

# Effect of Automotive Emissions on Human Health: The Case of Gwalior City

Alpana Gupta, Shyama Prasad Mukherji Urban Mission, India & Panchayat and Rural Development Government of Madhya Pradesh, Madhya Pradesh, India

## ABSTRACT

Vehicular emissions are creating major problems to the urban residents following by health impacts. According to WHO, Gwalior ranks second in the most air polluted city in India. The study is carried out to estimate automotive emissions, health effects, and estimation of health damage cost. Seven major junctions have been identified in which the highest peak hour PCU is observed at Bada (13,859) followed by Railway Station and Gole ka Mandir which accounts for through as well as destined traffic of whole city. According to the BS Norms, reduction in emission is calculated for different a pollutant, which shows 40.02Kg of CO concentration in BS III which reduces to 20.06 Kg in BSVI. Lastly, health damage cost for different Norms has been calculated which shows Rs.4938.54 for BSIII & Rs.467.33 for BS VI under low cost scenario. Health damage cost under high cost scenario for BS III shares Rs.68436.63 and Rs.6424.64 for BSVI. Introduction of cleaner fuels, maintenance of vehicles, and regular inspection of vehicles should be done to improve the quality of life of people.

## KEYWORDS

Air Pollution, Health Damage Cost, Human Health, Traffic Congestion

## INTRODUCTION

With the growing emergence of urbanization, an urban ecology is continuously withdrawing upon natural resources directly and indirectly giving rise to amount of wastes and gaseous forms. Pollution is creating chaos these days. The automotive pollution has gained focus in the domain of environment, which mostly affects human welfare. With the exponential growth in population, there is high mobility demand in third world cities which is driving as a key player of transportation demand. Urban transportation generally proffers by the huge traffic growth leading to congestion with inadequately developed transport infrastructure and traffic management studies. Dependency on the private modes in urban areas is directly linked to increase in emissions and deteriorating environmental quality (European Conference of Ministers of Transport, 2007). The major source of air pollution in developing countries like India is the emission from vehicles. (Chakrabartty & Gupta, 2015).

Automotive emissions are the assessment of reducing emissions from combustion engines and reducing health impacts on operators and others (Hudgins, 2011). Due to the continued exposure

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to pollutants, Global burden of disease estimated 695,000 premature deaths in 2010 and 18.2 million loss of healthy life years due to particulate matter (PM) 2.5 (Institute for Health Metrics and Evaluation, 2013). The main key players are those who generate negative externalities on account of their activities that increases the social cost of people living in the harmful zones and suffering from problems like respiratory disorders, nausea and skin irritation. To lessen the burden of social cost for targeted population and generating awareness regarding Air emissions and their health effects a study has been done.

The aim of this study is to assess the effect of Automotive Emissions on Human Health Due To Traffic Congestion. For this study, Gwalior City has been selected because Madhya Pradesh Pollution Control Board found Gwalior leading in Madhya Pradesh with 23% of diesel and 6.9% of petrol vehicles emitting above threshold limits in 2013-2014. The total number of registered vehicles in 2013-2014 is 330000 and 45000 number of vehicles added. Due to this health effects on respondents in the study area and health damage cost due to automotive emissions would also be find out.

## LITERATURE REVIEW

Clean air is necessary for sustaining productivity over the period of time. Anthropogenic activities lead to rise in primary pollutants which lead to the formation of secondary pollutants in the presence of chemical reactions. Intergovernmental Panel on Climate Change, Fifth Assessment Report says that all the non-carbon dioxide climate altering pollutants are damaging the health, by giving rise to secondary pollutants in the atmosphere. According to Mehta, 2012, Air pollution has been credited as the National Problem and ranks at fifth position for the cause of mortality in India. National Ambient Air Quality Programme categorizes three pollutants such as NO<sub>x</sub> (Nitrogen Oxides), PM (Particulate Matter) & SO<sub>2</sub> (Sulphur Dioxide) for regular monitoring at all locations. According to the Report of World Health Organization 2015, 15% of global death due to air pollution in 1990 has resulted, which is still increasing by 16.2% by the year 2010 (Lim et al., 2014). Increase in 12% in number of deaths has been recorded in India between 2005 and 2010, exposed to high concentration of pollutants due to increase in vehicular traffic and poor maintenance of roads. Level of pollutants depends upon the traffic density, exposure time and occupation. These people include roadside operators, hawkers, policemen and drivers (Sehgal et al., 2014).

Report of World Bank in 2009 estimated that 1100 billion INR as the annual cost of environment damage by air pollution (World Health Organisation [WHO], 2013). There is an increase of 4% i.e. 3.5 Million death from 2005 to 2010. (United Nations Environment Programme [UNEP], 2014). Cardiovascular diseases are more pronounced due to air pollution (Brook et al., 2004). World Health Organization Report in 2004 established the relationship between health effects and air pollution for those people living in close proximity to traffic.

Ministry of Petroleum and Natural Gas has inaugurated the Auto Fuel Policy in 2002 and committee was setup in 2013 for cleaner fuels and vehicles in the country up to 2010. BS (Bharat Stage) IV norms implemented in April 2010 in 13 cities and BSIII in October 2010 in whole country. BSVI emission standard is to be introduced by the end of 2024. This roadmap leaves India 10 years behind the European countries, so it is necessary that Government of India introduces BSV (Ramanathan et al., 2014). Curbing pollution also requires and has to compensate with the investments involved in Programmes (Organisation for Economic co-operation and development [OECD], 2015). The study was carried along Central Business District of Haile Selassie Avenues, which gets polluted due to emissions from vehicular traffic and congestion, which causes health impacts on road users. Health effects sometimes lead to deaths which results in environment as well as economic costs loss (Vliet & Kinney, 2007) studies show the 239 µg/m<sup>3</sup> and 396 µg/m<sup>3</sup> for PM<sub>10</sub> & PM<sub>2.5</sub>. Reported High concentration of NO<sub>x</sub> shows that vehicles are the major source of pollution.

Various congestion cost studies has been done (Sengupta & Mandal, 2006) estimated health damage cost from automotive emissions by using transfer of benefit method. Health damage cost of

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