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Transportation and Its Health Implications in India

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Abstract:- Purpose: This study examines the effects of atmospheric pollution emanating from transport infrastructure on human health in mega cities of INDIA(in particular study of DELHI ,capital city of INDIA and HYDERABAD, capital city of TELANGANA state) .

The paper makes an absorbing quest for the creation of a sustainable transport environment in Indian megacities along with a detailed investigation of the existing problems in health by motorized transport system. Thus the scheme of this paper is to examine the extent of the problem and to suggest remedial measures. Primary and secondary data were used for this research. The primary source involves the use of structured questionnaires to elicit information on the effects of transport pollutants in the study area. The secondary data was obtained from government periodicals, unpublished theses and journals. Analytical and statistical techniques have been used for interpretation and data representation.

Findings: - The findings revealed that the transport sector has contributed significantly to the emissions of toxic substances into the atmosphere. High demand for used automobiles has increased the emission of toxic substance into the atmosphere, which is inimical to human health in the study area. An estimated 32% of the traffic police personnel in Hyderabad, the capital city of Andhra Pradesh, the fifth largest metropolitan city in India, suffer from lung related disorders including pneumonia and bronchitis(an India Today report).Many of the residents have been affected by eye irritations, blurred vision lung cancer and many other related diseases.

The high rate of smoke emissions from automobiles in the city has adverse effects on the health of the inhabitants of Hyderabad and many other similar cities in India. Many surveys reveals that 45% of the respondents claimed that they have transport-related diseases in the city. It is pertinent to note that 50% of the respondents who claimed that they have transport-related health challenges have eye problems, approximately 16% has asthma and the same percentage has skin-burn diseases. In addition 8% and 5% of the patients claimed that they have upper respiratory tract infections and hypertension respectively. Only 2% of respondents indicated that they have hearing impairment resulting from unpleasant sounds emanating from indiscriminate use of horns by motorists and record players.

Obviously, many of these diseases occur as a result of exhaust from automobiles, combustion activities of industries, and dust particles, as well as smoke from the burning of fossil fuels. The interview with the health officers at the General hospital in Hyderabad revealed that the patients who live close to transport hubs/polluted areas have accumulated severe respiratory ailments over the years. The high rate of temperature changes in the city has aggravated the health challenges faced by these people due to the depletion of the ozone layer, which invariably affects the terrestrial radiation received on the earth's surface. On several occasions , many of the people living or working very close transport hubs/heavy traffic complained severe headaches, fatigue and body irritation. This suggests that the emission of toxic substances into the atmosphere in not restricted to a particular geographical area because of the general circulation of air. Many reports indicates that approximately 50% of the respondents who either work or live a distance of less than 100 meters from the transport hubs claimed that they have health challenges related to transport diseases in the study area. Another 30% of those transport hubs indicated that they have had similar health problems within the last six years. A significant proportion of responding households who reside beyond 200 meters from the transport hubs claimed that they also have health challenges related to transport diseases in the study area. This is an indication of the distance decay effect of the proportion of people with health challenges in relation to the proximity of their residence to the heavy traffic flow.

Approximately more than 45% of the respondents claimed that they have transport related diseases such as asthma, eye problems and upper respiratory tract infections in the city . The study concluded that there is a need to reduce trips through integration of land uses and transportation planning , and more importantly , there is a need to shift to more energy – efficient modes. Despite the strict regulations imposed on the importation of used vehicles into the country , the data obtained from the INDIA Licensing Office showed that the importation of automobile vehicles into Delhi, Mumbai, Hyderabad ,…(which do not meet the emission standards of advanced countries) has increased tremendously over the years. Similarly , reliable data from the statistical

records of INDIA revealed that the rate of emission of toxic substances has increased over the past decade because of the discharge of pollutants from transport infrastructure.

Keywords:- Urbanization, Transport , Atmosphere , Emission , Health, Automobile, planning

I. INTRODUCTION

Personal mobility is a significant aspect of any space economy. In addition to being an expression of an individual's free will, mobility takes place with the view to overcoming friction of distance and movement to different activity centers located in urban centers. For instance, trips to work, schools, markets, recreational centers and banks are undertaken in order to procure such services located in urban spaces. The segregation between residential areas and different land uses owing to the high rate of urbanization in towns and cities in Asian countries, in particular INDIA, has led to high travel demands, which rely mostly on automobiles with complex traffic on urban routes . The resultant effects are traffic congestion, emission of toxic substances and frequent accidents on highways.

Studies have show that transport is a major contribution to the emission of greenhouse effects and perhaps carbon dioxide(CO_2) is growing faster in the transportation sector than in any other sector, and its effects on the health of people, community values and environmental ecology are very severe.

In last DECADE, transport accounted for 3.298 of global greenhouse gas emission while 72% of global CO_2 emissions from fuel combustion are transport –related(refer from: global warming: a close look at numbers).

Studies have shown that the developed countries are largely responsible for the largest share of greenhouse gas emission from the transport sector, and emissions from third world countries are growing rapidly. All surveys & journals says that transport-related particles, particularly carbon monoxide(CO) emissions are expected to increase by 57% worldwide in the period 2010-2030; In a related study, observed that some of the current green house gas emission in the transport sector and virtually all the expected growth in emissions come from private cars, light duty vehicles, cabs and trucks. The study affirmed that ozone concentration in the atmosphere is largely caused by the transport sector.

Theoretical framework and literature review:

Studies have shown that approximately half of the world's population now lives in urban areas compared with only 15% in 1950. Similarly, more than 70% of the world's megacities will be found in developing countries. The increase in urbanization has led to high travel demands as people keep in touch with each other and require prompt accessibility to places in the urban environment, resulting in serious traffic congestion, green house gas emissions and other environmental hazards. In India, urban traffic congestion is characterized by many poorly maintained and sometimes unserviceable imported vehicles. The effect of the emission of toxic substances (CO and hydrocarbons) from the transport sector has prompted the proponent urbanism to advocate for integration of transportation planning into land use. The new urbanism movement proposed a reintegration of residential, recreational, employment –generating organization and commercials. The poor economic status of many Indians attitudes towards the importation of used vehicles in India have been largely responsible for the emission of toxic substances such as carbon monoxide, hydrocarbons, Pb and sulphur dioxide , which are very harmful to human health. Transport is responsible for most of the lead(Pb) concentrations which appear in the bloodstream of urban dwellers. Undoubtedly, transport-related air pollution has been found to be more severe over congested urban streets where pollutants may produce conditions that are harmful to human health. Much research on the external effects of transportation reveals that the importation of automobiles to the country creates more havoc to human life in terms of congestion, accidents and emission to toxic substances(CO, Pb, and So_2)which are detrimental to human health.

In studies have shown that approximately one third of a vehicle's lifetime emission stems from the manufacturing process of vehicles, which has an adverse effect on the environment. In the light of this observation, it is highly imperative to examine the consequences of the high travel demands of urban residents in automobiles in metropolitan cities with a view to improving their mobility patterns.

The Study Area:

Hyderabad is a typical city in Andhra Pradesh, which has experienced a high rate of urbanization over the past three decades. Like many urban centers in India, Hyderabad grew organically without any form of master planning . Many of the intra-city roads in this area are too narrow to accommodate vehicular traffic, which invariably makes mobility temporarily difficult during the rainy season. The situation in low-density

areas of the city is different from that of the urban region because the former are well-planned and occupied mostly by high income earners and top civil servants. The land use arrangement in Hyderabad metropolitan is greatly affected by movement patterns of urban residents in the city. For instance, many of the employment–generating organizations generate more trips than area of the city that are mainly for residential purposes. The daily commuting to different activity centers in mixed land use areas generates more complex traffic hazards, such as noise pollution and emissions of toxic substances to the urban environment, which is inimical to human health.. Many of the intra-city routes are poorly designed and maintained. Some of the inhabitants are low-income earners who cannot afford to buy new automobiles to enhance their daily commuting. The resultant effects are that many of the urban residents in the city depend on either public or private vehicles .For their day-to-day transactions, which culminates in the emission of toxic substance into the atmosphere.

II. METHODOLOGY

Primary and secondary data were used for this research. The primary source involves the use of structured questionnaires to elicit information on the effects of transport pollutants in the study area. The respondents were asked to indicate the distance of their residence/work places to the transport hub, transport network connecting their residential units/ work places, mode of transport embarked upon most frequently, types of pollution experienced in their area, nature of health challenges experienced as a result of transport emissions and many other questions. Secondary data were obtained from government periodicals, unpublished theses, journals, etc. Descriptive and inferential statistics such as Pearson's product moment correlation analysis were used to analyze strength of the relationship between the massive importation of automobiles in Hyderabad and emission of toxic substances into the atmosphere. Similarly , a regression analysis was used to examine the relationship between the geographical location of respondents places of work to the transport hub, and household's challenges to transport related diseases within the last five years.

III. RESULT OF THE ANALYSIS;

The findings revealed that 7,243,564 vehicles were registered in India in the year 2004 and due to high travel demand for automobiles, this figure increase tremendously increased to 17,916,035 in 2010 .Following Tables reveals that the number of registered vehicles has increased from 2003 to 2011.

No. of Motor Vehicles (in millions) in Major Cities- March 2011

CITY	CARS	MOTOR VEHICLES
DELHI	2.17	0.2
BANGALORE	0.714	0.5
CHENNAI	0.603	0.5
KOLKATA	0.44	1.8
HYDERABAD	0.49	3.0
PUNE	0.29	2.1
LUCKNOW	1.2	NA
MUMBAI	0.56	1.5

Table No. 1.6

Production of Motor Vehicles in India: 2003-04 to 2010-11

(In numbers)

Category	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
1	2	3	4	5	6	7	8	9
M & HCVs	166,123	214,807	219,295	294,258	294,957	192,283	250,133	344,542
LCVs	108,917	138,896	171,788	225,724	254,049	224,587	317,423	408,193
Total Commercial Vehicles	**275,040**	**353,703**	**391,083**	**519,982**	**549,006**	**416,870**	**567,556**	**752,735**
Cars	**782,562**	**960,487**	**1,046,133**	**1,238,021**	**1,426,212**	**1,516,967**	**1,932,620**	**2,453,113**
Multi-Utility Vehicles	**206,998**	**249,389**	**263,167**	**307,202**	**351,371**	**321,626**	**424,791**	**534,183**
Scooters	935,279	987,498	1,021,013	943,944	1,074,933	1,161,276	1,494,409	2,144,765
Motor Cycles	4,355,168	5,193,894	6,207,690	7,112,281	6,503,532	6,798,118	8,444,857	10,527,111
Mopeds	332,294	348,437	379,994	379,987	430,827	436,219	571,070	704,575
Electric Two-Wheelers	...	...	...	30,454	17,389	24,179	2,567	...
Total Two-Wheelers	**5,622,741**	**6,529,829**	**7,608,697**	**8,466,666**	**8,026,681**	**8,419,792**	**10,512,903**	**13,376,451**
Three-Wheelers	**356,223**	**374,445**	**434,423**	**556,126**	**500,660**	**497,020**	**619,194**	**799,553**
GRAND TOTAL	**7,243,564**	**8,467,853**	**9,743,503**	**11,087,997**	**10,853,930**	**11,172,275**	**14,057,064**	**17,916,035**

...: Not reported

M & HCVs : Medium and Heavy Commercial Vehicles. LCVs : Light Commercial Vehicles.

Source : Society of Indian Automobile Manufacturers, New Delhi

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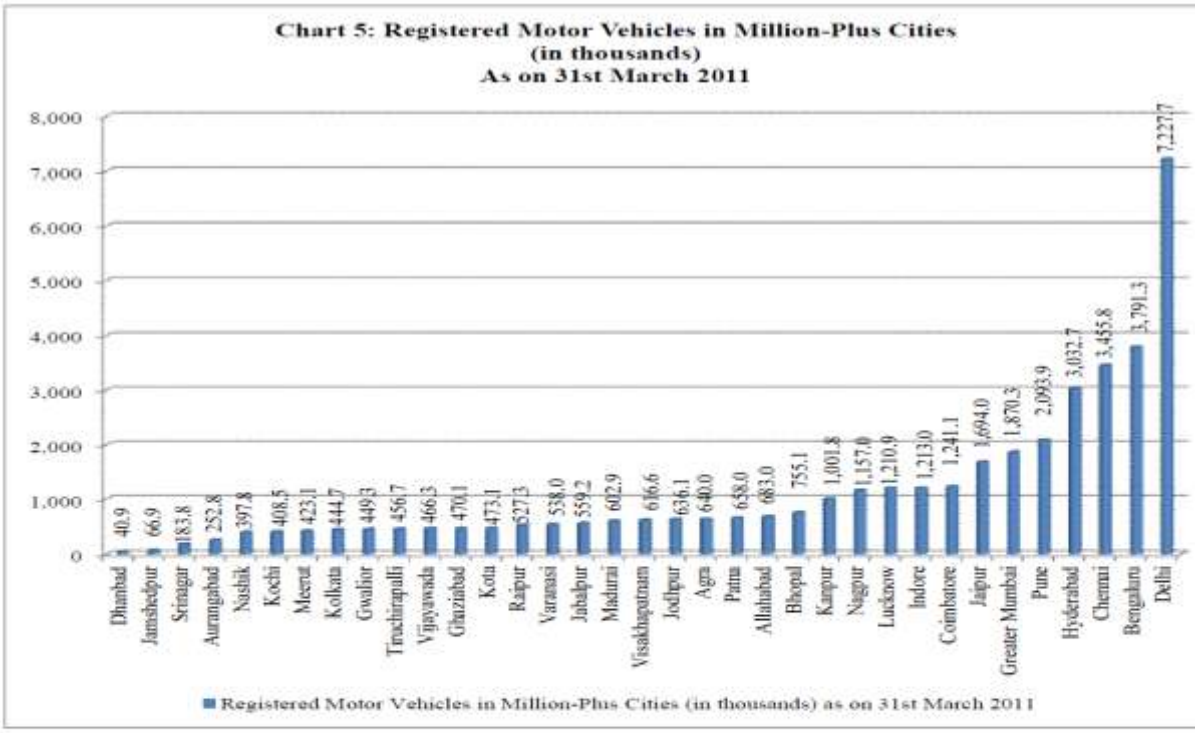
Table 2: India - Composition of Vehicle Population (% of total)

As on 31st March	Two Wheelers	Cars, Jeeps & Taxis	Buses	Goods Vehicle	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	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

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.



4.2 Amongst the top five cities in terms of the number of registered motor vehicles, the highest CAGR of 12.94% was recorded by Pune during 2001-2011. Hyderabad and Chennai too recorded CAGRs of more than 10% (Table 5).

THE EMISSIONS GAP REPORT -2012 SAYS that INDIA has unconditional pledge to Reduce emissions intensity of GDP by 20 to 25% by 2020 in comparison to the 2005 level. At present current emissions($MtCO_2e2010$) is 2692 and it is Share of global emissions 5.4% world total of the year 2010.

Table 4: Daily Vehicle Emission Loads in Four Metropolitan cities in India (Tonnes/Day)

City	SPM	SO_2	NO_2	HC	CO	Total
Delhi	10.3	8.96	126.46	249.57	651.01	1046.30
Mumbai	5.59	4.03	70.82	108.71	469.92	659.57
Kolkata	3.25	3.65	54.69	43.88	188.24	293.71
Chennai	2.34	2.02	28.21	50.46	143.22	226.25

Source: Central Pollution Control Board 1994

Table 5: Estimated Vehicular Emission Load in Delhi

Pollutants	Pollution Load in thousand tonnes			% reduction as compared to
	1990-91	1995-96	1998-99	1995-96
SO_2	10	15	11	27
NO_x	139	207	182	12
SPM	19	28	21	25
Pb	0.19	0.362	0.007	97
CO	243	351	337	4
HC	0.83	113	45	12
Total Pollution load	493	714	666	-
Emission lead in tonnes / day	1351	1947	1825	11

Source: Transport Department, Govt. of National Capital Region of Delhi, 2000

Table 6: Main Pollutants and Health Effects

Pollutant	Health Effect
SPM	Damage of lungs, bronchitis and asthma
SO_2	Acid rain, damage to lungs, eyes and skin
NO_x	Form Smog damage to respiratory system and eye irritation
CO	Toxic causes blood poisoning
HC	Cancer
Pb	Nervous system slow down ad brain development is retarded; slow reaction time.

Source: Delhi Environmental Status Report: Pollution Monitoring and Technical Corporation Division, New Delhi, 1995.

IV. OFFICIAL FIGURE

The type of pollution experienced in a geographical area varies over time and space and depends mostly on the transport infrastructure present. In this context, pollution refers to harmful substances released into the atmosphere, which can be in the form of dust and smoke from automobiles. The Pollution Control Board's surveys point out that HYDERABAD CITY have recorded air and noise levels way beyond the standard permissible limits. It has air quality registered a Respirable Suspended particulate Matter(RSPM) of aggregate of 97microgram per cubic meter. According to official figures, the total vehicular pollution load in Hyderabad had gone up from 528 tones in 1992 to 1,246 tones per day in 2006. This has now gone up to more than 1,500 tones per day. Again citing the department sources, the report went on to say that the total number of vehicles operating in Hyderabad city as on August 31, 2012 stood at 25.8 lakhs , but if the sub-urban area of Greater Hyderabad Municipal Corporation were also taken into consideration , the total number of vehicles was more than 35 lakh. Of them,74% were two-wheelers, while 15% were cars and 3% were auto-rickshaws.

Interestingly, Department of Environmental Toxicology of Institute of Genetics under Osmania University also conducted a study three years ago on the impact of vehicular exhaust on the traffic policemen in the city. The study revealed that the traffic cops are vulnerable to cytogenetic changes due to chromosomal mutations, if they are exposed to high levels of pollution and that would lead to enhanced risk of suffering from cancer.. The main polluting vehicles ,according to the officials were auto – rickshaws , state – run RTC buses, vehicles of more than 15-20 year old and government transport vehicles.

The respondents who indicated that they experienced pollution caused by exhaust vehicular movement claimed that they live or work very close to the transport hub in the city. The high demand for used vehicles has increased the emission of toxic substances into the atmosphere in the study area. At the aggregate level of all

pollutants, It is pertinent to note that the rate of importation of used automobiles is highly positively correlated with the rate of emission of toxic substances.

Seeking solutions to air pollution, congestion, and climate:

An uneven distribution pattern of socio-economic facilities in urban centers in Hyderabad generate a considerable volume of movement between residential areas to other different land uses, and this requires automobile transport to meet the other different land uses, and this requires automobile transport to meet the travel demand of urban residents in Hyderabad. Incidentally, some of the imported vehicles used for these services do no meet the emission standards of the western world. The emissions from the exhaust pipes of automobiles wreak havoc on the health of the people in the city. There is a need to re design the master plan of the city to improve the mobility characteristics of the urban residents. There is also a need to review the transport policy in the country and encourage people to commute via a non-automobile mode of transport, substances that are harmful to human health.

Some of the Environmentalists play vital role for service, one of them is CSE, DELHI.

Centre for science and Environment (CSE) organized a roundtable discussion on "Transport and climate: building an agenda for action" along with the Global Partnership on Sustainable , Low Carbon Transport in New Delhi on November 18,2009.This brought together experts, policy makers, and civil society groups to discuss the climate imperatives of the transportation sector. The partnership on Sustainable, Low Carbon transport in a multi-stakeholder membership representing development organizations, intergovernmental organizations, governmental organizations, NGOs, private sector, and academe. This is hosted by agencies including Asian Development Bank. Its aim on sustainable, low carbon transport to combat climate change.CSE is a member of this partnership.

The roundtable stimulated debate on the role of the transportation in climate mitigation and imperatives and opportunities of the developing regions. Solutions to this problem can emerge from a deeper understanding of the diversity of issues and of local mobility imperatives in the region.

Remedial Measures for sustainable Transport Systems:

1. Design and development of modern and sophisticated bus transport system
2. Implement the metro railway system
3. Construction of segregated bicycle lanes in all roads in mega cities.
4. Strict control the speed of all vehicles to prevent noise pollution

V. CONCLUSION

The high demand for automobile trips in developing cities in INDIA has led to complex traffic congestion, frequent accidents and emissions of harmful substances such as CO, SO_2,and Pb into the atmosphere. This has resulted in widespread transport-related diseases in many urban centers in developing countries of the world such as India, who depend on the importation of automobiles that do not meet the emission standards of the western world. This type of problem had earlier been experienced in the Asian countries, particularly in China, and they encouraged the use of non–motorized modes of transport for their day-to-day transactions to minimize the congestion in their cities. The INDIA government should encourage their citizens to adopt the use of less energy efficient modes to transportation for their demands as the use of these modes emits less harmful substances into the atmosphere. There should be constant public enlightenment on the risks involved for the people living or working close to the transport hubs. This study concludes that the use of light rail should be introduced for urban mobility in the major urban centers in India and other similar cities in developing countries of the world.

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