

## **Emissions from Road Transportation, Spatial Distribution and Policies**

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### **Abstract**

Air pollution has become one of the main global issues resulting climate changes, temperature rising, more frequent extreme weather events as well as increased number of mortality due to respiratory issues. Vehicle emission is one of the major contributory factors for air pollution which emits CO<sub>2</sub>, NO<sub>2</sub>, SO<sub>2</sub>, and Particulate Matter (PM) along with other pollutants. Although there are international agreements and some targets being set to limit the concentration levels of those harmful pollutants around the world, there is no clear mechanism to achieve such targets yet, especially in Sri Lanka. When developing such mechanism or policies in the transportation sector it is important to know the base case first and then what are the impacts on people's day-to-day transportation needs with new policies. As a starting point, the objective of this research is to analyze the level of road side air pollutants in Western Province of Sri Lanka and to identify the annual variation of road side air quality parameters. In addition, investigating impacts on road side air quality due to imposed policies or development of new policies to improve the road side air quality has been considered in this study. Air quality data (measured monthly using passive sampling technique) from 40 fixed locations from year 2013 to 2018 were collected and spatial analysis was carried out. NO<sub>2</sub> and SO<sub>2</sub> concentrations of all the measured locations are analyzed using spatial analyze tools in Arc GIS software and maps were generated visualizing the spatial distribution in Western Province of Sri Lanka in order to identify critical locations with low air quality. In order to improve the accuracy of the spatial analysis Western Province boundary is used as a mask. Based on the spatial analysis results it was observed most of the urban area having very high concentration levels of NO<sub>2</sub> and SO<sub>2</sub> which exceeds more than twice the standard concentration level. It was also observed that from year 2013 to 2017 a gradual decrease of NO<sub>2</sub>, SO<sub>2</sub> levels in Western Province although in year 2018 there is a sudden increase of NO<sub>2</sub>, SO<sub>2</sub> concentration levels but no possible explanation for such an increase has found yet. Results of spatially analyzed concentration levels are correlated with vehicular traffic volumes at selected locations in order to identify the relationship between traffic volumes and the air quality. Average emissions factors were calculated for vehicles in Sri Lanka using Vehicle Emission Testing (VET) data for each vehicle category and used to develop a relationship between air quality concentration levels and vehicular traffic volumes. Based on the analysis, various policies that can be implemented in order to reduce the concentration levels of emissions are discussed.

**Keywords:** *vehicle emissions, air pollution, air quality, policy, spatial distribution*

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