



Relative Impact of On-Road Vehicle Emissions on Public Health and Climate Change Mitigation in a Medium-Sized Colombian Andean City

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Abstract

Air pollution has become one of the main environmental problem in cities at national and international level due to its negative effects on health and the environment. Air pollution, public health and climate change mitigation have been directly related to transport and the accelerated growth of the industrial sector. Air pollutants such as carbon monoxide (CO), volatile organic compounds (VOCs), sulfur dioxide (SO₂), nitrogen oxides (NO_x) and particulate matter (PM) are called criteria air pollutants due to harm the health and the environment. Human exposure to environmental contaminants increases the risk of chronic diseases, especially cancer, cardiovascular disease, and respiratory diseases. In the Colombian Andean region, higher risk factors have been detected due to growth of the vehicle fleet, and therefore increase disease load. This study reveals a high impact of transport on human health and the environment in intermediate cities in developing countries such as Colombia.

Keywords: Climate change; Public health; Air pollution; Urban transport.

Introduction

Air pollution, public health and mitigation of climate change are directly related to the transport sector and therefore the increase in the vehicle fleet has raised sustainability concerns in developing countries. Globally, integrated emission control policies and measures have been established under EURO VI [1] regulations and the promotion of sustainable transport. However, in developing countries such as Colombia, there are great limitations due to the characteristics of the vehicle fleet, the quality of fuels, the transport infrastructure and the weak implementation of integrated public policies.

Colombian air quality standards exceed those established by the World Health Organization (WHO), generating a risk factor in the development of respiratory diseases [2]. In Colombia, chronic obstructive disease due to COPD is the third leading cause of death in the country, becoming a public health problem, 9 out of 100 people over 40 who have been exposed to risk factors suffer from the disease [3].

In the country, air quality management is promoted from the Air Pollution Prevention and Control Policy [4]. Where priority lines of action are identified for the development of technical tools for the formulation of strategies to reduce air pollutant emissions, including air quality monitoring systems (SVCA) and the preparation of inventories of air pollutant emissions [4]. From the above, the monitoring of air pollutants in different locations and with a certain periodicity, is necessary to assess their impact on health and the environment. In this sense, the present study is aimed at evaluating air criteria pollutants in the Manizales Caldas municipality and evidences relationships between disease burden, vehicle fleet and air criteria pollutants.

Methodology

This study was carried out under the project: Environmental Health in 5 departments of the Central region of Colombia: Burden of disease and costs of health care. Colombia 2010-2016 and the young researchers program. Processes financed by the Ministry of Science, Technology and Innovation.

An ecological study was carried out in the municipality of Manizales Caldas, which focused on analyzing sources of information such as DANE, SISPRO, Regional Autonomous Corporations (CARs) and the Superintendence of Public Services. This process related to the environmental characterization of the air based on criteria pollutants and indicators established by Colombian regulations, the WHO and international agencies recognized as Environmental Protection Agency [5]. The analysis plan was based on descriptive statistics, burden of disease and to know the incident atmospheric emissions in the city of Manizales, the estimation of criteria pollutants identified in ground transportation was performed, the source of information was the secretariat of traffic and analysed from the number of vehicles by category, among them are automobile, commercial, bus, motorcycle, truck and others, in the period 2010-2019.

Results and Discussion

In the department of Caldas located in the Colombian Andean region, one of the regions with the highest urbanization rate and with the highest growth rate of the automotive fleet, 3,440 deaths were registered between 2010 and 2016. For this period, for every one hundred thousand inhabitants, the rate Overall for premature death (YLL) from COPD was 4,265 years lost while the burden of disease was 5,223 years lost adjusted for disability (DALYs).

Correlations between disease burden, vehicle fleet and air pollutant criteria are analyzed in the case study. Mitigation actions are a priority due to the increase in emissions. For CO₂ emissions there is an increase of 75% for emissions from 2010 to 2019, for CH₄ N₂O an increase of 107% and for NOX precursor pollutants, CO and VOC 53%, 100% and 103% [6]. In the recent past all the other gaseous components seem to be under control except for the levels of RSPM. The mitigation actions would have co-benefits in the reduction of criteria air pollutants as particles that show average annual concentrations of up to 21.7 µg/m³ in PM_{2.5} and 45.6 µg / m³ for PM₁₀ in this period. Therefore, the impact of transportation on intermediate cities in developing countries is evident.

Conclusion

The relationship between air pollution and health is clear, air pollution contributes substantially to the global disease burden, because of demographic, epidemiological trends and increasing levels of air pollutants in low-income countries and medium. Scientific evidence on the effects of environmental pollution on health identify the risk of suffering from different diseases.

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