

# A REVIEW OF ENVIRONMENTAL IMPACT OF MOTORIZED VEHICLE ON HUMAN

## Debela JIMA<sup>1</sup>, Tibor SIPOS<sup>2</sup>, Retta ZEWDIE<sup>3</sup>

<sup>1</sup>Budapest University of Technology and Economics, Department of Transportation and Vehicle Engineering, Ph.D. Student, Debela.Jima@edu.bme.hu <sup>2</sup>Budapest University of Technology and Economics, Department of Transport Technology and Economics, senior lecturer, sipos.tibor@kjk.bme.hu <sup>3</sup>Departments of Vehicles and Ground Transport Faculty of Engineering, Grach University of Life

<sup>3</sup>Departments of Vehicles and Ground Transport, Faculty of Engineering, Czech University of Life Sciences in Prague, Czech Republic, zewdie@tf.czu.cz

#### Abstract

Globally, around 7 million people die annually due to air pollution. The aim of this review was to define the impact of motorized vehicles on humans due to air pollution. Using 1995 as a baseline, the increase in death and disability due to air pollution was discussed over a five-year period. The review showed that of global death and disability, on average, around 13% and 5% were registered due to air pollution. In total air pollution deaths, motorized vehicles contribute around 7% annually. It shows that air pollution caused by motor vehicles accounts for less than 1% of global deaths. Unprocessed biomass fuel, diesel, and older motorized vehicles are still widely used in developing countries. These contribute to more than half of the air pollution in developing countries. As a result, stakeholders must deal with motorized vehicle air pollution.

Keywords: air pollution; developing country; diesel effects; motorized vehicle; old vehicle

## INTRODUCTION

Toxic substances emitted from indoor or outdoor sources are a factor in causing environmental degradation. A particulate pollutant is a mixture of microscopic liquid droplets and solid particles found in the air that are generated by vehicle emissions, smoke particles, dust particles, and ash from industries (*World Health Organization, 2020; toppr, 2020*). Approximately; half of the world population and up to 90% of rural households in developing countries still rely on unprocessed biomass fuels (*World Resources Institute (WRI), 1998*). In 2020, around 7 million people died due to air pollution; of this, around 0.5 million were caused by motorized vehicles (*World Health Organization, 2020*). This shows 1 out of 14 air pollution deaths occur due to motorized vehicles. In low-income countries, 6% of all deaths are the result of indoor air pollution (*Hannah and Max, 2019*). Motorized vehicles are one of the outdoor air pollutants that emit toxic gases into the environment (*Ostro, 2004*). Emissions and the toxic nature of the gas can vary based on the type and nature of power consumed (*Union of Concerned Scientists, 2014*). The aim of this review is to define the effect of motorized vehicles on air pollution and its severity level on humans. For further consideration and analysis, the review was presented as follows:

## EFFECTS OF ENVIRONMENTAL AIR POLLUTION

Climate change is one of the most serious health threats of the twenty-first century. That was caused by air pollution, which is the single largest environmental health risk (*World Health Organization, 2016*). Of the total world population, around 90% of the population breathes polluted air (*World Health Organization, 2018*). Actually, the air quality inside a home can be worse than the air quality outside (*Robert, 2016; Budget Home Services, 2020*).

The levels of indoor air pollutants are often 2 to 5 times higher than outdoor (*Medical Associates of Northwest Arkansas, 2020; Victoria, 2019*). The most common indoor pollutants and sources are asbestos, biological pollutants, carbon monoxide (CO), pressed wood products, nitrogen dioxide (NO2), indoor particulate matter, etc. (*United State Environmental Protection Agency, 2020*). However, the most common sources of outdoor air pollution are emissions caused by combustion processes from motor vehicles, solid fuel burning, and industry (*Department of Pediatrics, 2019*).

Air pollution can cause human deaths; long-term health effects include heart disease, lung cancer, respiratory disease, birth defects, and damage to other organs (*Texas A & M University, 2019; Lili et* 



#### 8<sup>th</sup> TAE 2022 20 - 23 September 2022, Prague, Czech Republic

*al.*, 2019). Air pollution is linked to 9% of global deaths (*Hannah and Max*, 2019). Death rates from air pollution are highest in low-to-middle income countries (*Jos et al.*, 2018; *Dr. Susanne*, 2018).

|                  | Year                  | 1995  | 2000  | 2005  | 2010  | 2015  | 2020 | Avg.  |
|------------------|-----------------------|-------|-------|-------|-------|-------|------|-------|
| Total Population | Death (million)       | 51.34 | 52.98 | 54.02 | 54.5  | 56.33 | 59.3 | 54.75 |
|                  | Disability (billion.) | 2.55  | 2.55  | 2.51  | 2.47  | 2.43  | 2.62 | 2.52  |
| Air Pollution    | Death (million)       | 7.38  | 7.32  | 7.23  | 7.02  | 6.9   | 6.7  | 7.09  |
|                  | Disability (million)  | 130.3 | 124.4 | 119.4 | 116.6 | 107.6 | 98.8 | 116.2 |

Tab.1 Global number of Death and Disability

Source: (United Nations (UN), 2019; Global Burden of Disease Collaborative Network., 2018)

As shown in Tab.1, globally on average, around 55 million and 2.5 billion people die and become disabled annually. Air pollution contributes to 7 million (13%) and 116 million (5%) of global deaths and disabilities annually. It also shows the total number of deaths and disabilities gradually increases and decreases.



Fig. 1 Annual Growth Rate of Death and Disability

According to Fig. 1, the maximum death and disability growth rates were observed in 2020, using 1995 as a base year within a five-year interval. Relatively, due to air pollution, the maximum reduction in death and disability growth rate was also observed in 2020.

## EFFECTS OF MOTORIZED VEHICLE AIR POLLUTION

Motor vehicles emit toxic and carcinogenic compounds (*American Cancer Society*, 2020). Hydrocarbons and nitrogen oxides contribute to smog, which damages the lungs and aggravates respiratory disease (*Dasom et al.*, 2018). In 2018, diesel vehicles were responsible for nearly half of the health impacts of air pollution from vehicles worldwide, and two-thirds of the impact in India, France, Germany, and Italy (*Joshu*, 2019). It was estimated that over 80% of people living in urban areas were exposed to motorized air pollution that exceeded the WHO limit. In 2016, over 95% of the world's population was breathing unhealthy air. From this, transportation emissions contributed 32% (*Susan et al.*, 2019). Recent evidence indicates that the health problems caused by air pollution may be greater at high concentrations than previously estimated; this would likely happen due to vehicle exhaust emissions increasing (*Joshu*, 2019).

The principal emissions from motor vehicles are greenhouse gases. In vehicles, the principal greenhouse gas is carbon dioxide (CO2), but vehicles also produce other greenhouse gases such as nitrous oxide and methane. For example, diesel vehicles have a higher emission limit for nitrogen oxides than petrol vehicles have a higher emission limit for carbon monoxide (*İbrahim et al., 2014*; *An Australian Government Initiative, 2021*). Once greenhouse gases are released, they can stay in the atmosphere for more than 100 years (*National Academies of Sciences, 2021*). It acts like a blanket around the Earth, trapping energy in the atmosphere and causing it to warm. In 2019, the total CO2 emissions from aviation and motor gasoline combustion were about 22% of the total US energy related CO2 emissions. This resulted in 9% of greenhouse gas emissions from the tailpipe (*U.S. Energy Information Administration, 2020*).



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Vehicle age, type, power consumption, tonnage, speed, etc. play a critical role in defining the amount of gas emitted to the environment. Transportation contributed more than half of the carbon monoxide and nitrogen oxides emitted into the atmosphere in 2013, as well as nearly a quarter of the hydrocarbons (*Union of Concerned Scientists, 2014*). The valuation of health effects associated with diesel vehicles is at least 5 times greater than those associated with petrol vehicles, and around 20 times greater than battery electric vehicles (*Dr. Christinian, 2018*). Close to half of all deaths by transport air pollution are caused by diesel road vehicles (*BreatheLife Campaign, 2019*). By removing cars from cities, it's difficult to reduce emissions (*Audrey, 2018*).

| Tab 2 Death due to | Total Air Pollution   | and Motorized | Vehicle air pollution |
|--------------------|-----------------------|---------------|-----------------------|
|                    | I Otal All I Ollution |               | v chicle an ponution  |

| Year  | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | Avg. |
|---|------|------|------|------|------|------|------|
| Total Air Pollution Death (million)             | 7.38 | 7.32 | 7.23 | 7.02 | 6.9  | 6.7  | 7.09 |
| Motorized Vehicle Air Pollution Death (million) | 0.51 | 0.7  | 0.4  | 0.2  | 0.4  | 0.5  | 0.45 |

Source: (Clean Air Coaliation (CCAC) secretariat, 2020; Global Burden of Disease Collaborative Network, 2017; ScienceX Network, 2019)

As shown in Tab.2, the number of deaths caused by air pollution gradually decreases, but the number of deaths due to motorized vehicle air pollution oscillates up and down. Motorized vehicles contribute approximately 6.5% of all air pollution deaths on an annual basis. It shows a reduction in deaths. It needs special care by the stakeholders.



Fig. 2 Death Annual Growth Rate due to Air Pollution

As shown in fig. 2, referencing 1995 as the base year, over a five-year interval the maximum total motorized vehicle air pollution growth rate in deaths was observed in 2015. In consideration of global death, motorized vehicle air pollution contributes around 1% on average annually. This shows that out of 100 people killed, 1 person died due to air pollution resulting from motorized vehicles.

# EFFECT OF MOTORIZED VEHICLE AIR POLLUTION IN DEVELOPING NATION

The benefits of motorized vehicles are countless, but the disadvantages are more pollution and energy use (*Daniel*, 2004). The number of motorized vehicles in the world is expected to reach about 1.3 billion by 2020 (*Andrew*, 2018). Between 1990 and 2020, emission reductions from road transport have been lower than originally anticipated over the last two decades due to transport having grown more than expected (*Susan and Timothy*, 2007; *European Environment Agency*, 2019).

China and the USA are the leading polluters in the world in terms of motor vehicles. America generates more than 25% of global warming emissions that come from the transportation sector (*United States Environmental Protection Agency*, 2018). The U.S. has 30% of the world's automobiles, yet contributes to about half of the world's car emissions (*Howstuffworks*, 2020). Air pollution accounts for about 6% of deaths in Austria, France, and Switzerland annually (*World Health Organization Regional Office for Europe*, 2015). European citizens still breathe harmful air, mostly due to weak legislation and poor policy implementation (*European Court of Auditors*, 2018).

Atmospheric pollution has emerged as one of the primary environmental issues in developing countries. China has become the world's largest vehicle market. Vehicle emissions have become a significant



source of air pollution and are ranked 109th out of 180 countries (*Wu et al., 2016*; *Liu et al., 2017*). Globally, the top ten countries with the highest mean exposure to outdoor air pollution include Nepal, India, Niger, Cameroon, Nigeria, and Chad; and Qatar, Saudi Arabia, Egypt, and Bahrain in the Middle East (*Florina and Wendy, 2019*). This shows most developing countries are more responsible for environmental air pollution.

In India, 12.5% of deaths were attributable to air pollution (*India State-Level Disease Burden Initiative Air Pollution Collaborators, 2020*). India has 18.1% of the global population but contributes 26.2% of the global air pollution (*Sahana, 2019*). In Delhi, diesel vehicles were responsible for 62.5% of the total particulate load coming from all vehicle emissions (*Yewande et al., 2015*).

Most African countries import a large number of used vehicles that account for around 40% of the world (*United Nation Environmental Program, 2020*). The poor quality of used vehicles was not only a cause of environmental pollution; it was also a cause of road traffic accidents (*Peter, 2020*). Developing countries are exporting air pollution by importing used vehicles (*Sophie Edwards, 2017*). Even if the number of vehicles were small in developing countries, those tend to have worse air pollution than developed nations. Lack of technology and resources aggravates air pollution (*Nationwide Air Filter Company, 2017*). Vehicles with an age of 5 and above pollute the environment more (*Peter, 2020*; *Cathryn et al., 2014*). The age of the vehicle is a concern and defines the amount of gas emitted to the environment in connection with its power traction type.

## CONCLUSION

Air pollution has killed or disabled millions of people worldwide. Motorized vehicle emissions are an outdoor (ambient) air pollutant that causes a large number of deaths and disabilities. Referring to 1995 as a base with an interval of 5 years, the maximum growth rate of global death and disability was registered in 2020. This review indicated that of global death and disability, air pollution contributes around 13% and 5% of death and disability, respectively. From the total global deaths caused by air pollution, vehicle emissions on average contribute to around 0.5 million (7%) deaths on an annual average. Even if the global death rate gradually increases, deaths due to air pollution and disability slightly decrease, and the number of deaths due to motorized vehicle air pollution oscillates up and down. Even so, the number of deaths caused by motorized vehicle air pollution accounted for around 1% of global deaths.

Approximately half of the world's population, as well as up to 90% of rural households in developing countries, are still subjected to air pollution caused by unprocessed biomass fuels. Even though developed nations use more motorized vehicles, the damage caused by vehicle emissions is much worse in developing nations. The reason behind it was that more than half of used vehicles with an age of 5 years and above are dumped in developing nations and most of them consume diesel. As a result, motorized vehicle emissions account for more than half of all air pollution in developing countries. Therefore, in order to overcome these problems, stakeholders must focus on the age of imported vehicles and the type of power consumption they consume in developing countries.

## ACKNOWLEDGMENTS

It gives us great pleasure to honor those who contributed their precious time in reviewing and commenting on the report while conducting this review article. The research was supported by OTKA - K20 - 134760 - Heterogeneity in user preferences and its impact on transport project appraisal led by Adam TOROK.

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## **Corresponding Author:**

Debela Jima, Budapest University of Technology and Economics, Department of Transportation and Vehicle Engineering, Műegyetem rkp. 3, 1111, Budapest, Hungary, phone: +36205815441, email: Debela.Jima@edu.bme.hu