

Science for Environment Policy

EU ship emissions directive improves air quality in harbours

To reduce air pollution levels in harbours, EU Directive 2005/33/EC requires all anchored ships to use fuels with low sulphur content. A recent study of air quality in Mediterranean harbours shows that levels of sulphur dioxide have decreased significantly since the Directive was implemented in 2010.

Ships are a major source of harmful air pollutants, such as sulphur dioxide (SO₂) and nitrogen oxides (NO_x). Studies estimate that ships contribute around 15% of global NO_x and 4-9% of global SO₂ emissions. These figures are expected to rise with the increasing growth in maritime activity.

Harbours, in particular, are influenced by ship emissions, which can affect the local population. As a result, from the 1st of January 2010, the Directive on Emissions from Maritime Transport 1999/32/EC¹ was updated by Directive 2005/33/EC to stipulate that all ships anchored in European harbours use fuels with less than 0.1% sulphur by weight. Prior to this, passenger ships in the Mediterranean basin were able to use fuels with a sulphur content of up to 1.5% by weight and cargo ships could use fuels with up to 4.5% sulphur content.

The researchers placed a monitoring station, containing a range of air pollution measuring equipment, on board an Italian cruise liner from August to October in 2009 and again in 2010. Measurements of SO₂, NO_x and Black Carbon (BC) levels from four harbours in the Western Mediterranean (Italian ports Savona and Civitavecchia, and Spanish ports Barcelona and Palma) and one non-EU harbour (Tunis) were analysed.

A decrease in the average SO₂ concentrations from 2009 to 2010 was found in all of the EU harbours. The average decrease in the daily measurements of SO₂ across the ports was 66%. Recordings from a local monitoring station at the Barcelona harbour, made at the same time as the study, also revealed a strong reduction of SO₂, by 75%. The non-EU harbour of Tunis showed an increase in the average SO₂ level.

The results for the other pollutants were less promising. NO_x and BC measurements did not show a statistically significant change in the EU harbours. With regard to the influence of reduced sulphur on particles, while less sulphur in the fuels means there are lower particle emissions from ships, there is not such a clear relationship between fuel sulphur content and emissions of BC. The study did not find evidence for strong impact of fuel sulphur content on BC emissions which, to-date, is an uncertain issue. However, another recent study² indicates a potential for high quality distillates (0.1% sulphur) to reduce BC emission factors by an average of 30%, and possibly up to 80% compared to residual fuel oil.

Even though there is strong evidence that the reduction in ambient SO₂ concentrations is the result of the new Directive, more onshore measurements and measurements from a larger number of harbours would be useful for verifying the results.



30 November 2012
Issue 308

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Source: Schembari, C., Cavalli, F., Cuccia, E., *et al* (2012). Impact of a European directive on ship emissions on air quality in Mediterranean Harbours. *Atmospheric Environment*. 61: 661-669.
Doi:10.1016/j.atmosenv.2012.06.047.

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Theme(s): Air pollution, Sustainable mobility

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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.

1. See: <http://ec.europa.eu/environment/air/transport/ships.htm>

2. See: <http://www.atmos-chem-phys.net/12/3985/2012/acp-12-3985-2012.html>