

Science for Environment Policy

Reduced heavy metals and nitrogen in mosses reflect falling air pollution across Europe

Deposition of heavy metals and nitrogen is falling across Europe, a new study suggests. The researchers used the levels of these pollutants in mosses as indicators of how deposition has changed from 1990 to 2010. These reductions are likely to be the result of effective air pollution policies, they say.

Heavy metals, such as lead and cadmium, can be toxic to both humans and wildlife, and nitrogen pollution can lead to eutrophication, damaging aquatic ecosystems. Previous studies have demonstrated that the level of these pollutants found in mosses, due to air pollution from vehicle emissions, for example, can be used as an indicator of the amount of heavy metal and nitrogen being deposited from the atmosphere to the ground.

In this study, the authors measured heavy metal and nitrogen levels in mosses in 2010, and added these results to data that have been collected across Europe every five years since 1990. The researchers hypothesised that because the emission of heavy metals, and to a lesser extent nitrogen, has decreased during this time period, the levels in the mosses will reflect this.

The presence of heavy metals and nitrogen in several moss species (the most common being *Pleurozium schreberi*) were tested at 4400 and 2400 sites across Europe, respectively. However, some countries did not provide data, and in others only selected regions were tested. Where data were provided, maps using 50 km² x 50 km² squares were created to show the average concentration of metals and nitrogen across Europe in 2010.

The maps demonstrated that, in general, mosses from countries in northern Europe had the lowest heavy metal concentrations, whereas countries in eastern and south-eastern Europe, Bulgaria and Romania for example, had the highest.

The researchers found that there has been a decrease in the level of heavy metals found in mosses since 1990. Levels of lead, for example, had decreased by, on average, 77% and cadmium by 51%. This decrease is very likely to be the result of strategies to reduce air pollution. In regions such as eastern and south-eastern Europe such strategies have been introduced more slowly, which may be contributing to the higher levels of heavy metals seen in those areas.

There was a small decline (5%) in the level of nitrogen in mosses across Europe between 2005 and 2010. The countries that have the highest concentrations of nitrogen are generally found in the central or western areas of Europe. However, the authors noted the data across Europe were somewhat incomplete.

The authors conclude that while some countries have shown no change, or an increase in the levels of heavy metal and nitrogen found in mosses, overall there is a trend of decreasing levels across Europe.



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