



One Capability, Three Ports

How Cargill Uses Discrete Event and Agent Based Simulation to Drive Port Decisions

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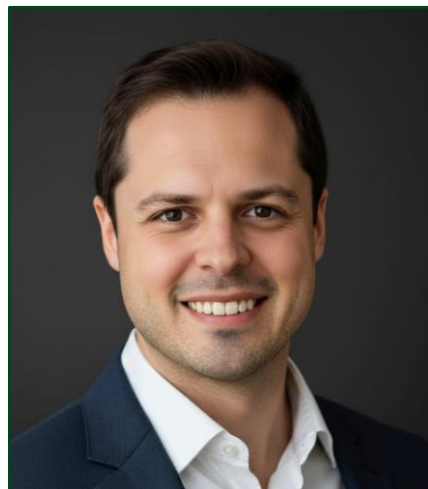
Today's speakers



Amanda Murphy

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Agenda

- 01 Our A&T Supply Chain
- 02 Port 1 – Strategic Planning, One-time
- 03 Port 2 – Tactical Planning, Continuous
- 04 Port 3 – Tactical Planning, Continuous
- 05 Wrap Up



Cargill and Ag&T at glance

Our Purpose:
Nourishing the world in a safe,
responsible and sustainable way.

Cargill enterprises

 Ag & Trading 

 Food 

 Specialized Portfolio 

161+
years

Ag&T as the longest standing business in Cargill, We operate on an integrated global basis to source, store, trade, process and distribute grains and oilseeds to feed and fuel a growing global population.



Ag & Trading is the engine of the global food system



-  Feed grains
-  Food grains
-  Soybeans
-  Meals
-  Liquid oil & soft seeds
-  Tropical oils



70
Countries



155K+
Employees



1K+
Facilities

Ag&T Supply Chain ambition: turn uncertainty into better choices



Traditional Planning



- One Plan
- Expected conditions
- **One answer**

Scenario-Based Planning

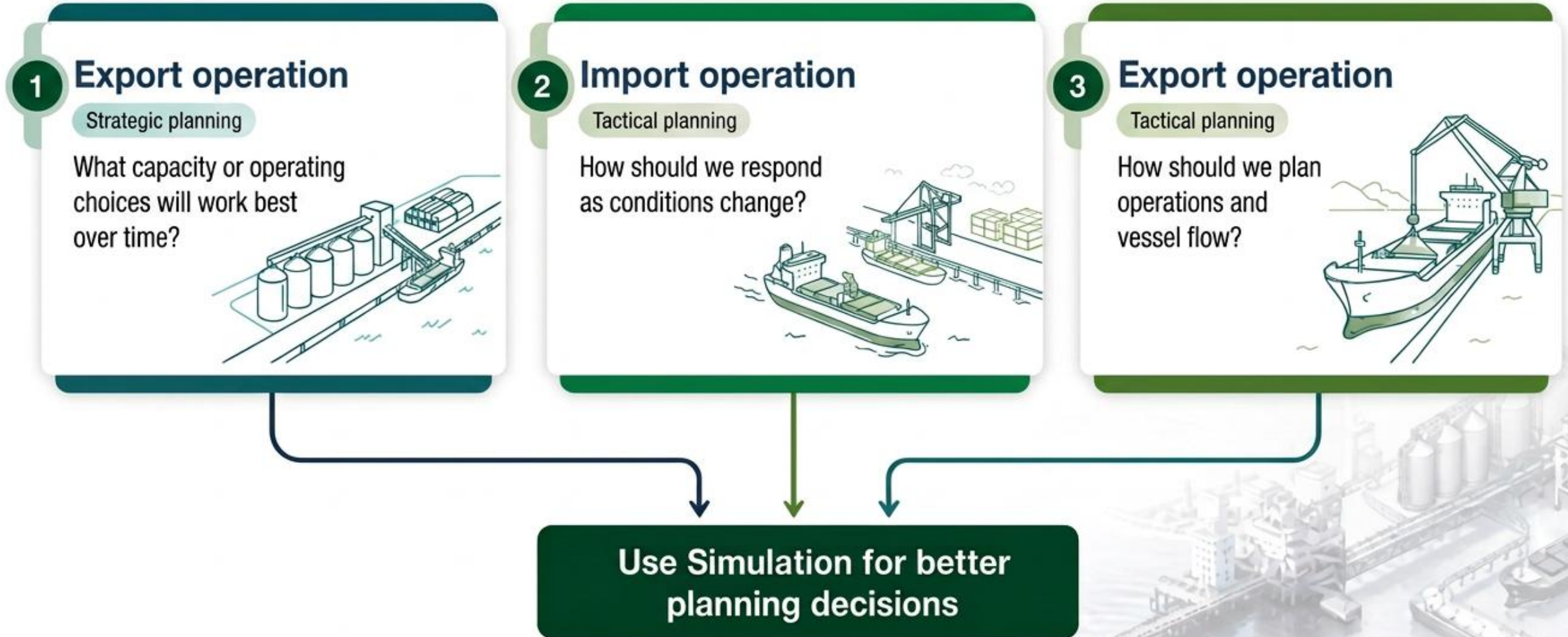


- Multiple possibilities
- Understand trade-offs
- **Choose the best response**

The goal is to make better decisions across a range of possible futures

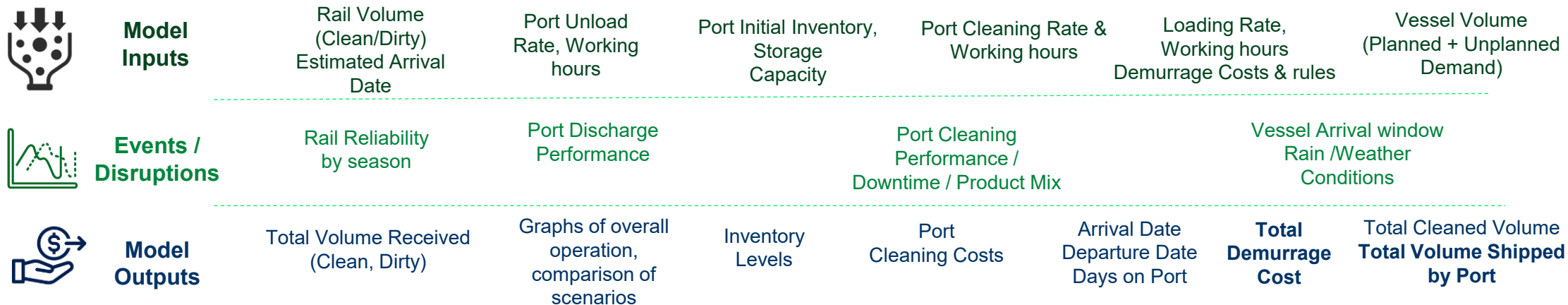
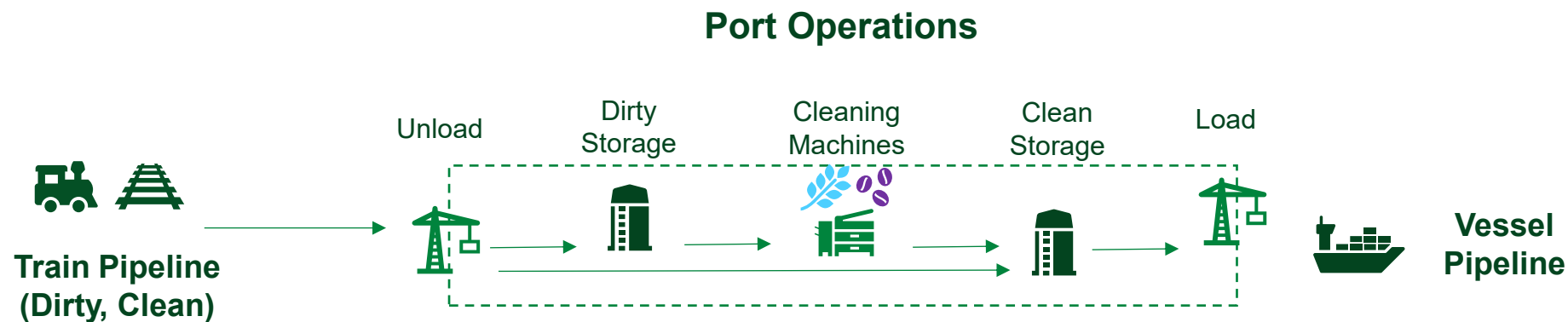
Different Port Decisions.

The same need to plan under uncertainty.



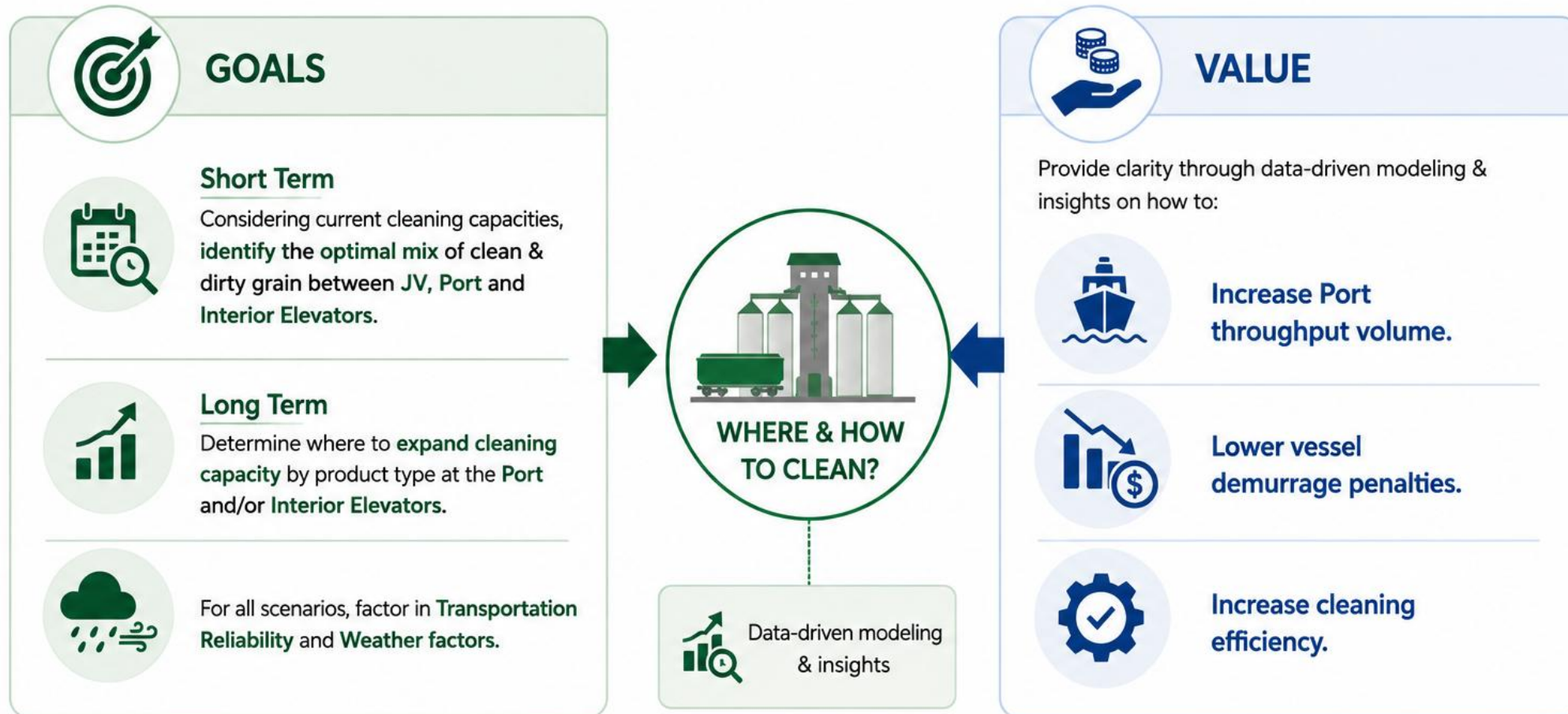
Port 1

Problem Statement



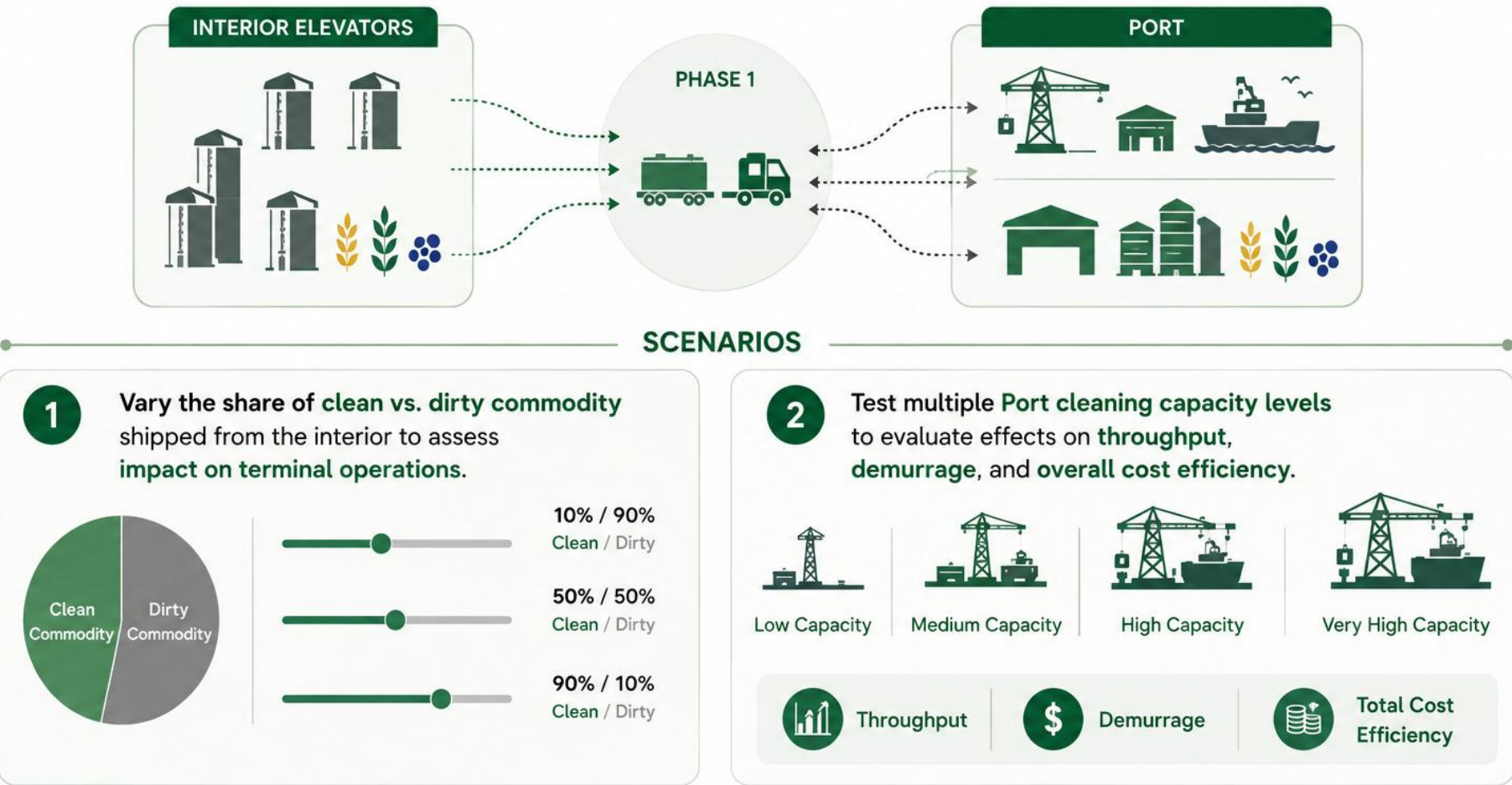
Objective: Identify right cleaning strategy

Make decisions on where and how to clean commodity to maximize throughput and minimize cost



Scenarios to Evaluate

Evaluate different cleaned x dirty commodity volume shipped from interior elevators to assess opportunities in the Port



Port 2

Problem Statement

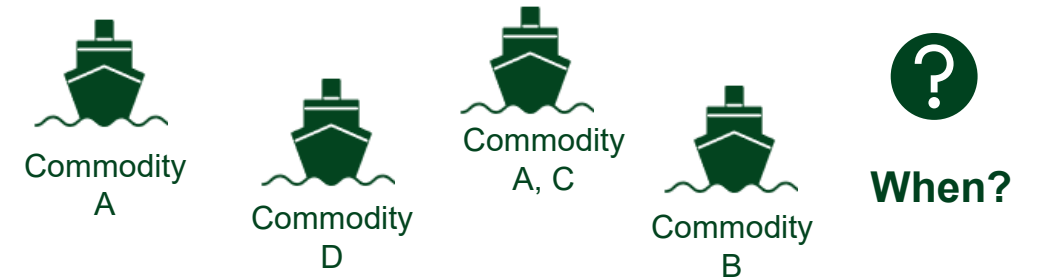
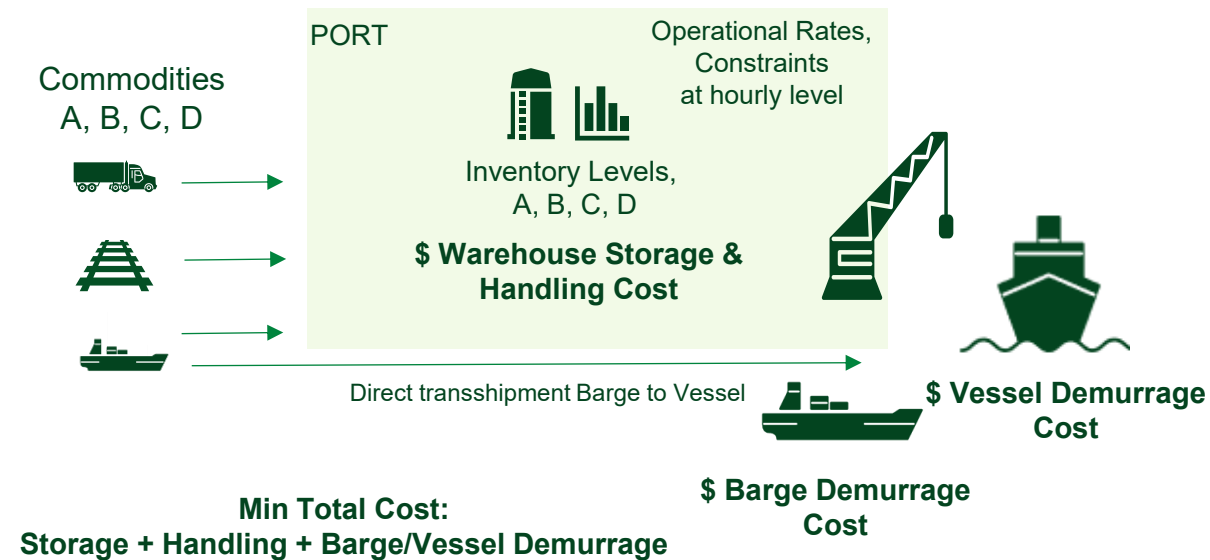
Combine scenario simulation with optimization to provide actionable schedules, throughput, and cost estimates

Input Projected Supply Schedule

Input Starting Inventory

Input Forecast: Sales Plan

Tactical 1 to 3 Months Forecast



What is the best vessel sequencing to improve port throughput and lower costs?

Output: Optimized Vessel Schedule, Increase Port Throughput and Inventory Turnover



Value Drivers

Primary: Income Generation

- Enable higher throughput → increased margin
- Unlock additional vessel capacity without capex

Secondary: Cost Reduction (per ton)

- Reduced demurrage (barge & vessel)
- Reduced storage days (higher turnover)
- Improved asset utilization (berth, loaders, storage)

How is the tool intended to be used?



1. Vessel Scheduling	2. Scenario Testing	3. Bottleneck Identification	4. Commercial Empowerment
• Test if adding/removing vessels is feasible • Identify optimal sequencing to improve port inventory turn over and reduce loading time • Quantify the total cost of the plan with clear trade-offs: • Barge Direct transshipment x Store at Port • Demurrage Costs • Inventory Turn Over (cost of storage)	What happens if: • Commodity mix changes (e.g., 2 → 4 commodities)? • Additional vessel is introduced mid-month? • Intake is disrupted (rail, barge constraints)? Eg. Low water levels or rail limitations. • Third-party port usage scenarios	• Define maximum system capacity under constraints • Identify which constraint becomes binding first: • Intake • Storage • Loading	• Support S&OE discussions with quantified scenario analysis: • Trade-offs between vessel timing and cost • Impact of commodity choices • Impact of reallocate flows between domestic and export markets

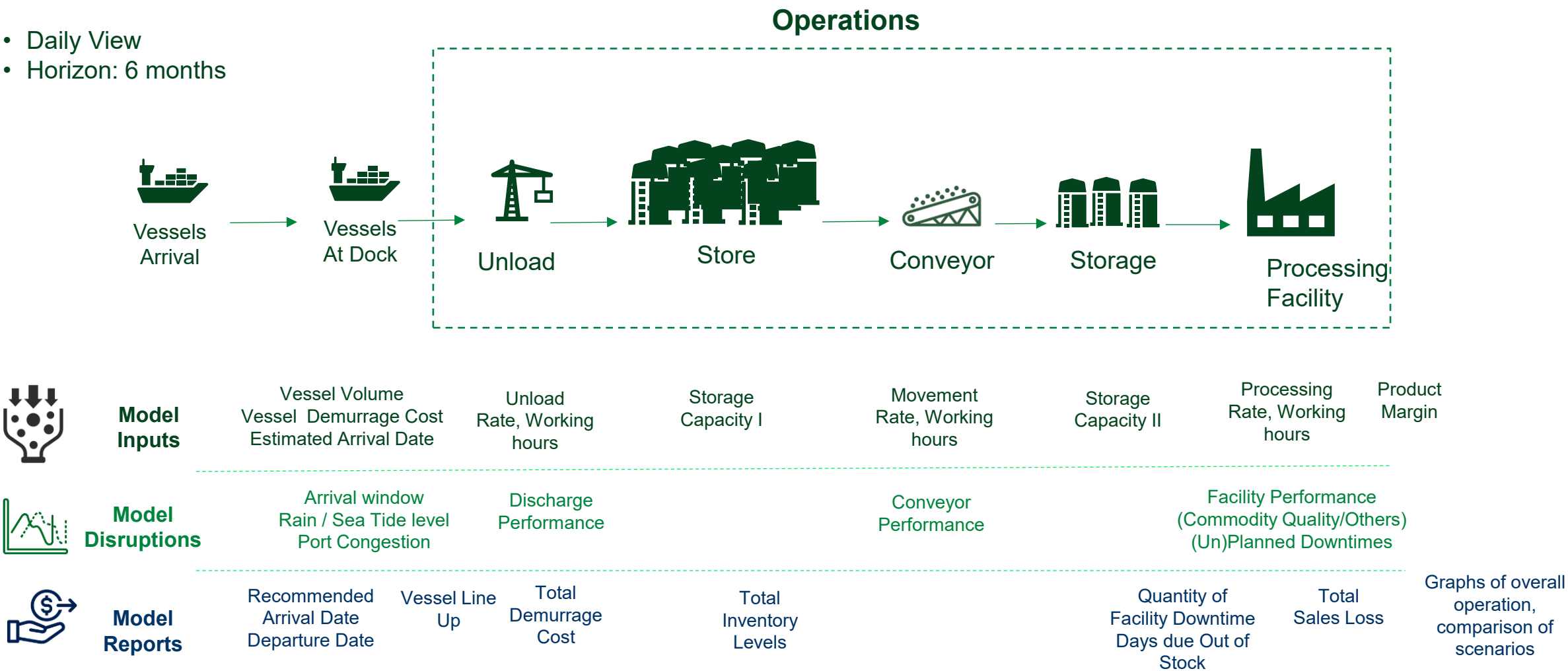
The tool is intended to support Planning and Commercial decisions, not replace or automate them

Port 3

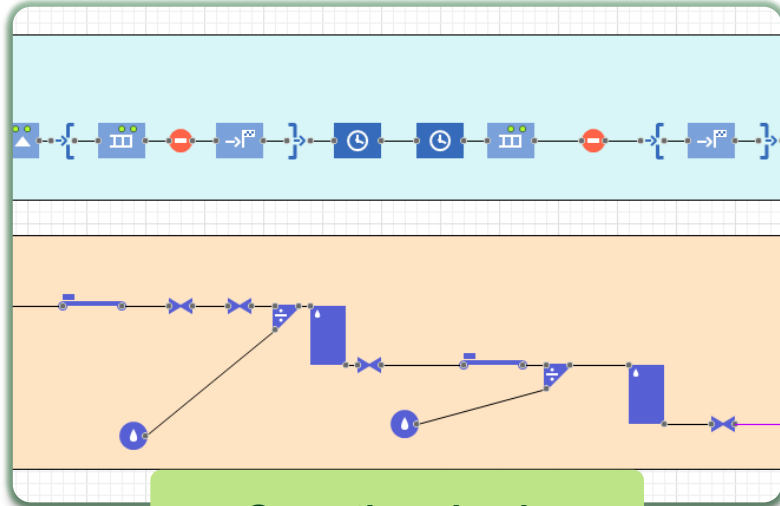
Simulation Scope

Design

- Daily View
- Horizon: 6 months



Overview & Capabilities



Operations Logic

Includes complex conditions such as:

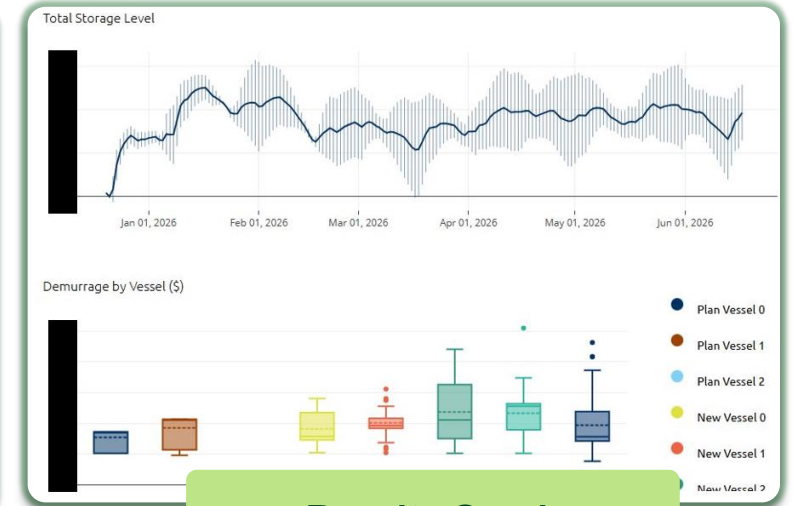
- Arrival window
- Port Congestion
- Tide Effects
- Operational Rates & Bottlenecks

This screenshot shows the 'Inputs' configuration panel of the simulation software. It includes sections for 'Experiment settings' and 'Experiment Name'. Key parameters are listed with input fields or dropdowns: 'Simulation Days' (180), 'Allow Port Congestion' (toggle), 'Allow Overtime' (toggle), 'Demurrage Rate (\$)' (23000), and 'Margin (\$/ton)'. The 'Experiment Name' is set to 'Baseline Laycan Opti'. The 'Number of replications' is 50, and the 'Start date' is 2025-12-19 00:00:00. The 'Objective' is set to 'Total Costs per Vessel' with a 'Minimize' dropdown.

Parameters Inputs

Key parameters, such as:

- Simulation Duration, Start Date
- Demurrage Rates, Product Margins
- Vessel Size, Arrival Distribution
- Storage Size



Results Graph

Possibility to view the results over time:

- Total Inventory Levels
- Detailed Operating Dates by Vessel
- Total Days at Port (Waiting or Unloading)
- Simulated Vessel Line Up
- Total Demurrage, Stock Out and Overtime Costs

DEMO

THE TAKEAWAY

Simulation helped us move faster from complex questions to better decisions

Across three different ports, simulation gave teams a faster, safer way to test choices before acting in the real operation

01

Move faster

Evaluate many scenarios in hours—not through lengthy manual analysis or trial-and-error in operations.

02

See the system

Capture variability, constraints and ripple effects so decisions are based on the full end-to-end operation.

03

Reuse the capability

Apply one simulation approach to strategic design, tactical sequencing and continuous arrival planning.

Simulation did more than improve the answer - it accelerated the path to the answer