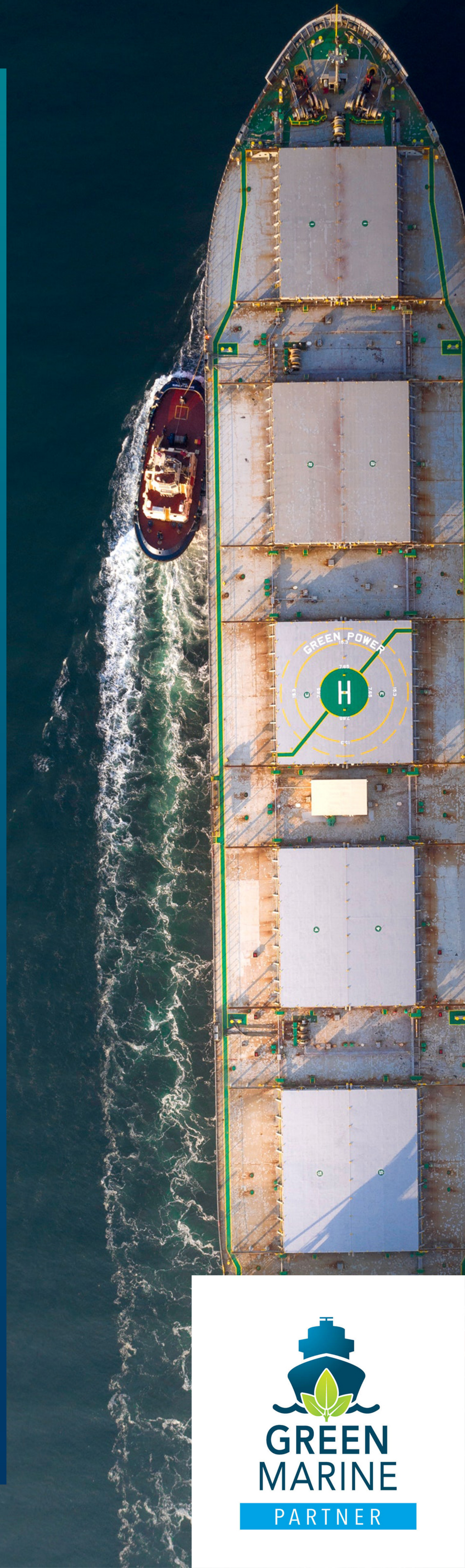


TRUE NORTH
MARINE
POWERED BY
OPTINAV



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TNM'S OPTINAV

Optimized Routing Solution



Increasingly stringent environmental regulations and fluctuating hire & fuel rates have added complexity for vessel operators. OptiNav provides a decision support system to simplify the process



Modest savings in fuel on each voyage can translate to significant annual savings while ensuring emission goals are met.



TNM Analysts provide a bridge between client and OptiNav to determine optimal solution and alert client whenever anomalies exist that could signal it is preferable to route traditionally with CP warranties.



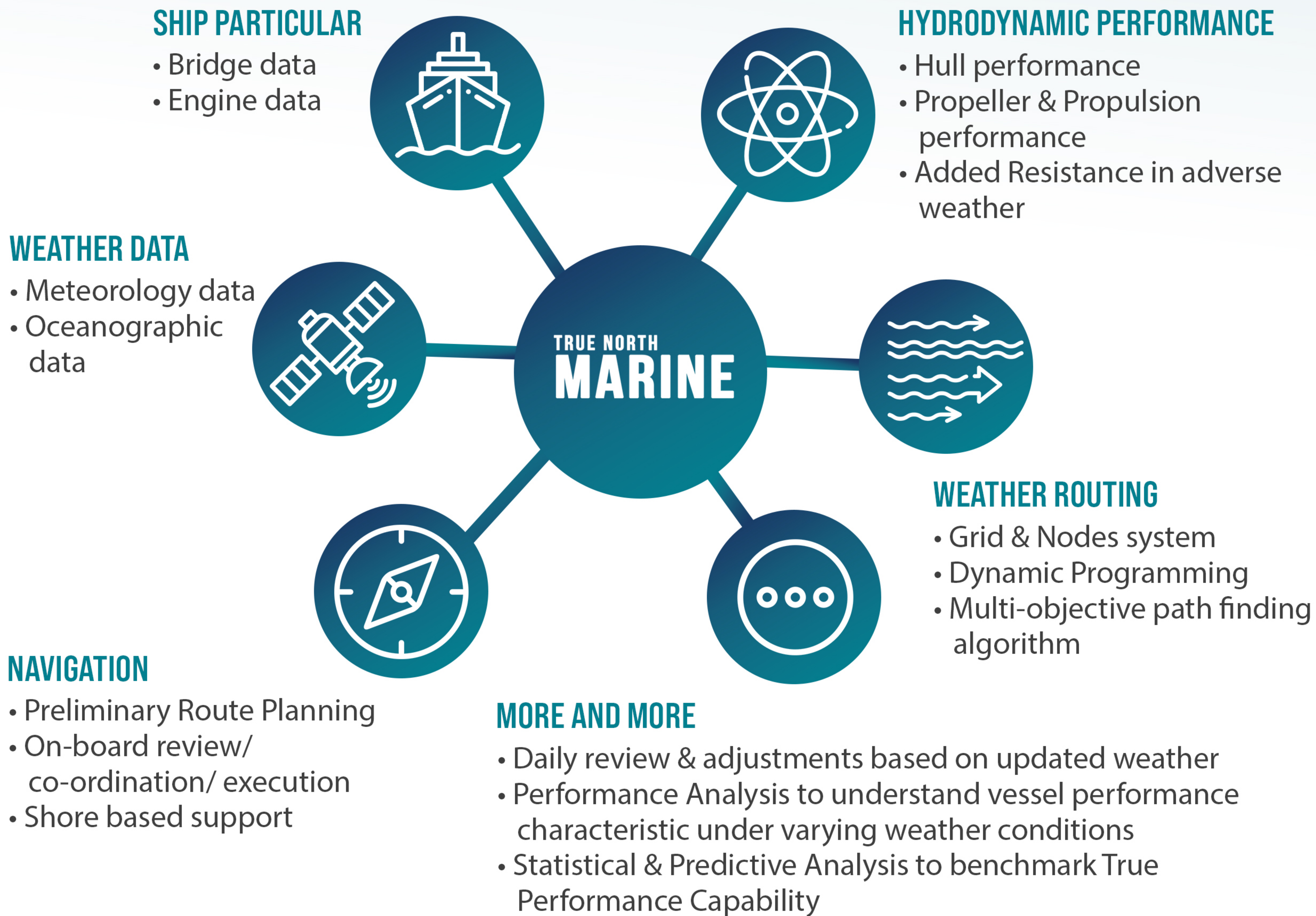
An AI enabled multi-objective model balancing Cost Factors with Safety of Navigation and GHG Emissions.

Clients can use one of the many optimization objectives i.e Least Voyage Cost, Shortest Time, Least Emissions or Hybrid, to achieve their desired Optimization Goal.

A new Commercial Objective module as well, which routes the vessel optimally while respecting warranted description. A complete one-stop solution for any form of voyage optimization at sea.

TNM's OptiNav works for all stages of the voyage. From pre-Voyage estimates to help you make informed decisions prior voyage, to detailed and actionable advice during the voyage for Master from our expert analysts, this service helps improve your voyage earnings or achieving your Emission goals. Our novel concept of Human-in-the-Loop combined with this next Generation Digital Solution makes our Optimized Routing Service first of it's kind in the industry.

ROUTE OPTIMIZATION LOGIC



GOAL OF OPTIMIZATION

- Conduct voyages safely & efficiently
- Reduce voyage costs at sea
- Reduce carbon footprint of the voyage
- Manage voyage time

ROUTE OPTIMIZATION PROCESS

Next Generation Digital Solution for Route Optimization – Using decades of experience and data.

Multi-objective model balancing Cost Factors with Safety of Navigation and GHG Emissions.

CARGO & CREW SAFETY

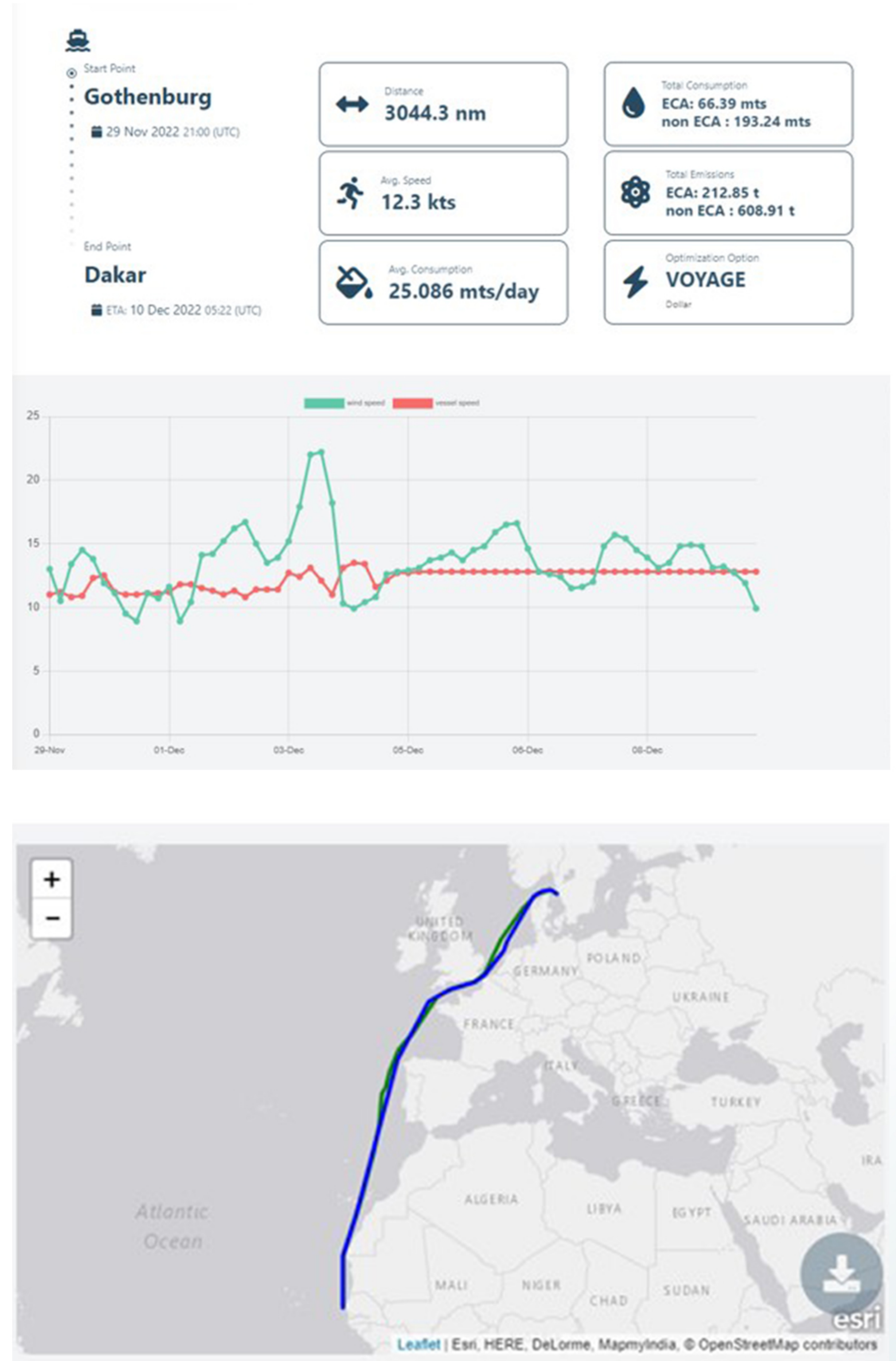
Implementing a set of seakeeping criteria to prioritize safety of crew and cargo.

SPEED LOSS ESTIMATION

Constructing an optimization network of all feasible region that vessel can reach to automatically solve the routing problem and estimate of speed loss in adverse weather.

VESSEL PERFORMANCE DATABASE

Simulating database of vessel profile in different sea states for analyzing True Performance Capability.



SELECT SHIP

Database or digital sister ship



ESTIMATED TIME OF DEPARTURE



VOYAGE COSTS



RESULTS



ROUTE PROPOSAL



INPUT ITINERARY



INPUT CONSTRAINTS

Safety and Charter Party



DATA CRUNCHING PHASE



OptiNav

EMBRACE NATURE OF RISK & IMPROVE VOYAGE ECONOMICS

TNM's Optimized Routing Solution - ORS

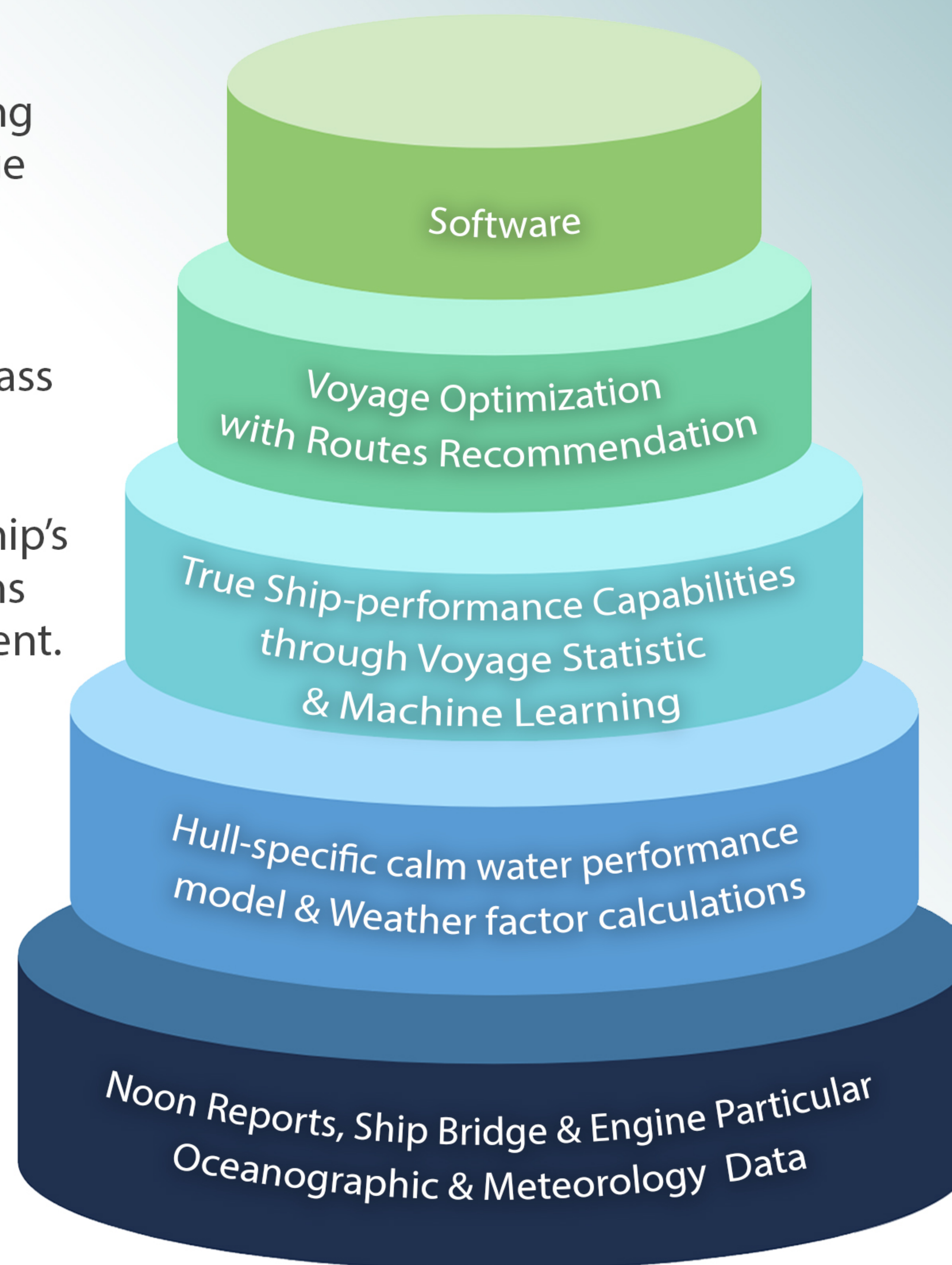
Web-based module with easy functions to allow operators to run end-end calculations for improving operational efficiencies and carry out better voyage planning and execution.

Advanced Path Finding method taking into consideration seakeeping criteria, avoiding landmass and respecting international navigation limits.

Sea Margin calculation covering wide range of ship's hull form resembling in adverse weather conditions including model bathymetry, wind and wave-current.

Speed/Fuel Consumption Estimation taking accounts of environmental conditions and IMO's **Emission Control Areas**.

Recommended route is later being verified by shore-based operator working alongside ship captain to create vessel performance profile for future **reinforcement learning and statistical studies**.



Available Data

Sea Margin Calculation

Vessel Performance-Analysis

Route Optimization with Weather Monitoring



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