



Analysis of Increase in Vehicle Population and its Effect on Air Pollution in Hyderabad : INDIA

KEYWORDS

Ambient air, Dependency, Emissions, Processes, Scenario, pollution

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ABSTRACT *The urban areas are contributing major pollution from the automobiles throughout the world. As Hyderabad is one of the metropolitan city in India, an attempt has made to study on urban air pollution particularly vehicular emissions. However, in the present scenario environment crisis demands a change in attitude, which initiatives can be taken to rescue environment from destruction of Hyderabad. The urban areas are contributing major pollutant gases from the automobiles throughout the world. Based on the statistics available the future vehicle growth and their impact is discussed to overcome emissions problems. The main objective is based on the emission of vehicles and their problems. The pollutants such as RSPM, TSPM, NO_x, SO_x, CO, NH₃ has been monitored and observed to be increase along with vehicular number from 2005-2015.*

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emission factors of vehicles.

1. INTRODUCTION

At the global level, the rapid growth in motor vehicle activity is a serious of energy security and climate change implications. The transport sector alone consuming nearly half of the world's oil (Cameron, Michael. 1991). But in urban areas of both developing and developed countries, the vehicular pollution is of responsible to air quality problem. The sources of pollutants are emissions from the combustion of fossil fuels in motor vehicles and industrial processes units, energy production plants, and from cooling sectors (Litman, T, 2004; sharma, C., Pundir,R, 2008). By this the quality of air has become so poor which reverts discomfortable environmental conditions at Hyderabad.

The rapid growth in motor vehicle activity is a challenge to overcome problem associated with pollution in in coming days. The rapid growth in motor vehicles number in Hyderabad is alarming the future pollution loads. This paper deals with the study of air pollutants concentration and vehicular statistics over a period of 2005-2015 and their trend in Hyderabad city.

The problem:

One of the main problems that was overlooked across the globe was pollution (BTRE, 2002; Marino J Malina and Luisa T Molina 2002). The Pollution was evident in many different forms, such as, water, sound, light, radioactive, land, and air. The only way was to reduce the problem of air pollution was the elimination or reduction of fossil fuels use in vehicles. Thus, the increase in population, migration, uncontrolled urban expansion, income, economic growth, energy consumption and mobility have created a serious for air pollution problems, in cities throughout the world (Chapman L, 2007). The study was to find the emissions from the vehicles and their impact on the environment. This deals with the present scenario of air pollution and the effects on environment in Hyderabad city. The worst thing about vehicular pollution was that it cannot be avoided as the vehicular emissions were emitted at the near ground level where we breathe. The problem of vehicular air pollution especially very high in Hyderabad. This paper depends on the data of registered vehicles and the

Objectives:

1. To identify the number of vehicles in Hyderabad city.
2. To identify the pollutants load in Hyderabad city.
3. To forecast and suggestion for controlling measures of air pollution in Hyderabad.
4. To suggest the possible mechanisms for mitigation of the vehicular pollution.

The Study Area:

Hyderabad is a rapid developmental urban area either in demography, migration, transportation, or industrial sector since last two decades. The Hyderabad had the highest demography and the only metropolitan city, of Telangana state. The intensity, quantity, and frequency of both urban, suburban and movement with other cities are same factor of increasing transportation problem in the Hyderabad area; particularly in transportation utility development could not comply with the demand. The dependency of urban population on transportation systems on fossil fuels is quite high. The Hyderabad is one of the cities having 7 lacks registered vehicles apart from other vehicles of neighboring cities and towns. The vehicle with poor environmental quality continues to grow in multiple ratios. There is an urgent need to address the interrelated problems and obstacles experienced by the people of Hyderabad regarding air pollution through the vehicles. The traffic congestion resulting from transportation changes contributes even greater to deteriorating environment in urban communities. In the last few years, about 70% of ambient-air quality degradation in Hyderabad is affected by transportation activities. Based on Statistics of the department of road transport offices in Hyderabad (2010) the increasing of motor vehicle in Hyderabad was gone up by 2.9 times increase in vehicle number from 2005 to 2015, that is of 2.45 to 7.11 lakhs (Census, 2011). The average % increase of vehicle number is 29%. While the transportation activities could effect on positive impact like the increasing on Hyderabad economic activity, or negative impact like the increasing of street capacity in surrounding

downtown area. This could effect in decreasing ambient air quality and also decreasing on public health quality either pedestrian or local communities.

2. AIR POLLUTION FROM TRANSPORT SOURCES

Air pollution was an addition of any harmful gaseous, liquid or solid particles or substances to the atmosphere, which causes the damaging of the environment, human health on quality of life in urban area that can endanger the health of human beings, plants animals, or damage materials reduce visibility or release undesirable odors. By this one of the great problems faced in urban areas throughout the world is the increase in vehicles due to imbalance between the public transport and the increase in population, mobility and last mile connectivity. This increase in the number of vehicles was led to increase in congestion and the increase in pollution by the private vehicles polluting such a natural resource by various human activities will substantially change the composition of air. This may lead to many short term and long term implications on the life of plants and animals. Besides the change in composition, the pollution may directly add some poisonous and harmful gases - which may cause series of health complications (Sharma, C and Pundir, R., 2008).

Transportation is one of the important of economic activity and beneficial social interactions. While the transportation sector is also a major source of air pollution in Hyderabad. The growing problems related to traffic are congestion, accidents, pollution and lacks of security are also very worrisome. The key question is how to reduce the adverse environmental impacts and other negative effects of transportation without giving up the benefits of transportation.

This is due to increase in the automobiles and the mobility of people, rapid urban growth, which is likely to increase travel demand significantly in Hyderabad city. The population in Hyderabad increasing 4% per annum given current trends, by 2021 the Hyderabad city will have a 13.64 million populations which will reach 2 largest city including the nearby cities of other states capital such as, Bangalore, Chennai, Thiruvananthapuram in south India by 2021 (Figure-1). The increase in the number of vehicles from transportation sector presents a wide range of issues viz. air pollution, noise, congestion, accidents and increased travel time and delays. It was evident from the existing information that air pollution controls are not only important and a current priority in the local context, but also can present a significant potential to control greenhouse gas emissions. Thus, with an ultimate goal of greenhouse gas reduction, the present study has chosen air pollution control as a strategic target from the transport sector due to its high greenhouse gas co-benefits.

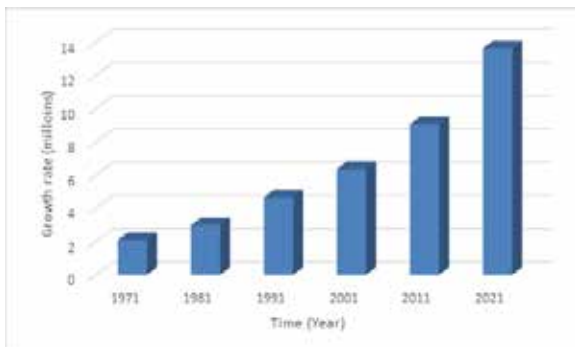


Figure-1 Population growth from 1971- 2021(expected)

3. Relation between vehicular number and air pollution

Due to increase in automobiles on the road today we experience higher levels of pollution than before. The automobile was one of the major sources, probably the leading contributor pollution in the cities. The transportation is of the major source for the economic activity and redistribution of resources among people. The growing automobiles, which lead to problems of congestion, accidents, and lack of security due to automobiles are worrisome. Therefore to reduce adverse environmental impacts and other negative effects of transportation without giving up the benefits of mobility.

As the increasing geographic dispersion of Hyderabad population was also likely to increase aggregate transportation demand, since the greater number of trips will also be longer and public transport will be less efficient and universal. As the population increased in residential areas where decentralized, patterns of passenger trip mode choice in Hyderabad have also shifted dramatically by using private vehicles: The number of private vehicles increased drastically, due to decentralization, globalization, economic development, standardization by most estimates at a rate of 29 percent annually in recent years, where as in bangalore the increase rate is of only 18%. This could mean a higher number of vehicles in Hyderabad, a higher ratio of vehicles per persons, possibility of trips and the distances traveled will increase even more for coming years.

Registered Vehicles:

The data shows the number of registered and share of different modes of vehicles in Hyderabad city for the year 2005 and 2015 from Hyderabad Transport Department. The share of percentage of vehicles is shown with a pie diagram shown below; but the number of vehicles data is shown in numbers in the form of tables-1.

From this it has been observed that the share of cars and two wheelers increased from 8% to 12 % and 81 to 81% within 10 years of span, which represents the private individual vehicular occupation. But in the numbers there is triple increment has been reported.

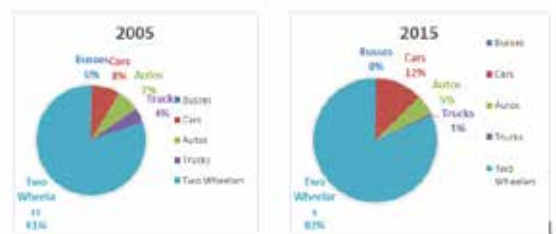


Figure 2 - Shows the share of vehicles in Hyderabad city in 2005 and 2015

From the below table it was observed that the number of cars and two wheelers increased tremendously in number. This might be due to the increased urbanization. The petrol small end cars, petrol high end, diesel small end and diesel high end cars increased 5.1 folds, 121 folds, 2 folds and 1,147 fold respectively, which represents the economic growth of the population. Along with this environmental deterioration also taking place due to the release of the toxic gasses form the vehicles.

Table1 - Data of registered vehicles from RTO'S Hyderabad

Particulars	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total registered vehicles	245119	326797	348654	326888	275923	329678	470131	534880	618024	678248	711984
Light weight school Buses	6	16	11	20	10	7	6	6	12	19	5
Conventional Buses	655	738	1432	1805	1285	1203	2415	1599	1044	867	1679
Mini Buses	41	10	10	25	13	7	7	7	8	6	9
Small end Cars (hatch back, Petrol)	6824	10684	14890	16853	15161	19330	24077	32359	39874	37691	34957
Small end Cars (hatch back, Diesel)	13478	18368	22713	20536	19404	31344	36718	33300	31335	34504	38880
High end cars (sedan, Petrol)	11	9	23	17	139	804	656	468	324	549	1332
High end cars (sedan, Diesel)	11	12	16	23	412	2930	4167	6890	8470	9050	12619
Auto- 3seaters (Petrol)	5492	5112	3689	1968	2866	3178	6073	2855	12966	2844	11878
Auto- 3seaters (Diesel)	10795	13878	13513	17172	17408	22935	20569	14955	17381	22456	24528
Auto- 7seaters (Diesel)	32	30	37	6	4	1	1	0	0	0	4
Mini Van -10 seaters (Diesel)	277	184	252	281	209	221	205	308	260	315	239
Commercial Vehicles Trucks -5 Tons	4284	8501	10244	10626	8399	10618	12419	14496	14080	9791	9498
Commercial Vehicles Trucks -10 Tons	1569	1652	1755	1552	1018	1479	1284	1016	824	530	544
Commercial Vehicles Trucks -20 Tons	1722	2357	2149	2134	1255	2363	2150	2402	2357	1583	1813
Commercial Vehicles Trucks -30 Tons	2964	4306	5104	4948	1552	2632	1692	1190	754	942	1208
Two Wheelers -100cc	136996	177267	173204	149181	113536	115323	163161	174904	179211	177805	172556
Two Wheelers -125cc	33110	46901	58524	57033	49951	56620	112415	176147	243306	307428	331852
Two Wheelers -150cc	24371	34593	35851	34367	31808	44067	63517	52923	49531	54762	45363
Two Wheelers -200cc	2481	2179	5237	8341	11493	14616	18599	19055	16287	17106	23020

Source: Telangana state transportation department, 2005-2015

4. SOURCES OF POLLUTION

Two-wheelers account for about 82 percent of the total vehicular population in Hyderabad. Because of inherent drawbacks in the design of 2- stroke engines, 2-wheelers emit about 25-45% of the fuel un-burnt/partially burnt. Presently, two-wheelers account for more than 65% of the hydrocarbons and nearly 50% of the carbon monoxide in Hyderabad. As these emissions are less visible, the general public is not aware of the role of 2-wheelers in the deteriorating air quality in the city (Chapman, L, 2007). The 2-stroke engine, in spite of R&D efforts towards improving its design, will continue to be a high emitter of hydrocarbons and carbon monoxide. While the absence of a technological breakthrough on the conventional 2-stroke engine and its high pollution potential, it is for consideration that Government considers the phasing out of two-stroke two and three wheelers. The 2,57,377 three-wheelers in Hyderabad nearly 7 percent of the total population of vehicles, they are petrol-driven, powered by 2-stroke engines. These vehicles are also high emitters of carbon monoxide and hydrocarbons. A pollution check conducted by Regional Transport Department has revealed that in some instances the levels are so high that they go beyond the measurable scale of test instruments. In addition, it is widely believed that petrol is adulterated with kerosene which results in emissions of thick black smoke (Ewing, R.

and R. Cervero, 2001; Maze, T.H., Agarwal, M., Burchett, G., 2006).

The Hyderabad city is having 6,02,212 vehicles on the roads as it consists of both petrol and diesel driven vehicles. It excludes the floating vehicles in the city area. These vehicles are also high emitters of carbon monoxide and hydrocarbons which pollutes the air. These consist of old as well as new vehicles in the city. The city is having 12 percent of cars, which occupies maximum space on the road, it is one of the air pollutants in the city. it is widely believed that petrol is adulterated with kerosene which results in emissions of thick black smoke (Dongzi Zhu et al., 2012; Schipper, L, 2002).

These vehicles number greatly influencing the environmental parameters. The pollutants considered in this study includes PM₁₀, TSPM, NO₂, SO₂, CO, and NH₃. The pollution levels of Hyderabad increased with increasing vehicular number in Hyderabad. As during 2005 the PM₁₀, TSPM, NO₂, SO₂, CO, and NH₃ were 80, 95, 3.9, 3.5, 69 and 20 respectively, whereas the present level of pollutants observed to be 155.3, 270, 5.2, 4.2, 92 and 34 respectively.

The collected data will be useful for control of pollutant in a spatial manner. The corporation or Telangana Gov-

ernment and other agencies has to contribute to the understanding of the air quality problem in Hyderabad by conducting measurements and modeling studies of atmospheric pollutants within the city. Such an understanding will help to provide a scientific base for devising effective emissions control strategies to reduce exposure to harmful pollutants in Hyderabad and also provide insights to air pollution science in other cities in Telangana.

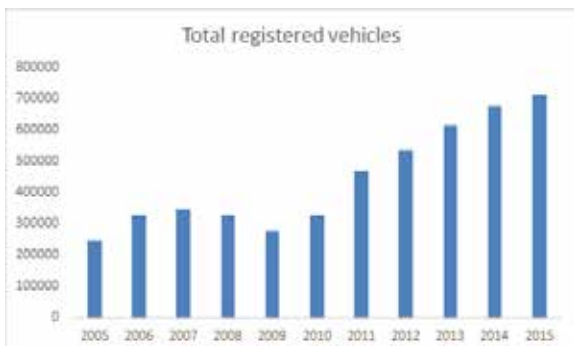
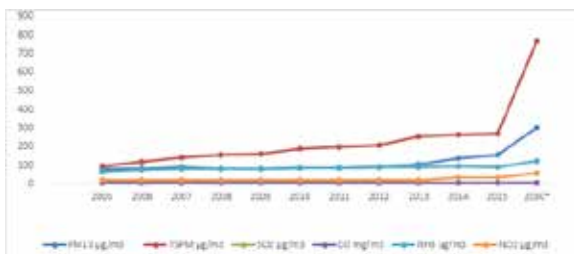
Particular	Total No. of vehicles (2005-2015)
Busses	14983
Cars	602212
Auto	257377
Trucks	175756
Two wheelers	3815998

Source: Telangana state Transportation Department

Table: Pollutant concentrations during the periods of 2005 to 2015

Year	PM ₁₀ µg/m ³	TSPM µg/m ³	SO ₂ µg/m ³	CO mg/m ³	NH ₃ µg/m ³	NO ₂ µg/m ³
2005	80	95	3.9	3.5	69	20
2006	83	120	4.1	3.5	78	19
2007	90	140	4.2	3.7	79.2	20.2
2008	79	154	4.6	3.9	80	21
2009	82	160	4.4	3.8	80.2	19
2010	86	190	4.5	3.9	84	22
2011	88	200	4.7	3.8	86.6	21.9
2012	90	210	4.8	3.9	89.1	20.9
2013	105	255	4.5	4.0	90.4	22.1
2014	138.7	265.1	4.9	4.0	95	32.4
2015	155.3	270	5.2	4.2	92	34
2030*	301.4	767.4	6.9	5.1	122.6	57.8

Source: TSPCB and Ministry of Environment and Forest, *Forecasted values



5. Suggested emission control:

1. Remote sensing technology will provide the traffic forecasting to manage the traffic problems, so that the low traffic roots will be identified to meet the emission meas-

ures, the pollutant level during the vehicle's exhaust while vehicle is traveling down the road.

2. Engine modifications to get low emissions.

3. Reducing individual vehicles use can cut carbon dioxide emissions by thousands of tones. As mention before, efficiency is unquestionably the largest, cheapest, and cleanest among the many we need to rid carbon from our energy economy. Avoiding unnecessary driving is the most effective way to reduce vehicle emissions; however, traffic trends indicate more vehicles are being driven more frequently due to urban sprawl. The options we have available to reduce the number of vehicles being driven on our roads.

4. Day without car/ 2 wheeler is a new idea which has been accepted in different countries and to accept and implement ideas such as a car-free day in order to ensure less traffic congestion and contribute our small bit in solving the environmental problems that confront us today. Odd and even number system is also acceptable.

5. Car Pooling: The employers, or groups of employers, find it convenient to have one or more cars or vans that are readily available for business use by a number of employees. The cars or vans are not allocated to any one employee and are only available for genuine business use. Such cars and vans are usually known as pooled cars and vans.

6. A very important factor in reducing vehicular pollution is the introduction of alternative fuels such as CNG and LPG.

7. It has been possible to reduce 30-40% pollution loads generated by vehicles through proper periodical inspection and maintenance of vehicles.

8. To discourage the use of individual motor vehicles by public, public transport system is augmented from time to time in various urban areas of the country. The number of buses has been increased in big cities like Hyderabad.

6. CONCLUDING REMARKS

The rapid population growth of vehicles in multiple ratios continues to be a matter of concern for the Hyderabad city as it has manifold effects since the last decade, one of the most important being environment degradation. The unprecedented speed of urbanization of Hyderabad has resulted in enormous pressure on the environment with serve adverse impacts in terms of pollution, and today city is considered as one of the most polluted city in the country. While the projected rate of population increase may be reduced, even moderate population growth is likely to lead to substantial increases due to passenger and freight travel demand in the city, due to introduction of Metro, fuel price etc. The increasing geographic dispersion of metropolitan population is also likely to increase aggregate transportation demand, since the greater number of trips will also be longer and public transport will be less efficient and universal. So to improve the quality of air and water there is a need of strict enforcement and monitoring program by the government of Telangana. Stringent rules application and suggestions implementation is required for future sustainability.

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