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**REVIEW OF THE IMPACTS ON HUMAN HEALTH OF AIR POLLUTION CAUSED BY VEHICLE EMISSIONS**

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<sup>1</sup>Mr. Anand Tryambakrao Tathod, <sup>2</sup>Dr. Shantanu N. Pawar, <sup>3</sup>Dr. Ram Nibudey

- <sup>1</sup>. Research student in Civil Engineering, Raisoni Centre for Research and Innovation, G. H. Raisoni University, Amravati,  
E-mail:- anandtathod@rediffmail.com,
- <sup>2</sup>. Asst. Professor in Civil Engineering, Raisoni Centre for Research and Innovation, G. H. Raisoni University, Amravati
- <sup>3</sup>. Joint Director, Technical Education, Regional Office, Nagpur

**Abstract.**

There is a big problem with how vehicle air pollution affects human health. 2 million Indians die prematurely each year due to air pollution, and vehicle emissions account for 27% of all air pollution. The primary cause of India's rapidly rising car population and subsequent vehicular pollution is the country's growing urbanization. It puts human health in danger. Chronic respiratory conditions, cancer, cardiovascular disease, skin irritation, and other illnesses are only a few of the negative effects of air pollution. All of these negative impacts point to a worrying situation. The problem of automobile air pollution must be resolved. This essay reviews the impacts of vehicle emissions and how they affect people's health.

**Key-words:** Pollution Effect, Vehicular Emission, Health effect, premature deaths, Diseases.

**I. Introduction**

In India, the effects of vehicle air pollution are a severe health concern. According to a survey based on 2016 statistics, at least 140 million people in India breathe air that is 10 times or more above the WHO safe guideline, and 13 of the 20 cities with the highest yearly levels of air pollution in the world are in India. 27% of the pollution is the fault of the automobile. 2 million Indians die prematurely each year as a result of air pollution. Although India's per capita emissions of greenhouse gases are modest, the nation as a whole rank third after China and the US in terms of emissions (WHO). During that year, the Air (Prevention and Pollution Control) Act was passed. The Air (Prevention and Pollution Control) Act was adopted in 1981 to reduce air pollution. The Government of India and IIT Kanpur launched the National Air Quality Index in 2015. In 2019; the Indian Government launched the National Clean Air Program with a national target of 20% to 30% reduction in PM<sub>2.5</sub> and PM<sub>10</sub> concentrations by 2024, taking 2017 as the base year for comparison. In December 2019, IIT Bombay and the McKelvey School of Engineering of Washington University in St. Louis jointly launched the Aerosol and Air Quality Research Facility to study air pollution in India.

**II. The Effects on Human Health and Environment.**

The ill effects on human health and environment because of the pollutants emitted from vehicles are summarized as below:

**1. Carbon monoxide:**

Vomiting, nausea, headache, and dizziness are all symptoms of CO inhalation. If the CO level becomes too high, the person may become unconscious or die. Long-term CO exposure raises the chance of developing heart disease. Motor vehicles contribute significantly to ambient carbon monoxide (CO) concentrations. Although CO emissions from motor vehicles have been reduced in many nations by emission control technologies and legislation, motor vehicles continue to be the principal source of this pollutant in the majority of sites. All motor vehicles emit CO, however the majority of CO released into the environment comes from light-duty, gasoline-powered automobiles.

## **2. Particulate matter:**

PM10 particles typically enter the lungs through the nose. When inhaled, these particles can have serious consequences for one's health and lungs. PM2.5 particles are smaller than one-tenth the width of human hair and pose a major hazard to human health. Particles with a diameter of less than 2.5 microns are referred to as "fine particles."

## **3. Oxides of nitrogen NO<sub>x</sub>:**

This causes photochemical smog, acid rain, and ozone destruction. When inhaled by humans, alveolar structures and their function in the lungs are interrupted, posing a serious threat to public health. Gas irritates the lung which has been shown to reduce the efficacy of the immune system. NO<sub>x</sub> causes serious respiratory problems. When combined with water; it forms nitric acid and other toxic. NO<sub>2</sub> is a main component in the formation of ozone at ground level.

## **4. Sulfur dioxide:**

Gas irritates the respiratory system and eyes and is responsible for long term heart disease, other cardiovascular disease and bronchitis. It also causes shortness of breath and coughing for asthma sufferers. Sensitive vegetation is severely damaged by SO<sub>2</sub> and is also a major contributor to acid rain, which damages the environment and disrupts the ecosystem.

## **5. Lead:**

Lead causes cancer, severe brain and kidney damage, and gastrointestinal problems. Total suspended particle total may not exceed lead. Although many nations no longer add Pb to gasoline, motor vehicle fuels still contain minute levels of Pb from crude oil.

## **6. Ozone:**

Breathing ozone causes chest pain, coughing, irritation of the throat, and inflammation of the respiratory tract. It can also reduce the function of the lung and serious harm the lung tissue. Ozone is not directly emitted from motor vehicles, and O<sub>3</sub> measurements are not typically collected for near-road applications.

**7. Carbon dioxide:** When individuals are exposed to carbon dioxide concentrations ranging from 17% to 30%, they experience unconsciousness, coma, convulsions, and death. Internal molecular vibration and rotation of carbon dioxide, methane, and gas molecules with comparable structures may influence global temperature by absorbing infrared light. When these gases enter the atmosphere, they absorb some of the heat that the Earth would otherwise radiate into space.

Carbon dioxide is a "greenhouse gas" that exists in the atmosphere

8. Volatile Organic Compounds:

It causes acute symptoms like nose, throat, and eye irritation, as well as headaches, nausea, dizziness, and allergic skin reactions. It can also harm internal organs like the liver and kidneys. Furthermore, certain VOC chemicals may not pose immediate dangers but may pose long-term health hazards. VOCs are essentially unburned fuel that has either escaped into the atmosphere through fuel evaporation or has been unburned during the combustion process. VOCs are frequently classified as either methane (CH<sub>4</sub>) or non-methane (NMVOC). Petrochemical production, oil refining, total incineration, paint manufacturing and use, and dry cleaning are all stationary producers of hydrocarbons. They can also cause hematological (blood-related) complications. [1]

### III. Source of Vehicular Population.

#### 1. Emissions of Green House Gases (GHGs) from

Transport Sector: According to a CO<sub>2</sub> emission assessment conducted by the Center for Science and Environment in Delhi, CO<sub>2</sub> emissions on Indian roadways are anticipated to reach 1212 million tonnes in 2035, up from 208 million tonnes in 2005. From 2005 to 2035, total CO<sub>2</sub> emissions from well to exhaust on Indian highways are given below. CSE, New Delhi, is the source.

**2. Vehicular Population Growth:** India's transportation needs is steadily increasing. Sustained economic growth, improved road infrastructure, and higher consumer disposable income have resulted in increased demand for road transportation. The number of registered automobiles Since 1951, the total number of registered motor vehicles in India has continuously climbed from roughly 0.3 million in March 1951 to 230.03 million, up from 5 million in March 1951.

#### IV. Literature Review:

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

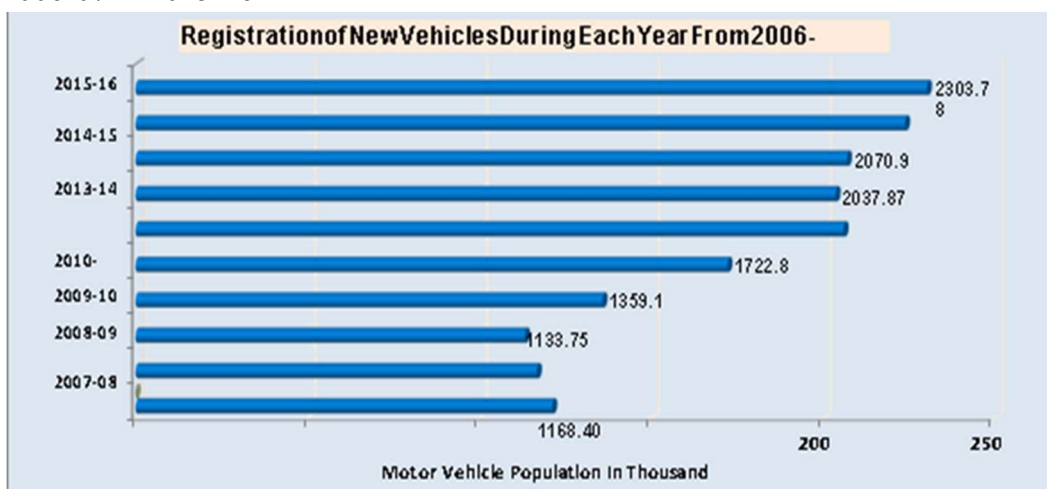
1. Mass Emission Standards (Bharat Stage IV) were adopted across the country on April 1, 2017 for all types of new cars. India will transition from BS-IV to BS-VI standards, and a notification for the implementation of BS-VI emission standards for all categories of new cars beginning on April 1, 2020, has been published.
2. On April 23, 2015, fuel efficiency standards for passenger cars were announced. Electric/hybrid car promotion through the National Electric Mobility Mission Plan 2020, as well as faster adoption and manufacturing of (hybrid and) electric vehicles.
3. Introduction of cleaner / alternate fuels such as LPG, CNG, Bio-Diesel Blends, Battery Operated, Hydrogen and Solar Operated vehicles.
4. Promotion of public transport and network of metro, e-rickshaws, promotion of car pooling, Pollution under control Certificate, lane discipline, vehicle maintenance, etc. [2]

According to the paper, lethal air pollution is a national issue that kills 1.2 million Indians each year and costs the economy an estimated 3% of GDP. If the country's development is crucial, combating air pollution must be a top concern. According to data obtained by Greenpeace India from state pollution control boards, nearly no sites in India meet WHO and National Ambient Air Quality (NAAQ) guidelines, and most cities are dangerously polluted. Except for a few localities in Southern India that have met NAAQ requirements, the whole country is suffering from a public

health crisis caused by high levels of air pollution. Given the variety of sectors responsible for pollution emissions, a number of ministries in state and federal governments, as well as industry and the general public, require immediate and resolute action. [3]

Internationally, air pollution is a big issue, with China and India receiving the most attention due to thick smog. Polluted air was responsible for 5.5 million premature deaths in 2013, with China and India accounting for 1.6 million and 1.4 million, respectively. However, in terms of death rates per capita, some European countries match those of Asia. According to the OECD data, China had 953.7 fatalities per million people in 2013, whereas it had 937.6 hungry people. Air pollution is the world's fourth leading cause of death, contributing to heart disease, stroke, lung cancer, bronchitis, and other illnesses [4]

Yearly Registration of Vehicles: Total number of vehicles in the Maharashtra State registered during the year 2015-16 is 23,03,783 having increased from 12,13,043 as in the year 2006-07. Thus, percentage increase in a decade is 89.91 %. Year wise registration of vehicles during the period 2006-07 to 2015-16 is shown in chart No. 1.



The Global trend indicates the shadow of things to come. The demand for restraints on personal vehicle-based mobility will get even sharper, as clean air and climate change policies begin to get more aggressive with time. The World Health Organization (WHO) also considered traffic related deaths and injuries as a major public health challenge, as they added to the disability burden of the country. This means measures should be put in place to change urban design to make cities safer walk able and public transport friendly. [5]

In India, the national air pollution monitoring program now tests for only five parameters: sulphur oxides, nitrogen oxides, suspended particulate matter, respirable particulate matter, and carbon monoxide. Unfortunately, we are all oblivious of the new air poisons that are already claiming our lives. Vehicle emission limits have been tightened over time. In addition, India has environmental air quality guidelines for traditional pollutants released by vehicles. There is, however, no regulation for mobile air contaminants. There are no norms or strategies in place to control them, either. Benzene, toluene, xylene, benzene soluble organic fraction, and PAHS are detected in Delhi, but not as frequently as conventional pollutants. [6]

Vehicle-centered urban growth is not unavoidable; rather, it is reversible. If Indian cities believe that regulating urban transportation to lessen reliance on automobiles is idealistic, they should reconsider. It is a harsh fact that other countries have recognized. Rich towns around the world have begun to take efforts to counteract the trends in travel preferences. Many communities are recovering parking spots from automobiles in order to make pedestrian and public spaces safer. Several cities in Europe and the United States have begun to limit the number of parking spaces available and charge exorbitant fees in order to reduce parking demand and automobile usage. Cars in Singapore must pay to enter core commercial districts. People must purchase bids in order to purchase automobiles, which raises the overall cost of the vehicle. [7]

Along with our major ailments, we live in an environment filled of carcinogenic poisons. The volume of new harmful air pollutants from autos is concerning. They are of greater concern because they are being closely monitored. A recent study, 'Smoke Screen ambient air quality in India,' conducted by the Chennai-based NGO Community Environmental Monitoring, found that the air toxicity variety in ambient air above the USEPA on average. We generally associate automobiles with traditional pollutants such as nitrogen, SPM, hydrocarbons, oxides, and carbon monoxide. BTEX chemicals, Polycyclic Aromatic Hydrocarbons (PAHs), and formaldehyde, on the other hand, are among the other pollutants that originate in automobiles and are designated as mobile air pollutants by the USEPA. They are emitted from a variety of sources, but with an ever-increasing number of vehicles on the road, such toxic substances need to be increasingly monitored. [8]

Two-stroke motor vehicles constitute a significant portion of the motor vehicle fleet in Asian countries. These vehicles account for over 60% of the fleet of motor vehicles and considerably contribute to air pollution, resulting in negative health effects, particularly for city people. They contribute significantly to particulate matter (PM), hydrocarbon emissions, and visible smoke. PM emissions from a standard two-stroke engine used in South Asia are orders of magnitude higher than those from an equivalent capacity four-stroke engine. Poor engine maintenance, lubricant usage, and fuel adulteration all contribute to pollution from these engines. Emissions from modern two-stroke gasoline engines can be reduced by utilizing the proper lubricant type and quantity, improving vehicle maintenance, and increasing gasoline efficiency. PM emissions from a traditional 2stroke engine used in South Asia are orders of magnitude higher than those from an equivalent capacity 4stroke engine. Poor engine maintenance, lubricant usage, and fuel adulteration all contribute to pollution from these engines. Emissions from today's 2-stroke gasoline engines can be reduced by using the proper type and amount of lubricant, better vehicle maintenance, and increasing gasoline efficiency. Other technological alternatives include replacing the 2-stroke engine with a 4-stroke gasoline engine and switching to cleaner alternative fuels such liquefied petroleum gas, compressed natural gas, and electricity. [9]

#### **V. Conclusion:**

According to various studies, vehicle emissions are a mixture of various pollutants that have negative health effects, including the mutagenesis of cardiovascular mortality, carcinogenicity, and deterioration of the health of vulnerable people, such as asthmatics, children, and the elderly.

Acute exposures have resulted in hospitalization owing to respiratory issues, whilst chronic exposures have resulted in health implications such as mutagenicity of cardiovascular health, carcinogenicity, and illnesses. In India, the CPCB now measures only five criteria at the national level for vehicular air pollution, although we are all oblivious of the fresh air toxin. As a result, successful vehicle emission reduction methods should be designed and implemented. Inadequate and poor-quality road pavements contribute to higher vehicle maintenance costs and hence higher emissions. It is estimated that road construction will result in a 15% reduction in vehicle operating expenses. To ensure the reliability of vehicle emission control systems, a vehicle maintenance and inspection program should be designed. Proper maintenance, testing, a clean vehicle, and the use of clean fuel are all ways to reduce pollution. The importance of an integrated systemic approach to vehicle emissions management cannot be overstated. Furthermore, the automobile and oil sectors must work together to accomplish air quality targets in order to meet increasing fuel quality regulations and vehicle technology.

Published Papers, Reports, and Study with Year	Variable	Findings
Journal of Clean Energy Technologies, Nov. 2018, 'Effects of Vehicular Emissions on Human Health Reference Note No. 14/RN./Ref./June/2018, Lok Sabha Secretariat, New Delhi	Effects of Vehicular Emissions Specification for Vehicular emission	The adverse health and environmental consequences Implementation of Norms to control vehicular emission.
<u>Dahiya, Sunil, Lauri Myllyvirta, &amp; Nandikesh S. Airpocalypse: Assessment of Air Pollution in Indian Cities. 2017</u>	National Ambient Air Quality	Urgent and determined action is needed
McCarthy, N., 'Europe Matches Asian Joins in Air Pollution Deaths' Statist May 9, 2016.	Risk factor for death	The fourth-highest risk factor for death is Air pollution
<u>Hidalgo D. Bhatt A. 'Don't miss the bus, Delhi. The Hindu Business Line, August 07, 2015</u>	National Urban Transport Policy (NUTP)	Cities should plan for people, not vehicles.
Shah Chirag 'Hazardous Mobile Air Toxins in the Air', July 2015	Ambient Air Quality Standards	Only five parameters monitored for vehicular air pollution in India
PARIVESH- Hazardous air pollutants - publication by, CPCB, MoEF, Government of India, 2009	the total air pollution load in many urban areas	Vehicular emissions impact on the general pollution
'Smoke Screen-Ambient Air Quality in India' Community Environmental Monitoring June 2006,	Variety of sources, Mobile source air toxics Conventional pollutants.	Other pollutants that also emanate from vehicles.
PARIVESH, Transport Fuel Adulteration, CPCB, India Newsletter (2003).	Public Health Damage to vehicles Adulteration of fuel	fuel Adulteration causes air pollution, damage to engines, and loss of public health

Table No.1 Summary of the study

**References**

- [1] Journal of Clean Energy Technologies, Vol. 6, No. 6, November 2018, "Effects of Vehicular Emissions on Human Health" Author-Adeyanju Anthony A. Mechanical Engineering Department, University of the West Indies, St Augustine Trinidad.
- [2] Lok Sabha Secretariat, New Delhi, Reference Note for the Use of Members of Parliament No. 14/RN./Ref./June/2018, "Vehicular Pollution in India" Prepared by Dr. Jayadev Sahu, Additional Director and Shri Sai Ram C.V., Junior Library Assistant of Lok Sabha Secretariat under the supervision of Smt. Kalpana Sharma, Joint Secretary and Smt. Anita Khanna, Director.
- [3] Dahiya, Sunil, Lauri Myllyvirta, and Nandikesh Sivalingam. Airpocalypse: Assessment of Air Pollution in Indian Cities. Greenpeace, 2017. {Online} available at <https://smartnet.niua.org/content/2fc94bbc-3ce8-475e-80b4-c752fb8a24eb>.
- [4] McCarthy, N., 'Europe Matches Asian Giants in Air Pollution Deaths' Statista May 9, 2016 [Online] Available at <http://www.statista.com/chat/4801/europe-matches-asian-giants-in-air-pollution-deaths/>
- [5] Hidalgo D. Bhatt A. 'Don't miss the bus, Delhi, The Hindu Business Line, August 07, 2015 [Online] available at <https://www.thehindubusinessline.com/blink/know/dont-miss-the-bus-delhi/article7508049.ece>
- [6] Shah Chirag 'Hazardous Mobile Air Toxins in the Air' [online] Available at <http://www.downtoearth.org.in/news/hazardous-mobile-air-toxins-in-the-air-8122>, Last Updated: Saturday 04 July 2015.
- [7] Pojani D, Stead D., 'Sustainable Urban Transport in the Developing World: Beyond Mega Cities', Sustainability, 7, 7784-7805, doi: 10.3390/su7067784, 17 June 2015.
- [8] PARIVESH- Hazardous air pollutants - a publication by, CPCB, MoEF, Government of India, New Delhi, (2009), (online) Available at [http://cpcb.nic.in/upload/Newsletters/Newsletters\\_64\\_COVER%20SOFT%20BACK%20EDITORIAL%20HAPs%20Newsletter.pdf](http://cpcb.nic.in/upload/Newsletters/Newsletters_64_COVER%20SOFT%20BACK%20EDITORIAL%20HAPs%20Newsletter.pdf).
- [9] 'Smoke Screen-Ambient Air Quality in India' Community Environmental Monitoring June 2006, [Online] Available at [http://www.sipcotcuddalore.com/Download/Smoke\\_Screen\\_Booklet.pdf](http://www.sipcotcuddalore.com/Download/Smoke_Screen_Booklet.pdf).
- [10] Asif Faiz, Surhid Gautam "Technical and policy options for reducing emissions from 2-stroke engine vehicles in Asia" International Journal of vehicle design vol. 34, issue. 1, pp. 52 Published online 24 February 2004.
- [11] PARIVESH, Transport Fuel Adulteration, CPCB, India Newsletter (2003).
- [12] Centre for Science and Environment a Report on the Independent Inspection of fuel quality at Fuel Dispensing Station Oil Tanks and Tank Lorries (2002).9. S. Sinha and V. Shivgotra Environmental Monitoring of Adulterated Gasoline with Kerosene and their Assessment at Exhaust level J. Environ. Biol., 33, 729-734 (2012).
- [13] Information on Maharashtra Transport Infrastructure – RTO [Online] available at <https://transport.maharashtra.gov.in/Site/Upload/GR/MTS%201516.pdf>

- [14] S. Sinha and V. Shivgotra Environmental Monitoring of Adulterated Gasoline with Kerosene and their Assessment at Exhaust level J. Environ. Biol., 33, 729-734 (2012).
- [15] 'Report on Integrated Assessment of Black Carbon and Tropospheric Ozone' UNEP & World Meteorological Organization, 2011 [available at <http://ramanathan.ucsd.edu/files/brt34.pdf>]
- [16] Ciurea A., et al, Studies regarding gaseous effluents reduction at gaseous fuels burning. Metalurgia International, (2010), 15(8), 78-81.
- [17] D. Biswas, Polycyclic Aromatic Hydrocarbons in Air and their Effects on Human health, CPCB News Letter (2003)
- [18] Centre for Science and Environment a Report on the Independent Inspection of fuel quality at Fuel Dispensing Station Oil Tanks and Tank Lorries (2002).