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Air pollution in Himachal Pradesh

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1. Introduction

At the time of formation of the Himachal Pradesh (HP), there were very few small scale industries that dealt with traditional skills and arts in handloom & handicraft. Industrialization started in 1980's in the state and geared up with the assignment of special package of incentives to the industry of the state in 2003 by the Indian government. Also, as state has more than two thousand temples, it attracts religious tourism. Due to the hilly nature of the state, rail and air connectivity is minimum resulting into high vehicular influx through the tourist visits. Rapid urbanization has thus resulted into deterioration of air quality of the state and mainly increased the levels of particulate matter.

This chapter briefly discusses the drivers and pressures responsible for the increasing levels of air pollutants in the state and the status of air quality, its impacts and the steps/interventions taken to curb this environmental issue.

2. Drivers and Pressures

Major sources of air pollution in Himachal Pradesh include industries (like mining and cement) and the vehicular sector (GoHP, 2005). However, growth of population and developmental activities are the driving forces behind the deteriorated air quality of the state.

2.1 Population and Economic Growth

Population in Himachal Pradesh has increased 2.5 times in the past 60 years (Figure 1). Per capita income of the state has increased from 33348 in 2004-05 to 83899 in 2012-13. However, growing population base exerts huge demands on the manufacturing sector which in turn put pressures on the quality of land, air and water resources.

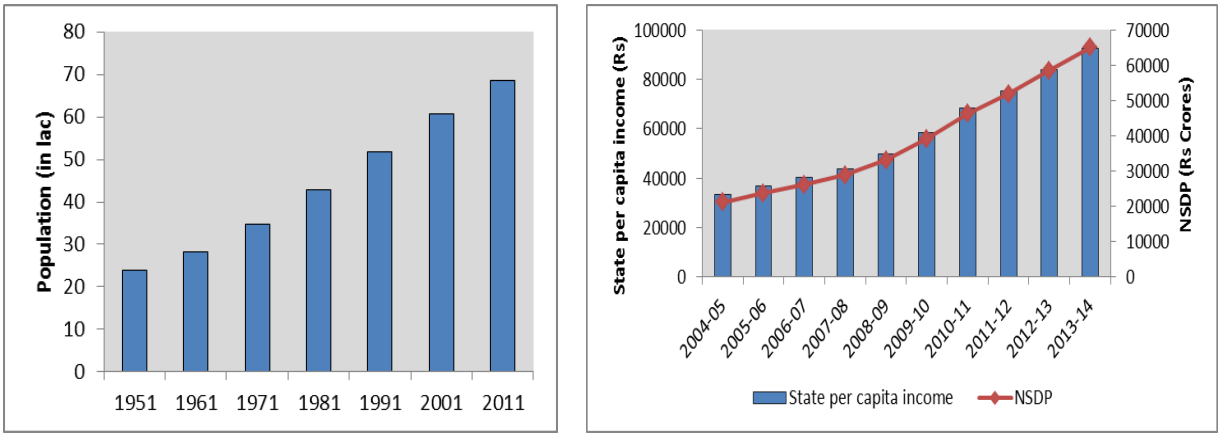


Figure 1 Growth of Population (1961-2011), Per Capita income at current prices for Himachal Pradesh

Source: State of Environment Report, GoHP (2012), MOSPI (2014)

2.2 Industries

Growth in industry sector in the past few decades has contributed the maximum to overall deterioration of air quality. Figure 2 shows the growth of small scale and medium/large scale industries in the state. Both small scale and medium/large scale industries show an increase in growth rate. The number of small scale industries has almost doubled in the span of twenty years (20545 in 1990-91 to 37364 in 2010-11). However, large and medium scale industries show a great increase in their number after 2003 most likely because of the allotment of special package of incentives to industries in the state in that year. Around 39,819 small scale industries and 499 large and medium scale industries are presently functioning in Himachal Pradesh (Dept. of Industries, 2014).

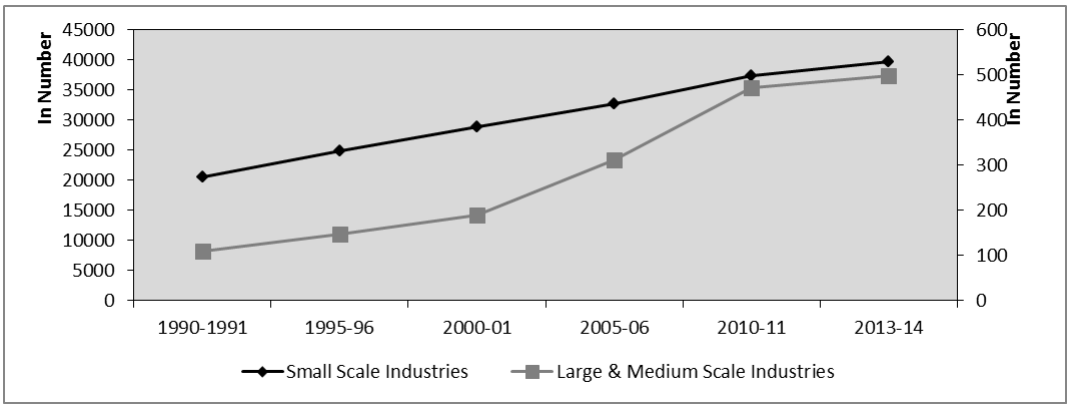


Figure 2 Growth of Industrial sector (Small scale, Medium & Large scale industries) in Himachal Pradesh
Source: Deptt. of Industries 2014

District wise distribution of industries is shown in Figure 3. Solan has maximum number (344) of large & medium scale industries whereas Kangra has maximum number (9198) of small scale industries in the state.

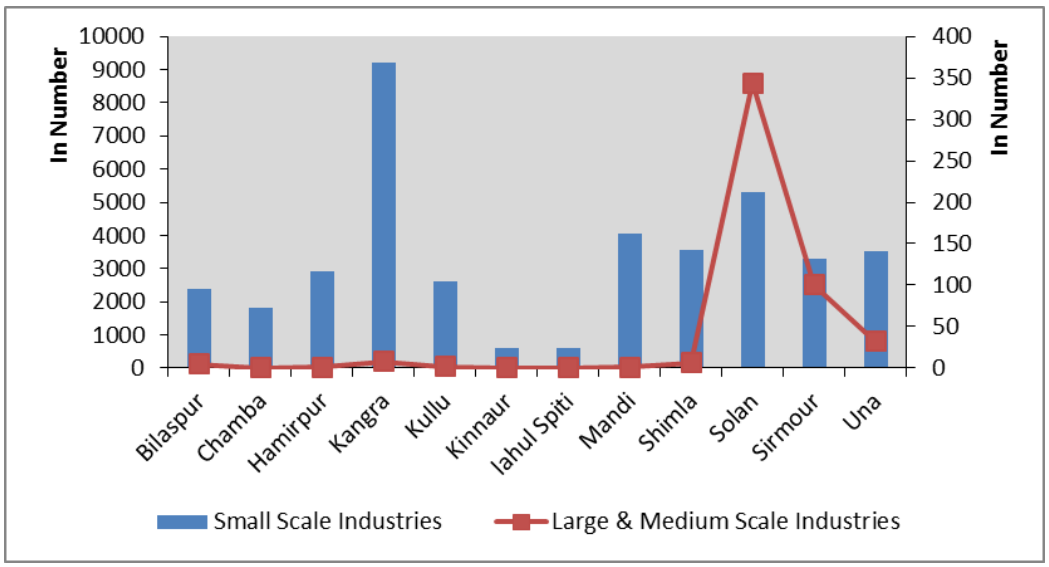


Figure 3 Statewide distribution of small scale and large & medium scale industries in Himachal Pradesh

Source: Deptt. of Industries 2014

2.3 Transport

Vehicular sector is one of the most important contributors to air pollution due to its immediate impact on the human health. It is evident from Figure 4a that number of vehicles in the state has increased more than its double (2.4 lac to 7.3 lac) from 2001 to 2012 in the state. Cars and two wheelers are contributing the most in this increase in number of vehicular fleet (Figure 4 b).

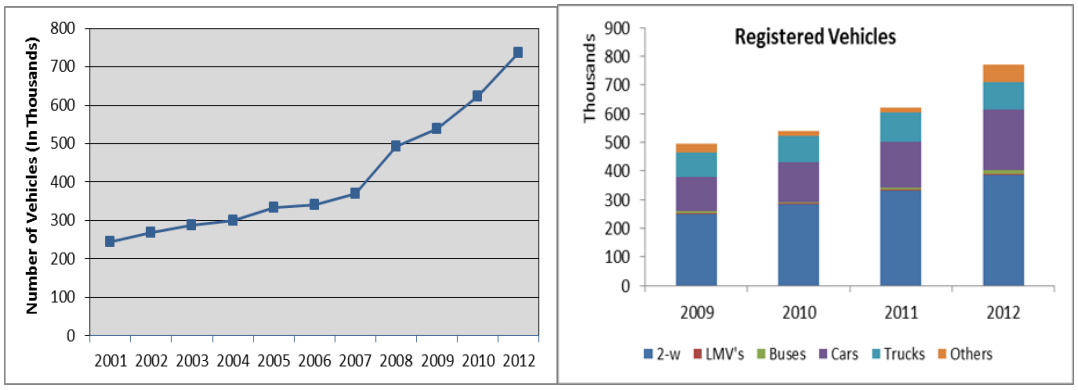


Figure 4 a) Growth of Vehicles b) Modal share of vehicles in Himachal Pradesh

Source: MoPNG 2013

3. Baseline Emissions

State-wise emission assessment study (TERI, 2015) shows sector-wise emissions for the Himachal Pradesh state (Figure 5). Industrial combustion contributes 43% of the PM10 emissions followed by residential sector and cement plants. 60 % of NOx emissions are contributed by transport sector in the state, followed by cement plants and open burning activities.

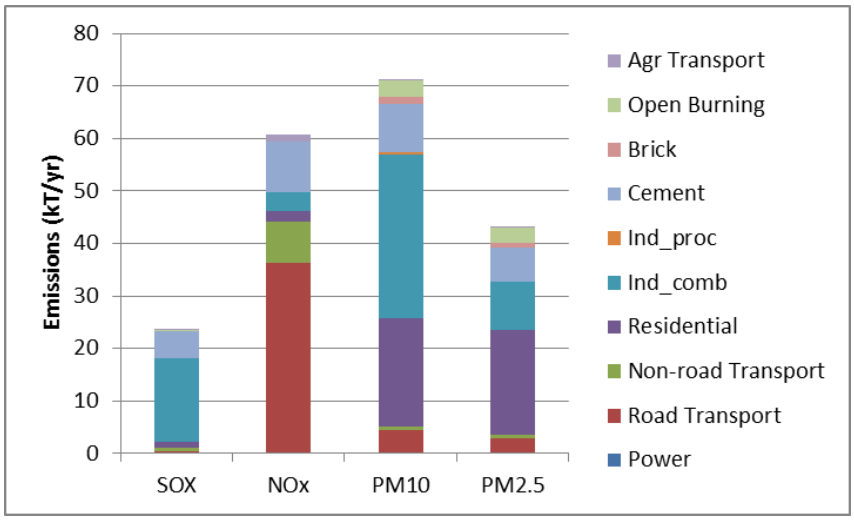


Figure 5 Sector-wise emissions for criteria pollutants from different sources in Himachal Pradesh in 2010

Source: TERI, 2015

4. State of air quality

Currently Himachal Pradesh has 20 air quality monitoring stations in seven cities under the national ambient air quality programme of CPCB (CPCB, 2014) as shown in Table 1. There are six monitoring stations in industrial areas and rest 14 in residential areas. Four stations in residential areas, in Shimla and Manali fall under ecologically sensitive areas category.

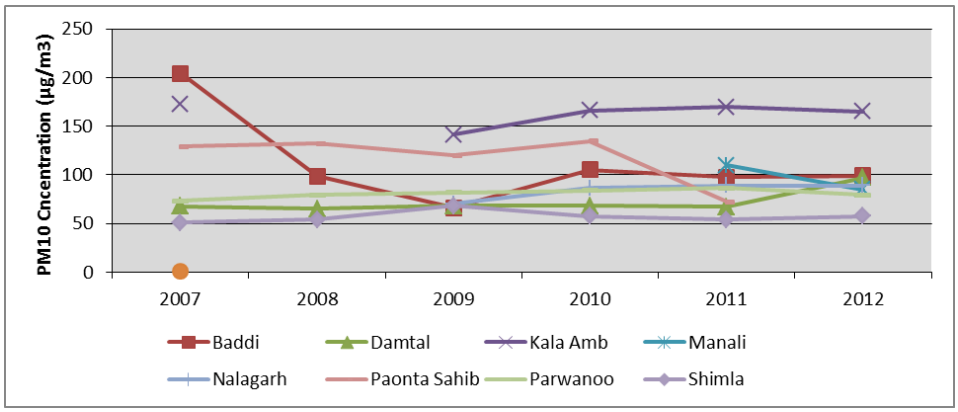
Table 1 Air quality monitoring stations in Himachal Pradesh under NAMP

Cities in Himachal Pradesh	Location	Residential (R)/ Industrial(I)
Baddi	Industrial Department Office Building	Industrial
	AHC barotiwala	Industrial
	Housing Board	Residential
Damtal	Regional Office	Residential
	Old Road	Residential
Nalagarh	Municipal Council	Residential
Kala Amb	Kala Amb Industrial Area	Industrial
	Kala Amb Town/Trilokpur	Residential
Parwanoo	Regional Office, Sector- 4	Residential
	Asst. Commissioner Building Sector I	Industrial
Paonta Sahib	Paonta Sahib	Residential
	Gondhpur Industrial Area	Industrial
Shimla	Tekka Bench Ridge	Sensitive
	Bus Stand, Winterfield	Sensitive
Una	Regional Office, Una	Residential
	DIC Building, Mehatpur, Una	Industrial
Sunder Nagar	HPSPCB, BBMB Colony, Mandi	Residential
	Muncipal Council, NH-21, Mandi	Residential
Manali	Nehru Park, Manali, District Kullu	Sensitive
	HPSPCB, Hadimba Road, Manali, Kullu	Sensitive

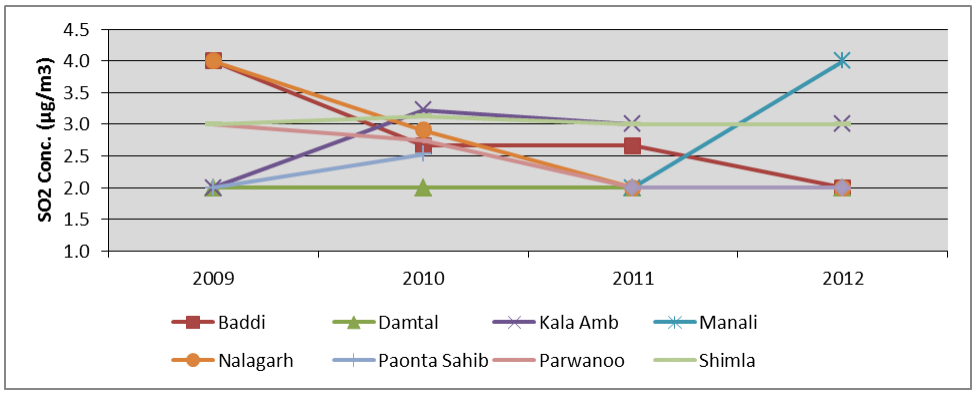
Source: CPCB, 2014

Figure 6 shows annual average concentration of RSPM, NOx and SO2 during 2007-2012 across different cities in Himachal Pradesh state.

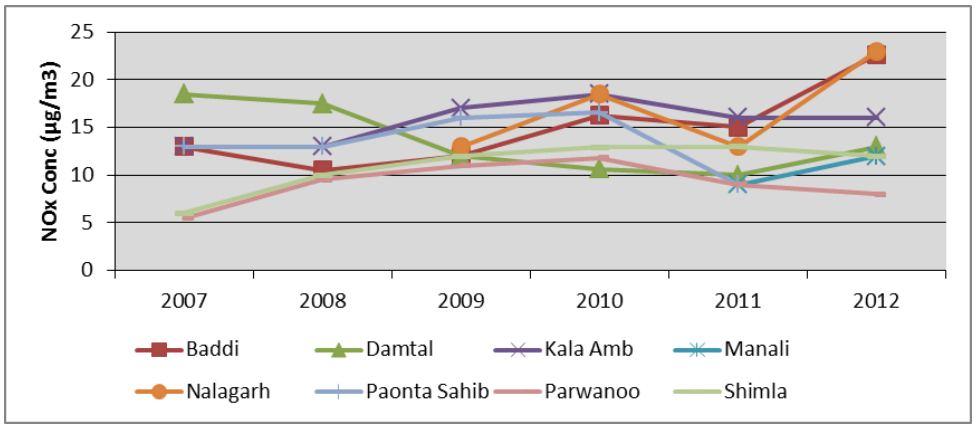
It can be seen from the figure that apart from Shimla, PM10 is above the annual average standard of 60 µg/m3 as provided by CPCB in all the cities of Himachal Pradesh. Shimla and Manali fall into ecologically sensitive areas as assigned by central government. SO2 and NOx are well within the permissible limits.



Annual Average Standard: For Residential /Industrial /Ecologically Sensitive areas: 60 µg/m^3



Annual Average Standard: For Residential /Industrial areas: 40 µg/m^3,
For ecologically sensitive areas:20 µg/m^3



Annual Average Standard: For Residential /Industrial areas: 50 µg/m3,
For ecologically sensitive areas: 30 µg/m3

Figure 6 Annual average of PM10, SO2 and NOx concentration for different cities in Himachal Pradesh

Source: CPCB, 2014

5. Impact

Air pollution has significant impacts on human health and the nearby environment giving rise to lesser visibility. It increases an individual's disease mitigation expenses and affects his /her working capacity too. Impacts of various air pollutants are given in Table 2.

Table 2 Different pollutants and their impact on human health

Pollutant	Impact on Human Health
Particulate Matter	Respiratory problems, Cardiovascular problems, Throat and eye irritation, skin diseases, Cancer
NOx	Respiratory problems
CO	At 15 μg/m^3 central nervous system get affected
SO_2	Throat irritation at 8-12 mg/m3, eye irritation at 10mg/m3 and immediate coughing at 20 mg/m3

Source: Envis Centre, Punjab

6. Response

Various interventions have been taken by the state government, central government, and different ministries at different time periods in order to control air pollution in Himachal Pradesh. They are put in chronological order in Table 3.

Table 3 Interventions taken to curb air pollution in Himachal Pradesh

Year	Intervention
2012	Implementation of Bharat Stage III fuel norms for passenger cars, heavy diesel vehicles and 2/3 wheelers
2009	Revision of air quality standards by CPCB- The earlier standards for residential areas have been uniformly applied for industrial areas also for PM10, carbon monoxide and ammonia. More stringent limits have been set for SO_2 and NOx for residential areas also. Fine particulate matter (PM2.5) has been introduced being more relevant for public health
2006-07	Cumulative number of APCE in the state is 1821
2004-05	On the basis of NAMP data, CPCB has identified Damtal, Paonta Sahib, Parwanoo & Shimla cities of HP where NAAQS have been violated with major pollutant of concern are particulate matter both PM10 and PM2.5. Sources of pollution in these areas has been fund to be natural dust and industries Action plans have been formulated for Ludhiana and Mandi Gobindgarh cities
2000	Introduction of lead free petrol
1986-87	Inception of monitoring of ambient air quality in HP
1986	Implementation of Environment Act 1986, Motor Vehicles Act 2000 in HP
1981	Implementation of Air Act 1981
1974	Constitution of Himachal Pradesh State Pollution Control Board

7. Barriers

Air pollution has been existing in HP majorly from tourism activities in transport sector and household chulhas in residential sector but it has increased to much higher levels in the past few decades due to growth in the cement sector and urbanization. Although control measures have been introduced in the state from time to time to combat the pollution levels but the pace at which the emission levels have increased is very high compared to that of control measures.

Every investment under the umbrella of environmental protection demands financial support from the government. Largely, the first priorities for big investments in India have been for providing basic infrastructural arrangements for the burgeoning population.. Thus, allocation of funds for environment sector comes as a next to first priority. For example, with the advent of urbanization, number of on-road vehicles have increased and as result emissions from the transport sector has increased tremendously. Looking at this, government has formulated an auto fuel policy which establishes mass emission standards. But the norms are not similar throughout the country and the timelines set for applicability of these norms is very far in the future.

In case of residential sector, traditional chulhas and traditional fuels are the main cause of emissions. Despite of information regarding better available technologies around the world, dissemination of the same across the entire country becomes a big challenge. RGGLVY (Rajiv Gandhi Gramin LPG Vitaran Yojana) started by the government is active since 2009 but to reach each remote village is a challenge. Since all the villages are still not electrified, many villages still rely on kerosene for lighting purpose in their households which lead to increased levels of pollutants. Similarly, though improved cookstoves have been introduced by the government through different programs but the scale of these programs is not sufficient to cater the needs of the entire country.

Complete awareness regarding the importance of protecting environment is still low in every village of HP.

8. Ways forward

Himachal Pradesh's major emitting sectors are road transport, industrial combustion, and residential cement industry. NOx emissions are dominated by road sector emissions whereas industrial combustion, residential sector and cement plants are mainly contributing to the particulate matter emissions. Although emissions are not quite high at present, but if the proper control measures are not taken into account, these will increase manifold. Industrialization is taken its rise after the special package of incentives to the industry of the state in 2003 by the Indian government. In the business-as-usual scenario, the future emissions from these sectors will grow (Figure 7). In 2030, it is predicted that total NOx emissions will increase three fold. However, not much increase is envisioned in particulate emissions. In 2047, along-with road transport and cement sector, contribution of particulate emissions from brick sector is also predicted.

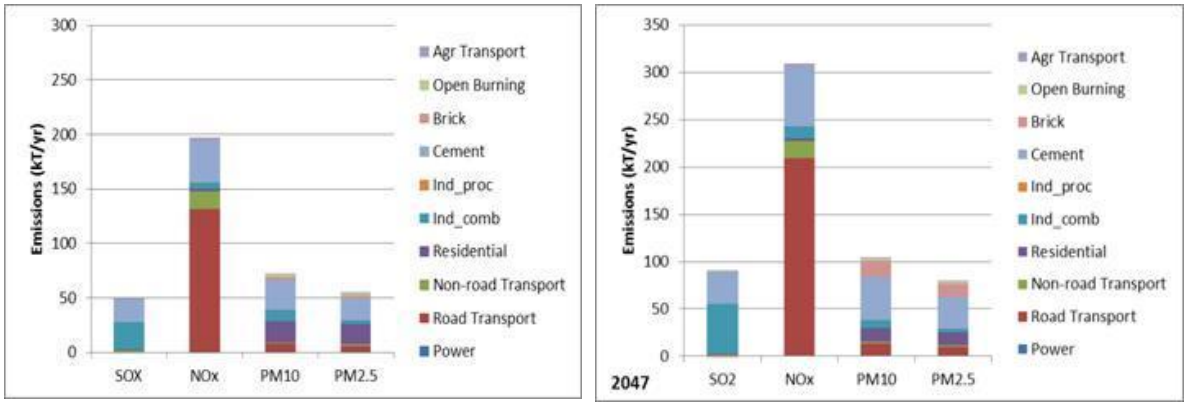


Figure 7 Sector-wise predicted emissions for criteria pollutants from different sources in Himachal Pradesh in 2030 and 2047

Source: TERI, 2015

Following recommendations are provided for major polluting sectors of Himachal Pradesh.

8.1 Transport

In transport sector, one of the ways to control air pollution is to have stringent norms for emissions and fuel quality.

- An Auto Fuel Policy was formulated in the year 2002, to lay down a roadmap for introduction of cleaner fuels and vehicles. Following this roadmap, 13 selected cities were moved to BS-IV norms in 2010 and rest of the country on BS III norms. But this is ambiguous that we follow same NAAQS standards throughout the country and different fuel quality standards.

- Recently auto fuel vision committee was set up in 2013 to recommend the future roadmap on advancement of fuel quality and vehicular emission standards 2025. It has recommended introduction of BS-IV by 2017, BS-V by 2020 and BS-VI by 2024 across the country (TERI, 2014).

- However, looking at the growth rate of vehicular sector, more stringent steps should be taken. Instead of following chronological order for the norms, BS-V fuels should be considered by enabling the Indian refineries to leapfrog from BS-II to BS-V.

- An effective inspection and maintenance system should be enforced by the Government in the state.

- Old vehicles should be banned in the state as they cause more pollution.

- Government should conduct programs at community level to sensitize the public about the growing levels of the pollution due to vehicles and promote public transport systems.

- Tourism activities should be managed properly to control the vehicular movement.

8.2 Industries

In this sector, cement sector is majorly contributing to the emissions in the state which is evitable from the increasing number of cement plants in the state.

- Installment of APCEs in all industrial units should be made mandatory for all the industries.
- Efficiency of installed APCE's should be checked at regular levels.
- In order to have more regular control, number of air quality monitoring stations in the state should be increased.
- Government should emphasize on adoption of cleaner technologies like Vertical Shaft Brick Kiln (VSBK) and tunnel kilns in brick sector. Due to the mobile nature of few brick making technologies, the exact number of brick kilns is never accurate. Thus, registration of brick kilns should be made mandatory.

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