



Cost-benefits analysis of the main actions for the reduction of particulate matter and black carbon emissions related with the transport sector as an input for a public policy

- Context

The World Health Organization (WHO) affirms that air quality in cities is one of the most critical environmental problems at the global level. According to 2012 data, approximately 6,5 million of deaths (11,6% of total worldwide deaths) were related with indoor and outdoor air pollution, it means that 1 out of 9 people death as a consequent of poor air quality (WHO, 2016). According with Organization for Economic Co-operation and Development (OECD) analysis, it's expected that air pollution will become the main environmental cause of premature mortality, even overcoming unhealthy water and lack of basic sanitation. It is estimated that the number of deaths due to exposure to particulate matter (PM10) will double by 2050 (OECD, 2012).

After carbon dioxide, one of the most anthropogenic pollutant gases that more significantly affect climate change is the Black Carbon. As a short-lived climate pollutant, black carbon can cause over 3.000 times as much warming as an equivalent amount of carbon dioxide over a brief 20-year period (Dallmann, Du, & Ray, 2017). The transportation sector is a major source of black carbon and is responsible for approximately 20% of this air pollutant at global level. By 2015, diesel engines were responsible of 95% of Black carbon emissions, while urban buses were account for 25%. The Black carbon is part of particular material (MP 2, 5) and its exposure is associated with premature death from ischemic heart disease, lung cancer and cerebrovascular disease, among other public health outcomes (Minjares, 2015).

In Latin America, the sector with the greatest emissions increase is transport (IDB, 2015). This is mainly due to the high urban density, the unequal process of location of jobs and public services, the phenomenon of "dormitory town"¹ and the growth of the vehicle fleet. It is estimated that the car fleet in the region will reach 200 million units in 2050 (UN Environment, 2016), which will imply an increase in the demand for fuel and therefore in the emissions of polluting gases. According to data from the European Commission, if public policies to reduce emissions in transport sector are not developed in an efficient and effective way, by 2050 this will increase by 30% (European Commission, 2015).

¹ A place from which many people travel, in order to work in a bigger town or city.

The Colombian Environmental and Sustainable Development Ministry with the support of the CCAC, has developed preliminary estimations of Black Carbon emissions in the country. For ground transportation, it's estimated emissions of 8.349 Tons/year of MP 2.5 and 3.720 Tons/year of Black Carbon by 2014, around 28% comes from public transport (buses and vans). This national data is according with the main cities emissions stocks, where it has been established that transport is the sector with more contribution to this emissions. For instance, according with Secretaria Distrital de Ambiente (SDA) in Bogotá for 2014, mobile sources represented 53.8% of MP 10 emissions and 75.2% of MP 2,5 (SDA, 2017). In the Metropolitan Valle de Aburrá Area (AMVA), 81, 7% of MP 2, 5 emissions come from transport sector (Valle de Aburrá Metropolitan Area, 2017).

In Colombia, according to the National Planning Department (NPD), around 10,527 people die annually due to poor air quality. Health costs associated with urban air pollution ascend to \$ COP 15.4 billion, that is, 1.93% of Colombia's GDP for 2015 (NPD, 2017). In Bogotá, 10, 5% (3.219) of total deaths, are due to outdoor air pollution, it generated approximately costs of \$ COP 4.2 billion, 2.5% of Bogota's GDP. In the Valle de Aburrá Metropolitan Area, the poor air quality was responsible for 12, 3% (2.105) of total deaths in this region, with an estimated cost of \$COP 2.8 billion, 5% of Valle de Aburra's GDP (NPD, 2017).

In order to face this problem and based on to the constitutional right to guarantee a healthy environment, the Ministry of Environment has updated the air quality regulation with higher emission standards of air pollutants, under a preventive management approach for 2030. This standard became effective in January 2018 and its fulfillment requires a multi-actor work, where commitments should be assume in the transport, industry, commerce, mining, energy and health sectors. Currently the Colombian government is developing and putting in place an air quality public policy, which aims to promote compliance of the air quality standard at intersectoral level, which allows to guarantee a healthy environment and minimize the risk to human health that can be caused by exposure to pollutants in the atmosphere.



The air quality public policy will integrate specific actions that the aforementioned sectors must adopt to move towards preventive management and achieve the vision of clean air by 2030 that the regulation contemplates. Its implementation will depend on the adequate institutional articulation, the strengthening of governance and the establishment of cost-effective actions that respond to the needs identified for the reduction of air pollution.

In Colombia, since 2010 preventive and controlling pollution air policy has been implemented, allowing to advance in the air quality management process in the country, generating, for example, institutional capacity for the environmental authorities in order to develop emissions stocks, implement monitoring systems, put in place decontamination air plans, among others achievements. Nevertheless, it has been made evident that most of the local actions to improve air quality require support from the national government and the involvement of different ministries. Bearing in mind the above mention, the Environmental Ministry has decided to develop an Air Quality Public Policy to implement actions to improve air quality in an efficient and effective manner. With the purpose to generate a discussion around the different ministerial agendas, emerges the need to make a cost-benefits analysis of the main prioritized measures and how this could contribute to the reduction of criteria air pollutants including particular material and Black Carbon.



Under this premise, the Center for Sustainable Development Studies proposes the development of an analysis that evaluates, in terms of social and economic impact, the benefits of the proposed actions for the reduction of air pollution specifically in the transport sector. It has been determined transport sector as a unit of analysis, since as mentioned above, the emissions from mobile sources are the ones that most contribute to the outdoor air quality. This study is considered as a technical input to put in place an air quality public policy which allows to optimize the solutions proposed for the reduction of air pollution, as well as to relate the possible achievements with the proposed objectives. Likewise, it will analyze the savings in health directly involved with the actions in transport sectors and the impacts to the environment resulting from the reduction of emissions in this sector.

The scope of the study includes the economic and social assessment of the following measures for the reduction of particulate matter (PM 10, PM2, 5) and Black Carbon in the transport sector, as a technical input to include these activities in the new air quality public policy:

- ❖ New emission standards for gasoline and diesel vehicles that add the fleet (buses, high and low capacity freight, cars) under the Euro VI standards
- ❖ Increase in the rates of highly polluting disintegration vehicles (private, public and freight)
- ❖ Restriction to enter diesel vehicles to the country starting 2025
- ❖ Increasing the amount of electric vehicles in the Colombian fleet

Moreover, the study includes the identification of the social and economic impacts of not implementing such measures. The social assessment will take into account the effects on human health and the environment. The economic estimation will analyze the incremental costs of each measure on a base scenario. This cost-benefits analysis will allow to compare the different actions proposed in the transport sector to define which of them can achieve greater reduction of particulate matter with a lower cost, which leads to prioritize its implementation. The development of this study will be carried out under the methodology of transfer of benefits, applied to particulate matter and Black Carbon emissions in Bogotá and the Valle de Aburrá Metropolitan Area.