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TITLE: The impact of scrubber discharge on the water quality in estuaries and ports

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ABSTRACT:

Abstract Background The International Maritime Organization (IMO) has set limits on sulphur content in fuels for marine transport. However, vessels continue to use these residual high-sulphur fuels in combination with exhaust gas cleaning systems (EGCS or scrubbers). Next to high sulphur, combustion of these fuels also results in higher emissions of contaminants including metals and PAHs. In scrubbers, exhaust gases are sprayed with water in order to remove SO_x, resulting in acidic washwater with elevated contaminant concentrations discharged in the aquatic ecosystem. The number of vessels with scrubbers is increasing rapidly, but knowledge on washwater quality and impact are limited. **Results** The scrubber washwater is found to be acidic with elevated concentrations of, e.g. zinc, vanadium, copper, nickel, phenanthrene, naphthalene, fluorene and fluoranthene. Model calculations on the effects of scrubber discharge under scenario HIGH (20% of vessels, 90th percentile concentrations) on the water quality in harbour docks showed a decrease in pH of 0.015 units and an increase in surface water concentrations for e.g. naphthalene (189% increase) and vanadium (46% increase). **Conclusions** The IMO established sulphur regulations to mitigate the impact of high sulphur emissions of the maritime sector. However, the use of open-loop scrubbers as an abatement technology will not reduce their contribution to ocean acidification. In addition, different types of scrubbers discharge washwater that is acutely toxic for aquatic organisms. However, washwater is diluted and the compounds for which a large increase in surface water concentrations was calculated in the Antwerp (Belgium) harbour docks (naphthalene & phenanthrene & fluorene & acenaphthene & vanadium) were not the compounds that already exceed their respective Water Quality Standards (WQS). Nevertheless, the WQS of several ?priority hazardous substances? (Water Framework Directive) are already exceeded in the docks and the Scheldt estuary. Since these hazardous substances are also identified in the washwater, scrubber washwater discharge should be discouraged in coastal waters and estuaries with large ecological value.

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