Supplementary Materials

The impact of ship emissions on air quality and human health in the Gothenburg area – Part II: Scenarios for 2040

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Supplement 1 – emission factors for 2040

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Table S1: Emission factors to derive 2040 emissions (CLE2040) from 2012 emissions from the Greenhouse Gas - Air Pollution Interactions and Synergies (GAINS) model using the emission scenario ECLIPSE_V5a_CLE_base.

Emission sectors	SO ₂	NO _x	PM ₁₀	NMVOC
Energy Industries	0.662978	0.854049997	\	0.889792231
Fuel combustion within industry for energy use	1.196401	0.846780766	1.657303371	1.448372093
Diffuse emissions from fuel management	0.843987	0.808	11.10621762	0.736323394
Refineries	0.558219	0.917042889	11.51612903	0.958333333
Boilers	\	\	0.075342466	3.432692308
Residential heating	0.575404	0.731368781	0.216500766	0.410687481
Mineral industry	\	\	1.857886905	\
Chemical industry	1.183701	1.18066561	3.930084746	0.988788041
Metal industry	1.179078	\	0.133764833	\
Pulp and paper industry	1.138498	1.138363893	2.289488477	\
Other industry	\	\	0.520822622	1.007579302
Non-road mobile machinery	0.454545	0.118023075	3.801980198	0.435876623
Solvents (use of chemical products in households and operations)	\	\	0.075296108	0.984338488
Agriculture	1	1	24.1754386	1

Supplement 2 – Seasonal BAU2040 results

Figure S1: The total modeled present day winter (December, January, February) concentration for NO₂, O₃, PM_{2.5} and SO₂ (column 1) as well as the concentration in BAU2040 (column 2) and the difference between the present day and BAU2040 in absolute (column 3) and relative (column 4) values. © OpenStreetMap contributors 2019. Distributed under a Creative Commons BY-SA License.

Figure S2: The total modeled present day summer (June, July, August) concentration for NO₂, O₃, PM_{2.5} and SO₂ (column 1) as well as the concentration in BAU2040 (column 2) and the difference between the present day and BAU2040 in absolute (column 3) and relative (column 4) values. © OpenStreetMap contributors 2019. Distributed under a Creative Commons BY-SA License.

Supplement 3 – EEDI2040 results

Figure S3: The total modeled present day concentration for NO₂, O₃, PM_{2.5} and SO₂ (column 1), as well as the concentration in EEDI2040 (column 2) and the difference between the present day and EEDI2040 in absolute (column 3) and relative (column 4) values. © OpenStreetMap contributors 2019. Distributed under a Creative Commons BY-SA License.

Figure S4: The total modeled present day summer (June, July, August) concentration for NO₂, O₃, PM_{2.5} and SO₂ (column 1) as well as the concentration in EEDI2040 (column 2) and the difference between the present day and EEDI2040 in absolute (column 3) and relative (column 4) values. © OpenStreetMap contributors 2019. Distributed under a Creative Commons BY-SA License.

Figure S5: The total modeled present day winter (December, January, February) concentration for NO₂, O₃, PM_{2.5} and SO₂ (column 1) as well as the concentration in EEDI2040 (column 2) and the difference between the present day and EEDI2040 in absolute (column 3) and relative (column 4) values. © OpenStreetMap contributors 2019. Distributed under a Creative Commons BY-SA License.

Figure S6: Absolute contributions of local ship emissions to annual mean concentration levels in Gothenburg in 2012 (column 1) and EEDI2040 (column 2), as well as the relative contributions (columns 3 and 4). © OpenStreetMap contributors 2019. Distributed under a Creative Commons BY-SA License.

Figure S7: Relative changes in annual mean NO₂, PM_{2.5} and O₃ concentrations for EEDI2040LP compare to EEDI2040 scenario. © OpenStreetMap contributors 2019. Distributed under a Creative Commons BY-SA License.