

climate-driven changes in air quality over europe by the end of the 21st century, with special reference to portugal

anabela carvalho¹, alexandra monteiro¹,
silvina solman², ana isabel miranda¹,
carlos borrego¹

¹ department of environment and planning & CESAM, university of aveiro

² university of buenos aires, argentina

Climate change alone may deeply impact air quality levels in the atmosphere because the changes in the meteorological conditions will induce changes in the transport, dispersion and transformation of air pollutants. Ozone and particulate matter (PM10) are two major atmospheric pollutants that may deeply influence human health and ecosystems with significant social, environmental and economic impacts. In this sense, the aim of this work was to evaluate the impact of climate change on the air quality over Europe and Portugal, using a reference year (1990) and the *International Panel on Climate Change – IPCC Special Report on Emission Scenarios – SRES A2* year (2100). The Hadley Centre global atmospheric circulation model (HadAM3P) was used to provide results for these two climatic scenarios, which were then used as synoptic forcing for the MM5-CHIMERE air quality modelling system. Results suggest that the O₃ monthly mean levels in the atmosphere may increase almost 50 µg.m⁻³ across Europe in July under IPCC SRES

A2 scenario. In Portugal, this increase may reach 20 µg.m⁻³. The changes of PM10 monthly average values over Europe will depend on the region. The increase in PM10 concentrations during specific months could be explained by the average reduction of the boundary layer height and wind speed in future climate conditions. Increases in the maximum values can also be expected by the end of the 21st century. This trend provides important information regarding the obligation to accomplish the national and European air quality standards. It also lights out the urgent need to institute measures aimed at decreasing precursor ozone emissions and PM10 emissions in order to reduce the peak ozone and PM10 values, but also to take background conditions into account.

In the scope of the air quality management for the next decades it is necessary to include climate change and changes in climate variability when defining long-term plans and measures to improve the quality of the air we are breathing.

