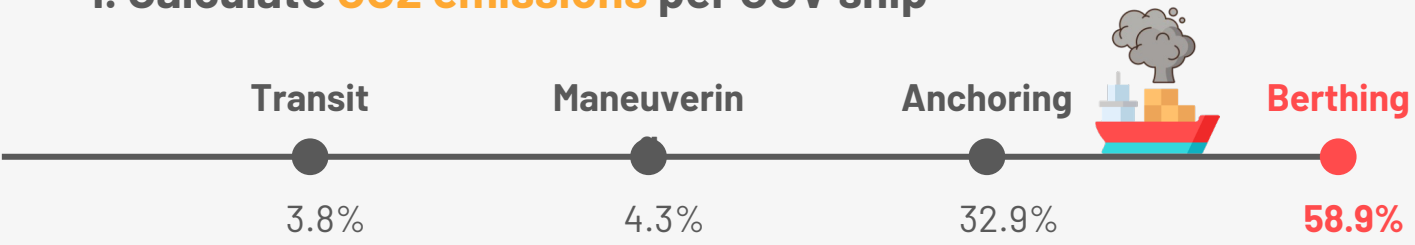
Observation 1 | Activity hours strongly correlate to emissions

Using the provided datasets and methodologies,

1. Calculate CO2 emissions per OGV ship



Makes up the majority of a ship's time in a given port, for cargo operations and other docking purposes

2. Find CO2 emissions for **each operating type**, to ascertain the most significant operation.
3. Find activity hours for **each operating type**, to find correlation between hours & emissions

How can we make use of this data to reduce emission?

Observation 2 | Singapore relies on natural gas for electricity

Shore power is the provision of shoreside electrical power to a ship at berth while its main and auxiliary engines are shut down

Leverages existing grid infrastructure to reduce installation costs

Shore Power

0.42 kg of CO2/kWh* x **40650402.27 kWh**** = **16943.09 tonnes per month**

* CO2 emission rate from electricity generation
** Monthly electrical energy

How does this compare to pollution from the engine?

supplementary_table

Vessel Data

Data on vessel coordinates, attributes and other values

emissions_table

Emission Factors

Emission values for various pollutants, including CO_2

pandas library

Emissions Pipeline

matplotlib

C02 Emissions

C02 is mainly emitted during Alongside/Hotel

Potentially due to Alongside/ Hotel having the most events

Electrical Load

Electrical load is relatively constant across hours

Night has more hours than day, owing to the classification

Analysis of C02 & Electrical Load

Monthly Berth C02 = **~94431 tonnes**

Monthly Electrical Energy (kWh) = **~40650402.27**

research papers

government sources

External Data

Information on electricity production in Singapore

Singapore's ports are one of seven main focus areas of the Maritime SG Decarbonisation Blueprint

Singapore uses mostly natural gas as its fuel for electricity generation **94.3% as of H1 2023**

Electricity generation in Singapore produces C02 emissions at a rate of **~0.42 kg of C02/kWh.**

The total **C02 emissions** from grid generation is predicted to be:

C02 rate * EL / 1000

=

16943.09 tonnes per month

Assuming that all ships use electricity when berthed, the emissions saved is

94431 - 16943.09 = **77487.91**

This is a significant **82.1%** reduction, possibly due to the fuel discrepancy

Recommendation

Electrification is a viable solution

This is a generous estimate compared to the **65% drop** predicted by another study

As green technology gets better with time, the drop in emissions will get closer and closer to our prediction