



Assessment of Vehicular Carbon Footprint and its Reduction Measures

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ABSTRACT

Urban cities are facing major air pollution problems due to rapid economic growth, urbanization and motorization. Air pollution is one of the serious environmental concerns of the urban cities where majority of the population is exposed to poor air quality. Mortality and respiratory diseases caused by air pollution are believed to be economic in major cities of these countries. The study emphasizes monitoring problems such as vehicle registration system, emission from vehicles, Ambient air quality and emission standards for vehicles in use. Monitoring problems in developing cities have similar problems such as a weakness in government initiatives and inadequate operations of government agencies, which results from a lack of human resources and availability of adequate facilities. Finally, this study proposes measures to be needed to assure air quality in these urban cities and introduces regulation method based on a policy survey to maintain air quality.

Keywords : Transportation, Air pollution, ambient air quality, Pollutants, Health impact.

II. INTRODUCTION

Rapid urbanization and industrialization have caused an unprecedented revolving in growth of motor transport all over the world. Air pollution is one of the serious environmental concern of the urban cities where majority of the population is exposed to poor air quality. The health related problems such as respiratory diseases, risk of developing cancers and ailments etc. due to poor air quality are known and well documented. Besides the health effect, air pollution also contributes to tremendous economic losses, especially in the sense of financial resources that are required for giving medical assistance to the affected people. The poor are often the most affect segment of the population as they do not have adequate measures to protect themselves from air pollution.

The urban traffic congestion has become a global phenomenon. The rapid urbanization in India has also resulted in a tremendous increase the number of motor vehicles. The vehicle fleets have even double in some cities in the last one decade. The air quality can be improved through a combination of technical and non-technical measures, legislative reforms, institutional approaches and market based instruments, there are certain unique challenges which the country has to face in tackling the problem of urban air pollution. These include the transport features which are different from the developed countries particularly in terms of the types of vehicles commonly used, the manner in which the road network is operated and sharing of limited space by pedestrian and non-motorized modes with modern vehicles in Indian cities. Vehicles in India are often much older and usually comprise technologies considered as out-dated in the developed world.

All motorized transportation today involves the combustion of fossil fuels, which produces energy to be transformed into motion. This combustion is the reaction of the hydrogen and carbon present in the fuels with oxygen in the air to produce—in the ideal world—water vapor (H₂O), carbon monoxide (CO), carbon dioxide (CO₂), sulphur dioxide (SO₂) and particles of carbon. Neither of these products is damaging to human health. However, CO₂ is the principal gas responsible for the “greenhouse” effect, an increase in the average temperature of the planet resulting from the trapping of solar energy, with

which the increased presence of this gas in the atmosphere is associated. The more energy consumed for transportation, the more CO₂ emitted.

The emissions react forming various species in various meteorological conditions interfering with man's activities. To counter some of these effects like fog and breathing excessive amounts of these gases. Though the efforts at monitoring air pollution and the adoption of strict norms for emission has been made, there has been no comprehensive planning to check this threat to the health of millions of urban residents. For the purpose of human health studying air pollution, sources of air pollution and its causes and effect on human health and suggest strategies for air quality management and its importance.

Table 1 :Air pollution Rank of Ahmedabad city

Rank	SPM	RSPM	SO ₂	NO ₂
1	Ahmedabad	Delhi	Bangalore	Kolkata
2	Delhi	Ahmedabad	Kolkata	Ahmedabad
3	Bangalore	Mumbai	Delhi	Delhi
4	Kolkata	Kolkata	Hyderabad	Mumbai
5	Chennai	Bangalore	Mumbai	Bangalore
6	Mumbai	Hyderabad	Ahmedabad	Hyderabad
7	Hyderabad	Chennai	Chennai	Chennai

(Source: CPCB-2003)

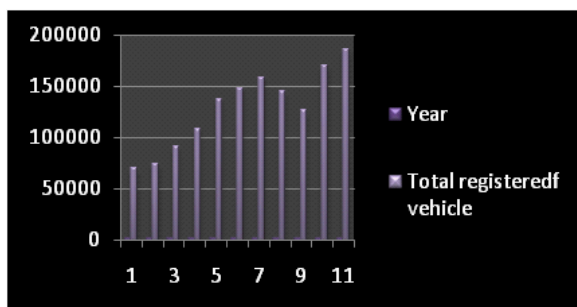
TRANSPORTATION IN AHMEDABAD

Ahmedabad is the fastest-growing city in India, and third in the world after two Chinese cities -[Chengdu](#) and [Chongqing](#). It is also mega city of Gujarat, is continuously loosing its grace and beauty under the growing pressure of densification of activities. Vehicle growth rate in Ahmedabad is very high. It is the centre of commercial activities and education. Industrial growth is also more. Due to this the vehicle activities are more during day time. Being one of the nerve centres of socio-political and economic activities in the state, the primacy of the city shall remain for quite some time. AMTS and BRTS are the services for mass transport in the city. Private car users are more than the mass transport users. There for the city

remains congested during peak hours.

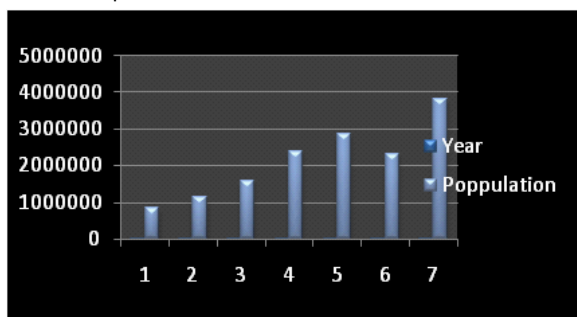
Rapid economic development of the city has resulted in the rise of vehicles. The percent growth of vehicles is higher than the growth of population. There is a large-scale increase in the number of two wheelers, but the major concern is the continuous increase in the number of three-wheelers and cars. Because of their size, these require more space to move and park, therefore more demand for road space. The last decade has witnessed the increase in the number of cars in the Ahmedabad region.

Chart 1: Vehicle growth in Ahmadabad



(Source: RTO Ahmedabad)

Chart 2: Population Growth of Ahmedabad



(Source: Census of India)

PROBLEMS WHICH CAUSES AIR POLLUTION

City presents a classic example of disorderly transportation environment. The root of the problem lies in the haphazard growth of the city. The problems which cause air pollution are:

- High rate of growth of vehicles.
- Congestion and mixed traffic.
- Lack of integration between land use and transportation.
- Concentration of activities in the core area of the city.
- Lack of proper scientific design of road network.
- Low quality and adulterated fuel.
- Age and improper maintenance of vehicle.
- Lack of proper enforcement.

METHODOLOGY

Study is divided into three different junctions in Ahmedabad.

- 1) Ambavadi X-junction (Residential Area)
- 2) Income Tax X-junction (Commercial Area)
- 3) Naroda T-junction (Industrial Area)

Traffic volume count survey and Ambient Air Quality measures are taken at above selected locations for the study purpose.

- Pollution load of different pollutant gases (SOX, NOX,CO,SPM,RSPM) from ambient air is calculated
- Pollution load of different fuelled vehicles calculated.

Calculation of SOx

Quantity of SOx = Petrol (l/yr) * Emission factor (g/l) * 1 kg /103 g.

= SOx emitted kg/year

Similarly for other fuel gases pollution load will be calculated.

- Comparisons of both Ambient air pollution load and pollution load from vehicles been done.

Chart 3 :Traffic distribution at Ambavadi X junction, Ahmedabad

	Permissible Limit (GPCB)	Measured
SO x	80	47
NO x	80	20
CO	4	0.44
SPM	100	143
RSPM	60	45

Chart 4: Traffic distribution at Income Tax X junction, Ahmedabad

	Permissible Limit (GPCB)	MEASURED
SO x	80	47
NO x	80	21
CO	4	2.4
SPM	100	156
RSPM	60	56

Chart 5: Traffic Distribution at Naroda T junction, Ahmedabad

	Permissible Limit(GPCB)	Measured
SO x	120	92
NO x	120	37
CO	10	2.4
SPM	300	207
RSPM	150	53

RESULT

Total pollution emitted from the vehicles are more than the Ambient Air pollution load. This is caused because of many factors which are below:

1. Wind velocity
2. Temperature
3. Weather
4. Vegetation

This factors affects the Pollution dispersion and pollution area covered.

COMMON DISEASE CAUSED BY AIR POLLUTANTS

Air Pollutants	Dieses caused by pollutants
Particulate matter (PM)	Respiratory diseases.
Sulphur dioxide (SOX)	Irritates respiratory system, causes bronchitis
Nitrogen dioxide(NOX)	Burning of eyes, nose etc., Severe irritation of respiratory system
Carbon monoxide (CO)	Deprive body cells of oxygen, causes unconsciousness.
Hydro carbons (HC)	Affects central nervous system
Hydrogen Sulphide	Respiratory paralysis, causes immediate unconsciousness.
Lead	Brain damage, Muscular paralysis,convulsions

(Source: CPCB)

REMEDIAL MEASURES

- At present there is no proper enforcement for emission regulation. Provide stricter rules for the vehicle inspection and maintenance.
- Fuel should be proper quality, which is according to speci-

fication provided. Mixing of fuel affects the air quality of the environment .

- Proper provision of signal should such that stop and delay will reduce and emission reduces.
- Road side and at the inter section of the roads there should be more vegetation because trees and plants are helpful for reduction of air pollution and noise level reduction too.

CONCLUSION

This paper presents the effect of emission from the vehicles . Vehicle growth is increasing day by day and no proper provision of emission regulation. Human are affected due to air pollution. Regularly maintenance and inspection required for the reduction of pollution level. Provision of proper traffic enforcement, traffic signal time improvement can reduce stopping time and delay in journey so that large amount of emission can be reduced. By reducing travel total demand also affects reduction in vehicular air pollution.