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HEALTH IMPACTS OF AIR POLLUTION FROM TRANSPORTATION SOURCES IN PARIS

A new study provides a detailed picture of the health impacts attributable to emissions from four transportation subsectors: on-road diesel vehicles, on-road non-diesel vehicles, shipping, and non-road mobile sources such as agricultural and construction equipment. The study, by researchers from the International Council on Clean Transportation, George Washington University Milken Institute School of Public Health, and the University of Colorado Boulder, links state-of-the-art vehicle emissions, air pollution, and epidemiological models to estimate health impacts at the global, regional, national, and local levels in 2010 and 2015.

KEY FINDINGS FOR THE PARIS REGION

In 2015, 1,100 premature deaths in metropolitan Paris were attributable to ambient $PM_{2.5}$ and ozone from transportation tailpipe emissions. Deaths attributable to ambient $PM_{2.5}$ and ozone from all sources totaled 3,400, meaning that transportation accounted for just under one-third (32.5%) of all deaths from air pollution that year in Paris.

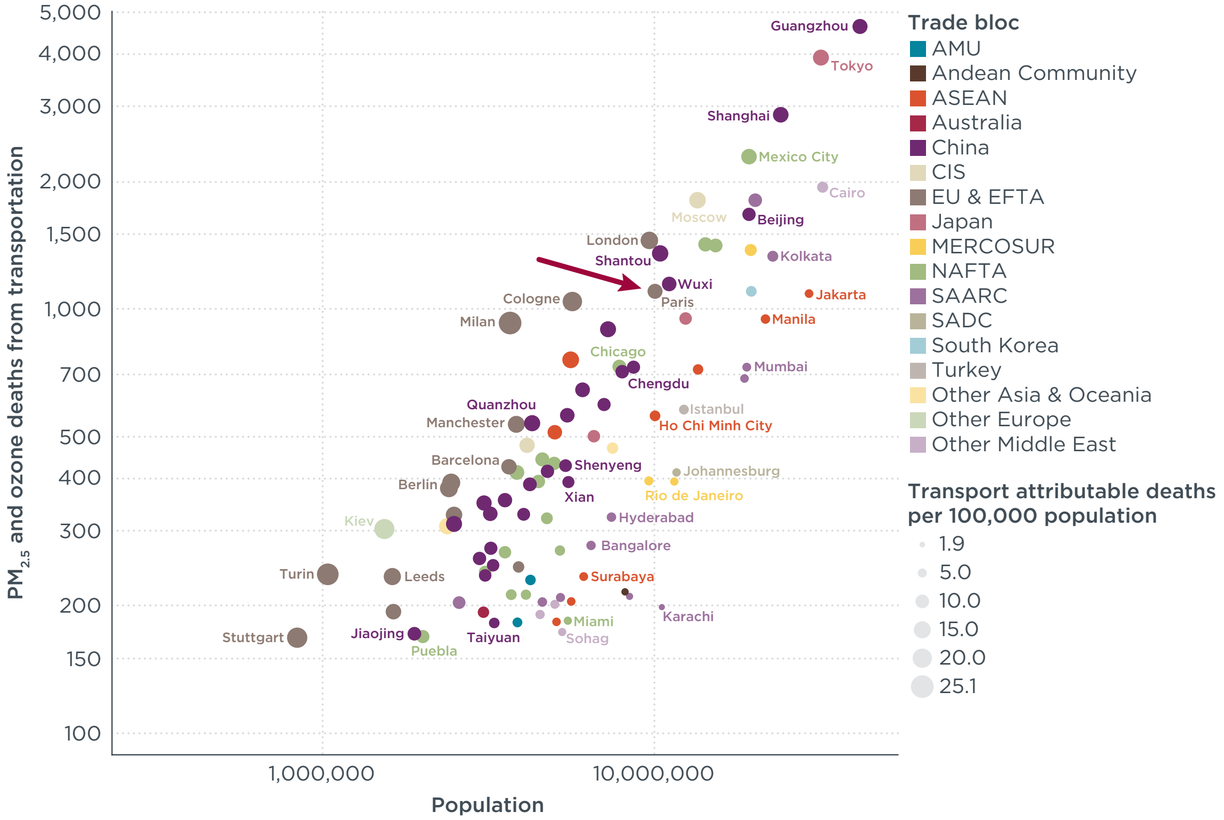
Paris accounted for 17.2% of transportation-attributable deaths from $PM_{2.5}$ and ozone pollution in France in 2015. That is a mortality rate of 11 deaths per 100,000 population in the metropolitan area (approximately 10 million in Paris and suburbs in 2015).

Among European Union (EU) member states, France had the fourth-highest transportation health burden in 2015, behind Germany, the United Kingdom, and Italy. If Paris were an EU member state, it would rank tenth in transportation health burden in 2015, ahead of Austria and Switzerland.

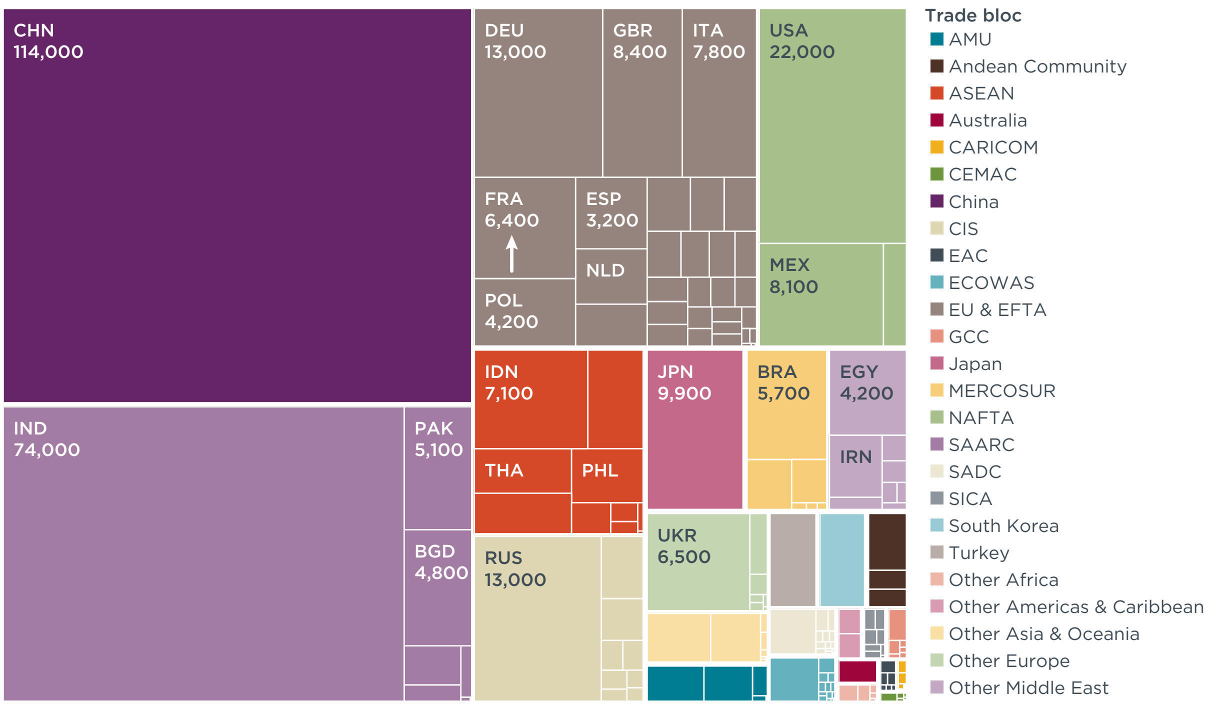
On-road diesel vehicles contributed 71% of the transportation health burden in Paris, followed by non-road mobile sources, including agricultural and construction equipment and rail (12%); international shipping (12%); and on-road non-diesel vehicles (5%). The high contribution of on-road diesel vehicles reflects both tailpipe $PM_{2.5}$ and NO_x emissions, the latter of which contribute to secondary $PM_{2.5}$ (in the form of nitrate aerosols) and ozone.

Among 100 major urban areas worldwide that the study evaluated, Paris ranked 27th in population and 17th in the number of deaths attributable to transportation emissions in 2015—that is, the health burden from transportation emissions in Paris is disproportionately heavy.

Paris had the ninth-highest fraction of deaths from air pollution attributable to transportation emissions in 2015 among major cities worldwide. The ten worst, in order, were Milan, Rotterdam, Turin, Stuttgart, Mexico City, Leeds, Manchester, London, Paris, and Cologne.



Transportation-attributable deaths from $PM_{2.5}$ and ozone pollution, mortality rates, and population in 100 major urban areas, 2015. Bubble color indicates the trade bloc in which an urban area is located. Bubble size indicates the transportation-attributable mortality rate per 100,000 population.[1]



National total $PM_{2.5}$ and ozone mortality that is attributable to transportation emissions in 2015 in major trade blocs globally, using central relative risk estimates. The size of each box corresponds to each region's share of global transportation-attributable $PM_{2.5}$ and ozone mortality in 2015.

1 Acronyms of the trade blocs identified in the figure: AMU = Arab Maghreb Union (North Africa); ASEAN = Association of Southeast Asian Nations; CARICOM = Caribbean Community; CEMAC = Central African Economic and Monetary Community; CIS = Commonwealth of Independent States; EAC = East African Community; ECOWAS = Economic Community of West African States; EU & EFTA = European Union and European Free Trade Association; GCC = Gulf Cooperation Council; MERCOSUR = Southern Common Market (South America); NAFTA = North American Free Trade Agreement; SAARC = South Asian Association for Regional Cooperation; SADC = Southern African Development Community; SICA = Central American Integration System.

POLICY IMPLICATIONS

Paris suffers a high public-health burden from transportation emissions, and controlling those emissions is of central importance to any air-quality management plan. In Paris, reducing emissions from on-road diesel vehicles could generate substantial benefits for public health, because those vehicles account for such a high proportion of the city's transportation-attributable deaths from air pollution. These findings also highlight the importance of the partnership between Paris and the TRUE initiative, which will enable Paris to have the most accurate data on real-world vehicle emissions for informing important policy decisions, such as increasing the stringency of their low-emission zone and developing complementary policies.

OVERALL SUMMARY AND METHODS

The study estimates the contribution of transportation sector emissions globally to $PM_{2.5}$ and ozone pollution and the health effects of those pollutants in 2010 and 2015. The analysis is restricted to the air pollution–related health impacts of transportation tailpipe emissions because a clear set of well-understood policies is available to reduce emissions, and global inventories of transportation tailpipe emissions exist.

The analysis used the GEOS-Chem global chemical transport model to simulate the fractions of $PM_{2.5}$ and ozone concentrations that are attributable to transportation emissions (transportation-attributable fraction, or TAF). It combines that data with epidemiological health impact assessment methods consistent with the Global Burden of Disease 2017 study to estimate the associated disease burden.

To evaluate the health burden attributable to specific subsectors (on-road diesel vehicles, on-road non-diesel vehicles, international shipping, and non-road mobile sources), the analysis summed the gridded $PM_{2.5}$ and ozone deaths attributable to each transportation subsector according to national boundaries and urban areas. Urban area definitions are taken from the Global Human Settlement grid for 2015 at 1km resolution, and regridded to 0.1° resolution. The study used the "urban centers or high density clusters" definition, which treats areas with dense contiguous urbanicity as one large city. The number of transportation-attributable mortalities in a subset of one of these areas could be estimated by multiplying the appropriate population estimate by the estimated transportation-attributable mortality rate (i.e., deaths per 100,000 population).

PUBLICATION DETAILS

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Download: www.theicct.org/publications/health-impacts-transport-emissions-2010-2015

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