

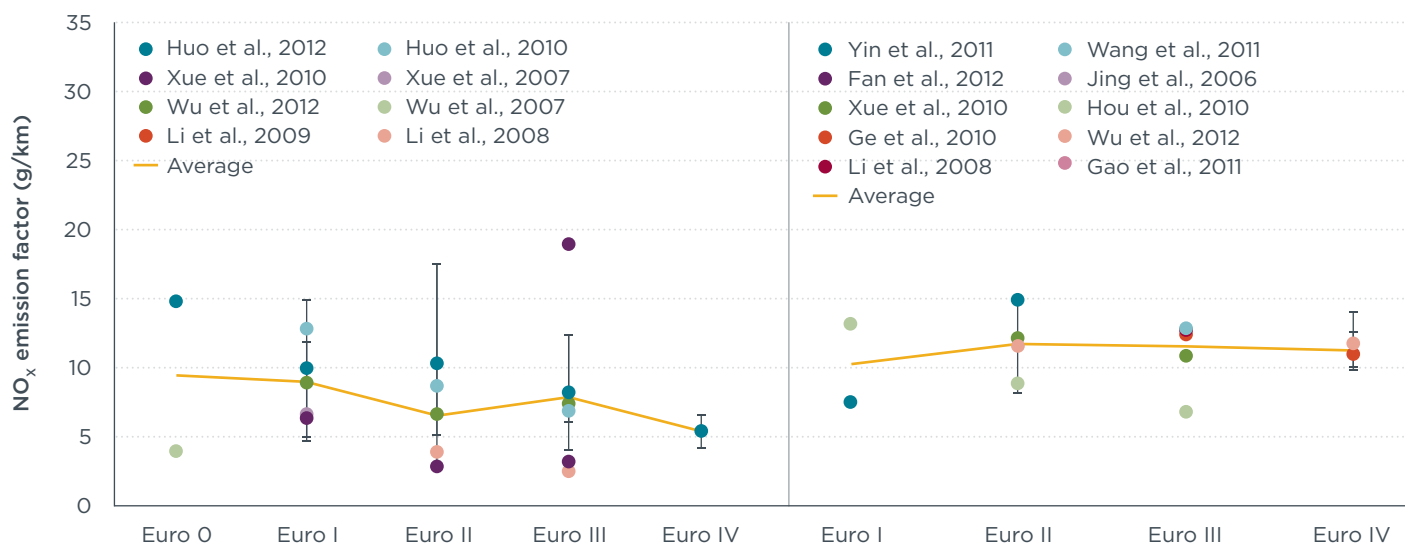
INVESTIGATION OF DIESEL EMISSIONS IN CHINA

Diesel vehicles, especially trucks, have been recognized as a major source of NO_x and particulate matter (PM) emissions in China. Accurately estimating emissions from these vehicles has important implications for air quality policy. However, real-world, in-use emissions data for diesel vehicles in China are relatively scarce. Most emissions inventory studies for China rely on European or US vehicle emissions models and databases, leading to potentially gross inaccuracies in total emissions estimates.

In 2012, the International Council on Clean Transportation supported Tsinghua University to investigate emission factors of diesel vehicles in China. The project included a careful review and summary of all available existing on-road emissions data for China (over 300 vehicles), new PEMS

(Portable Emissions Measurement System) measurements of twenty older diesel vehicles, and comparison of real-world emissions data against existing inventory studies.

The results of the study convincingly demonstrate that more stringent tailpipe emission standards in China have resulted in dramatic reductions in emission factors for CO, HC, and PM, but not for NO_x. Policy evaluations which assume a continuous decrease in NO_x emission factors as standards have been tightened almost certainly significantly underestimate total emissions in China. The following two figures from the report highlight the lack of significant NO_x emission factor reductions from trucks (left) and buses (right) as tailpipe emission standards have been strengthened:



Summary of Chinese PEMS testing results for NO_x emissions from heavy-duty diesel trucks (left) and buses (right). Note lack of significant reductions in average NO_x emission factors, especially from Euro 0 to Euro III, even as emission standards have become more stringent.

One conclusion of the report is that the Chinese government needs to enforce stricter NO_x standards for diesel vehicles in order to achieve the national target of reducing NO_x emissions by 10% during the 12th Five-Year Plan (2011-2015). Euro IV standards, which just went into effect nationwide in China on July 1, 2013, should deliver some NO_x emissions reductions for trucks and other vehicles operating with high speeds and high loads. However, the real-world data show that Euro IV will not be effective at reducing NO_x emissions from urban buses operating under low-load, low-speed conditions. This is due to the lack of effectiveness of certain Euro IV and V selective catalytic converter (SCR) aftertreatment systems when exhaust temperatures are low.¹ Beijing's municipal government has recently adopted supplemental Euro IV and V test procedures to force vehicle and engine manufacturers to control NO_x emissions over a broader operating range.² Further testing is needed to confirm that Beijing's Euro IV/V supplemental test procedures are effective at reducing real-world NO_x emissions, so that Beijing's experience

1 For more detailed information, see the 2012 ICCT report "Urban off-cycle NO_x emissions from Euro IV/V trucks and buses," available at: <http://theicct.org/urban-cycle-nox-emissions-euro-ivv-trucks-and-buses>

2 Beijing's supplemental test procedures are detailed in the 2013 ICCT policy update, "Supplemental NO_x standards for Euro IV/V HDVs in Beijing," available at: <http://theicct.org/supplemental-nox-standards-beijing>

may be duplicated elsewhere in China and around the world.

In addition to the real-world NO_x trends conclusions, the study highlights the significant inaccuracies that result from building emissions inventories for China without using emission factors based on local, real-world testing. The study's comparative analysis between PEMS-derived emission factors and those used in various inventory modeling studies for China shows great variability in results. Many existing inventory studies based purely on COPERT (a European model) or MOBILE (a US model) grossly underestimate actual emission factors in China. On the other hand, other models which have been customized for China (such as COPERT-China) show mixed results, sometimes underestimating and sometimes greatly overestimating emission factors.

The report suggests that inventory model results based on European or US vehicle emission databases, even databases built from real-world testing in developed countries, will likely be unrepresentative of the real-world emissions conditions in China. It concludes that the use of inventory modeling without considering on-road, real-world test data almost certainly leads to inaccurate estimates of emissions from diesel trucks and buses for recent years. The study recommends the development of an emission inventory model based on local, real-world measurements in China.

FURTHER INFORMATION

Investigation of Diesel Emissions in China

DOWNLOAD <http://www.theicct.org/investigation-diesel-emissions-china>

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