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D I G E S T

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Reducing Transport Emissions

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Review of real driving emission versus local air quality

This study reviews emissions-related European regulations for passenger cars and how they impacted urban air quality in the European Union (EU). It also provides an overview of why diesel was adopted to reduce carbon dioxide (CO_2) emissions from passenger cars. Despite this measure, an outdated driving cycle for type-approval has increased the gap between laboratory and real-world emissions, which undermines the effectiveness of Low Emission Zones (LEZs) to control urban air quality.

Road transport is a significant contributor to urban air quality in the EU. Although emissions of particulate matter ($PM_{2.5}$ and PM_{10}), nitrogen dioxide (NO_2) and ground-level ozone (O_3) have decreased over time, road transport remains a main source of these pollutants in cities. It is also a major contributor to CO_2 emissions, with passenger cars representing approximately 62 % of total road transport emissions.

Over the last two decades, the European Commission (EC) has focused on reducing CO_2 emissions from passenger cars and their contribution to climate change. Yet CO_2 emissions from road transport have increased by 17 % in the period 1990 to 2014. This is due to the growth in personal and freight transport, which has been accompanied by a 23 % rise in fuel consumption.

Since 1992, successive EC Euro emission standards have regulated vehicle emissions from European passenger cars (i.e. carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NO_x), PM and particle number (PN)). The EU has continuously challenged the automotive industry to develop emission control devices and for cars to pass type-approval procedures based on the New European Driving Cycle (NEDC). However, the NEDC has been found to poorly represent modern vehicle usage. As a consequence, Euro 5 and Euro 6 emission limits for the regulation of diesel cars have failed to achieve the expected reduction in NO_x emissions.

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Review of real driving emission versus local air quality

Real driving emissions testing with portable emission measurement systems (PEMS) has the potential to change this situation and ensure manufacturers comply with emissions regulations over the engine operation range. The European Parliament has given car manufacturers until 2020 to reduce diesel NO_X emissions.

The failure to meet Euro emission standards for diesel NOx has undermined the effectiveness of LEZs, which have been used to levy urban tolls by creating traffic-limited zones or just traffic restrictions.

Whereas most LEZs target heavy-duty vehicles, several cities have begun to regulate passenger car access. However, there are no uniform guidelines for the application of LEZs in the EU. Most studies that focus on the impact of LEZs have demonstrated that a reduction in PM and NO_X emissions is feasible. Traffic restrictions not only reduce PM emissions, but also less PM is resuspended. Resuspension is independent of powertrain technologies, as is tyre and brake wear. The influence of non-exhaust PM emissions are expected to grow as exhaust PM is successfully reduced.

The study suggests that LEZs should, ideally, place a total ban on combustion-based vehicles given the abundance of alternative modes, such as public transport. There is also a need for incentives to make the transition towards zero-emission technologies. The success of LEZs remains dependent on financial incentives until technology costs equal those of conventional vehicles