Environmental assessment by using vessel movement data

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(1) Motivation：Transportation is the single biggest Green House Gas (GHG) emission sector and most of them came from generating energy by burning fossil fuel to drive truck, train, plane, and vessel (Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2016). Transportation mode like truck, train, and plane are relatively well monitored, however, shipping is the least controlled area. IMO (International Maritime Organization) just started to collect the vessel GHG emission data and long-term plan will be established on 2023 after analyzing all the data IMO collect. European Union (EU) is more actively working on controlling emission from shipping. EU released that shipping would be included in EU Emission Trading system if there is no comparable system operating to control GHG emission until 2021. Purpose of this study is that have clear understanding and insight about LNG carrier emitted GHG by visualizing the results of calculation and AIS (Automatic Identification system) data acquired.

(2) Data：The data used in this study is collected by company named exactEarth. As exactEarth collect AIS data which includes vessel identification, position, speed over the ground and course. As data collected by satellite, it is possible to get AIS data through the ocean regardless of the position of vessel. Time range of the AIS data used is from Jan 2016 to June 2017, unique number of vessel ID is 327, and total number of data is 9,439,354.

(3) Method: Several studies have made to make estimation of vessel resistance in specific speed. We adopted method suggested by Harvald (1983), and amended and released by Lützen & Kristensen (2012). It allows us to calculate power requirement when the vessel sailed in specific speed with few vessel specification. To calculate data by this method, we adopted Python and used Arcmap to visualize it.

(4) Future plan: In this study we have analyzed the data without divide it into month or season. We will implement analyzation to make sure that it has monthly or seasonal trend.

(5) References:

Harvald, S. A. (1983) *Resistance and Propulsion of Ships*. New York: John Wiley & Sons.
Lützen, M., & Kristensen, H. O. H. (2012) A Model for Prediction of Propulsion Power and Emissions – Tankers and Bulk Carriers. Paper presented at World Maritime Technology Conference, Saint-Petersburg, Russian Federation.
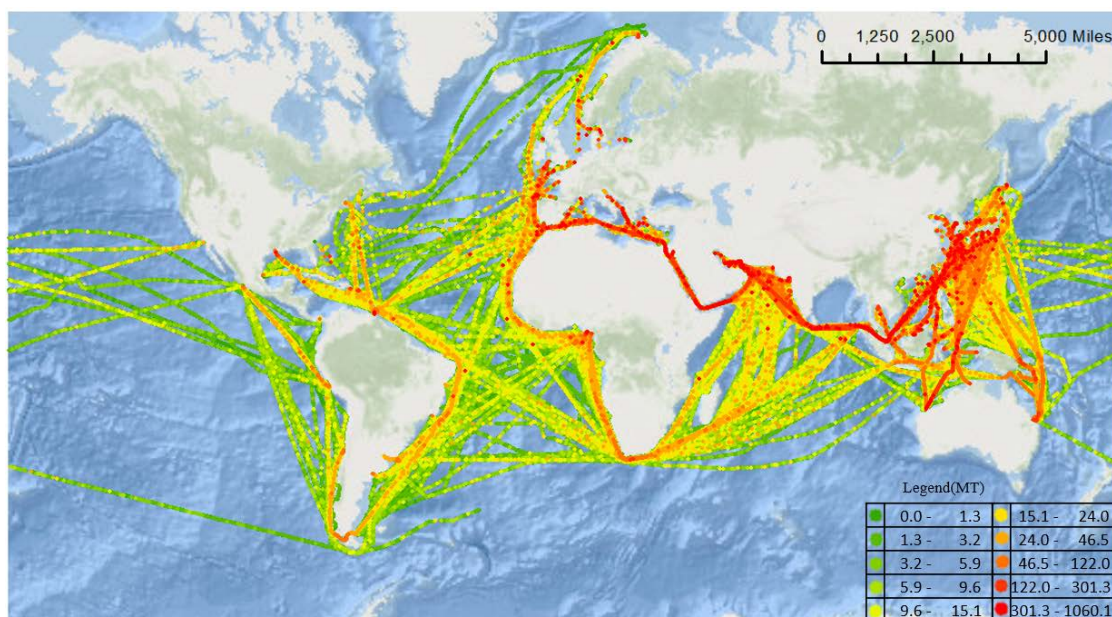
Figure 1: Distribution of bunker consumption by LNG carrier(Jan – Jun, 2016)