

Maritime Hackathon 2026

Smart Fleet Selection — Safety, Sustainability & Cost

Background

The maritime industry faces the challenge of delivering cargo efficiently while controlling costs, reducing environmental impact, and maintaining high safety standards. Ship operators must now make multi-objective decisions, balancing financial performance against safety and sustainability targets.

In this challenge, you will develop a solution to select the optimal fleet of ships to transport bunker fuel as cargo between the ports of Singapore (A) to Australia West coast ports (B) **in a month**. You will explore the trade-off between cost and safety and perform sensitivity analysis should the risk factor in the industry change.

Your Task Objective = Optimum Fleet selection

The amount of cargo to be moved in a month by your team's selected fleet will be as per MPA's Annual report (*Page 10: 2024 Performance Summary*) on Bunker Sales Volume of all fuel types combined (in Million tonnes) **for the year 2024** after distributing equally over a 12-month period.

Example: If 49.83 million tonnes were moved in 2020 (12 months), 4.15 million tonnes would have to be moved in a month.

Select a fleet of ships that account for the **least owning and operational cost** and capable of moving the **monthly** bunker weight (cargo) between ports A to B within defined selection constraints.

1. Meets cargo demand: Combined fleet DWT capacity $\geq D$ tonnes of bunker fuel for transport in **one** month.
2. Least operational cost and safety trade-off premiums.
3. Average fleet Safety score ≥ 3
4. **At least one vessel of each** Main engine fuel type.
5. Each ship can be selected **only once** in your fleet, repeat trips are not allowed.

Data Provided

Below data and more will be provided as necessary to achieve the hackathon outcome.

Ship dataset provided:

- Vessel ID, name, vessel type
- AIS vessel movement data –
 - date/time stamp, latitude/ longitude positions
 - Positional information - at anchor, in port
- Cargo carrying capacity (DWT in tonnes)
- Design speed (Vref)
- Machinery powers/ load
 - Main Engine (P)
 - Auxiliary engine (ael)
 - Auxiliary Boiler (abl)
- Fuel type —
 - Fuel type the ship is designed to burn in its above three machineries
 - main_engine_fuel_type
 - aux_engine_fuel_type
 - aux_boiler_fuel_type
 - Specific fuel oil consumption (sfc) for each of the above three machineries
 - sfc_me
 - sfc_ae
 - sfc_ab
- Ship Safety Score — integer 1–5 (1= Highest Risk; 5 = Least Risk)

Global parameters provided:

- Emission factors (Cf) per tonne of fuel burnt for three primary Greenhouse gases:
 - Tonne CO₂ (for Carbon Dioxide)
 - Tonne CH₄ (for Methane)
 - Tonne N₂O (for Nitrous Oxide)
- Energy content of each fuel i.e. Lower Calorific Value (LCV – MJ/kg)
- Fuel price by fuel type, stated in USD per GigaJoule energy content (GJ)
(The cost of fuel for each ship will be calculated using the USD per GJ price for its designated fuel type for each machinery).
- Carbon price as of 2024 on the European Exchange - 80 USD per tonne of CO₂ equivalent
- Cost of purchasing a ship (CAPEX) with average life (N) of 30 years
 - Base conventional Distillate fuel type range as per ship DWT size
 - Multiplier factor for actual ship cost as per main_engine_fuel_type
 - Asset depreciation rate (r)
 - Capital Recovery factor (CRF)
- Safety score and corresponding adjustment rate (%)
 - Penalty = + (Riskier hence increased cost of risk)
 - Reward = - (Safer hence reduced cost of risk)

Cost Model

Below cost breakdowns are to be considered within this hackathon scope for each ship:

1. Fuel cost for running the ship
2. Carbon cost for emissions from fuel consumption
3. Amortized ownership cost per month
4. Risk Premium

Constraints

1. Meets cargo demand: Combined fleet DWT capacity \geq D tonnes of bunker fuel to be transported in **one** month.
2. Each ship can be **used only once** for an A to B voyage without return or round trips.
3. Average fleet Safety score \geq 3.0
4. **At least one vessel of each** Main engine fuel type.

Stretch Objective

Sensitivity Analysis:

Perform and regenerate the above fleet selection and results by adjusting Average Safety constraint.

Example if the industry's demand changes to more safer vessels preference i.e. risk premiums go up then the fleet's average safety score constraint (point 3 of constraints section) becomes 4 to get a safer fleet and a resulting cost adjustment.

Discuss this in your report document to be submitted.

Required Outputs

1. Total DWT of selected fleet
2. Total cost of selected fleet (USD)
3. Average fleet safety score
4. Number of unique main_engine_fuel_type vessels in selected fleet
5. Sensitivity analysis performed – Yes/No (Provide detail in report document separately)
6. Size of fleet (Number of ships)
7. Total emission of CO2 equivalent (tonnes)
8. Total fuel consumption (tonnes)

Questions & Clarifications

If you have any questions, please submit them via the link (<https://forms.gle/qXTGDBfNYAPcay6G9>) between 9:00 am to 12:00pm on Friday, 06 February 2026.

All submitted questions, together with the corresponding responses, will be consolidated and uploaded to the Google Drive at the following times on Friday, 06 February 2026.

(https://drive.google.com/drive/folders/1Ahkd3jqu_9XvEo2vZ2KinYX_RU5YufiA?usp=drive_link)

Updated Time	Questions Received Before
10:00 AM	9:30 AM
10:30 AM	10:00 AM
11:00 AM	10:30 AM

Updated Time	Questions Received Before
11:30 AM	11:00 AM
12:00 PM	11:30 AM
12:30 PM	12:00 PM

Questions submitted after 12:00 pm will not be included in the compiled responses.

Please refer to the Google Drive for the latest updates before finalizing your submission.

Submission - closes 7th Feb 2026 09:00hrs (SGT)

Submission link

Category A: <https://forms.gle/DFKte48fk9qivv7F7>

Category B: <https://forms.gle/d5qGFfJJipuz5sSf6>

Follow the following file format in the excel and word documents. Any deviations can lead to your report getting rejected.

1. Case Paper Word/PDF report (up to 3 pages excluding the cover page)
 - a. Name it as "MaritimeHackathon2026_CasePaper_teamname". **DO NOT DEVIATE from this naming format.**
 - b. Provide analysis of the sensitivity outcome stretch objective in your report.
2. Final numeric results - Enter your team's name and word/pdf case paper report name correctly in the provided cells of the csv file. Submit your results in provided csv format template ONLY in column named "Submission").
 - a. **DO NOT ALTER** the other columns' contents or order of columns.
 - b. The csv file template **must** be renamed to: teamname_submission.csv
3. A power point presentation bearing your team name to be presented on stage to the judging panel when called. The presentation needs to cover your understanding of the problem statement, ideation, workflow for solving it, outcomes, sensitivity analysis comparison, conclusion etc.
 - a. Each team is advised to prepare **4-6 slides** for the presentation.
 - b. The presentation must not exceed **10 minutes** in duration.
 - c. The presentation file **must** be renamed using the following format: teamname_presentation.ppt