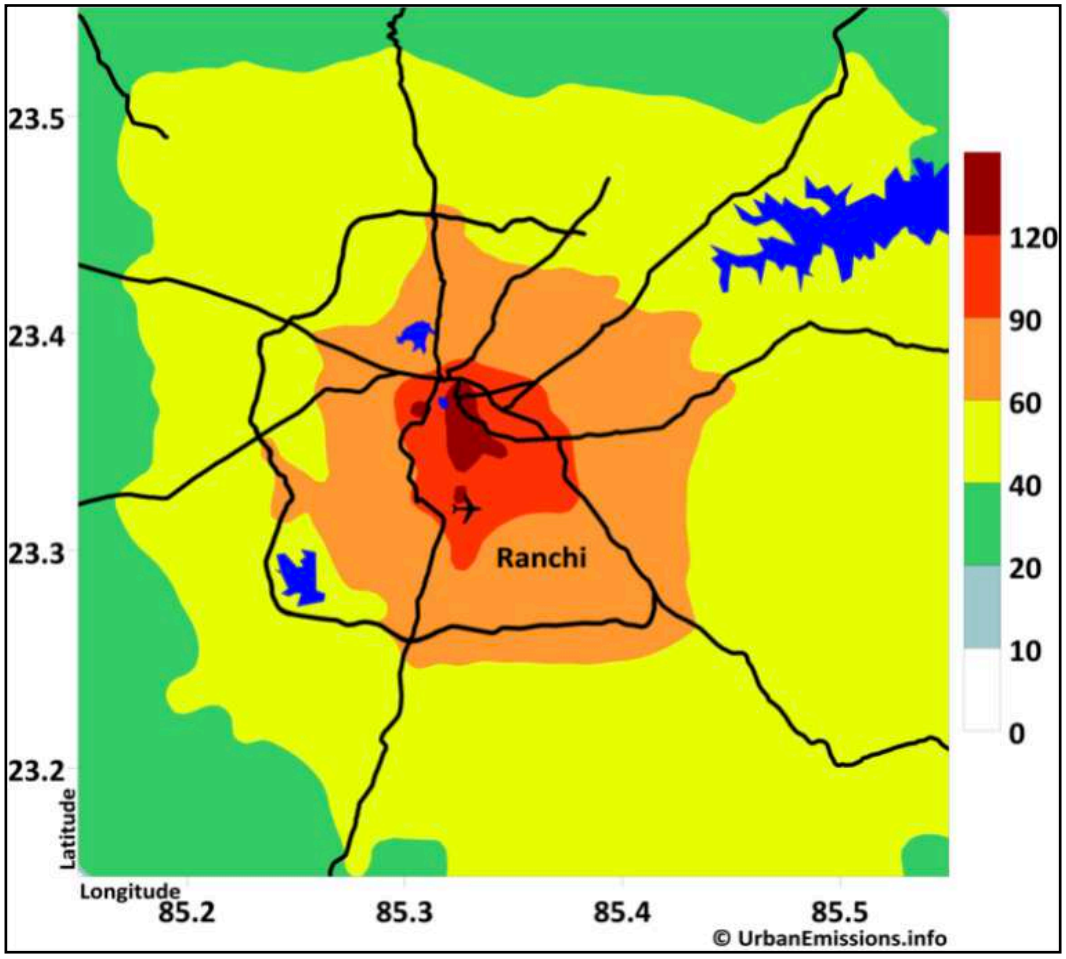


Figure 11 : Modelled annual Average of PM2.5 concentration

As Figure 12 indicates that the transport sector is the highest contributor of PM2.5 with 22% of pollution load followed by domestic cooking on biomass and road dust. A major proportion of the estimated annual PM2.5 pollution in the city is coming from outside or transboundary level (30% of total pollution load), which suggests that a proper airshed management plan is also required. Solid fuel burning for cooking & lighting for domestic purposes contributes 17%. Furthermore, Dust contributes 15% of the total load where incidence of open waste burning has 11% of the total contribution in the city. DG sets and brick kilns each contribute 2% of the total pollution load in Ranchi, while industries have merely 1% contribution.[8]

[8] [8] Estimates based on the source profile of year 2015 prepared by Urban Emissions.info

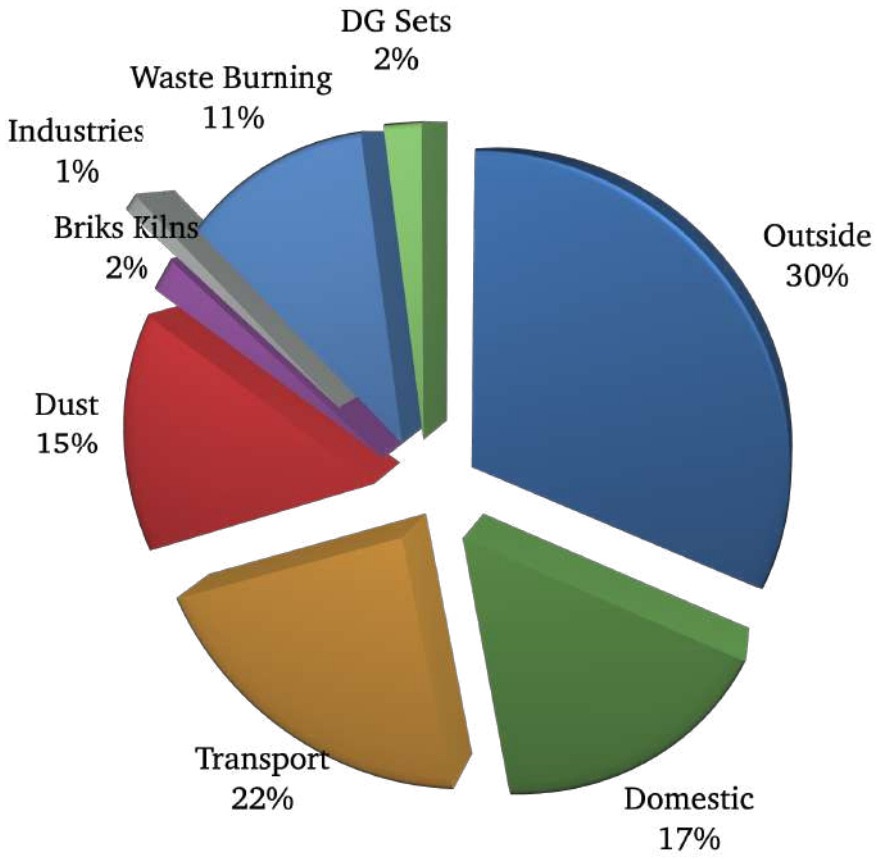


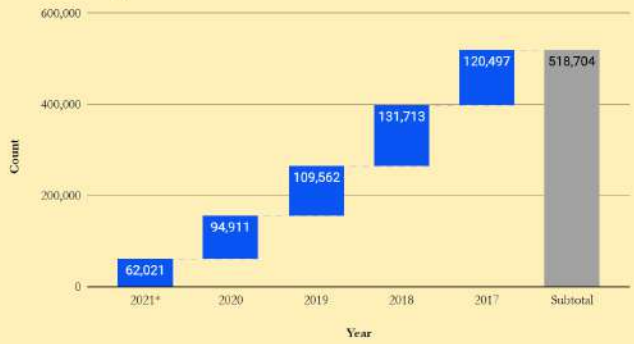
Figure 12 : Source wise percentage share in Ranchi (2020)

- Domestic: Contribution of domestic cooking, space /water heating, and lightning
- Dust: Contribution of re-suspended dust on the roads and construction activities
- DGS: Contribution of Diesel Generator Sets (DGS)
- Brick kilns: Contribution of brick kilns
- Waste burning: Contribution of open waste burning
- Industries: Contribution of industrial activities
- Transport: Contribution of passenger transport and freight transport (heavy and light trucks, non-road vehicles, and shipping)
- Others: Contribution of anthropogenic emissions from outside (and within the modelling domain) and natural emissions

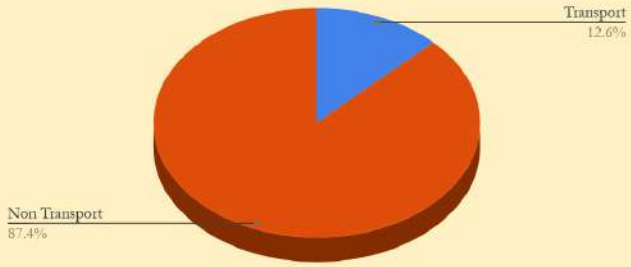
5.1 VEHICLES & TRANSPORT

While the road transport sector is not the singular cause of rising air pollution in Ranchi, its contribution, notwithstanding, is quite massive with 22%. In the last few decades the considerable growth of private vehicles has been seen (see Figure 13). The analysis of data from the Ministry of Road Transport & Highway reveals that the personalised vehicle shares the maximum percentage of the vehicle population in Ranchi.[9] Figure 14,15,16 & 17 presents various aspects of vehicles in the city.

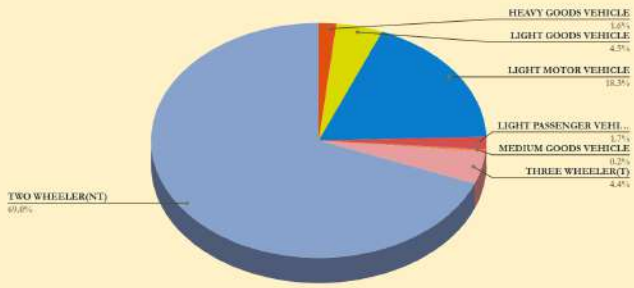
Vehicles Registered in last 5 Years — Figure 13



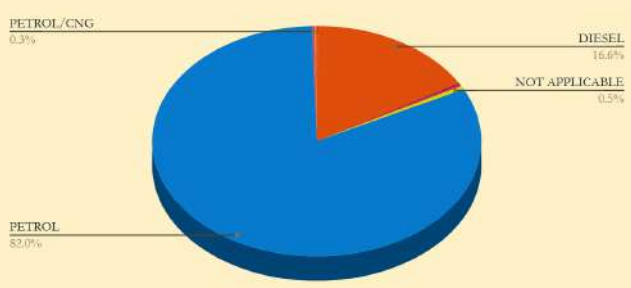
Vehicle Class Comparison — Figure 14



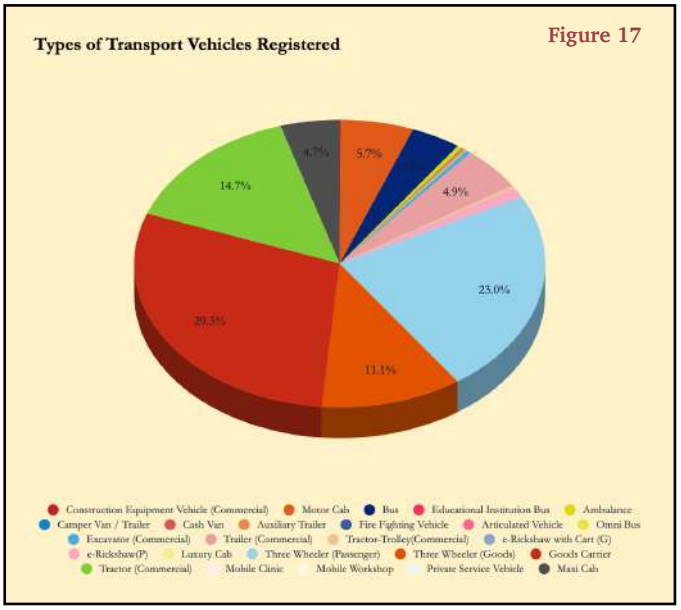
Categories of Vehicles — Figure 15



Fuel Type of Registered Vehicles — Figure 16



Types of Transport Vehicles Registered — Figure 17



[9] https://www.indiastat.com/table/transport-data/30/registered-motor-vehicles-in-metropolitan- cities/452565/1308542/data.aspx

(A) COMMON ISSUES FACED BY TRAFFIC & TRANSPORT SECTOR

- Most of the roads in the area are encroached by permanent or temporary encroachments, leading to diminution of road width and capacity as a result the roads have capacity constraint in inner built-up areas, inner cordon roads, and even at some points the regional and outer cordon roads have lesser width/related infrastructure.
- No comprehensive Traffic Management Plan has been prepared for the city; the only methodology adopted is the traffic plan by police is done in a non-technical way.
- The quality of roads is of poor quality which also affects smooth traffic and lifecycle of the vehicles.
- The Pedestrian facilities on all most all the roads of different levels are inadequate, promoting less pedestrian but more traffic movement
- Limited provision for bicycles: In the entire city provision required infrastructure to promote cycle movement in the city is very limited
- The city also faces informal marketing on the roadside as hawkers, roadside vendors, informal arrangements of vegetable /grocery item vendors is a serious problem in the city, affecting road efficiency.
- A large number of markets, commercial and other activity centers on various roads in Ranchi are suffering from inadequate parking facilities. On most of these stretches, the root cause of the congestion on the street is caused due to on-street parking.

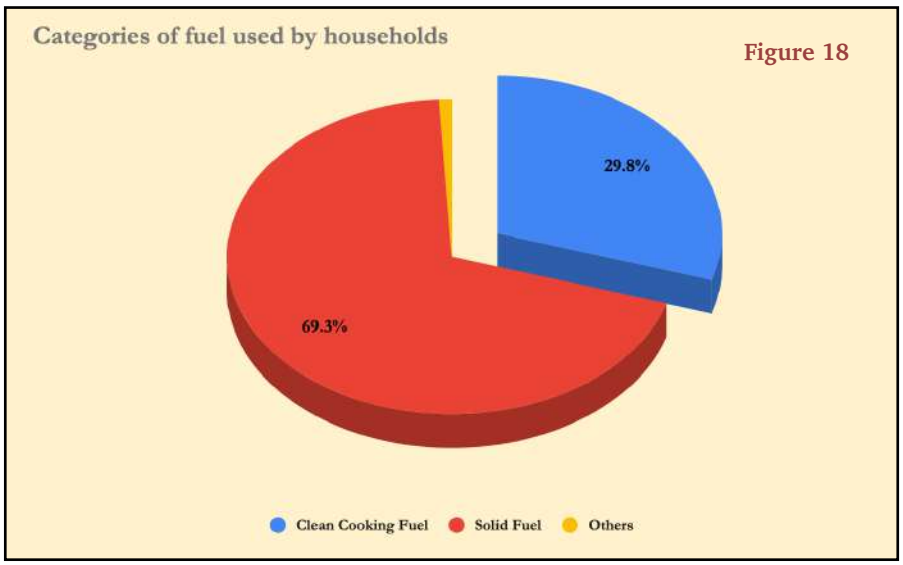
(B) FUTURE STRATEGIES & PLAN:

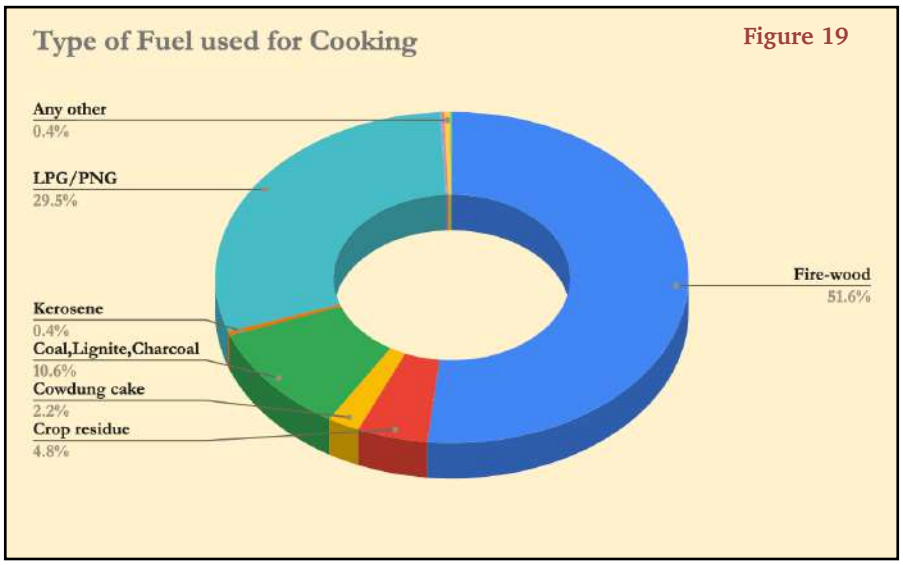
A good quality Comprehensive Mobility Plan needs to be updated and implemented with clearly defined timelines. The plan envisages various elements indicated here:

- Mobility corridor plan, road capacity augmentation, promoting public transport system with fleet augmentation and its Infrastructure,
- Establishment and relocation of Inter-city bus terminals,
- Promoting, Non-motorised transport with separate pedestrian crossing, dedicated cycle track, freight management and parking management,
- Use of alternative fuel cleaner like CNG, LPG, electricity, ethanol-blended fuel,
- Regular checks on vehicle fitness and Phasing out of old unfit vehicles

5.2 SOLID FUEL FOR COOKING & HEATING IN DOMESTIC PURPOSE

Coal consumption in households for cooking and lighting has led to the increase in the pollution levels in Ranchi. District level data shows that most of the households still use solid fuel as domestic fuel for cooking although most of them are in rural or semi urban areas but its contribution to air pollution of Ranchi cannot be ignored. The use of coal in commercial cooking (Dhaba, Open eateries) is also a major challenge. The district level census-2011 data of Ranchi shows that the majority of the households use solid fuel as a cooking fuel (Figure 18). Only 29% of the total population in Ranchi district uses clean fuel for cooking in households (see Figure 19.[10]





The number of households using LPG/PNG, as a cooking fuel is highest in Ranchi among the other districts of Jharkhand, though still a major population relies on solid fuel. However, due to Pradhan Mantri Ujjwala Yojna (PMUY) and several other initiatives to promote cleaner energy options, the number of households using solid fuel has decreased in Ranchi but still the situation is far from favourable. The clean fuels should be made economically viable for domestic use as

[10]Census Survey-2011

compared to cheaper solid fuels such as coal, firewood and crop residues. Ranchi requires 100 percent LPG penetration for reliable supply for domestic and commercial usage, which will also require strong public awareness program support.

5.3 INDUSTRIES

The air quality of Ranchi is also affected by industrial emissions. Industries located inside or around the periphery of the city pollute the air of Ranchi as air pollution is a trans-boundary phenomenon. About 4054 registered industrial units are in the district, as reported by MSME-Development Institute[12]. There are several designated industrial areas in and around namely Tupudana, Kokar, Getalsud, Namkum, Tatisilwai-I and Tatisilwai-II. The major large-scale industries in Ranchi are Heavy Engineering Corporation, Garden Reach ShipBuilders Ltd, Central Coal Field Ltd, Steel Authority of India Ltd, Sikidiri Hydro Power Plant (JSEB) and Hindalco Ltd[11]. (See Table 11)

Table 11: List of industries/units in and around RMC area

Sl	Name of the Industries	Address of industries	Dist.	Type of Industries
1	M/s Foundry Forge Plant, HEC	H.E.C., Dhurwa, Ranchi.	RANCHI	Industry or processes involving foundry operations
2	M/s Heavy Machine Building Plant, HEC	H.E.C., Dhurwa, Ranchi.	RANCHI	Engineering workshop, machine shop, fabrication shop, smithy shop, press shop
3	M/s Heavy Machine Tools Plant, HEC	H.E.C., Dhurwa, Ranchi.	RANCHI	Engineering workshop, machine shop, fabrication shop, smithy shop, press shop
4	M/s Usha Martin Limited (Wire Rope and Specialty Products Division)	Tatisilwai, Ranchi	RANCHI	Wire & Wire Rope
5	M/s Usha Martin Limited (Specialty Products Division)	Tatisilwai, Ranchi	RANCHI	Conveyor Chord, Wire etc.
6	M/s CAPTIVE POWER PLANT (2X10 MW), USHA MARTIN LIMITED.	Tatisilwai, Ranchi	RANCHI	Captive Power Plant.
7	M/s Pengg Usha Martin Wires Pvt Limited	Tatisilwai, Ranchi	RANCHI	Wire Tempered Wire / Patented Wire

[11] http://dcmsme.gov.in/dips/2016-17/Ranchi.pdf

Table 11: List of industries/units in and around RMC area				
8	M/s PRASAD EXPLOSIVES & CHEMICALS	At: Pandra, P.O. Kamre, Dist. Ranchi	RANCHI	Emulsion Matrix
9	M/s Ammonia Supply Company.	At.-Kamre, Dist.-Ranchi.	RANCHI	Ammonia refilling.
10	M/s Mineral Resources	At.-Namkum Industrial Area, Po-Namkum, Ps-Namkum, Dist.-Ranchi	RANCHI	Minerals grinding
11	M/S Foundry of India	Kokar Industrial Area, Mauza-Kokar, Ranchi	RANCHI	Iron and Steel (Involving processing from ore/scrap/ integrated steel plants).
12	M/s Rajesh Chemical Pvt. Ltd	64/65, TUPUDANA INDUSTRIAL ESTATE. HATIA, RANCHI JHARKHAND	RANCHI	Paints and varnishes (excluding blending/ Mixing).
13	M/S SETHI RECLAIMERS	AT- SIMALIYA, PO-RATU, RANCHI	RANCHI	Tyre Pyrolysis Process
14	M/s MODERN ABATTOIR COMPLEX	MODERN ABATTOIR COMPLEX, Arsande, Ranchi	RANCHI	Slaughter house (as per notification S.O.270(E)dated 26.03.2001) and meat processing industries, bone mill, processing of animal horn, hoofs and other body parts
15	M/S HINDUSTAN BATTERY	KOKAR INDUSTRIAL AREA, RANCHI	RANCHI	Lead re-processing & manufacturing including lead smelting.
16	M/S DADHEECHI FOODS (P) LTD	AT-5 TATISILWAI, INDUSTRIAL AREA, PHASE-I, RIADA, RANCHI	RANCHI	Food and food processing (with more than 1o lakhs investment on plant & machinery).
17	M/S CHHOTANAGPUR REFRACTORIES	Ancillary industrial area	RANCHI	Ceramic / refractory.
18	M/S THE WAXPOL INDUSTRIES LTD.	AT.- HB ROAD BOOTY, DIST.- RANCHI	RANCHI	Brake fluid Shellac Gasket Cement Glass Cleaner-Polish Auto C1eaner Rubbing compound etc. Making unit.
19	M/s Poddar Agrotech Pvt Ltd	Tupudana Industrial Area,	RANCHI	Lead re-processing & manufacturing including lead smelting.

Table 11: List of industries/units in and around RMC area				
20	M/s UNIQUE SOLUTIONS	140 A, TUPUDANA INDUSTRIAL AREA	RANCHI	Glass molding units.
21	M/s INDIAN OIL CORPORATION LIMITED, RANCHI DEPOT(NEW)	INDIAN OIL CORPORATION LIMITED, RANCHI DEPOT(NEW), NAMKUM, RANCHI - 834010	RANCHI	Oil Depot
22	M/s Shree Shakambari Rice Mill Pvt. Ltd.	Industrial Area, Tupudana, Hatia Ranchi	RANCHI	Rice Mills
23	M/s Neeraj Stone Works (Stone Mines)	At+Mauza-Balsiring Po+Ps-Hatia, Dist.-Ranchi	RANCHI	Stone Mines
24	M/s Sri Lal Harinath Sahdeo	Village- tupudana, P.o-Tupudana, P.S- Dhurwa, District-Ranchi	RANCHI	Stone Mines
25	M/s Niraj Kumar	At.-Hardag, Po-Hatia, Dist.-Ranchi	RANCHI	Stone Mines
26	M/s Bhilai Chemicals (P) Ltd.	At+Mauza-Tupudana Industrial Area, Po-Hatia, Dist.-Ranchi	RANCHI	Coal Tar distination
27	M/s T&T METALS PRIVATE LIMITED	AT-TUPUDANA INDUSTRIAL AREA, PO-HATIA, DIST.-RANCHI	RANCHI	MS Ingot.
28	M/S S.S.H. AGROTECH (P) LTD	PLOT NO: 19P/20/21P, TATISILWAI INDUSTRIAL AREA PHASE-II, RANCHI, JHARKHAND	RANCHI	Rolling mill
29	M/s Aarnav Powertech	21P, Tatisilwai Industrial Area, Phase 1, Tatisilwai, RANCHI	RANCHI	Unit Manufacturing Electrical Transformer
30	M/s Hemkund gases	plot 17P, phase-2, tatisilwai Industrial area	RANCHI	Storage of Petroleum Product.
31	M/s Bharat Minerals & Ceramic Industries	Purulia Road, P.O. Mahilong, Ranchi	RANCHI	Ceramic / refractory.
32	M/s Fortune Infra Partners LLP	86, 87B, 88, 89B, Khata No. 47, 98, Tupudana Ind. Area, Ranchi	RANCHI	Galvanizing of steel structure
33	M/s Miki Wire Works Pvt Ltd	Mahilong Ranchi	RANCHI	Wire drawing and wire netting
34	M/s ULCAA MONOFRAX COMPANY	47P & 48 ANCILLARY INDUSTRIAL AREA, TUPUDANA, HATIA, RANCHI-834003	RANCHI	Ceramics and Refractories
35	M/s Express Confectioners Pvt. Ltd	At+P.O- Mahilong, Distt-Ranchi	RANCHI	Bakery

Table 11: List of industries/units in and around RMC area				
36	M/s BIRMA INDUSTRIAL & BUSINESS ENTERPRISE PVT LTD.	56, TUPUDANA INDUSTRIAL AREA HATIA RANCHI-834003	RANCHI	Engineering workshop,
37	M/s SHIV GANGA ENTERPRISES	52/53C, ANCILLARY INDUSTRIAL AREA P.O. HATIA RANCHI - 834003 JHARKHAND	RANCHI	Engineering workshop,
38	M/S CHORUS AGRO PRIVATE LIMITED	INDUSTRIAL AREA TUPUDANA	RANCHI	Parboiled Rice Mills
39	M/s BOHRA SALES & SERVICES LTD.	14-P, INDUSTRIAL AREA, KOKAR, RANCHI	RANCHI	Plastic Products.
40	M/s SHRI RAM WIRE	Industrial Area, Kokar	RANCHI	Wire drawing (cold Process) and bailing straps.
41	M/s SMV AGRO PRODUCTS PVT LTD	At- Ara Gate, Mahilong, Namkum, Ranchi	RANCHI	Parboiled Rice Mills
42	M/s VICKY ENAMEL INDUSTRIES PVT. LTD.	54/55 TUPUDANA INDUSTRIAL AREA HATIA	RANCHI	Engineering workshop,
43	M/S J. K. POLY PLAST	Berwari, Childag, Ranchi	RANCHI	Plastic Products.
44	M/s Shree Mahabir Refractories Works	Ancillary Industrial Area Tupudana Hatia Ranchi 834003 (Jharkhand)	RANCHI	Ceramics and Refractories
45	M/s Bihar State Milk Co-op. Fed Ltd. Ranchi Dairy	At+Mauza-Sector-02, HEC, PO-Dhurwa, Dist.-Ranchi	RANCHI	Dairy and dairy products (small scale)
46	M/S Garden Reach Shipbuilders & Engineers Ltd.	Plant Plaza Road, Dhurwa, Ranchi	RANCHI	Diesel Engine
47	M/s PRAGATI CHEMICALS INDIA	TIPUDANA INDUSTRIAL AREA	RANCHI	Food and food processing including fruits and vegetable processing
48	M/s Chaika Polymers Pvt. Ltd	Plot No 45, 46 tupudana Indistrial Area, Ranchi-3	RANCHI	Plastic Products.
49	M/S Balaji Food Products	At - Industrial Areas, Tatisilwai, Distt - Ranchi	RANCHI	Foods production
50	M/s Pure & Sure Products	Plot No - 54 & 55 (P), Phase - II,Riada industrial estate Tatisilwai, Ranchi	RANCHI	Poultry feed and cattle feed
51	M/s Mineral India	At.-9P, Industrial Area, Kokar, Ranchi	RANCHI	Minerals grinding
52	M/s. Wali & Brothers Plastics	Hutup, Ranchi.	RANCHI	Reprocessing of waste plastic including PVC

Table 11: List of industries/units in and around RMC area				
53	M/s Nitcab Electric India Pvt. Ltd.	8C, 9A, 9B, Namkum Industrial Area, Dist.-Ranchi	RANCHI	Units manufacturing tubes, pipes, boxes tanks, etc. from plastics HDPE, LDPE, PVC
54	M/s NATIONAL INDUSTRIAL CORPORATION	TUPUDANA INDUSTRIAL AREA	RANCHI	Engineering workshop, machine shop, fabrication shop, smithy shop, press shop
55	M/s Ajanta Bottlers And Blenders (P) Ltd.	96-99B + 105-107B, Tupudana Industrial Area, Hatia, Ranchi 834003	RANCHI	IMFL Bottling.
56	M/s MOREISH FOODS LIMITED	48/49 Kokar Industrial Area, Ranchi - 834001	RANCHI	Bakery
57	M/s Ranchi Refractories (Ind) Pvt Ltd	194(p), 195(p), 234(p), 238(p), Khata No.- 98, 59, 101, Mauza- Pugru	RANCHI	Ceramics and Refractories
58	M/s Hatia Goods shed	At- Hatia Good Shed, S.E. Railway, Hatia	RANCHI	Railway sidings
59	M/s SATYAM FLOUR MILL	TUPUDANA	RANCHI	Flour mills (dry process)
60	M/s D & V ENTERPRISES	DALADALI CHOWK	RANCHI	Bakery /confectionery
61	M/S HIRALAL INDUSTRIAL TECHNOLOGIES PRIVATE LIMITED	TUPUDANA INDUSTRIAL AREA	RANCHI	Ready mix cement concrete
62	M/S SUBERNREKHA ENTERPRISES	At- 6 New Ancillary Industrial Area,Tupudana,Hatia,Dist - Ranchi	RANCHI	Steel Casting.
63	M/s Shivalik Reclamation Pvt. ltd	Tatisilwai industrial area phase II	RANCHI	Tyre and Rubber industries.
64	M/s AMBITION ENTERPRISES PRIVATE LIMITED	TATISILWAI INDUSTRIAL AREA - PHASE II	RANCHI	Plastic Products.
65	M/s. JSMDC Limited Unit Tupudana Granite Plant	At- Tupudana, PO-Hatia, Distt- Ranchi	RANCHI	Cutting, sizing and polishing of marble stone
66	M/s Elite Food Products	Industrial Area Plot No - 15 Tupudana	RANCHI	Bakery /confectionery
67	M/s SHLOK POLYMERS PRIVATE LIMITED	Tupudana Industrial Area, PLOT NO. 148	RANCHI	Plastic Products.
68	M/s Namkom Goods shed	Namkom Goods Shed	RANCHI	Railway sidings
69	M/s Lakhota Plastic industries	Lakhotia plastic industries 5 p Industrial area kokar ranchi	RANCHI	Plastic Products.

Table 11: List of industries/units in and around RMC area				
70	M/s S.N. Polymer	At+Mauza-Industrial Area Tatisilway, Phase II, Dist.-Ranchi	RANCHI	Plastic Products.
71	M/s Shree Ambaji Food Products Pvt Ltd	At+Mauza-Namkum Industrial Area, Namkum, Ranchi	RANCHI	Flour mills (excluding Roller mills and domestic Atta Chakki).
72	M/s Bharat Petroleum Corporation Limited	Station Road, Chutia, Ranchi, Jharkhand-834001	RANCHI	Oil Depot
73	M/S WONDER PLASTO PACK INDUSTRIES	TUPUDANA INDUSTRIAL AREA	RANCHI	Plastic Products.
74	M/s SIMRAN POLYMER	TATISILWAI IND. AREA, PHASE-2	RANCHI	Plastic Products.
75	M/s Piska Goods shed	Piska Railway station Ranchi	RANCHI	Railway sidings
76	M/s Deenbandhu Industries	Tupudana Industrial Area, Hatia, Dist- Ranchi	RANCHI	Flour mills (excluding Roller mills and domestic Atta Chakki).
77	M/s SUPREME POLY PLAST	AT - TATISILWAI INDUSTRIAL AREA PHASE II	RANCHI	Plastic Products.
78	M/s DUCKBACK (INDIA) LIMITED Formerly BIHAR RUBBER CO. LTD	INDUSTRIAL AREA KOKAR RANCHI	RANCHI	Rubber goods industry (with gas operated baby boiler)
79	M/S IMPERIAL AUTOMOBILES PRIVATE LIMITED	29, Kokar Industrial Area, Kokar, Ranchi- 834001	RANCHI	Railway sidings
80	M/s Chhottanagpur Industries	At- Industrial Area, Tupudana, P.O- Hatia, Distt- Ranchi	RANCHI	Flour mills (excluding Roller mills and domestic Atta Chakki).
81	M/S. Ram Kripal Singh Construction Pvt. Ltd.	Industrial Area, Tupudana, Hatia, Ranchi	RANCHI	Ready mix cement concrete
82	M/s Popular Bakery	Khata No.-67,98, Khesra No.-529(P),530(P), Mauza-Pugru, Tupudana Industrial Area.	RANCHI	Bakery /confectionery
83	M/s SHRI AMBAJI FOOD PRODUCTS PVT. LTD.	Plot no.-10(P), Khata No.-3745/96	RANCHI	Flour mills (dry process)
84	M/s OM SAI PLASTIC	Plot no.-802, Khata no.-97, Mauza-Argora, Ranchi.	RANCHI	Plastic Products.
85	M/S SAA VISHNU BAKERS (P) LTD.	AT-HAZAM, PO-HATIA, DIST.-RANCHI	RANCHI	Bakery and confectionery

(A) MAJOR ISSUES OF INDUSTRIAL POLLUTION & ITS MANAGEMENT

- Many industries either did not have data on fuel consumption or accurate inventory of the pollution sources and their capacities, thus making the evaluation of pollution load a bit challenging. Similarly, there is little to no data on small scale industries or other unorganised sectors. A complete, updated, and accurate inventory of the industries is needed which will further assist in identifying the areas or sectors of concern from the perspective of environmental pollution.
- Most of the industrial areas have poor road conditions with the movement of heavy vehicles on them which led to the high amount of PM10 fugitive emissions in the area. The condition of the roads is very poor resulting in traffic congestion of heavy vehicles. Many MSMEs don't have effective Air Pollution Control Devices particularly which contribute to pollutant release in ambient air without treatment.
- A clear fuel policy is required which can regulate in identifying which fuels are banned and which clean fuels are recommended for industries in the future. Many industrial areas have access to natural gas as proper infrastructure is available, but the cost of shifting from conventional fuel to piped natural gas doesn't go well with the most of the industries resulting in their unwillingness to switch over to PNG. There should be proper timelines for the implementation of such a policy to fast-track the change in fuel use and subsequently reduce the pollution load.
- One of the most important issues is the management of industrial waste which is generated in some areas. It has been observed in most of the industrial areas that waste disposal is not proper. This calls for proper solutions with scientific disposal of the wastes.
- For promoting best practices, industrial associations should be identified and given a timeframe to adopt best mitigation measures since they are considered as major stakeholders in the air pollution action plans.
- All the industrial area development agencies and urban planning departments should properly coordinate to clearly demarcate industrial and residential areas, and come up with remedial measures or buffer zones to prevent the residential population from the effects of air pollution from industries.

5.4 SOLID WASTE BURNING

Due to inefficient waste management systems in the city, there are chances that waste is burned to free up space at dumpsites, to facilitate scavenging of non-combustible materials (such as metals) for profit, or for use as a heat source. Further, in

uncontrolled landfills and dump sites, waste may also spontaneously combust adding much to already polluted air. The source emission profile of Ranchi indicates open waste burning contribution as 11% of the total PM emissions in 2020. Therefore, the clean air action plan has also looked for the measures to control such activity and push for decentralised management of waste and recycling and strict enforcement of MSW rules-2016.

5.5 CONSTRUCTION, DEMOLITION & ROAD DUST

The Construction/ Demolition activities and road dust shares a major proportion of the total burden of PM concentration in Ranchi. Around 15% of the total dust comes from resuspension of road dust and construction/ demolition activities. Measures like strict compliance of construction and demolition wastes including other measures like penalty and use of C&D debris in road making etc has been proposed in the action plan. The measures like end-to-end road pavement, plantations along road sides, strict compliance of existing policies and the introduction of mechanical sweepers can also help to reduce suspended road dust particles.

(A) CONTROL MEASURES RELATED TO ROAD DUST

Edge to edge paving/greening, road shoulder (unpaved part) should be covered with interlocking tiles or grass. Water sprinkling on unpaved roads and Night washing of the paved roads using treated water. Whenever road washing is not possible, dense sprinkling through treated sewage mixed with dust suppressant should be done regularly. Continuous operation of fountains at main roads crossing and parks should be done regularly. Making the roads pothole free and Anti-smog guns should be installed. Roads should be regularly cleaned using mechanical sweeping machines and collected dust should be dumped at proper place, so that it could not deposit again on the roads.

Ensuring that the building material is fully covered while transporting and Ensuring no C & D Waste stored on the road side.

(B) BEST PRACTICES FOR C&D WASTE MANAGEMENT

- The Construction and Demolition Waste Rules and Regulations, 2016 have mandated reuse of recycled material. A significant proportion of construction waste can be recycled and reused and brought back to construction to substitute naturally sourced material. This demands a circular economy that can turn C&D waste into a resource. This can help reduce energy intensity and environmental footprints of buildings and infrastructure. Usage of recycled aggregates can not only preserve the finite raw materials but also reduce energy consumption and overall construction costs.
- Certain components of demolition waste such as plasterboard are hazardous once landfilled as it is broken down in landfill conditions releasing hydrogen sulfide, a toxic gas. It is important for having a proper in-situ Construction waste management plan for Gorakhpur city with the facility of sorting and transformation.
- All areas for storing C&D wastes/construction material to be demarcated and preferably barricaded particularly those materials that have the potential to be dust borne. Use of demolition waste as a raw material in the brick-making as a substitute for fertile soil.
- Fine material, such as sand, dust, etc. can be used as cover material over the sanitary landfill. Wet suppression is the most convenient method for controlling construction

dust at the site. Speed of transportation vehicles at the construction site must be minimised to avoid fugitive emission.

5.6 BRICK KILNS AND OTHER SOURCES

The source profile also indicates contribution of Brick kilns and Diesel Generator (DG) sets as 2% of the total emissions in Ranchi. Thus, adoption of cleaner and efficient production technologies such as vertical shaft kilns, Hoffman kilns, and tunnel kilns for brick manufacturing is needed. Further, solar rooftop programs in big commercial establishments can reduce the dependence on DG sets.

The brick sector is a resource-intensive and highly air polluting sector. It is a largely unorganised labor-intensive sector. Bricks can be of many types and the most popular type is fired clay brick. Clay fired bricks are produced in small enterprises mostly located in peri-urban and rural areas. Green bricks are fired at approximately 1000^{O} C temperature for high strength and durability. Brick firing is an energy-intensive process. Coal, wood, and many agricultural wastes such as mustard stalk, rice husk, etc. are used as fuels for firing bricks. There is heavy dependence on coal for firing which results in high particulate matter emissions, CO_2, and black carbon.

Fixed Chimney bull's trench kiln (FCBTK) is the most used firing technology which accounts for approximately 80% of total kilns present in the district. There is a trend of adopting cleaner firing technology like zigzag Kiln but the number of such kilns is less (see Table 12, 13, 14 & 15)).

Table 12 : Status of adopting stainable techniques in Brick kilns	
No. of Bricks manufacturing unit which have not converted into Zig-Zag kiln & induced draft system.	20
No. of Bricks manufacturing unit which have converted into Zig-Zag kiln & induced draft system.	11

(A) MAJOR ISSUES RELATED TO BRICK KILNS SECTOR

- Use of low-quality coal generates more ash content, SO_2 emission.
- The simple reason behind the use of agricultural waste is its easy availability and lower price. Apart from this, many other hazardous wastes such as carbon from tyre pyrolysis plants, rubber waste, shredded plastics, etc., were seen being used at few kiln sites.
- The sources of fugitive emissions are Coal Crushing Unit, openly stored fuel, loading and unloading of bricks, dust on the road within the premises of the kiln, rubbish stored at the kiln, and the area where green bricks are prepared.

Table 13 : List of Bricks manufacturing unit which have not converted into Zig-Zag kiln & induced draft system.

S No.	Industry Name	Industry Address	District	Khata No. & Plot No.
1	M/S Shekhar Bricks	AT-Berwai,Angara , DIST -RANCHI	RANCHI	375,376, Khata no.-128, Mauza-Berwai, Ranchi
2	M/S S.R.B. Bricks	At- Sanga, P.O. Malsiring, Dist-Ranchi	RANCHI	941, 939, Khata No.-503/78, Mauza-Sanga
3	PUJA BRICKS	At+Mauza-Burmu, Po-Ginjo Thakugowan, Ps.-Burmu, Dist.-Ranchi	RANCHI	Plot no.-575, 598, Khata no.-113
4	M/S Jyoti Bricks	Vill - Tarup, p.o - Katam Kuli, P.S - Ratu, District - Ranchi	RANCHI	Plot no.-1103, Khata no.-41
5	M/S G.D.R BRICKS	Vill- West Tarup, P.O -Ratu, P.S - Ratu, District - Ranchi	RANCHI	1179,1180,1181,1186, Khata no.-03, Mauza- West Tarup, Ranchi
6	M/S NEELU BRICKS	At- Baridih(Sembo),PS - Baralong,Dist- Ranchi	RANCHI	Plot no.-813, Khata no.-32
7	M/S SINGH BRICKS	Vill - Sillidih, P.O - Tatkinawadih, District - Ranchi	RANCHI	Plot no.-213, 214, 179, Khata no.-45
8	M/S Nikhil Bricks Works	Mauza-Sugnu,Po-Sugnu,Ps-Sadar,Dist-Ranchi,pin-835103	RANCHI	2688, Khata no.-56, Mauza- Sugnu
9	M/s Shankar Brick works	At Mauza -Hesal, PO-Angara, Dist -Ranchi	RANCHI	1294, Khata no.-225, Hesal, Ranchi
10	M/S A.R BRICKS	Vill - Ushamatu, P.O - Ratu, P.S - Ratu, District - Ranchi	RANCHI	525, Khata No.-61, Mauza-Ushamatu, Ranchi
11	N.R.L BRICKS	At- Karge,P.O-MandarPS- Karge Distt - Ranchi	RANCHI	Plot no.-2457, Khata no.-194
12	M/S Hind Bricks Works	Vill - Malti, P.o & P.S - Namkum, District - Ranchi	RANCHI	Plot no.-686 & 687, Khata no.-8,16.
13	M/S Rahul Bricks	Mauza-Childag(soso),Ps-Angara,Dist-Ranchi(Jharkhand)	RANCHI	471 & 476, Khata no.-26 & 06, Mauza-Childag Soso, Ranchi

Table 13 : List of Bricks manufacturing unit which have not converted into Zig-Zag kiln & induced draft system.				
14	M/s R S W Bricks	At+Mauza-Mayapur, Sarnatoli, Po-Lapara, Ps-Maikluskiganj, Dist.-Ranchi (Aera-2.48acre)	RANCHI	722 to 725, 730, Khata no. 06, Mauza-Mayapur Sarnatoli, Ranchi
15	M/s S.M.B. Bricks	Mauza-Hochar,P.O-Garh Husir, Dist-Ranchi	RANCHI	323,324,325, Khata no.- 123,64, Mauza-Hochar, Ranchi
16	M/S Biniy Bricks	Mauza-Mariyatu,Po.-Bijuliya,Distt-Ranchi.	RANCHI	Plot No.- 106, 109, Khata No.- 131, Mauza- Mariyatu,
17	M/S BINNY BUILDER (R.S.S BRICKS)	Vill - Tikara Toli, P.O - Piska Nagari, P.S - Ratu, District - Ranchi	RANCHI	Plot no.-842, 896, 985, 989, Khata no.-20, At+Mauza-Tikratoli, Po-Piska Nagri, Ps-Tikaratoli, Dist.-Ranchi.
18	M/S D.K.M Bricks	Mauza-Ulatu,Po.-Ormanjhi,Distt-Ranchi.	RANCHI	468, Khata no. 75, Mauza- Ulatu, Ranchi
19	M/s NATH BRICKS	Mauza - Hesal,PO - Hesal Angara,PS-Angara,Dist - Ranchi	RANCHI	50,51,52,67, Khata no.-16, Mauza-Hesal, Ranchi
20	M/s Sevak Bricks	Mauza-Janum,Po.-Angara,Distt-Ranchi	RANCHI	101,102 Khata no.-19,25, Mauza-Janum, Ranchi
21	S R B Bricks	At+Mauza-Saga, Po-Malsering, Dist.-Ranchi	RANCHI	Plot no.-795, 797, 766, Khata no.-05, 32, 795, At+Mauza-Saga, Po-Malsering, Dist.-Ranchi.
22	M/s Shakti Bricks	Mauza -Lupung , Ps-Angara, Dist-Ranchi	RANCHI	490, 491, Khata No.-104, 77, Mauza-Lupung, Ranchi
23	M/S SAHU BRICKS	Mauza- Berwari, P.S.-Burmu, Dist- Ranchi	RANCHI	Plot No.- 480, Khata No.- 70, Mauza-Bansari,

Table 14 : Number of Brick Kilns closed for violating norms				
Sl. no.	Case no	Respondents	Subject	Case filing Letter No. & Date
1	799/21	M/s K.N.P. Bricks, Mauza-Sugnu, Ps-Kanke, Dist.- Ranchi	-do-	ACJM Court, Ranchi-96/08.02.2021
2	800/21	M/s J.M.D. Bricks, Mauza-Sugnu, Ps-Kanke, Dist.- Ranchi	-do-	ACJM Court, Ranchi-97/08.02.2021
3	801/21	M/s Dipu Bricks, Mauza-Sugnu, Ps-Kanke, Dist.-Ranchi	-do-	ACJM Court, Ranchi-98/08.02.2021
4	802/21	M/s Anup Bricks, Mauza-Sugnu, Ps-Kanke, Dist.-Ranchi	-do-	ACJM Court, Ranchi-99/08.02.2021
5	804/21	M/s M.B.W. Bricks, Mauza-Sugnu, Ps-Kanke, Dist.- Ranchi	-do-	ACJM Court, Ranchi-100/08.02.2021

(B) BEST PRACTICES IN THE BRICK KILNS SECTOR

Capacity building of regulators and Stakeholders - Setting up of an expert committee at the state/district level to monitor the conversion of the kilns. District level seminars and exposure visits to Zig-Zag kilns for brick entrepreneurs to acquaint them with the new technology. Also, regular training programs and courses on cleaner kiln technology and their viability will be designed and organised for kiln entrepreneurs, workers, and technicians at institutes, etc.

Table 15 : List of Bricks manufacturing unit which have converted into Zig-Zag kiln & induced draft system.				
1	M/S Radhe Shyam Singh (R.S.S Bricks)	Mauza-Kudlum,Ps-Nagari,Distt.-Ranchi	RANCHI	1336, 1342, Khata No.-93, Mauza- Kudlum
2	M/S CDR Bricks	At - P.O feta PS - Ratu Ranchi Distt - Ranchi	RANCHI	Plot no.-607, Khata no.-35
3	M/s Ambey Bricks	Village - Hurhuri, P.O - Ratu, P.S - Ratu, District - Ranchi	RANCHI	Plot No.- 964, 966, Khata No.- 208, Mauza-Hurhuri,

4	M/s JRB Bricks (Unit-II)	Mauza - Dubliya,PS - Pithoria,Dist - Ranchi	RANCHI	1076, Khata no.-148, Mauza-Dubliya, Ranchi
5	M/S Kamal Bricks	Vill-Chandway, P.o - Puranadih,P.S-Kanke,Dist-Ranchi	RANCHI	Plot No.- 482, 483, 484, 908, Khata No.- 77, 84, Mauza- Chandaway
6	M/s S.M.M Bricks	Mauza-Kamhariya,Po.-Satkanadu,Distt-Ranchi.	RANCHI	1635, 1648 , Khata no.-40, Mauza-Kumhariya, Ranchi
7	M/s Hind Bricks	At+Mauza-Haldama, Po-Hundur, Ps.-Pithoriya, Dist.-Ranchi	RANCHI	503, 504, Khata no.-30, Mauza-Haldama, Ranchi
8	M/S M.B.A. Bricks	At - Hochai, PO - Sadma, Distt - Ranchi	RANCHI	Plot No.- 549, Khata No.-16, Mauza- Hochai,
9	M/S PUJA BRICKS	VILLAGE-SUTIYAMBE	RANCHI	857, Khata no.-11, Mauza-Sutiyambe, Ranchi
10	M/S DINESH KUMAR BRICKS	Mauza-Kaditola,Po.-Suganu,Distt.-Ranchi.	RANCHI	Plot no.-2048, 2049, Khata no.-127
11	M/s R.B.C. Bricks.	Mauza-Bundu, Ranchi.	RANCHI	Plot no.- 3, 6, Khata no.-220.

Advanced cleaner Production Technology: Zig zag kilns produce more class 1 bricks at lesser coal consumption and pollutant emission than FCBTK. Retrofitting existing FCBTK to Zigzag kiln structure is a win-win approach for brick entrepreneurs and the environment. There is a need to study the scope and techno-economic aspects for implementing energy efficient technologies like Tunnel Kiln, Hoffman Kilns, etc.

Shift toward Resource-efficient Bricks (REBs): Production of perforated and hollow burnt clay bricks synergize in saving clay and fuel, reducing manpower requirements, and production cost. There is a need for establishing the demand/market for resource-efficient products.

Control of Fugitive emission: Pavement of approach road and the road around the brick kiln, crushing of coal in enclosed equipment/ area, covering ash layer in the preheating zone with plastic sheet/tirpal, etc can help in controlling fugitive emission

Use of Solar energy: Machines like pug mill, crushing roller, extruder, etc can be operated on solar energy.

Improving operational practice: Adoption of single man fuel feeding process, double-wall wicket gate closing mechanism & use of insulated feed hole cover.

Use of Air Pollution Control Devices (APCD): This can help in controlling stack

emission of brick kilns. The particulate removal efficiency of different designs of Gravity Settling Chamber (GSC) generally ranged from 20-63%.

(C) BETTER REGULATION & MANAGEMENT OF DG SETS

Central Pollution Control Board (CPCB), has been regulating emissions from diesel generators at the manufacturing stage (through product certification) since 2005. Besides manufacturing reforms, better operational and management practices are essential to maintain the performance of DG sets. Inadequate operational and management practices like Poorly maintained fuel injection pump, Faulty nozzle, blocked fuel filters, improper cooling water circuit, loading below optimal, reduction in the air-fuel ratio(higher air intake temperature) due to poor cross ventilation, etc. should be timely addressed and resolved to control high fuel consumption and pollutant emission. Installation of a retrofitted emission control system in DG sets will also help in reducing emission.

5.7 MINES

Though the available source profile has not specified the contribution from mining activities, its contribution to pollution cannot be ignored and is crucial to control fugitive emissions from such activities. Many coal mines, bauxite mines, stone mines and sand mines exist in and around the city. Mining activities that involve distinct physical operations including quarrying (like drilling, blasting, loading, hauling) and plant process operations (such as crushing, screening, conveying storage and transfer operations) usually generate considerable emissions. Further, in the mining area the internal transportation also contributes to particulate matter emission. Interventions like Mist sprinkler, Fixed sprinklers and Dust Suppression should be implemented to control the suppression of dust and fugitive emissions. Some stone crushers violating the norms have been closed. See Table 16.

Table 16 : Number of Stone Crushers closed for violating norms

Sl. no.	Case no	Respondents	Subject	Case filing Letter No. & Date
1	774/ 21	M/s Rita Metal (Stone Crusher), Mauza-Khirabera, Dist.-Ranchi	Violation of section 25, 26 of Water (Prevention & Control of Pollution) Act, 1974 & U/S 21 the Air (Prevention & Control of Pollution) Act, 1981.	ACJM Court, Ranchi-73/08.02.2021

2	775/ 21	M/s Yuvraj Stone Crusher, Mauza-Khirabera, Ps-Ormanjhi, Dist.-Ranchi	-do-	ACJM Court, Ranchi-74/08.02.2021
3	776/ 21	M/s Manoj Mahto Stone Crusher, Mauza-Khirabera, Ps-Ormanjhi, Dist.-Ranchi	-do-	ACJM Court, Ranchi-75/08.02.2021
4	777/ 21	M/s Tarkeshwar Singh Stone Crusher, Mauza-Khirabera, Chutupalu Ps-Ormanjhi, Dist.-Ranchi	-do-	ACJM Court, Ranchi-76/08.02.2021
5	778/ 21	M/s Basant Mehta Stone Crusher, Mauza-Khirabera, Chutupalu Ps-Ormanjhi, Dist.-Ranchi	-do-	ACJM Court, Ranchi-77/08.02.2021
6	780/ 21	M/s Subodh Gupta Stone Crusher, Mauza-Khirabera, Chutupalu Ps-Ormanjhi, Dist.-Ranchi	-do-	ACJM Court, Ranchi-78/08.02.2021
7	781/ 21	M/s Sanjay Verma Stone Crusher, Mauza-Khirabera, Chutupalu Ps-Ormanjhi, Dist.-Ranchi	-do-	ACJM Court, Ranchi-79/08.02.2021
8	783/ 21	M/s Ajay Singh Stone Crusher, Mauza-Khirabera, Chutupalu Ps-Ormanjhi, Dist.-Ranchi	-do-	ACJM Court, Ranchi-80/08.02.2021
9	784/ 21	M/s Ajit Singh Stone Crusher, Mauza-Khirabera, Chutupalu Ps-Ormanjhi, Dist.-Ranchi	-do-	ACJM Court, Ranchi-81/08.02.2021
10	785/ 21	M/s Parmeshwar Singh Stone Crusher, Mauza-Khirabera, Chutupalu Ps-Ormanjhi, Dist.-Ranchi	-do-	ACJM Court, Ranchi-82/08.02.2021
11	786/ 21	M/s Sanjay Mehta Stone Crusher, Mauza-Chutupalu, Ps-Ormanjhi, Dist.- Ranchi	-do-	ACJM Court, Ranchi-83/08.02.2021
12	787/ 21	M/s Ranjit Metha Stone Crusher, Mauza-Chutupalu, Ps-Ormanjhi, Dist.- Ranchi	-do-	ACJM Court, Ranchi-84/08.02.2021
13	788/ 21	M/s Sanjay Thakur Stone Crusher, Mauza-Chutupalu, Ps-Ormanjhi, Dist.- Ranchi,	-do-	ACJM Court, Ranchi-85/08.02.2021

14	789/ 21	M/s Surendra Singh Stone Crusher, Mauza-Chutupalu, Ps-Ormanjhi, Dist.- Ranchi	-do-	ACJM Court, Ranchi- 86/08.02.2021
15	790/ 21	M/s Satyendra Agrawal Stone Crusher, Mauza-Chutupalu, Ps-Ormanjhi, Dist.- Ranchi	-do-	ACJM Court, Ranchi- 87/08.02.2021
16	791/ 21	M/s Manoj Singh Stone Crusher, Mauza-Banadag, Po- Getalsud, Ps-Angara, Dist.- Ranchi	-do-	ACJM Court, Ranchi- 88/08.02.2021
17	792/ 21	M/s Dhiraj Bariyar Stone Crusher, Mauza-Banadag, Po- Getalsud, Ps-Angara, Dist.- Ranchi	-do-	ACJM Court, Ranchi- 89/08.02.2021
18	793/ 21	M/s Chandu Bediya Stone Crusher, Mauza-Nagrabera, Ps-Sikidiri, Dist.- Ranchi	-do-	ACJM Court, Ranchi- 90/08.02.2021
19	798/ 21	M/s Kuldeep Singh Stone Crusher, Mauza-Malghosha, Ps-Sikidiri, Dist.- Ranchi	-do-	ACJM Court, Ranchi- 91/08.02.2021
20	795/ 21	M/s Ajit Kumar Stone Crusher, Mauza-Nagrabera, Ps-Sikidiri, Dist.- Ranchi	-do-	ACJM Court, Ranchi- 92/08.02.2021
21	796/ 21	M/s Gulgul Stone Crusher, Mauza-Aadarpakhna, Ps-Sikidiri, Dist.- Ranchi	-do-	ACJM Court, Ranchi- 93/08.02.2021
22	797/ 21	M/s Shiv Prasad Stone Crusher, Mauza-Malghosa, Ps-Sikidiri, Dist.- Ranchi	-do-	ACJM Court, Ranchi- 94/08.02.2021
23	798/ 21	M/s Govinda Stone Crusher, Mauza-Malghosa, Ps-Sikidiri, Dist.- Ranchi	-do-	ACJM Court, Ranchi- 95/08.02.2021

(A) MEASURES FOR REDUCING EMISSION AT MINES SITES

- Applying treated water to mitigate dust generation on the construction site. Water can be applied by a variety of methods, for instance, Anti-Smog Guns, trucks, water pulls, water cannons, hoses, fire hydrants, sprinklers, etc. Use of Dust Suppressants and its various techniques are important.

- Designing the layout of the construction site to minimise fugitive dust generation potential, including access roads, entrances and exits, storage piles, vehicle staging areas, and other potential sources of dust emissions. Use of Fencing, scaffolding sheets/nets for dust control at the site is important.

- Utilise enclosures/coverings for storage piles e.g. tarpaulins for storage piles. Storage pile activity (Loading & unloading) should be conducted downwind. There should be properly shaped storage piles so that they do not have steep sides or faces. Besides, sharp changes of shape in the final storage pile should be avoided.

- For better material handling, remove material from truck underbodies and tires prior to leaving the site as well as implement techniques to periodically remove mud/dirt track out/carryout from paved streets at the access point(s). Mandatory PUC Certificate for vehicles used for transport of materials.

- Monitoring of sites is very important to ensure proper adherence of the norms. Installation of display board in construction site mentioning the details of statutory environmental clearance, Name, address, contact no. & email of site in charge and owner.

5.8 LOCATION BASED SOURCES OF POLLUTION

Various pollution sources have been identified across the city which includes places of heavy traffic congestion, construction and demolition activities, use of more than 15 years old commercial vehicles, open cast mining locations, brick kilns, locations of pothole patches in the city, polluting industries, residential areas using fossil fuels for cooking and residential complexes having open spaces (see Table 17).

Table 17 : Location based source of Pollution

S.No.	Source of Pollution	Location	Stakeholders/ Implementing agency
1	Traffic congestion	Shajanand Chowk, Kutchary Chowk, Lalpur Chowk, Kantatoli Chowk, Karbala Chowk, Ratu road Chowk, Argora Chowk,	Municipal Corporations and Traffic Police District Administration & JSPCB

2	Construction and Demolition activities	Smart city site, Morhabadi area, Bariyatu, Kantatoli	Municipal Corporations and District Administration
3	Plying of more than 15 Years old commercial vehicles	Around and outskirts of the city, sub-urban areas	Transport Dept & Municipal Corporations
5	Pothole patches of roads	Kantatoli, Ratu road, Railway Station road, Morhabadi area	Municipal Corporations
6	Parking in non-designated areas	Main road, daily market, upper bazaar	Municipal Corporations
7	Brick kiln	Boreya, Rukka, Namkum	Municipal Corporations
8	Stone crushers	Ormanjhi, Namkom	District Administration & JSPCB
9	Residential complexes having non green spaces	Hinoo, Lalpur area, Mahatma Gandhi road	Municipal Corporations
10	Polluting industries	HEC, Usha martin, Rice mills stone mining and crushers	JSPCB/Industries Dept
11	Cooking and burning fossil fuel	Sub-urban area of Ranchi	Municipal Corporations

6. HEALTH IMPACTS CAUSED BY AIR POLLUTION

Air pollution is one of the most serious public health risks and over the last two decades many scientific studies have demonstrated that particulate matter is a matter of concern from a health perspective. The National Health Policy Document of the Ministry of Health and Family Welfare (MoHFW), which was released for the first time in 2017, listed air pollution exposure as a priority area for action. The state-level Disease Burden estimates released by IHME, ICMR and PHFI showed that air pollution ranks as the third-largest risk factor responsible for the premature deaths in Jharkhand. Various diseases such as Ischemic heart disease and lower respiratory infections have been identified as the leading cause of disability in 2017. The air pollution exposure, both household and ambient, is associated with a broad range of health effects ranging from minor physical morbidity to death from acute respiratory and cardiovascular disease. Considering the severity and extent of exposure, a well-defined strategy can be in place with emergency response action and a sustained action is required in this regard.

Generally, the high exposure and incidences of smog episodes largely occur when weather is adverse with calm atmosphere, cold temperature, and lower mixing height that traps pollution very close to the ground. In this case the emergency response action (e.g. GRAP) can control further loading of emissions and reduce exposure and associated health risk. It identifies control strategies to reduce pollution from every source within a definite time frame involving all stakeholders and shared responsibility. It is also equipped with stringent regulations to ensure the enforcement. The CCAAP also fixes reduction targets for achieving the National Air Quality Standards (NAAQS).

7. PUBLIC AWARENESS AND COMPLAINTS REDRESSAL MECHANISM

A Public Grievance Redressal Portal (similar to SAAMER APP) has been developed for the public. This is a mobile app which can be downloaded through Google play store by using this link in Google play store https://play.google.com/store/apps/details?id=com.aeologic.pollutionjharkhand. After downloading (through installation and OTP based registration of mobile number) one can put grievances of his/her area regarding pollution problem. The problem will be monitored and addressed by the Jharkhand State Pollution Control Board.

8. KEY POLICIES AND PROGRAMS TO MITIGATE AIR POLLUTION

Over the last few years JSPCB has undertaken many steps to improve the regulatory framework for vehicular emissions, industrial emissions and others. The aligned policies & programs both at the center and state level are discussed below:

8.1 COMPLIANCE OF EMISSION STANDRAD, OCEMS & ENVIRONMENT (SITING FOR INDUSTRIAL PROJECTS) RULES-1999

Power, Cement, Iron & Steel, Pulp & Paper, Textile, Tanneries including other categories of industries release large quantities of air pollutants. In order to regulate such emissions to safe limits, CPCB has prescribed standards for various pollutants emitted by the industries as notified under the Environment (Protection) Act-1986. Furthermore, to strengthen the compliance monitoring and ensure that industries and facilities comply with emission standards of June 2015, installation of OCEMS in 17 categories of highly polluting industries has been mandated[12]. All the industries falling in these categories of highly polluting industries have installed OCEMS in Ranchi.

8.2 STAR RATING PROGRAM

JSPCB is also implementing the Star-rating program. The program utilises the continuous monitored emissions data from major industrial plants to categorise industry from least complaint to most compliant. The program is bringing more transparency to control emissions from industries and also incentivises quicker uptake of improved emissions control systems.

8.3 VEHICULAR EMISSION NORMS

The vehicle emission standards were set by the Central Government to keep a check on the pollutant levels emitted by vehicles that use combustion engines. Following the national roadmap, Jharkhand has implemented the Bharat Stage VI (BSVI) emission norms for new vehicles since April 2020.[13] As per BS-VI emission norms, it is expected to reduce the pollution level in the state; petrol vehicles will have 25% reduction in

[12] www.indiastat.com/transport-data/30/transport/30/vehicles/289/stats.aspx

[13] http://www.indiaenvironmentportal.org.in/files/file/Revised%20Guidelines%20for%20Real-time%20Effluent%20Quality%20Monitoring%20System.pdf

their NOx, while diesel engines will reduce their HC+NOx by 43%, NOx level by 68% and particulate matter by 82%.

8.4 CNG & ELECTRIC MOBILITY

Compared to petrol and diesel, CNG vehicles are pollution free as it is made up of methane and results in less carbon emissions. In a major push towards CNG transportation in the personal mobility space, rollout of 200 to 250 CNG stations within the next few years has been announced for Jharkhand.[14] Two CNG stations in Ranchi are already operational as part of the government's of push to reduce the dependence on fossil fuel.

In partnership with the Energy Efficiency Services Limited (EESL), the Jharkhand government has adopted an E-mobility program for the deployment of 50 Electric Vehicles (EVs) for various government offices in Ranchi. However, the state does not have a statewide comprehensive Electric Vehicle policy yet. The state wise number of electric/battery operated vehicles in India statistics shows that as on 9 July 2019, 5257 electric/battery-operated vehicles exist in Jharkhand. Out of the total 36 are electric cars. The Union Government's National Urban Electric Mobility Mission and Smart City program gives a considerable opportunity in Ranchi to adopt electric mobility. Converting the maximum fleet to electric powered will result in reduction in air pollution to a large extent. Further, Ranchi is favourable for quicker adoption of the electric vehicles because of compact periphery, urban design and small area.

8.5 PHASING OUT OF OLD VEHICLES

Many studies have highlighted that the emission rate of vehicles generally increases with usage over time. Diesel and petrol vehicles should be scrapped as they reach their end-of-life (EOL) stage after 10 and 15 years respectively. Jharkhand has been articulating the need to phase out all the old polluting vehicles.

8.6 MOVEMENT OF HEAVY DUTY VEHICLES

The heavy-duty vehicles (trucks and trolly) play a major role in the economy of the city;

[14] https://auto.economictimes.indiatimes.com/news/oil-and-lubes/cng-png-project-launched-in-jharkhand/70815043

the vehicle movement and operations like hauling coals from mines to industries and transporting thousands tonnes of raw materials around cities. These vehicles also greatly affect air pollution and public health. A spatial planning and development of the road network is important to bypass the city, as well as criteria like covering the loading and the pavements of pathways in the coal yard is important.

8.7 PUBLIC TRANSPORT

Public transport produces significantly less air pollution per passenger than a standard car carrying a single driver. Further, it also helps to keep traffic congestion lower, which in turn reduces air pollution from idling vehicles. However, in Ranchi the personalised vehicle population is more and will tend to increase because of many factors. Apart from rising affluence and economic progress, lack of effective and convenient public transport can be seen as the major reason for high growth of private vehicles. The city needs to be de-congested by reducing the number of private vehicles and introducing integrated public transport systems.

8.8 STRENGTHENING POLLUTION UNDER CONTROL SYSTEM

The on-road emissions from vehicles are also important to regulate. Due to the presence of a large number of ill-maintained vehicles in the city, the benefits of strict emission norms and introduction of BS VI vehicles will not be reflected in the ambient air quality. To check emissions from these vehicles and to ensure proper maintenance, Central Motor Vehicle Rules (1989) mandates every one-year-old transport and non-transport

vehicle to be tested for emission compliance and obtain a Pollution Under Control (PUC) certificate.[15] A robust implementation of the current emission control system (PUC) is important to effectively mitigate vehicular emission.

8.9 GREENING & AFFORESTATION

The role of green infrastructure in addressing the challenges of the 21st century cannot be underestimated. It is a natural, service providing infrastructure that is often more cost effective, more resilient, and capable of meeting social, environmental, and economic objectives than 'grey' infrastructure.

The growth of future cities depends upon how well we can plan for the 'unplanned'. The generic theme evolving is that as cities expand, the 'informal' sector grows faster than the 'formal' sector. This means that our plans will need paradigmatic change to deal with the heterogeneous housing and mobility needs of growing city populations. We will have to plan spaces for activities that cannot always be well-defined and predicted. It is better to plan for what is inevitable than to turn a blind eye to the future.

In many cases a substantial transformation of city environments will be required to create effective Green Infrastructure and achieve a better balance between green and grey. However, by recognising nature as an opportunity for an effective solution and by realising that

[15]http://chdtransport.gov.in/Forms/CMVR_1989.pdf

green infrastructure can be integrated and linked into existing and future built developments in an attractive way, the potential is there to create more livable cities with reducing impact of air pollution in particular on the people living in the cities.

Green Infrastructure including trees within cities can remove fine particles from the atmosphere and consequently improve air quality and human health.

9. GRANT SUPPORT FROM 15TH FINANCE COMMISSION

As per the 15th Finance Commission (FC-XV) constituted in 2017, Urban Local Bodies (ULBs) were divided into two categories: (a) Million plus urban agglomerations/cities, excluding Delhi and Srinagar; and (b) all other cities and towns with less than one million populations. The commission (FC-XV) has recommended grants for Million plus cities, which is allotted for Ambient Air Quality and Solid Waste Management & Sanitation. And for all other cities the Commission (FC-XV) has recommended a grant of which 50% will be untied and the remaining 50% will be tied grant.

Further to release grants for Million plus urban cities and to achieve the target on ambient air quality, the Ministry of Environment, Forest and Climate Change (MoEF&CC) is the nodal ministry to develop city wise and year wise targets on ambient air quality targets for 2020-25 based on annual average concentrations of PM10 and PM2.5.[16] Besides ambient air quality improvement, grants to Million Plus cities have also been linked for improving conservation, supply and management of water and efficient solid waste management. For this component, the Ministry of Housing and Urban Affairs is the nodal Ministry and is entrusted with development of city-wise and year-wise targets and recommend disbursals of grants to these cities.[17]

As recommended by the Commission (FC-XV), Urban Development and Housing

[16] http://www.mohua.gov.in/upload/whatsnew/5ee874a82ec60ULBs_15FC_Operational%20Guidelines_for_2020-21.pdf

[17] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1709146

Department (UD&HD) in consultation with Jharkhand State Pollution Control Board (JSPCB) and other stakeholders has designed the Action Plans for the control of air pollution in Ranchi, which is based in the operational guidelines for the implementation of the recommendation on urban local bodies by Ministry of Finance, (Finance commission Division), Govt. of India.

9.1 PERFORMANCE BASED GRANTS

As recommended in the 15th Finance Commission report to encourage the improvement in air quality in Million plus cities, the second instalment shall be disbursed against the stipulated performance-based outcomes in terms of year-on-year improvement in air quality in January 2021. The recommended basis of allocation of the 2nd tranche is as mentioned in Table 18 & 19.

Table 18 : Recommendation for second tranche allocation (Source: XV FC report)

Year on Year improvement in air quality in January 2021 (%)	Share of its allocated fund (%)
>5	100
4-5	80
3-4	60
2-3	40
1-2	20
<1	0

In case of non-achievement targets, 50% of unallocated funds to be distributed to The top performers based on criteria prescribed in the below table, while remaining 50% to be distributed to non-million plus cities in proportion to their population.

Table 19 : Performance based criteria (Source: XV FC report)

Year on Year in Air Quality in Jan 2021 (%)	% of allocation of unallocated funds
Cities with improvement > 5	40
Cities with improvement 4-5	35
Cities with improvement 3-4	25

CHAPTER II - COMPREHENSIVE CLEAN AIR ACTION PLAN

1. CLEAN AIR ACTION PLAN (CCAAP)

The Comprehensive Clean Air Action Plan identifies strategies to reduce pollution from every source in a time bound (Small, Medium and Long term) manner with control strategies involving all stakeholders with a shared responsibility. To ensure proper enforcement, the action plan will also be equipped with monitoring provisions and will also set interim mile-stones.

The plan (see Table 20) identifies specific measures in each sector, enlisting the agencies responsible for the implementation of each of the measures with a fixed timeline. It provides short term, medium term, medium to long-term and long-term measures; where short-term measures need to be implemented immediately. On the other hand, medium-term measures should be implemented within a 1 year period. Medium to long-term measures should be implemented in 1-2 years. Long term should be implemented in 2-3 years. A draft Emergency Response Action Plan based on GRAP of Delhi and National Capital Region has also been prepared which will help in taking stringent measures and reducing emissions during severe air pollution days. Institutional arrangements to ensure timely implementation of suggested action has also been discussed. Similarly, the establishment of Project Management and Audit Units are also mentioned.

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
Capacity building, monitoring network and source apportionment,	Installation & Commissioning of Monitoring Stations	Establishment of CAAQMS	March, 2022	RMC
		Establishment of Manual Stations	March, 2022	JSPCB
	Air Quality Forecasting	Release regular air quality data through Quarterly and Annual Bulletin reports. An APP to be developed by JSPCB to forecast of air quality data on a regular basis	March, 2022	JSPCB
	Assessment of Sources	Emission Inventory	November, 2021 December, 2021	JSPCB
		Source Apportionment & Carrying Study	December, 2021 September, 2022 March, 2023	RMC
		Health Impact Studies	September, 2022	Department of Health & Family Welfare, GoJ
	Training & Capacity Building	Training & Skill Development of Public Officals	December, 2022	RMC
		Infrastructure Development (Laboratory/ AQM Cell)	March, 2022	JSPCB
		Enforcement Unit	November, 2021	RMC
		Establishment of Project Management Unit (PMU) to coordinate, monitor, evaluate & future planning to contain air pollution with various departments	December, 2021	JSPCB

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
Public outreach	Emergency Response System	Setting up of Graded Response Action Plan (GRAP)	March, 2022	Disaster Management Authority
	Public Outreach	Daily Air Quality Public Information Dissemination System	March, 2022	JSPCB
		Sensitization for Media/ journalists	Regular intervention throughout the year	RMC
		Issue Public Health Advisory for prevention and control of air pollution	Regular	JSPCB
		Deeper public engagement and consultation (workshops/ programmes in schools/ colleges)	December, 2022	RMC
		Launch of mobile app to update public about status of air quality	March, 2022	JSPCB
		Public Outreach with residential societies & Resident Welfare Associations (RWAs)	December, 2022	RMC
		IEC Activities	December, 2022	RMC
	Public Grievance Redressal System	App Based System	July 2020	JSPCB
		Helpline Number	March, 2022	JSPCB
		Immediate lifting of solid waste generated from desilting and cleaning of municipal drains for its proper disposal	Regular	RMC
		Maintain potholes free roads	March, 2022	RMC

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
	Control of Road dust	Regular cleaning of street surfaces and spraying of water to suppress dust	March, 2022	RMC
		Black-topping of unpaved road	February, 2023	RMC
		Appropriate action to remove road dust/silt regularly by using mechanical sweepers	March, 2022	RMC
		End-to-end paving of the road	March, 2022	RMC
		Introduce water fountain at major traffic intersection	April, 2022	
		Widening of Roads	December, 2024	RMC
		Improvement of infrastructure for decongestion of road		
		Implement truck loading guidelines; use of appropriate enclosures for haul trucks; gravel paving for all haul routes	March, 2022	RMC
		Identify road stretches with high dust generation	March, 2022	RMC
	Creation of Green Cover	Creation of green buffers along the traffic corridors and its maintenance	March, 2024	RMC
		Necessary changes in bye-laws for Greening of open areas, gardens, community places, schools and housing societies	March, 2024	RMC
		Urban Greening with Vertical Garden	December, 2022	RMC

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
Road dust and construction & demolition		Builders should leave 15% area for green belt in residential colonies to be made mandatory	Completed	RMC
		Implementation of maintaining at least 10% tree cover area in the city in master plan.	Completed	RMC
	Control on Construction Activities	Ensure transportation of construction materials in covered vehicles	Regular	RMC
		Strict enforcement of CPCB guidelines for better construction activities (use of green screens, side covering of digging sites, etc.)	Regular	RMC
		Restriction on storage of construction materials along the roads	Regular	RMC
		Covering of construction site.	Regular	RMC
		To create separate space/zone to handle solid waste, C&D waste and other waste in the city	December, 2023	RMC
		To mandate facility of tar road/gravel lined roads inside the construction site for movement of vehicles carrying construction material	Regular	RMC
		Promotion of the use of prefabricated blocks for building construction	Regular	RMC
		Enforcement of Construction and Demolition Waste Rules	Regular	RMC

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
		Control measures for fugitive emissions from material handlingconveying and screening operations	Regular	RMC
		Frame and implement policy for segregation of construction and demolition waste and provide a network of decentralised C&D waste segregation and collection sites across the city.	Regular	RMC
		Promote recycling of construction and demolition waste	Regular	RMC
	Improve and strengthen PUC programme	Increase Number of Pollution Under Control (PUC) centers in the city	March, 2022	Transport Dept.
		Regular checking of Vehicular emission and issue of PUC Certificate	March, 2022 and continuous process	Transport Dept./Traffic police
		Auditing and reform of PUC certification	March 2022	Transport Dept.
		Linking of PUC centers with remote server and eliminate manual intervention in PUC testing.	March 2022	Transport Dept.
		Link PUC certificates with annual vehicle insurance	March 2022	Transport Dept.
		Vehicle labeling or sticker programme	March 2022	Transport Dept.
		Use of offpeak passenger travel times to move freight and restrict the entry of heavy vehicles into cities	March 2022	Transport Dept.

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
	Freight transport	Provide truck rest areas/ parks along national and state highways to prevent entry of trucks into cities during peak hours	March 2022	Transport Dept.
		Diversion of truck traffic	Round the year	Transport Dept.
		Check overloading: Use Weighin-Motion bridges / machines (WIM) and Weigh bridges at entry points to the city to check the payload of commercial vehicles. As per the CMVR, a penalty of 10 times the applicable rate for overloaded vehicles is applicable.	December 2022	Transport Dept.
		Define routes, permits, fares, vehicle design and safety standards, and vehicle technology standards for para-transit vehicles.	Ongoing	Transport Dept.
	Clean fuel and fuel Quality	Check on fuel adulteration and random monitoring of fuel quality data	December, 2022	Transport Dept.
		Alternative clean fuel policy for vehicle	December, 2022	Transport Dept.
		Use of Biofuel	December, 2022	Transport Dept.
	Parking Management	Prevent parking of vehicles in the nondesignated areas	Round the year	Transport Dept.
		Development of Multi-layer parking	Round the year	RMC/ Transport Dept.

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
Steps to control emissions from vehicular pollution		Penalise parking of vehicles in nondesignated areas	Regular	Transport Dept.
	Strengthening of Public Transportation	Assess and introduce a city bus system of appropriate fleet size of small buses and desirable bus type replete with GPS tracking, ETVMs for fare collection and Passenger Information Systems	March, 2022	Transport Dept.
		Develop route plan for bus operation; target trunk roads	March, 2022	Transport Dept.
		Intermediate public transport (IPT) and bus system	December 2022	Transport Dept.
		Introduction of new electric buses (with proper infrastructure facilities such as charging stations) and CNG buses for public transport which will reduce plying of private vehicles on road and help to curb tail-pipe emissions	December, 2022	RMC/ Transport Dept.
		CNG infrastructure for auto gas supply in the city and transition of public transport vehicles to CNG mode Introduction of e-buses for Public transport in metro cities	December, 2022	Transport Dept.
		Steps for promoting battery operated vehicles like E-rickshaw/ E-Cart	March, 2022	RMC

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
	Traffic Congestion	Conducting audit of traffic intersections and install functional traffic signals at all major intersections	Round the year	Transport Dept.
		Synchronize traffic movements/ Introduce intelligent traffic system for lane-driving	March, 2022	Transport Dept.
		Prepare plan for construction of diversion ways/ bypasses to avoid congestion due to nondestined vehicles.	December 2022	Transport Dept.
		Prepare plan for widening of road and improvement of infrastructure for decongestion	September, 2022	Transport Dept.
		Launch Public awareness campaign for air pollution control, vehicle maintenance , minimizing use of personal vehicle, lane discipline, etc.	Round the year	Transport Dept.
	Periodic calibration test of vehicular emission monitoring instrument.	Launch of public outreach campaign through advertisement, nukkad natak, wall painting, social media and other means near major polluted roads and public places. 10 outreach campaign with a target to reach out 10,000 people is being planned	Round the year	Transport Dept.

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
	Periodic calibration test of vehicular emission monitoring instrument.	SOP for calibration of emission monitoring instrument to be prepared	Round the year	Transport Dept.
	Phase out old vehicles and vehicle scrappage policy	Inspection / maintenance to all BSII & BS III	Round the year	Transport Dept.
		Restriction on plying and phasing out of 15 years old commercial diesel driven vehicles.	FY 2021-22	Transport Dept.
		Enforcement of law against visibly polluting vehicles: remove them from road, impose penalty, and launch extensive awareness drive against polluting vehicles.	Regular	Transport Dept.
		Initiate steps for retrofitting of particulate filters in diesel vehicles, when BS-VI fuels are available.	Round the year	Transport Dept.
		To increase fine on vehicle owners (not drivers) where the visible smoke is emitted and noticed	Round the year	Transport Dept.
		Examine existing framework for removing broken down buses or trucks from roads and create a system for speedy removal and ensuring minimal disruption to traffic from such buses or trucks.	March, 2022	Transport Dept.

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
	Non Motorized Transportation (NMT)	Introducing cycle tracks along with the roads	FY 2021-22	Transport Dept./ Ranchi Smart City corporation
		Prepare and implement zonal plans to develop an NMT network	FY 2021-22	Transport Dept./ Ranchi Smart City corporation
	Industrial Air Pollution Control	To intensify monitoring of industries to reduce emission	Ongoing enforcement activity	JSPCB
		Action against non-complying industrial units	Ongoing	JSPCB
		Shifting of polluting industry	Ongoing	JSPCB
		Ban on Polluting Industries	March 2022	JSPCB
		Random auditing for air pollution measures and online reporting systems in the industries	Regular activity	JSPCB
		Ensuring installation/ Up-gradation and operation of Pollution Control Devices (PCDs) in industries	Regular activity	JSPCB
		Action/closure against defaulting/ unauthorized industrial units.	Regular activity	JSPCB
		Ensuring emission standards in industries	Regular activity	JSPCB

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
Step to control industrial pollution		Prepare and implement local area action plan for pollution hotspots and strict enforcement of air pollution control measures in all industries, including those located in unauthorized areas.	Ongoing	JSPCB
	OCEMS in Industries	Implement Continuous Online Emission Monitoring System (OCEMS) across all targeted and applicable polluting industry	Ongoing	JSPCB
		Development of mobile facility/van for continuous ambient air quality monitoring for different localities.	FY 2021-22	JSPCB
	Clean fuel in Industries	Introduction and shifting towards cleaner fuels in industries	September 2021	DoEFCC
	Control of air pollution from Brick kilns	Adapting new technologies for Brick kilns	March 2022	JSPCB
	Control of air pollution from Diesel generator sets	Allow only DG sets meeting emission and design of chimney/ exhaust, acoustic enclosures standards to operate	Regular	JSPCB
		Discourage use of DG sets in cellular towers. Promote use of alternate power	Regular	JSPCB
		Regular check and control of burning of municipal solid wastes	Ongoing	RMC
		Fines for open burning imposed on violators	Ongoing	RMC

Table 20 : CLEAN AIR ACTION PLAN OF RANCHI				
Sector/ Source group	**Action**	**Steps Being Undertaken**	**Time target for Implementation**	**Responsible Agency(ies)**
Waste and biomass-dumping and burning	Control on Biomass Burning	Identify Garbage burning locations	Ongoing	RMC
		Launch extensive drive against open burning of biomass, crop residue, garbage, leaves, etc	Ongoing	RMC
		Construction of advanced waste management site	March 2024	RMC
		Regular collection and control of municipal solid wastes	FY 2021-22	RMC
		Providing Organic Waste Compost machines , decentralization of processing of Waste, dry waste collection centers.	June, 2022	RMC
		Awareness for controlling of burning of agricultural waste and crop residues.	FY 2021-22	RMC
		Door to Door collection of waste	March 2023	RMC
		Ensure segregation of waste at source	March 2023	RMC
	Domestic Fuel	Introduction of improved chullahs (low emission chullahs)	March 2022	RMC

2. GRADED RESPONSE ACTION PLAN

In the longer term, the Clean Air Action Plan is required to permanently reduce emissions by taking strong and sustained action, while the Graded Response Action Plan (GRAP) serves as an emergency response plan to rising pollution. GRAP is critical for ensuring emergency response actions and reducing high exposure during sudden spike of air pollution. Generally during winter months, the pollution levels may increase drastically due to anthropogenic and natural phenomena-combined impact of meteorological factors.

The GRAP includes the measures, which will immediately kick in under a particular air quality category with well-defined executing agencies. India established NAQI in 2015 to effectively communicate how clean or unhealthy air is and what associated health effects might be a matter of concern. Based on this index, daily pollutant concentrations are classified and graded as "Good, Satisfactory, Moderate, Poor, Very Poor and Severe". Each category is colour-coded so that the general public can understand the different levels of concentration and health risks associated with it. To control this unexpected increase in pollution levels, the State Government must develop a responsive action plan, and simultaneously start issuing health advisory. However, it is to be noted that the GRAP implementation requires a daily AQI level for which installation of real-time monitors is important.

Ministry of Environment, Forests and Climate Change, Govt. of India (vide its notification S.O. 118 (E), dated January 12, 2017) and CPCB has formulated Graded Response Action Plan for Delhi & NCR based on Air Quality Index and concentration of particulate matter. In accordance with the same, GRAP has been formulated for Ranchi as hereunder (Table 21).

Table 21: Graded Response Action Plan	
Severe + or Emergency (ambient PM2.5or PM10 concentration values of 300μg/m3 or 500 μg/m3 respectively persist for 48 hours or more)	**Agency responsible/ Implementing Agency**
Stop entry of truck traffic in city (except essential commodities)	Municipal Corporations and Traffic Police
Stop construction activities	JSPCB and Municipal Corporations
Introduce odd and even scheme for private vehicles based on license plate numbers and minimize exemptions	Transport Department,
Task Force to take decision on any additional steps including shutting of schools	District Administration
Severe (ambient PM2.5or PM10 concentration value is more than 250 μg/m3 or 430μg/m3 respectively)	**Agency responsible / Implementing Agency**
Close brick kilns and Stone Crushers	JSPCB and District administration
Increase frequency of mechanized cleaning of road and sprinkling of water on roads. Identify road stretches with high dust generation.	Municipal Corporations, Public Works Departments
Very Poor (ambient PM2.5or PM10 concentration value is between 121-250µg/m3or 351-430 µg/m3 respectively)	**Agency responsible/ Implementing Agency**
Stop use of diesel generator sets	JSPCB
Enhance parking fee by 3-4 times	Municipal Corporation
Stop use of coal/firewood in hotels and open eateries	Municipal Corporation
Alert in newspapers/TV/radio to advice people with respiratory and cardiac patients to avoid polluted areas and restrict outdoor movement.	JSPCB
Moderate to poor(ambient PM2.5 or PM10 concentration value is between 61-120 µg/m3 or 101-350 µg/m3 respectively)	**Agency responsible/ Implementing Agency**
Strictly enforce/stop garbage burning in landfills and other places and impose heavy fines on person responsible	Municipal Corporation
Close/strictly enforce all pollution control regulations in brick kilns and industries	JSPCB
Strictly enforce pollution control in thermal power plants through PCB monitoring	Plant companies/ JSPCB

Do periodic mechanized sweeping on roads with heavy traffic and water sprinkling also on unpaved roads every two days	Municipal Corporations, Traffic Police
Strict vigilance and no tolerance for visible emissions – stop plying of visibly polluting vehicles by impounding or heavy fine.	Transport Department and Traffic Police
Strict vigilance and enforcement of PUC norms	
Strictly enforce rules for dust control in construction activities and close non-compliant sites	Traffic Police
Deploy traffic police for smooth traffic flow at identified vulnerable areas	Traffic Police
Strictly enforce Supreme Court order on diversion of non-destined truck traffic	Municipal Corporation
Strictly enforce Supreme Court ban on firecrackers	Chief Controller of Explosives
Information dissemination Social media, mobile Apps should be used to inform people about the pollution levels, contact details of control room, enable them to report polluting activities/sources to the concerned authorities, and actions that will be taken by government based on the level of pollution.	JSPCB

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Under the 15th Finance Commission (XV-FC) revised COMPREHENSIVE CLEAN AIR ACTION PLAN OF RANCHI CITY has been prepared by the State Air Quality Monitoring Committee, Jharkhand.

The signature of the concerned committee members are as follows:

Member Secretary,
SPCB, Jharkhand

Director
Agriculture, Animal Husbandry and Co-Operative Department,
Govt. of Jharkhand

Director
State Urban Development Agency,
Urban Development and Housing Department,
Govt. of Jharkhand

Commissioner,
Transport Department,
Govt. of Jharkhand

Director
Industries Department,
Govt. of Jharkhand

Special Secretary
Forest, Environment and Climate Change
Govt. of Jharkhand