

AIRUSE LIFE+: Review of the efficiency of major air quality measures for road traffic in Europe for abatement of particulate matter

Roy M. Harrison^{1,2}, Claire Holman^{1,3}, Xavier Querol⁴

¹School of Geography, Earth and Environmental Sciences, University of Birmingham, B15 2TT

²Also at: Department of Environmental Sciences / Center of Excellence in Environmental Studies, King Abdulaziz University, PO Box 80203, Jeddah, 21589, Saudi Arabia

³Brook Cottage Consultants, Elberton, Bristol, BS35 4AQ

⁴Institute of Environmental Assessment and Water Research, (IDÆA)/Consejo Superior de Investigaciones Científicas (CSIC) C/ Jordi Girona 18-26, 08034 Barcelona, Spain

Presenting author email: r.m.harrison@bham.ac.uk

The AIRUSE LIFE+ project has investigated the experience of a range of road transport emission mitigation measures applied in northern and central Europe and their application to southern Europe. The measures reviewed include the use of low emission zones (LEZs), policies to promote cleaner vehicle technologies such as electric vehicles and to discourage diesel cars, and the role of eco-labels to influence consumer vehicle choice. This paper provides an overview of the approximately 200 LEZs that now exist in 12 EU countries and the evidence on their impact. These LEZs vary hugely in terms of the vehicles that are restricted, enforcement and area. There is some evidence from ambient measurements that LEZs in Germany, which restrict passenger cars as well as heavy duty vehicles (HDVs), have reduced long term average PM₁₀ concentrations by a few percent. Elsewhere, where restrictions are limited to HDVs, the picture is much less clear. The difficulty in identifying an improvement in many LEZs is due to the large number of confounding factors. These include the effect of day to day variations in meteorology on concentrations which often mask the smaller effects of a LEZ (e.g. Cyrus et al., 2014), and the difficulty in separating the direct effects of a LEZ from the effects of other policy measures, such as the German scrappage schemes (Cyrus et al., 2014) and the introduction of zero sulphur diesel (<10 ppm) (Jones et al., 2012), which occurred during a similar period as the introduction of some LEZs. In addition, in many cities the local traffic exhaust emissions make a relatively small contribution to overall concentrations (e.g. Lutz, 2009). The largest impact has been seen in Munich where a ban on HDVs in the city centre was introduced 8 months prior to the LEZ, and therefore represents the combined impact of both measures (Fensterer et al., 2014). Other confounding factors include the deep recession that has occurred in Europe in recent years, the normal renewal of the vehicle fleet, and the increasing number of diesel cars which have higher exhaust emissions of particulate matter than gasoline cars. Most of the good quality studies to date have used long term monitoring data (over several years) to determine the impact, and therefore most of the studies have been on early stages of LEZs. It may be that the later stages will be more effective at improving air quality. There is some, albeit limited, evidence that LEZs may result in higher reductions in concentrations of carbonaceous

particles, due to traffic making a larger contribution to ambient concentrations of these particles than to PM₁₀ and PM_{2.5} (e.g. Qadir et al., 2013).

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