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Impact of inland shipping emissions on elemental carbon concentrations near waterways in the Netherlands

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ABSTRACT

This study aims to quantify the impact of black carbon from inland shipping on air quality, expressed as elemental carbon (EC) near inland waterways in the Netherlands. Downwind measurements of particle numbers and EC were used to establish emission factors for EC from inland shipping using inverse modelling. These emission factors were combined with data on energy consumption to derive annual average emissions rates for all Dutch waterways. A line source model was applied to compute the contribution of inland shipping to annual average EC concentrations for around 140 000 people living within 200 m of busy waterways in the Netherlands. The results showed that they are exposed to additional EC concentrations of up to 0.5 $\mu\text{g EC per m}^3$ depending on the shipping volume and distance from the waterway. In view of the envisaged growth in water transport, this underlines the need to reduce combustion emissions from inland shipping. Targeting “gross” polluters may be the most effective approach since 30% of ships cause more than 80% of the total emissions.

Keywords: black carbon, elemental carbon, inland shipping, emission factors

1. INTRODUCTION

The transport of goods over Europe’s 37,000 kilometres of waterways amounted to 7% of the total inland goods transport in Europe in 2010 (EC, 2012). What is more, this share is increasing because CO₂ emissions per ton-kilometres over water are lower than those for land transport by a factor of six (EC, 2012). Research into emissions from shipping and the likely wider impact on air quality and climate change has been mainly directed at sea-

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