



Air pollution: A public health approach for Portugal

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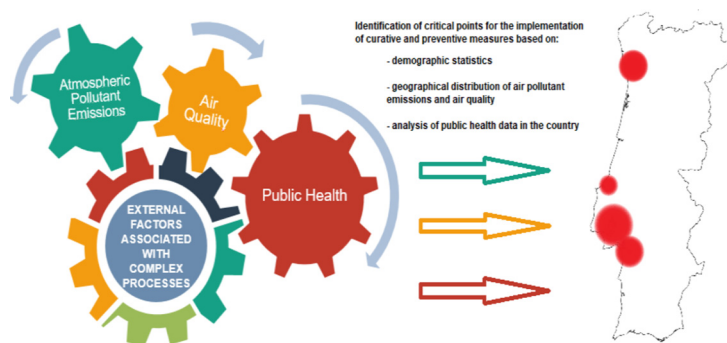
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HIGHLIGHTS

- Lisbon and surroundings are the most critical areas of pollutant emissions.
- All regions shown improvements in SO₂ concentrations.
- Northern and Southern Portuguese regions shown increasing concentration levels of NO₂ and PM_{2.5}.
- Respiratory and cardiovascular mortality had more impact on North, Center and Lisbon regions.

GRAPHICAL ABSTRACT



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ABSTRACT

At the global level, several epidemiological studies have conclusively pointed out the associations between short-term exposure to air pollution and acute health effects, and long-term exposure with adverse health effects such as premature mortality from severe respiratory and cardiovascular diseases. This study intended to characterize exposures and their adverse health effects. Three independent sets of vectors were analyzed on a nationwide level and annual basis: air pollutant emissions, ambient air concentrations and health indicators of the period 2009 to 2015. The emissions analysis, for the studied pollutants, pointed out the main findings: (i) Lisbon Metropolitan Area presents the most problematic region with regard to the emissions of all the pollutants under study; (ii) the regions of the Alentejo and Algarve showed reduced emissions of the studied pollutants compared to other parts of the country; (iii) Northern regions PM₁₀ concentrations decreased during the two years in analysis.

Regarding the analysis of air quality, it was concluded that: (i) regarding ozone, concentration shown a decreasing trend throughout the country; (ii) nitrogen dioxide and particulate matter, concentrations demonstrated an increasing trend in most of the northern part of the country; (iii) the regions of Alentejo and Lisbon Metropolitan Area showed increasing trends for sulfur dioxide and fine particles for the evaluated period. Decreasing trends in mortality associated with cardiovascular and respiratory causes are found mainly in the Alentejo and Algarve regions. In comparison, the North, Central regions, as well as, Lisbon Metropolitan Area exhibited higher mortality values related to this health indicators.

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1. Background

The relationship between the increased risk of mortality and global morbidity and exposure to air pollutants has led to the development

of mitigating strategies for emissions reduction of atmospheric pollutants (Song et al., 2017). Air pollution is associated with problems in the cardiovascular and respiratory systems and other adverse side effects (Le Boennec and Salladarré, 2017; Kim et al., 2017). As harmful

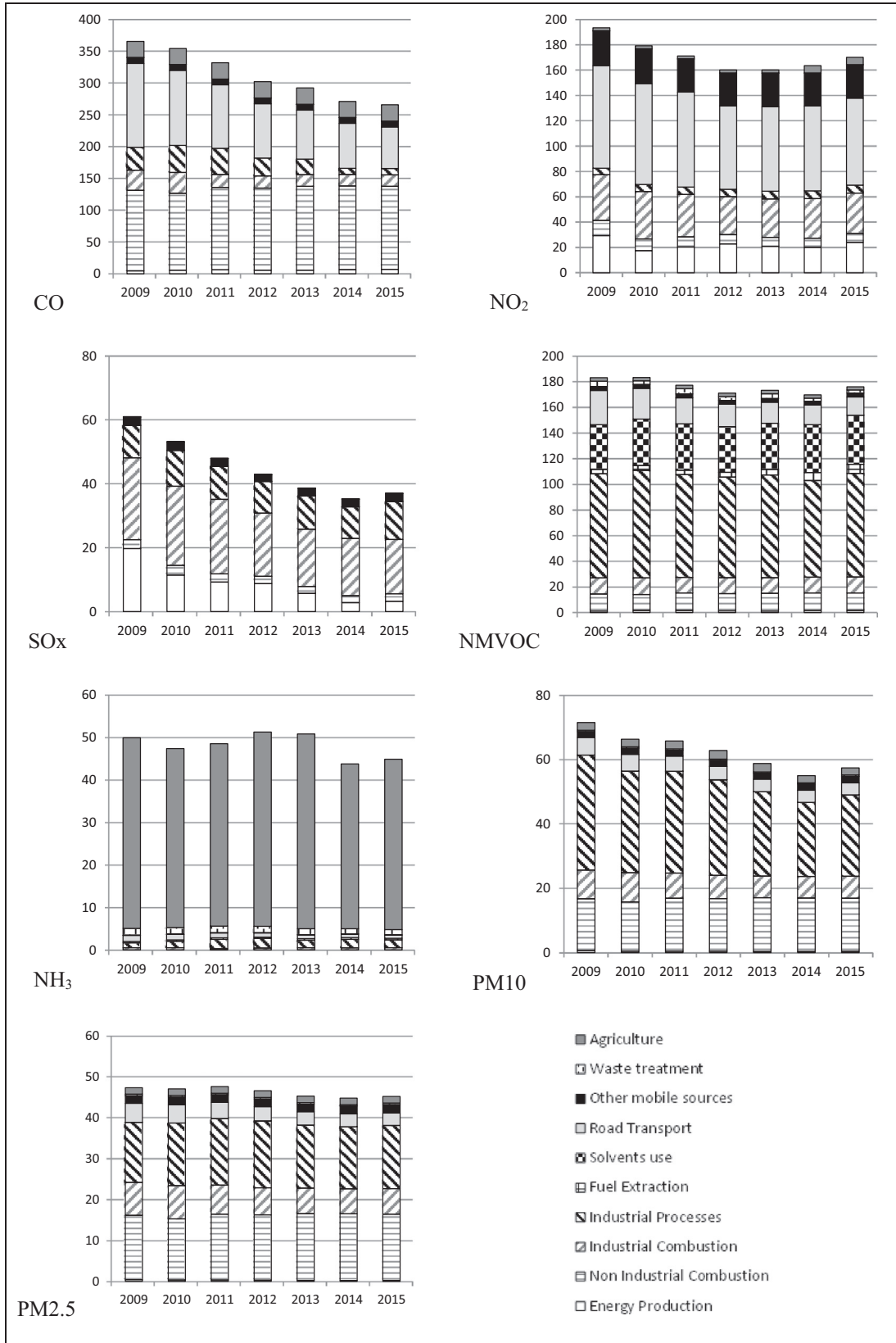


Fig. 1. Total annual emissions (kt_{on}·yr⁻¹) and source contributions (by activity sector) reported for Portugal between the years 2009 and 2015.

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