Better air quality in harbours thanks to EU policies

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Levels of sulphur dioxide in ports of the EU have been reduced by 66% as a result of European policies aimed to improve the quality of the air we breathe. Sulphur dioxide is a serious air pollutant that causes acid rain and also generates fine dust. This dust is dangerous for human health, causing respiratory and cardiovascular diseases and reducing life expectancy in the EU by up to two years. European research has shown that this reduction is a direct result of the EU Directive 1999/32/EC which required low-sulphur fuels for ships at berth or at anchor in ports and which came into effect as of January 2010. The findings were made by scientists at the European Commission's Joint Research Centre (JRC) who measured key air quality parameters in Mediterranean harbours before and after the entry into force of the low-sulphur requirements in

January 2010.

In stark contrast, while European harbours experienced an average decrease of 66%, measurements taken in a non-EU port and not part of the Directive showed that levels of sulphur dioxide remained the same.

To measure the air quality, an automated monitoring station was set up on the Concordia class cruise ship Costa Pacifica which followed a fixed weekly route in the western Mediterranean during 2009 and 2010. When analysing the data, the researchers noted that the concentrations of sulphur dioxide were found to drop off significantly in three out of the four Mediterranean EU harbours that were investigated: Civitavecchia, Savona and Palma de Mallorca; the daily mean concentrations in all of the harbours decreased on average by 66%.

JRC measurements taken in the harbour of Barcelona proved to be inconclusive as a result of large day-to-day concentration variations. However, independent measurements taken from monitoring stations in the harbour of Barcelona and in the vicinity of the harbour of Palma de Mallorca confirmed a strong decrease in sulphur dioxide concentrations from the period 2009 to 2010. Measurements of sulphur dioxide in the harbour of Tunis showed no decrease.

Measurements of other air pollutants taken in the harbours of Civitavecchia, Savona, Palma de Mallorca and Tunis showed no reduction. This showed that the decreases measured in sulphur dioxide were a direct result of EU policies. The study also confirmed a correlation between sulphur dioxide and chemical elements typically emitted from ship stacks which demonstrates that ships were the main source of sulphur dioxide in the harbours.

The aim of the EU Directive was to establish limits on the maximum sulphur content of gas oils, heavy fuel oil in land-based applications as

well as marine fuels. In so doing it incorporated the sulphur provisions of the MARPOL Annex VI. MARPOL is the International Convention for the Prevention of Pollution from Ships and is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. In particular, the Directive specified that all ships at berth or at anchor in European harbours use fuels with a sulphur content of less than 0.1% by weight, while previously, outside of Sulphur Emission Control Areas, a sulphur content of up to 4.5% was allowed.

The logistics for the automated ship-borne monitoring station for air pollutants used in this work were provided by the company that operates the cruise lines, Costa Crociere S.p.A. Meanwhile the measurements were performed in collaboration with scientists from the Universities of Genoa and Florence, the INFN-LABEC Laboratory in Florence and the Institute of Environmental Assessment and Water Research in Barcelona.

More information: Schembari, C., et al. 'Impact of a European directive on ship emissions on air quality in Mediterranean harbours', *Atmospheric Environment*, 2012. doi:10.1016/j.atmosenv.2012.06.047

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