EMISSIONS FROM CONTAINER VESSELS IN THE PORT OF SINGAPORE

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Overview

Given the adverse effects that ship exhausts impose on humans and the environment, estimating ship emissions has attracted much research interest, which can largely accredited to the three Greenhouse Gas studies of International Maritime Organisation (IMO 2000, 2009, 2015). Ports are in the proximity of inhabited areas, so the emissions in ports may have more adverse effects than those at sea (Cullinane and Cullinane, 2013; Lam and Notteboom, 2014). The port of Singapore plays a key role in international shipping as a vital pass in many seaborne trading routes, and a main transshipment hub for cargoes that go to neighboring regions. Every year, over 120,000 ship calls pass through this strategic port.

Our research concentrates on container vessels, one of the most important shipping sectors in the port of Singapore. The objective is to quantify the amount of CO_2 emissions emitted by container vessels as well as effects of their operational patterns on the emissions.

Methods

A bottom-up performance-based model is developed to quantify CO_2 emissions from the operation of 2,241 vessels in the port of Singapore in 2016. The model estimates fuel consumption of each ship in operational stages in the port, then convert the consumed fuel into CO_2 emissions. The model is supported by two major data sources: nearly two million records of Automatic Identification System (AIS) data and ship specification data. The former data provides operational speed and detailed positions of ships whereas the latter one provides key information regarding ship capacity, main engine power and designed speed.

Results

The key results will be the total emissions from ship operation. In addition, our research reveals temporal variation of emissions, effects on emissions of factors such as ship size, main route/ feeder routes and operators.

Conclusions

The activities of container vessels contribute substantially to the economy of Singapore. At the same time, they emit a large amount of greenhouse gases into the air. Our research has implications for policy-making by port authorities and maritime regulation institutions in terms of green port regulation and compliance, as well as emission account reporting scheme.

References

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