

Science for Environment Policy

Economic hardship in Greece has increased wood burning to keep warm in winter

Air quality in the Greek city of Thessaloniki has worsened during the recent economic crisis, as residents burn more wood and other types of biomass to keep warm. A recent study has found a 30% increase in the concentration of fine particle (PM_{2.5}) emissions associated with wood smoke from residential heating in 2012 and 2013, with implications for the health of local residents.

Thessaloniki is the second largest city in Greece and one of the most [polluted](#) cities in the EU with high levels of particulate matter (PM) in the air. Its economy has been damaged by the recent Greek financial crisis, and it is thought that more residents are heating their homes using wood and other biomass instead of more costly oil fuel.

To determine the extent to which wood burning has increased in Thessaloniki, the researchers took air samples during the winter months in 2012 (February-March) and 2013 (January-February). The samples were analysed for their [chemical](#) composition and toxicity to living cells in laboratory tests.

The results revealed there had been a substantial increase in fine particle emissions over the two years, with the total PM_{2.5} (particles smaller than 2.5 micrometres in diameter) increasing by 30% from 2012 to 2013, from 26 to 36 micrograms per cubic metre. Levels of PM_{2.5} were twice as high in the evenings compared with the mornings in 2013, illustrating the effects of higher wood smoke emissions from residential heating in the evening.

Organic matter was the most common component of the PM_{2.5} samples. Evening samples contained a higher proportion of organic matter (74%) compared with the morning samples (58%), again suggesting more wood and biomass were used for heating in the evening.

Potassium concentrations were two to three times higher in 2013 compared with 2012 and were also two to three times higher in the evening compared to the morning. Analysis revealed the potassium most likely came from wood smoke. Furthermore, the concentrations of vanadium and nickel, which indicate combustion of residential fuel oil and industrial activity, were 30-40% lower in 2013 compared with 2012.

The concentrations of the chemicals levoglucosan, mannosan, and galactosan, commonly found in wood smoke, were four to six times higher in 2013 compared with 2012 and the concentrations of all three compounds were three to four times higher in the evening compared with the morning.

The researchers also tested the effects of the PM_{2.5} samples on living cells and found that the levoglucosan, mannosan, galactosan and potassium components were all associated with increased 'free radicals'. These have been linked to cell damage and [health](#) problems, such as inflammation of the lungs.

The authors of the study recommend urgent action by the authorities to implement air quality control strategies in the city. They suggest that one way to cut emissions would be to increase connections to natural gas supplies in residential areas.



20 February 2014
Issue 362

**Subscribe to free
weekly News Alert**

Source: Safari, A., Daher, N., Samara, C. *et al.* (2013). Increased Biomass Burning Due to the Economic Crisis in Greece and Its Adverse Impact on Wintertime Air Quality in Thessaloniki. *Environmental Science & Technology*. 47: 13313–13320.
DOI:10.1021/es403847h

Contact:
sioutas@usc.edu

Read more about:
[Air pollution](#),
[Environmental health](#),
[Urban environment](#)

The contents and views included in Science for Environment Policy are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.

To cite this article/service: "[Science for Environment Policy](#)": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.