

+ ANALISIS POLA PERGERAKAN DAN   
JUMLAH KAPAL DI SELAT SUNDA  
BERBASIS SISTEM AIS PERIODE JULI 2024

Disusun Oleh :  
KELOMPOK 1



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# Daftar Isi

**01**  
Latar Belakang

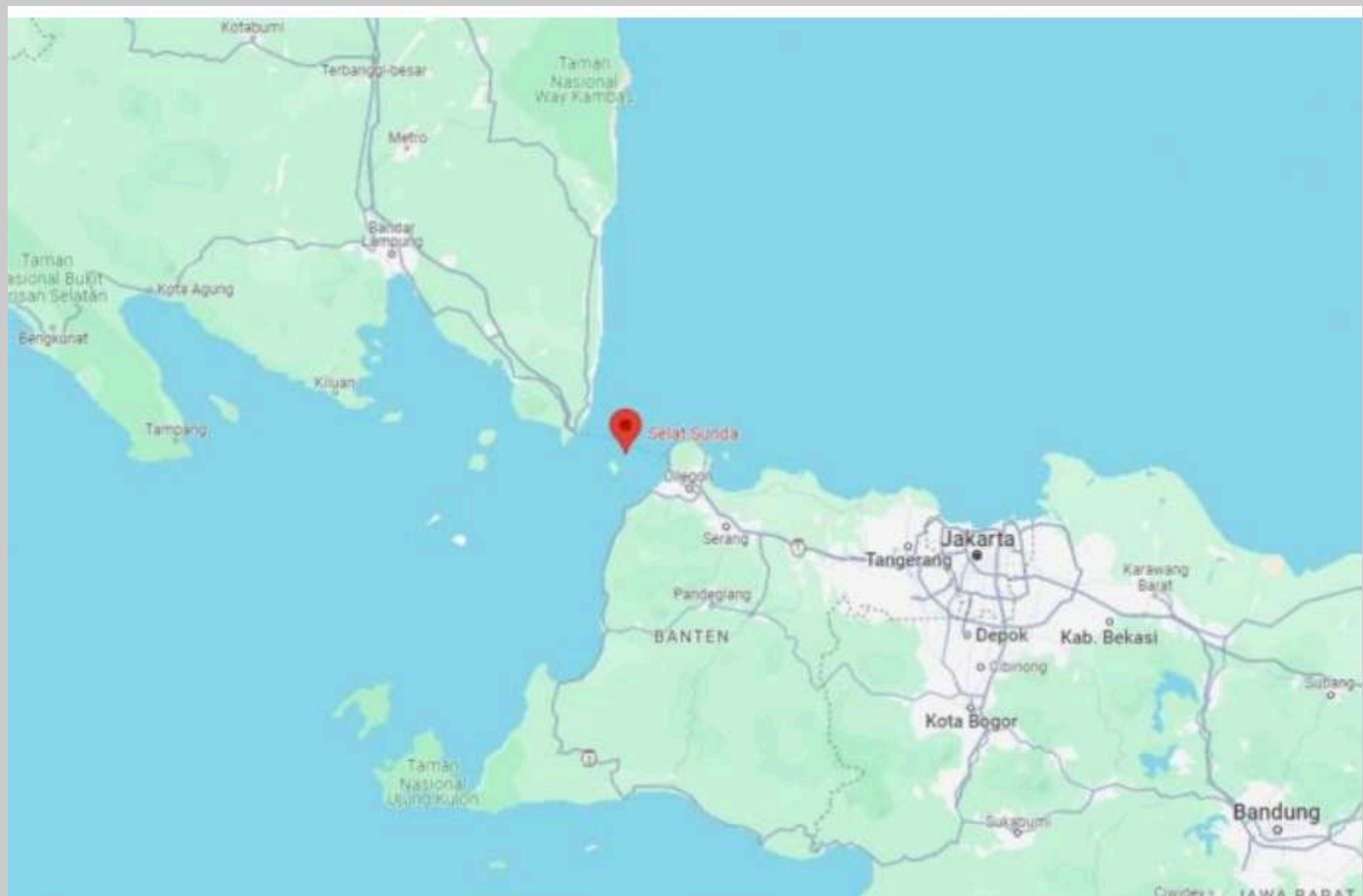
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# *Latar* **Belakang**



The Sunda Strait is a strategic and busy shipping lane because it connects the Indian Ocean and the Java Sea and is part of ALKI I. The high volume of passenger, cargo, and tanker activity increases the potential for accidents, especially given the narrow and strong currents of the waterway. Although the TSS has been in place since 2020, vessel compliance and the monitoring capacity of the Merak VTS are still limited, requiring accurate data to evaluate current navigation conditions.

The urgency of this research stems from the increase in shipping activity, which requires the latest analysis to assess the effectiveness of the TSS and evolving navigation risks. The novelty of this research lies in the use of AIS data from July 2024, which is analyzed spatially and temporally to describe actual ship movement patterns and shipping density in the Sunda Strait a study that is still rarely conducted specifically in this region. This research provides an important up-to-date overview to support the improvement of safety and maritime traffic management.

# Tujuan *Penelitian*



The purpose of this study is to analyze the movement patterns and number of ships passing through the Sunda Strait using Automatic Identification System (AIS) data from July 2024. Through spatial and temporal analysis, this study seeks to identify ship movement routes, calculate the number of ships based on type, and determine areas with the highest shipping density. In addition, this study aims to provide an actual picture of the dynamics of maritime traffic in the Sunda Strait as a basis for evaluating the effectiveness of the Traffic Separation Scheme (TSS) and supporting the improvement of safety and shipping management in the region.



# Metode *Penelitian*

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This study uses a descriptive-quantitative method with a spatial-temporal approach. According to Arif Rachman et al. (2024), the descriptive-quantitative method is used to describe phenomena that occur systematically using numerical data that can be processed statistically. The spatial-temporal approach is applied to analyze the patterns of ship movements based on the dimensions of space and time.

## Data Collection Method

Data was collected indirectly through access to the BeWAIS database, thus falling into the category of secondary data. The data collection process was carried out by downloading ship position data for the last month for the Sunda Strait region. The data was then selected to ensure that it only included ships operating in the research area.

# Metode *Penelitian*



## Data Analysis Method

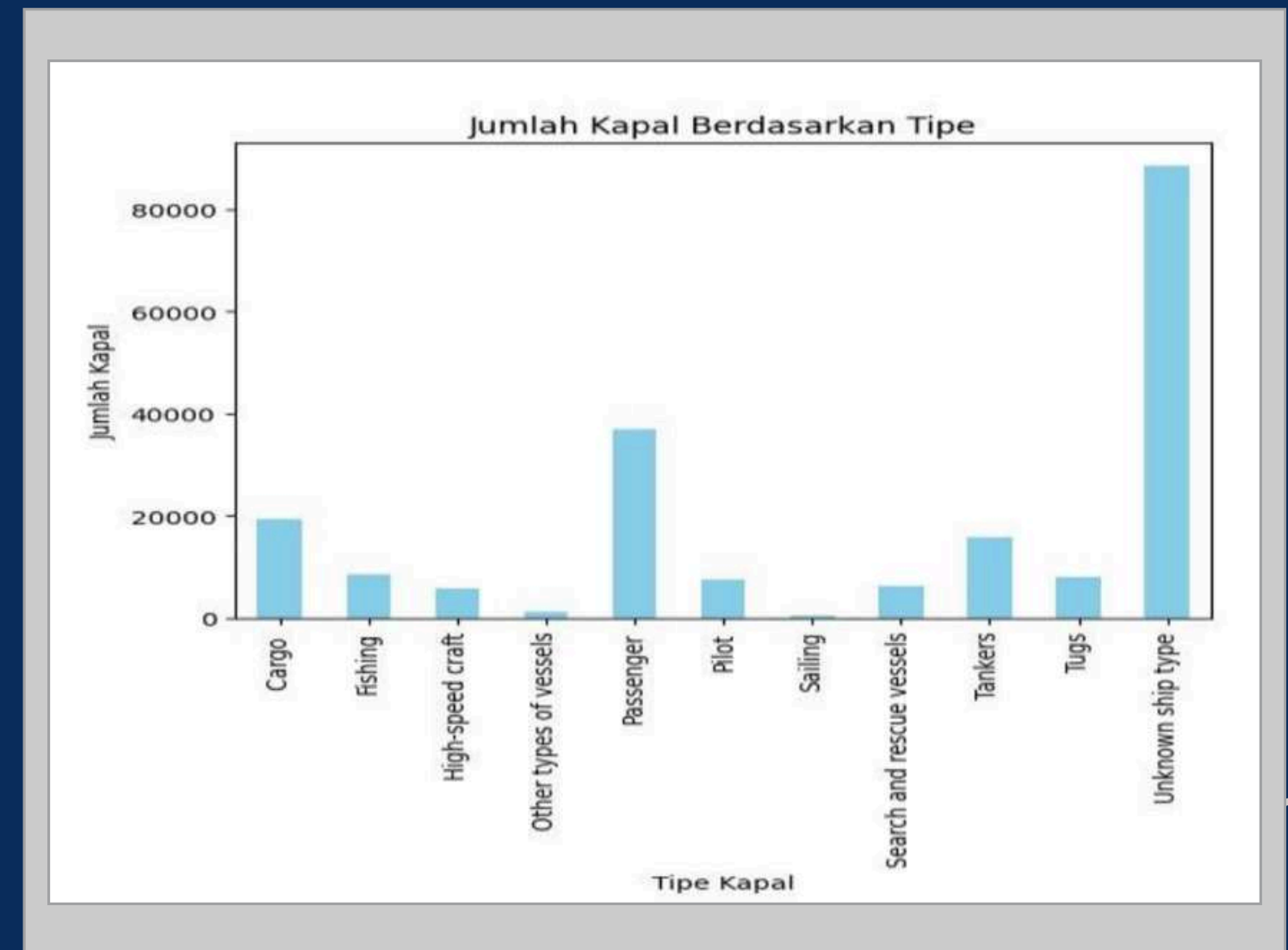
Data analysis was conducted in several stages. First, data cleaning to remove duplicates and invalid values. Second, classification of ship types based on categories such as cargo ships, tankers, passenger ships, and fishing vessels. Third, descriptive statistical analysis to calculate the number of ships per category and average speed. Next, spatial-temporal analysis is performed using QGIS software to map the distribution of ship positions and identify areas with high shipping density (traffic hotspots). The results of the analysis are presented in the form of graphs, diagrams, and distribution maps to comprehensively illustrate shipping activity patterns.



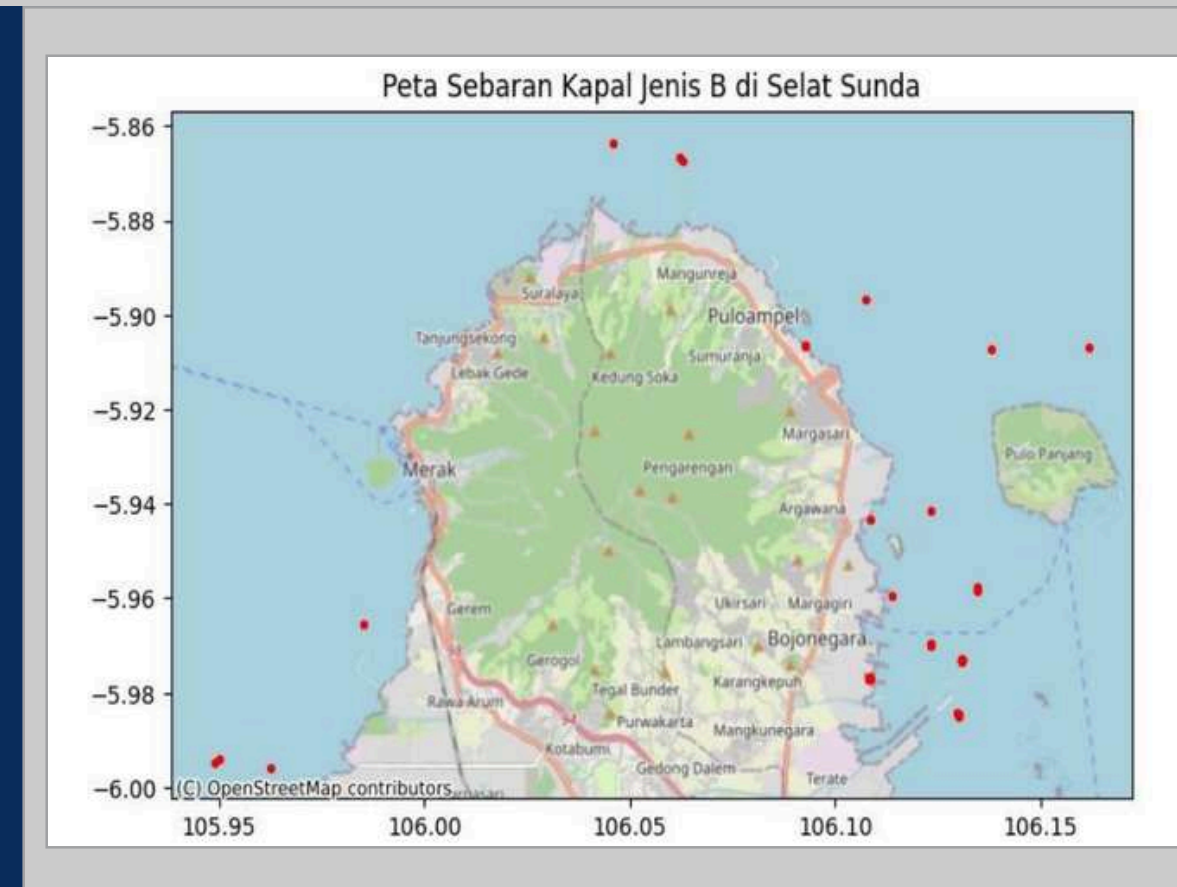
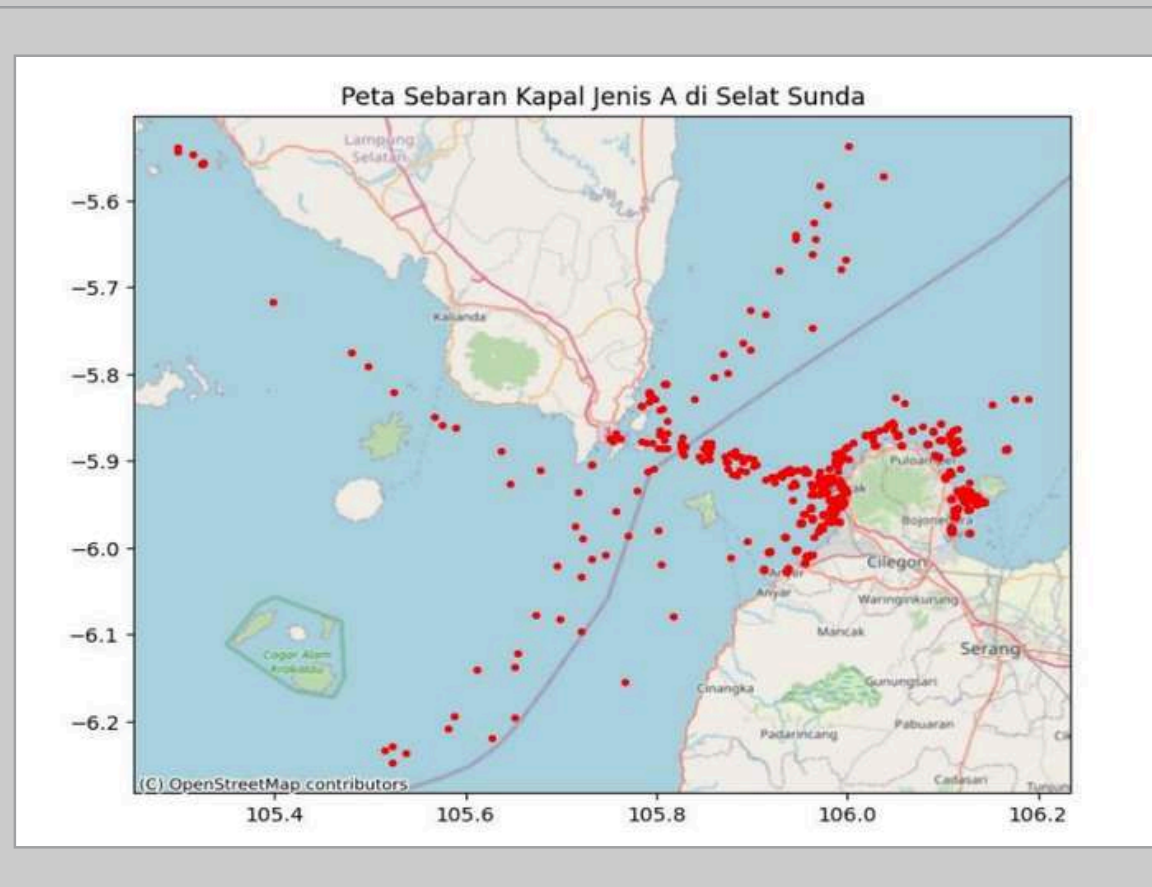
Data processing results show that during the observation period there were 198,912 ships passing through the study area. Based on category, vessels of the unknown type dominated with 88,412 units, followed by passenger ships with 36,927 units, cargo ships with 19,390 units, and tankers with 15,971 units. The remainder consisted of tugboats, fishing vessels, and other service vessels.

The high number of AIS signals received reflects the intensity of maritime traffic and the complexity of navigation management, especially in waters adjacent to major ports. Meanwhile, the high number of unknown ship types may indicate limitations in the installation of AIS on small vessels that are not required to activate the system (Rahmawati et al., 2025). This shows that there are still gaps in the maritime safety monitoring system that need to be improved.

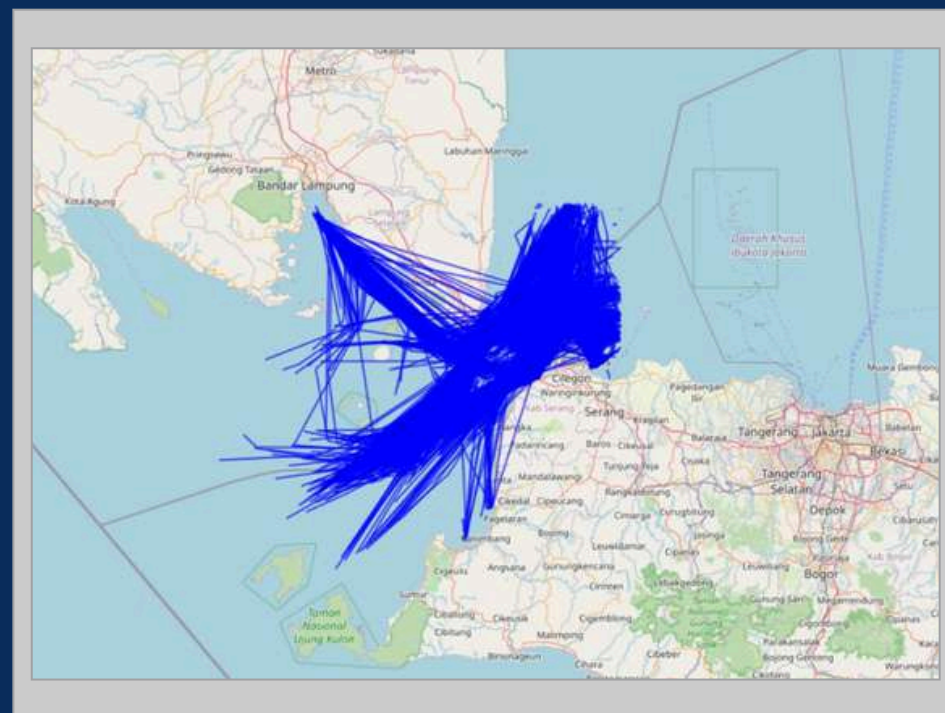
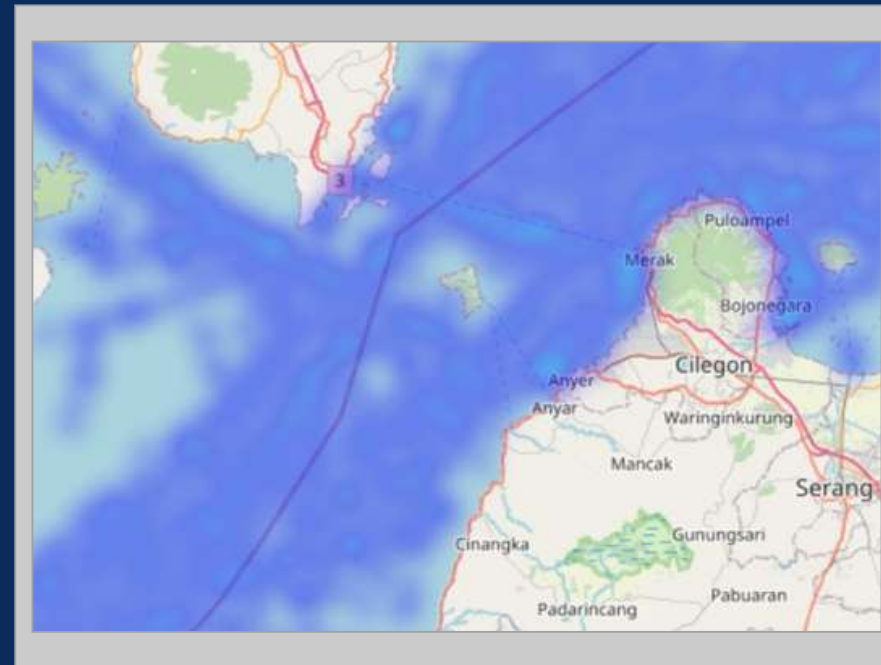
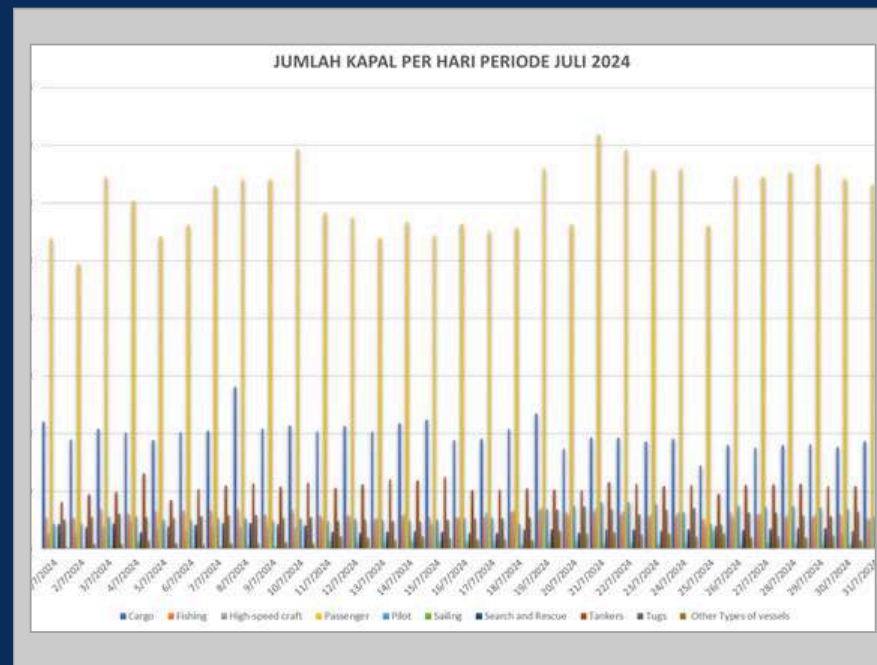
# Hasil Penelitian



Spatially, the results of ship track mapping show that ship movements are concentrated in the central lane of the Sunda Strait, especially in the corridor between the Port of Merak (Banten) and the Port of Bakauheni (Lampung). This route is part of the Traffic Separation Scheme (TSS) established by the International Maritime Organization (IMO) and has been implemented by Indonesia since 2020 to improve shipping safety (Anton Daud et al., 2025).



# Hasil Penelitian



Spatial analysis using AIS data-based heatmaps clearly visualizes the very high concentration of vessel movements in the main Merak-Bakauheni corridor, marked by the most dominant light blue color gradation. This concentration underscores the strategic role of the Sunda Strait as a maritime chokepoint and national logistics artery, which also carries implications for high navigation risks due to traffic density. Temporarily, daily data for the period 1–31 July 2024 shows stable shipping activity with a total daily vessel count in the range of 5,300 to 6,000 vessels. Passenger vessels emerge as the most dominant category, consistent with repeated and high-frequency ferry operations. The visualized vessel trajectory pattern shows overlapping recurrent trajectories focused in the center of the strait, indicating a regular and stable shipping route. Although this pattern indicates a fairly high level of compliance with the official route (TSS), the discovery of a small number of vessels passing outside the recommended route emphasizes the need for continuous evaluation of TSS implementation and strengthening of the Merak VTS system to ensure shipping safety and efficiency in this strategic area. Overall, the use of AIS data provides a comprehensive understanding of the distribution, types, and dynamics of maritime traffic in the Sunda Strait.

# *Kesimpulan*

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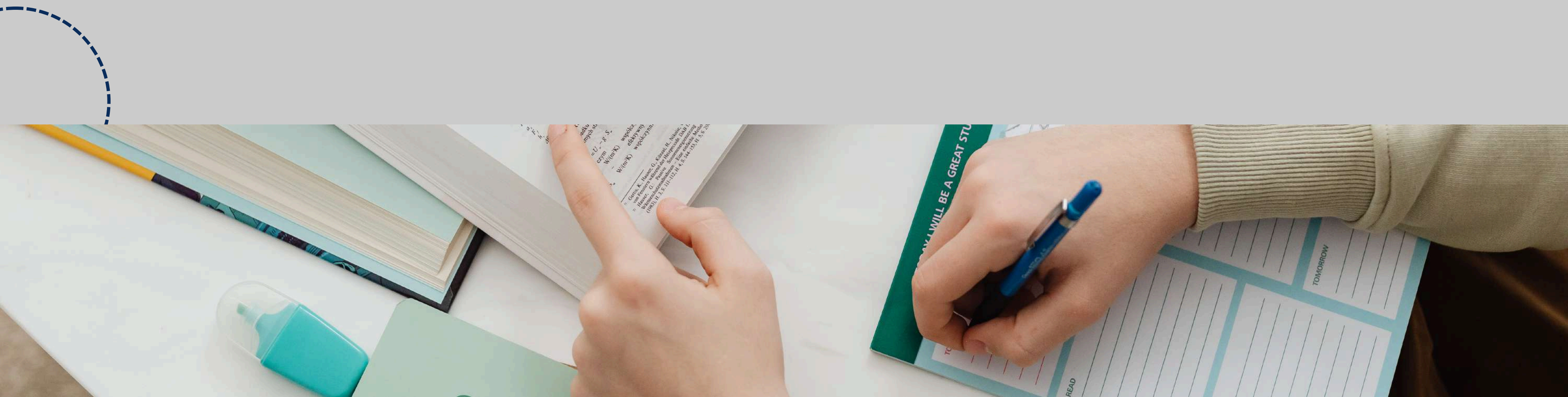
This study shows that the unknown vessel category dominates the July 2024 AIS data, but this category was excluded from the daily analysis because the signal data was incomplete. After data cleaning, passenger ships became the most dominant type of vessel, in line with the routine Merak–Bakauheni crossing activities.

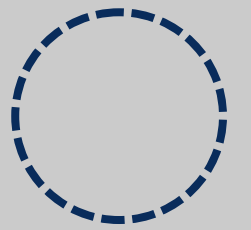
Vessel movements are concentrated in the central lane of the Sunda Strait, which has been part of the Traffic Separation Scheme (TSS) since 2020. Compliance with the TSS is quite good, although some violations are still found. The daily number of vessels is stable at around 5,300–6,000 units, reflecting regular shipping operations.

The study emphasizes the need for continuous evaluation of the TSS and strengthening of the Merak VTS system to reduce the risk of collisions. Compliance with AIS activation also needs to be improved for more accurate monitoring. AIS data has proven to be effective in understanding shipping dynamics in the Sunda Strait and forms the basis for formulating safety policies and more efficient and sustainable maritime traffic management.



# Sesi Tanya Jawab & Diskusi





# Terima Kasih

