

Estimated on-road vehicle emissions in China: current status and future trends

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Introduction

Among urban residents in China, severely polluted air has become a main source of complaints and frustration over health concerns in recent years. Vehicle emissions have become one major source of air pollution in many cities, especially in the well-developed regions. As a result, the State Council released the Action Plan for Air Pollution Prevention and Control on Sep. 12, 2013, which is the national guide for air pollution control in the next period (Environmental Protection Agency, 2013). This plan clear contains stringent emission control measures for on-road vehicles in the future.

This study estimates the current status of on-road vehicle emissions in China. In addition, we design several scenarios to predict the future trends through 2030.

Methodology

Emission inventory

The emissions of CO, HC, NO_x and PM_{2.5} of on-road vehicles for each province are estimated and calculated based on fleet-average emission factors, vehicle population and annual vehicle kilometers travelled (VKT).

$$E_j = \sum_i (10^{-6} \cdot VP_i \cdot VKT_i \cdot EF_{i,j})$$

The EMBEV model is used to calculate the emission factors for each vehicle fleet. The historic vehicle population distribution and the fleet-averaged annual VKT are mainly collected from statistical data, previous studies and surveys. The future data regarding vehicle population and activity are estimated based on the overall outlook of the economy, population and some relevant control measures.

Simulation Scenarios

NO	Control scenarios	Major factors
1	Without control	--
2	Control of new vehicles and fuel	Implementation of emission standard and Fuel quality
3	Traffic control	VKT, speed
4	Licence control	Vehicle population
5	Scrappage of in-use vehicles	Distribution of vehicle fleet
6	Penetration of alternative fuels and advanced vehicles	Distribution of vehicle fleet, emission factors

Results and discussions

Emissions in 2012

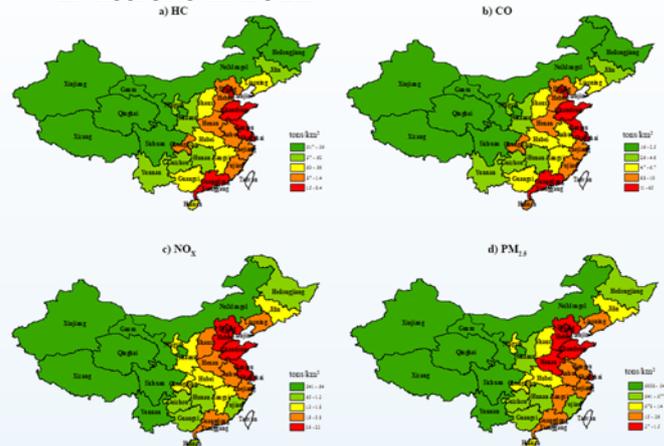
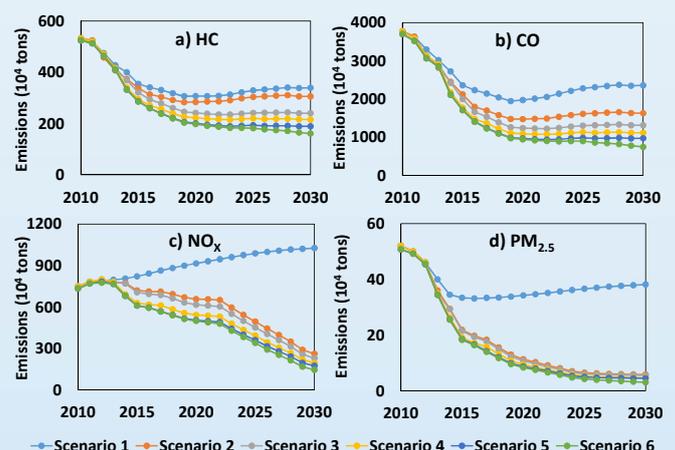


Figure 1. The spatial distribution of emission density of on-road vehicles in China in 2012 is illustrated in

The emissions in East China, especially in three developed regions: Jing-Jin-Ji, Yangtze-River-Delta and Pearl-River-Delta, are significantly higher than other regions. Those regions accounted for only about 20% of the population, but nearly 50% of the vehicle population in China by the end of 2012. As a consequence, much more control strategies are implemented in those regions in recent years.

Emission trends from 2012 to 2030



The estimated emissions of CO, HC, NO_x and PM_{2.5} of on-road vehicles would possibly keep increasing trends through 2030, if effective control measures are not implemented. Under some stringent control scenarios, estimated emissions are predicted to decrease significantly, especially in the three developed regions.