

Analysing Ship Nox Emissions with Hadoop A Case Study for the Port of Rotterdam

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Abstract— Atmospheric emissions such as NO_x from ship engines have a drastic impact on the environment. Controlling them is crucial for maintaining a sustainable growth for any logistics company. The Port of Rotterdam (The Netherlands) is using big data analytics to gain actionable insights into these emissions. Our case study deals with the implementation of the emission calculations and reporting implemented in Hadoop. In the analytical setup we introduce the method for estimating emissions based on recorded ship position data and information about its engines. We present a flexible approach that stores intermediate results allowing different levels of aggregation. These levels of aggregations are per geographical area, per grid or for a whole journey attributed to each visited berth. The results are visualized in a Geographical Information System (GIS). The estimated atmospheric emissions also serves as input for the deposition model. We present some selected results of emissions per grid as well as for pre-defined areas. These results are used by the port to make strategic decision. For future work we recommend to also implement the deposition model in Hadoop as this model is also calculative intensive and therefore it currently only accepts aggregated emissions as input, whereby its accuracy is most likely reduced.

Keywords—atmospheric emissions, emission model, GIS, Hadoop, Mapreduce

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