CityZen Science Policy Brief:
Particulate Matter (PM_{10})

Particulate matter (PM) is comprised of solid particles and liquid droplets in the atmosphere, originating from natural and man-made sources. Particulate matter is a concern for human health, visibility, and climate forcing.

Particulate matter with a diameter smaller than 10 μm (PM_{10}) has been monitored and regulated for a number of years. The EU standard for PM_{10} is:

- 40 μg m^{-3} annual average,
- 50 μg m^{-3} 24 hour average, with no more than 35 exceedances permitted per year.

Policy Implications

- Based on PM_{10} monitoring station observations, PM_{10} concentrations in Germany, UK, and BeNeLux have been decreasing (1998-2007) and is attributed to successful air quality regulation.
- A lack of monitoring sites results in significant gaps in data and information, limiting effective model evaluation and thereby predictive capabilities. Appropriate combination of aerosol remote sensing from space with ground based measurements, whilst challenging, potentially resolves the problem.
- As $PM_{2.5}$ is a more relevant metric for the protection of human health, long-term monitoring of $PM_{2.5}$ should be increased, as modelling/prediction capabilities depend on observations for validation.

During the past decade, daily PM_{10} exceedances have continued to be a problem in a number of European cities, including Paris and Bruxelles.

At urban air quality monitoring sites in Athens, PM_{10} exceedances have fallen from approximately 60% of days in a year a decade ago to about 40% currently.

There is a strong regionality in the factors controlling PM_{10} levels throughout Europe, with a much larger natural (e.g., desert dust, sea salt, forest fires) component in the Eastern Mediterranean region.

Despite strong natural influence in some locations, exceedances in the urban areas are mainly attributed to local anthropogenic emission sources and the fine ($PM_{2.5}$) contribution to PM_{10}.

Natural climate variability has a strong influence on PM levels, and precipitation specifically is an important driver. The influence of meteorological variability and especially the scarcity in data availability, makes trends in PM difficult to quantify.

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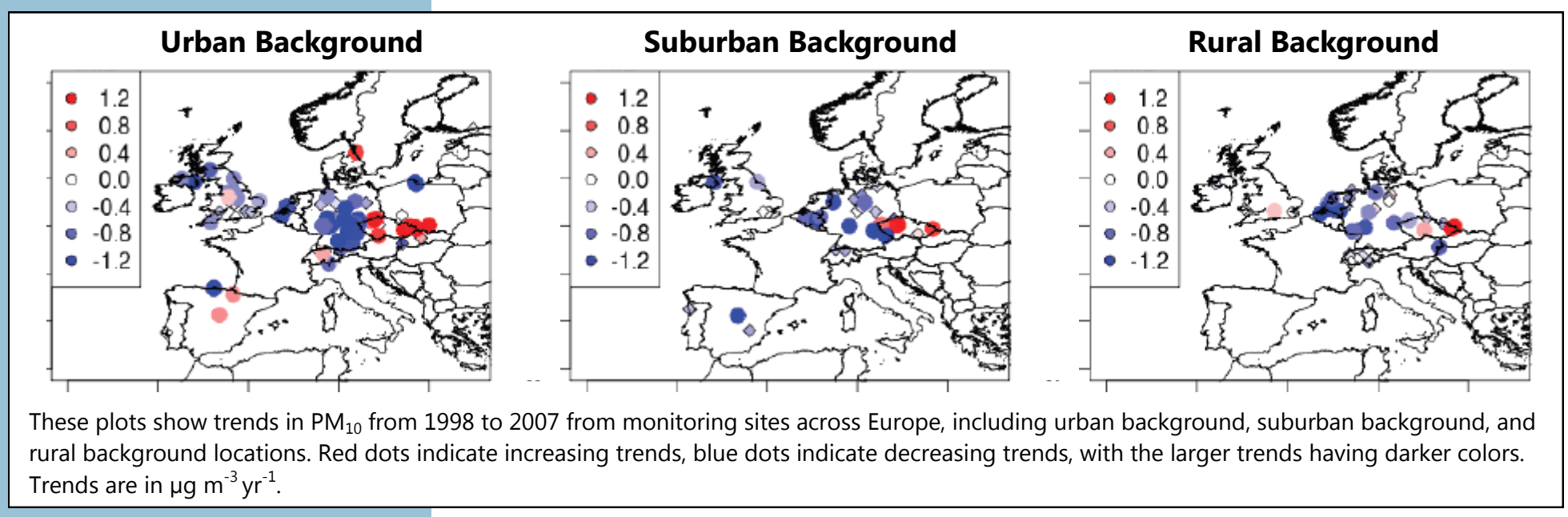
In a warming climate:

- areas of southern Europe, North Africa and the eastern Mediterranean become more arid, resulting in an increase in PM levels,
- the increase in PM and related hazards from sporadic events, such as those from forest fires become more probable and prominent,
- increasing wind leads to increases in sea salt aerosol and impact on nitrate partitioning,
- increasing summer smog will lead to greater exceedances in urban areas.

Trends in PM_{10}

Long-term (≥10 years) PM_{10} monitoring data shows that more than 80% of European monitoring stations exhibit a significant decreasing trend over the decade (1998-2007), which is attributed to successful air quality regulations. However, in some areas of Northern Germany and the UK, the decreasing trend was observed to lessen and stagnate towards the end of the decade.



These plots show trends in PM_{10} from 1998 to 2007 from monitoring sites across Europe, including urban background, suburban background, and rural background locations. Red dots indicate increasing trends, blue dots indicate decreasing trends, with the larger trends having darker colors. Trends are in μg m^{-3} yr^{-1}.

Trends in areas of Spain and the Czech Republic show increasing concentrations in PM_{10}.

All of these trends were similar at urban, suburban, and rural monitoring sites.

A modelling inter-comparison study found that PM_{10} trends were quite well captured, supporting model utility for future projections of air quality, although validation was not as rigorous as desirable owing to the relative lack of long term measurements and their sparseness.

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SEVENTH FRAMEWORK PROGRAMME

prepared by the University of Leicester