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VEHICULAR POLLUTION IN INDIA

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Vehicular Pollution in India

Introduction

Air pollution is one of the serious environmental concerns of the urban cities where majority of the population is exposed to poor air quality. The rapid urbanization in India has resulted in a tremendous increase in the number of motor vehicles. As the number of vehicles continues to grow and the consequent congestion increases, vehicles are now becoming the main source of air pollution in urban India.

The country has taken a number of measures for the improvement of the air quality in cities. These include, the improvement in the fuel quality, formulation of necessary legislation and enforcement of vehicle emission standards, improved traffic planning and management, etc.

Vehicular pollutants

Automotive vehicles emit several pollutants depending upon the quality of the fuel they consume and engine efficiency. The release of pollutants from vehicles also include fugitive emissions of the fuel and the source and level of these emissions depending upon the vehicle type, its maintenance, etc. The major pollutants released as vehicle/fuel emissions are, carbon monoxide (CO), nitrogen oxides (NO_x), photochemical oxidants, air toxics, namely benzene (C₆H₆), aldehydes, 1,3 butadiene (C₄H₆), lead (Pb), particulate matter (PM), hydrocarbon (HC), oxides of sulphur (SO₂) and polycyclic aromatic hydrocarbons (PAHs). While the predominant pollutants in petrol/gasoline driven vehicles are hydrocarbons and carbon monoxide, the predominant pollutants from the diesel based vehicles are Oxides of nitrogen and particulates.¹

¹ Status of the Vehicular Pollution Control Programme in India, CPCB, p.2-3.

Effects of Vehicular Pollutants on Human Health

The vehicular emissions have damaging effects on both human health and ecology. There is a wide range of adverse health/environmental effects of the pollutants released from vehicles. The effects may be direct as well as in-direct covering right from reduced visibility to cancers and death in some cases of acute exposure to pollutants, specially carbon monoxide. These pollutants are believed to directly affect the respiratory and cardiovascular systems. In particular, high levels of Sulphur Dioxide and Suspended Particulate Matters are associated with increased mortality, morbidity and impaired pulmonary function. The pollutant wise health effects are summarized below.

Pollutant	Effect on Human Health
Carbon Monoxide	Affects the cardio vascular system, exacerbating cardiovascular disease symptoms, particularly angina; may also particularly affect fetuses, sick, anemic and young children, affects nervous system impairing physical coordination, vision and judgments, creating nausea and headaches, reducing productivity and increasing personal discomfort.
Nitrogen Oxides	Increased susceptibility to infections, pulmonary diseases, impairment of lung function and eye, nose and throat irritations.
Sulphur Dioxide	Affect lung function adversely.
Particulate Matter and Respirable Particulate Matter (SPM and RPM)	Fine particulate matter may be toxic in itself or may carry toxic (including carcinogenic) trace substance, and can alter the immune system. Fine particulates penetrate deep into the respiratory system irritating lung tissue and causing long-term disorders.
Lead	Impairs liver and kidney, causes brain damage in children resulting in lower I.Q., hyperactivity and reduced ability to concentrate.
Benzene	Both toxic and carcinogenic. Excessive incidence of leukemia (blood cancer) in high exposure areas.
Hydrocarbons	Potential to cause cancer

Vehicular Pollution Problems in India

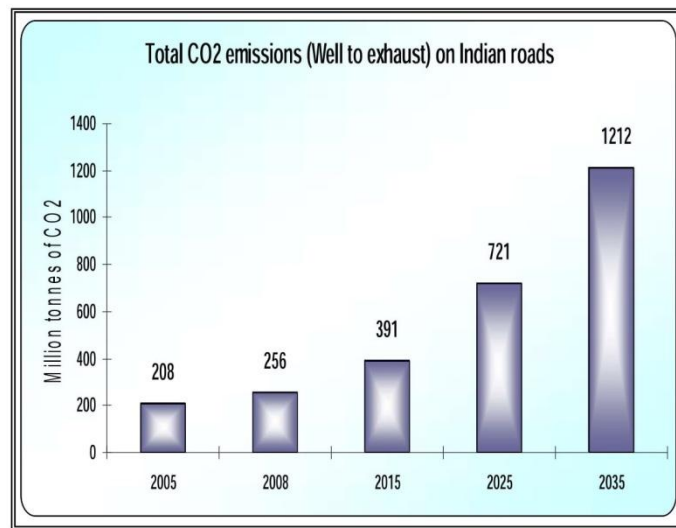
Motor vehicles have been closely identified with increasing air pollution levels in urban centers of the world. Besides substantial Carbon Dioxide (CO₂) emissions, significant quantities of Carbon Monoxide (CO), Hydrocarbon (HC), Nitrogen Oxide (NO_x), Suspended Particulate Matter (SPM) and other air toxins are emitted from these motor vehicles in the atmosphere, causing serious environmental and health impacts. Like many other parts of the world, air pollution from motor vehicles is one of the most serious and rapidly growing problems in urban centers of India. The problem of air pollution has assumed serious proportions in some of the major metropolitan cities of India and vehicular emissions have been identified as one of the major contributors in the deteriorating air quality in these urban centers. The problem has further been compounded by the concentration of large number of vehicles and comparatively high motor vehicles to population ratios in these cities. Reasons for increasing vehicular pollution problems in urban India are as below;

- High vehicle density in Indian urban centers.
- Older vehicles predominant in vehicle vintage
- Predominance of private vehicles especially cars and two wheelers, owing to unsatisfactory public transport system, thereby causing higher idling emissions and traffic congestion.
- Absence of adequate land use planning in development of urban areas, thereby causing more vehicle travel and fuel consumption
- Inadequate inspection & maintenance facilities.
- Adulteration of fuel & fuel products
- Improper traffic management system & road conditions
- High levels of pollution at traffic intersections

- Absence of effective mass rapid transport system & intra-city railway networks
- High population exodus to the urban centers.
- Increasing number skyrocketing buildings in the urban areas causes stagnation of the vehicular emissions to the ground level and preventing its proper dispersion.

Emissions of Green House Gases (GHGs) from Transport Sector

A study for CO₂ emission carried out by a Delhi based organization Centre for Science and Environment has depicted that the emission of CO₂ on Indian road is expected to reach a value of 1212 million tonnes during 2035 from a value of 208 million tonnes during 2005. Total CO₂ emission from well to exhaust in Indian roads from 2005 to those projected in 2035 are depicted below:²



Source: CSE, New Delhi

Vehicular Population Growth: The transport demand in India has been growing rapidly. Sustained economic growth, improved road infrastructure and increased disposable income of households have led to the rising demand for road transport. There has been a continuous increase in the number of registered motor vehicles in India since 1951. The total number of registered motor vehicles increased from about 0.3 million in March, 1951 to 230.03 million up

² *ibid.* p.10-11.

to 31st March, 2016 (**Annexure-I&II**). The total registered vehicles in the country grew at a Compound Annual Growth Rate (CAGR) of 9.9 per cent between 2006 and 2016.³

Vehicular Pollution Control Measures

The Union Government of India have been emphasizing the need for planning and developing strategies to implement mitigation measures to maintain the urban air quality and make the cities cleaner and greener for achieving better air quality and good health for its citizens.

Vehicular Pollution Control Initiatives in India can broadly be categorized into Technical & Non-Technical Measures. The Technical Instruments for controlling vehicular Pollution include Implementation of stringent emission norms for both new & in-use vehicles, improvement in vehicular technology, improvement in the quality of fuels, switching over to cleaner vehicles as well as fuels, etc. The Non Technical instruments include measures like better traffic management system, augmentation in public transport system, implementation of market based instruments *i.e.* fiscal instruments, generating mass awareness, drives for checking adulteration, etc.

Some of the major steps taken by the Union Government to check vehicular pollution include:-

- Mass Emission Standards (Bharat Stage IV) implemented across the country for all categories of new vehicles from 01 April, 2017. India will leap frog from BS-IV norms to BS-VI and Notification for implementation of BS-VI emission norms for all categories of new vehicles from 01 April, 2020 has been issued.
- Fuel efficiency norms for passenger cars have been notified on 23 April, 2015.

³ Road Transport Year book (2015-16), MoRTH, p.8-9.

- Promotion of electric/hybrid vehicles through National Electric Mobility Mission Plan 2020 and Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles.
- Introduction of cleaner / alternate fuels such as LPG, CNG, Bio-Diesel Blends, Battery Operated, Hydrogen and Solar Operated vehicles.
- Promotion of public transport and network of metro, e-rickshaws, promotion of car pooling, Pollution Under Control Certificate, lane discipline, vehicle maintenance, etc.^{4,5}

Conclusion

Air pollution imposes a cost on society as it increases both morbidity and mortality. There is thus an urgent need to deal with the problem of vehicular pollution. Advanced emission norms, Bharat IV and VI are being adopted to deal with the problem. Awareness has to be created among people to undertake measures to keep their vehicles well maintained to reduce emissions. However, the greatest benefit come from the public transport as it will reduce the number of vehicles on Indian city roads at the same time meeting the mobility needs of the people. The pollution level can be minimized by the use of innovative and technical methods as well as the alternative fuels. Measures should be taken to run public transport vehicles on fuels which pollute less such as Compressed Natural Gas, so that emissions from these vehicles can be minimized.

Sources Consulted

1. Status of the Vehicular Pollution Control Programme in India, CPCB, MoEFCC, New Delhi, 2010.
2. Road Transport Year Book (2015-16), MoRTH, New Delhi, 2018.
3. Reply to Lok Sabha and Rajya Sabha Questions.

⁴ *Op.cit.* Status of Vehicular, p.34.

⁵ Reply to Rajya Sabha Question No.1805 dated 12-03-2018.

The total number of registered motor vehicles in India from 1951 to 2016

Table 2.1: India - Composition of Vehicle Population						
As on 31st March	Two Wheelers	Cars, Jeeps & Taxis	Buses @	Goods Vehicles	Other Vehicles	Total
	(as % age of total vehicle population)					(Million)
1951	8.8	52.0	11.1	26.8	1.3	0.3
1961	13.2	46.6	8.6	25.3	6.3	0.7
1971	30.9	36.6	5.0	18.4	9.1	1.9
1981	48.6	21.5	3.0	10.3	16.6	5.4
1991	66.4	13.8	1.5	6.3	11.9	21.4
2001	70.1	12.8	1.2	5.4	10.5	55.0
2002	70.6	12.9	1.1	5.0	10.4	58.9
2003	70.9	12.8	1.1	5.2	10.0	67.0
2004	71.4	13.0	1.1	5.2	9.4	72.7
2005	72.1	12.7	1.1	4.9	9.1	81.5
2006	72.2	12.9	1.1	4.9	8.8	89.6
2007	71.5	13.1	1.4	5.3	8.7	96.7
2008	71.5	13.2	1.4	5.3	8.6	105.3
2009	71.7	13.3	1.3	5.3	8.4	115.0
2010	71.7	13.5	1.2	5.0	8.6	127.7
2011	71.8	13.6	1.1	5.0	8.5	141.8
2012	72.4	13.5	1.0	4.8	8.3	159.5
2013	72.7	13.6	1.0	4.7	8.0	176.0
2014	73.1	13.6	1.0	4.6	7.7	190.7
2015	73.5	13.6	1.0	4.4	7.5	210.0
2016	73.5	13.1	0.8	4.6	8.1	230.0

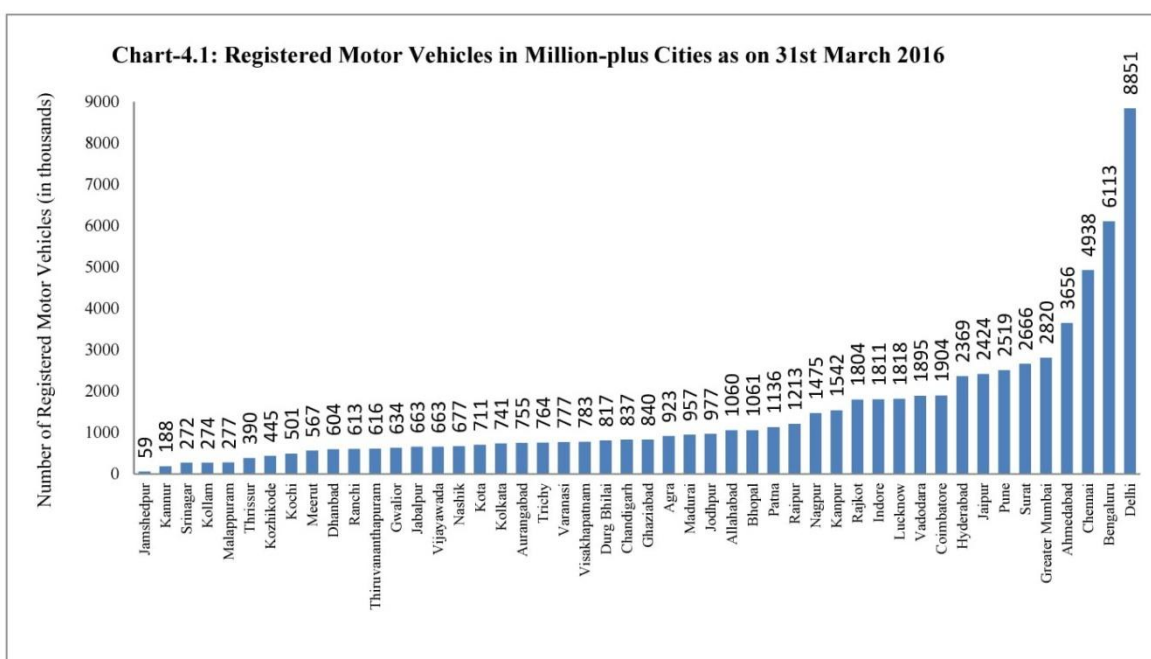
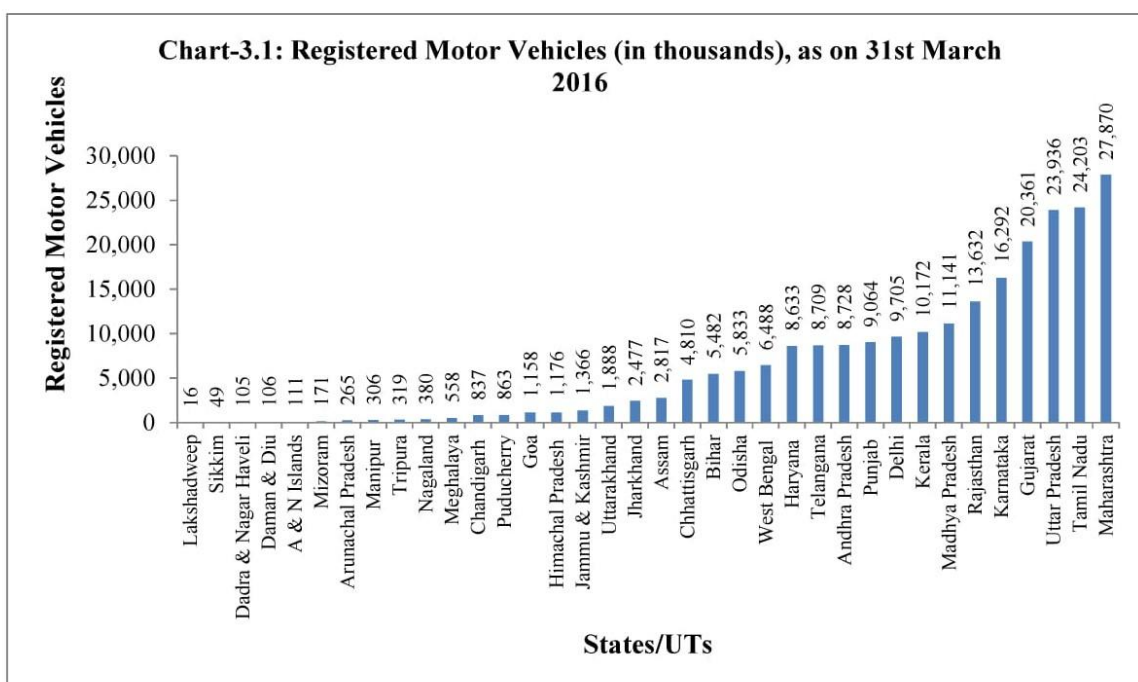
Source: Offices of State Transport Commissioners/UT Administrations.

Note: 'Other vehicles' include tractors, trailers, three wheelers (passenger vehicles)/LMV and other miscellaneous vehicles which are not classified separately.

@ includes Omni buses since 2001

Source: Road Transport Year Book (2015-2016)

State-wise and million-plus cities wise distribution of Registered Motor Vehicles



Source: Road Transport Year Book (2015-2016)