



Air Pollution next to Cruise Ship Terminals

Results of air quality measurements in port cities

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Cruise terminals are mostly located near or in the middle of city centres with their lively streets and places frequented by thousands of citizens and tourists every day. While at berth cruise ships keep their engines running in order to supply the massive energy demand for all hotel-, leisure- and entertainment facilities on board which is comparable the energy demand of a small town. As a matter of fact ships burn fuel that is up to 3,500 times dirtier than diesel for cars but other than cars they have no exhaust gas abatement technology installed. Therefore, cruise ships contribute significantly to local air pollution levels which cause severe health problems like cardiovascular diseases or cancer and damage climate as well as nature. In Europe alone 50,000 people annually die prematurely because of air pollution from ships. At the same time cruise tourism becomes more and more popular and records enormous growth rates which lead to the order of bigger ships and larger fleets every year.

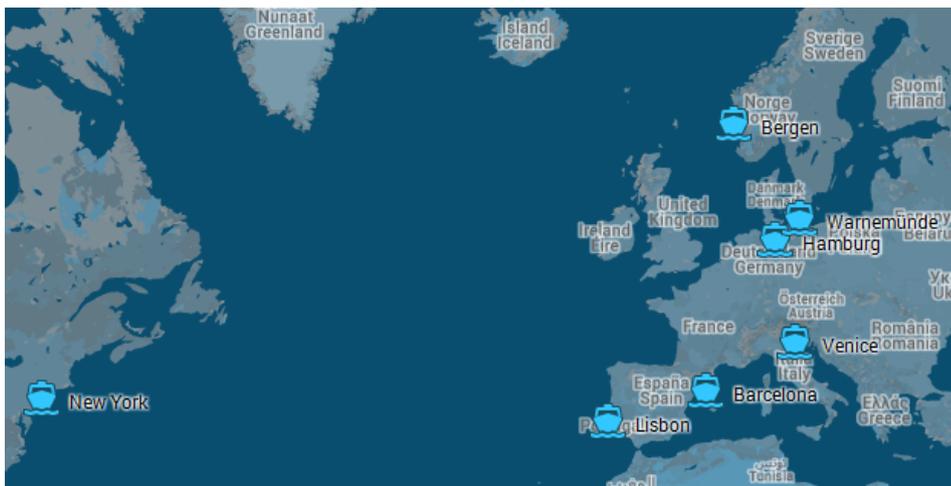


Figure 1: Sites of air quality measurements

In 2011 NABU (the German Nature and Biodiversity Conservation Union), Germany's biggest environmental NGO, launched the campaign "This stinks! Clean up Cruise ships!". Since then NABU conducted numerous test measurements at cruise terminals in European port cities. The results are alarming: The concentration of the dangerous ultra fine particles (UFP) is up to 400 times higher compared to clean areas and still 50-80 times higher than next to main roads in cities centres with dense traffic. UFPs and its component soot (or black carbon) are mostly responsible for human health problems. In 2012 the World Health Organisation (WHO) declared diesel soot to be as car-



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cinogenic as Asbestos while the German Lung Foundation dissuades people with weak health constitution or respiratory problems to sit on a cruise deck at all.

Unfortunately, there is no legally binding threshold for black carbon or particle number (PN) emissions, from ship engines. Same is true for the requirements due to the European ambient air quality directive: It only prescribes limit values for PM10 and PM2.5 which refers to particle mass but is useless in order to limit particle number concentrations which are a much better indicator for human health threats. Therefore, NABU conducted air pollution measurements with special attention to ultra fine particles in various ports. The device used is a TSI P-Trak 8525 that is able to detect fine and ultrafine particles with a diameter size between 20 and 1000 nanometer (which is 1 micrometer). Particle number (PN) is measured as part per cubic centimetre (pt/cc).



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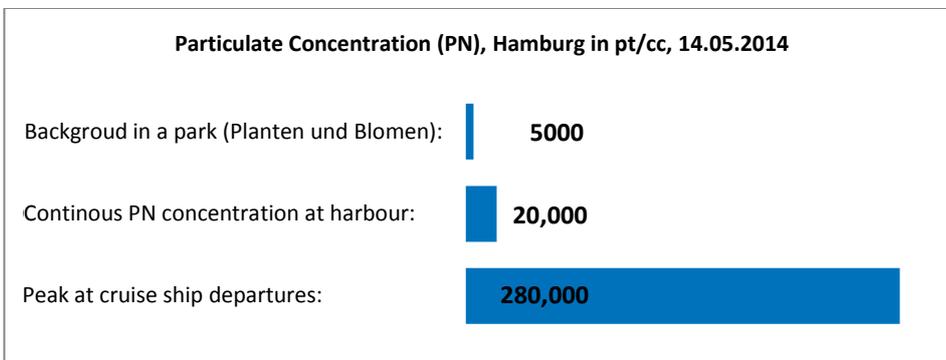


Figure 2: Exemplary air pollution levels in mayor German port city Hamburg

Particulate number in remote areas with good air quality is way below 2000pt/cc. The background level in big cities varies from 3000 to 5000pt/cc. Next to highly frequented streets the levels sometimes raise up to 10,000 pt/cc. NABU measurements in cruise harbours have shown peak concentrations of more than 400,000 pt/cc. The only way to limit air pollution effectively is a change either to alternative fuel like Liquid Natural Gas (LNG) or to cleaner diesel in combination with effective exhaust gas abatement technology consisting of a diesel particulate filter and a SCR catalyst.

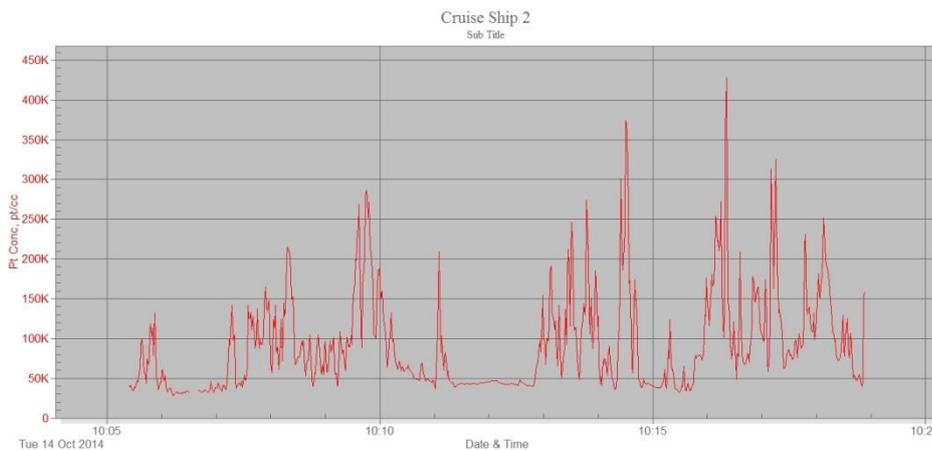


Figure 3: Air pollution level of a departing cruise chip in Barcelona

More information is available at www.NABU.de/ships