ECOPRODIGI
HARNESSING DIGITALISATION FOR THE BENEFIT OF MARITIME INDUSTRY

CARGO STOWAGE OPTIMISATION

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AGENDA

- **DFDS**
  - **Network**
  - **Hardware**
  - **Structure and Business**
  - **Strategy and Motivation**

- **ECOPRODIGI**
  - **Digital solutions**
  - **Learnings**

- **Next steps**

DFDS - AN INTEGRATED PART OF EUROPE'S INFRASTRUCTURE

8.000 employees

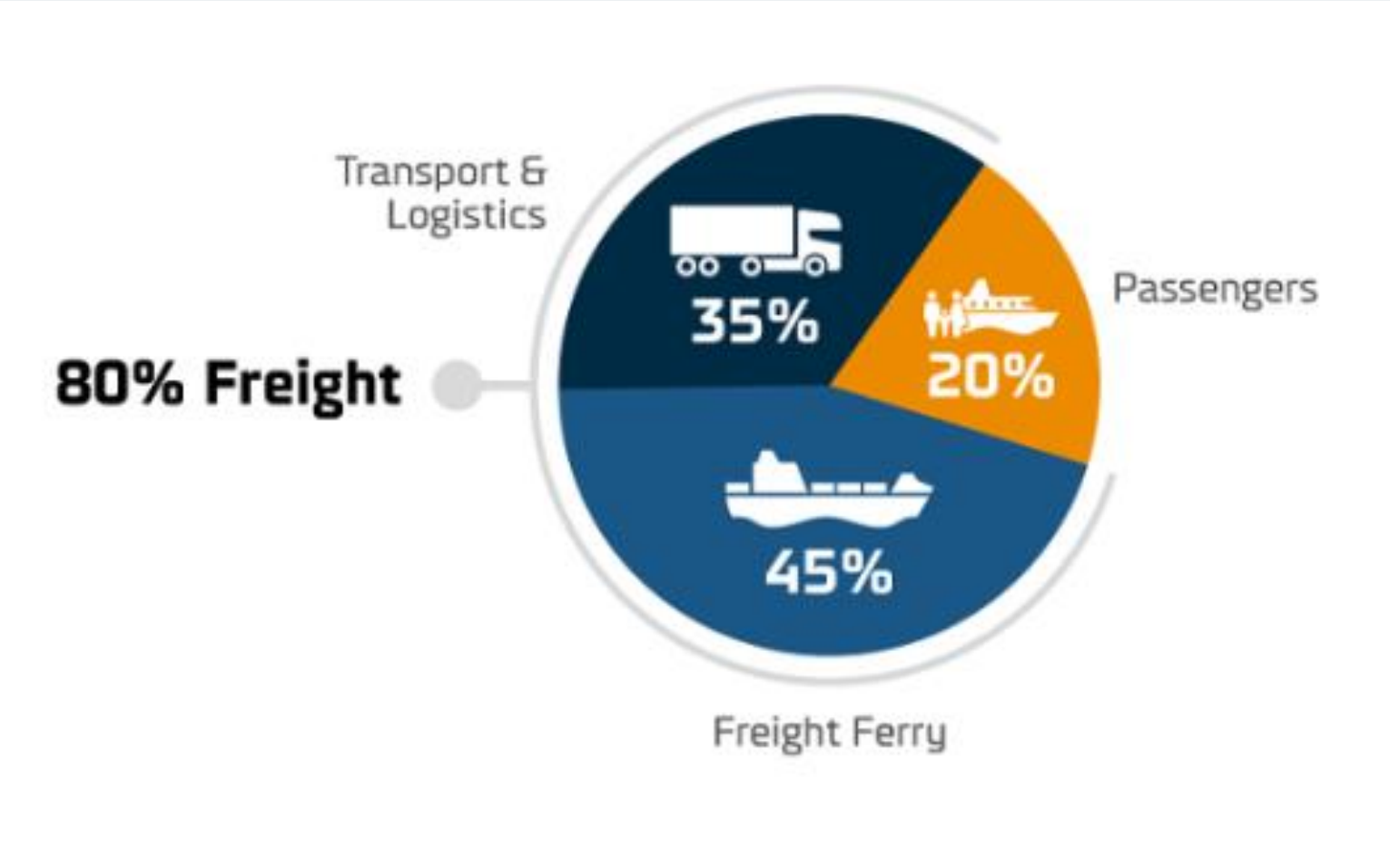8.000 trailers

600 trucks

60 vessels

8 terminals (36)

36.000 voyages/yr

1 mio. lane-metres/week

2020

1866

Company structure

Divisions

Ferry | Logistics

DFDS

People & Ships | Finance

Corporate Service Functions

Transport & Logistics

80% Freight

35%

Passengers 20%

45%

Freight Ferry

DFDS

TRUCKS AND TRAILERS

RORO AND
ROPAX FERRIES

TERMINALS

The biggest risks facing our world

1	Extreme weather events (e.g. floods, storms, etc.)	
	Failure of climate-change mitigation and adaptation	2
3	Major natural disasters (e.g. earthquake, tsunami, volcanic eruption, geomagnetic storms)	
	Massive incident of data fraud/theft	4
5	Large-scale cyberattacks	
	Man-made environmental damage and disasters (e.g. oil spills, radioactive contamination, etc.)	6
7	Large-scale involuntary migration	
	Major biodiversity loss and ecosystem collapse (terrestrial or marine)	8
9	Water crises	
	Asset bubbles in a major economy	10

Top
10
Risks by
Likelihood
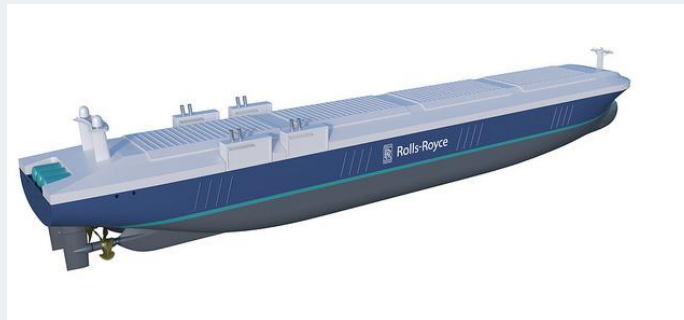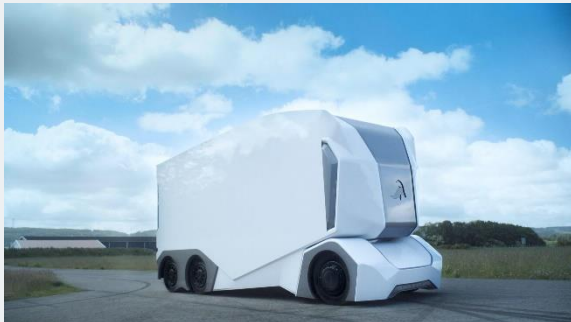**Global Risks Report**

WORLD
ECONOMIC
FORUM
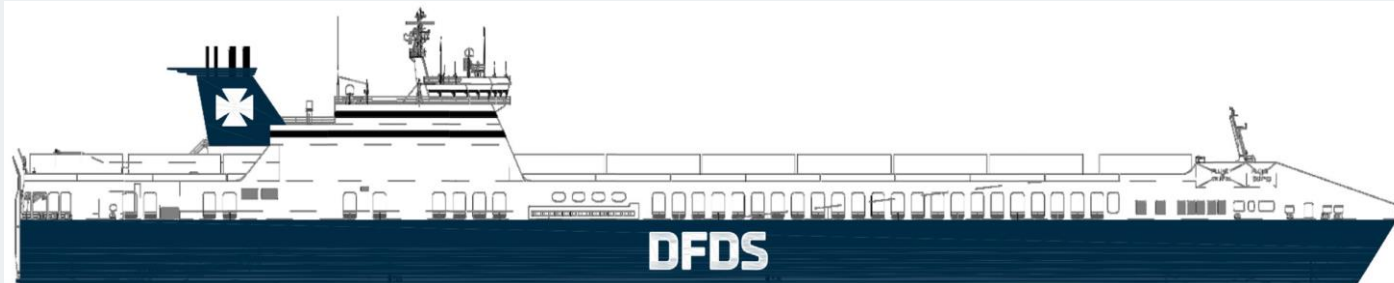
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Strategy, focus areas

To stay relevant we need to develop and grow with our customers.

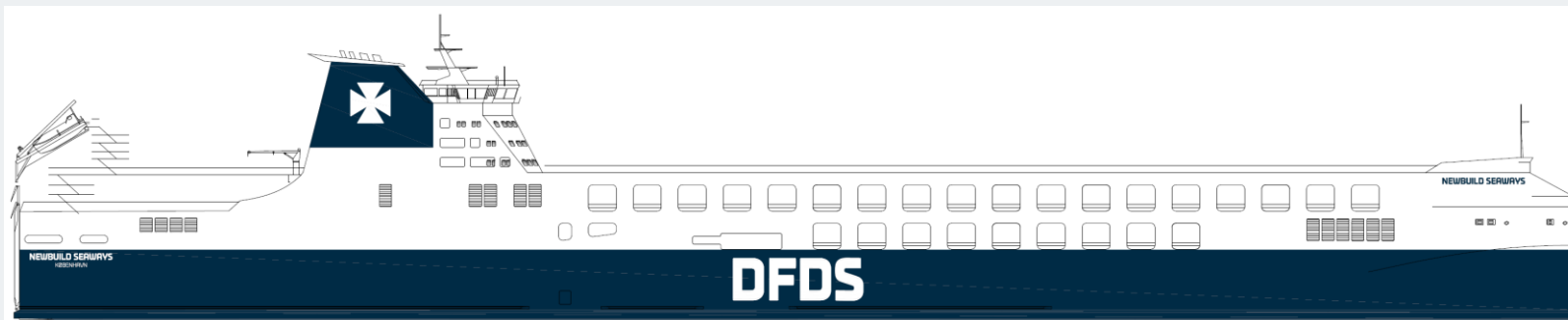- Energy 2.0
- Automation / autonomous

Newbuilding projects

- GARDENIA & TULIPA SEAWAYS (4,100 lm Ro-Ro) from
  Flensburg delivered in 2017

- 210 x 26 m
- 4 cargo decks
- 262 trailers
- 21.3 kn.
- 19,200 kW

- 6 x 6,700 lm Ro-Ro from Jinling (China) entering into service in 2019-2020

- 235 x 33 m
- 5 cargo decks
- 450 trailers
- 21.0 kn.
- 23,600 kW

Newbuilding projects

Optimizing cargo flow
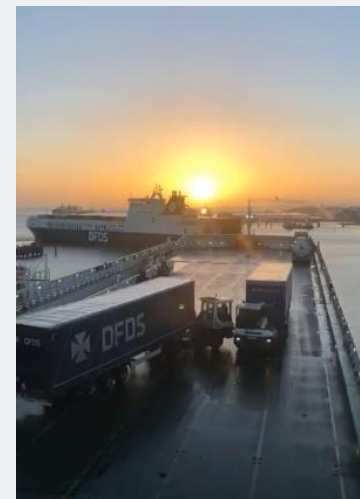
Real time tracking cargo units or arrival times

Smart Gate validates cargo ID, weight, dimensions and damages

Cargo location and condition is tracked in terminal

Cargo position data enables precise information on arrival time to customers

Advanced planning of port and vessel operations and optimal stowage with reduced ballast intake

Efficient loading process reduces turn-around time

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Case 2: Digital & Optimized Cargo Stowage (DFDS)

Aim and Scope

- Reduce fuel consumption and emissions 2-10% per ship / route + 2-10% efficiency and emission gain at terminals via digital and optimized cargo stowage processes
- Less waiting time and service benefits for RoRo customers
- Baseline analysis: 3 routes, 4+ ships
- Test scope: 1 route / ship
- Simulation runs (2019) have validated benefits
- Further pilot testing and validation planned from 2021+

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Case 2: Digital & Optimized Cargo Stowage (DFDS)

Developed and Implemented Solutions

- Digital data capture for cargo units (dimensions, weight, positions, damage) at terminals / onboard ship via cameras, drones, track units etc.
- Connectivity via LORA / 4G etc. and storage in DFDS Cloud
- 2D / 3D scans and data models for cargo units and vessel (digital twin)
- Prediction models for cargo uptake per voyage
- Systems and data integration across different DFDS applications (Sertica, Phenix, Loadmaster, GTMS etc.)
- Algorithms for stowage optimization with the purpose of reducing ballast water onboard
- Algorithms for dual cycling able to optimize discharge and loading operations
- 2D / 3D simulation models able to validate alternative yard / ship layouts and discharge / loading tactics on emissions
- Training and skill building of HQ, terminal staff and onboard crew via simulation / game based training methods

Dual Cycling Optimization

A simple example of single cycling vs dual cycling

		7	13	19	25	31	37	43	49
	3	8	14	20	26	32	38	44	50
1	4	9	15	21	27	33	39	45	51
2	5	10	16	22	28	34	40	46	52
	6	11	17	23	29	35	41	47	53
		12	18	24	30	36	42	48	54

An example of a deck with 54 trailer slots, fully loaded.
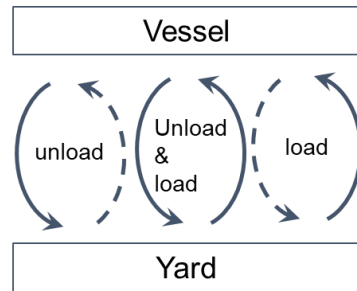All jobs are unit length and operated by 2 tugs

Single cycling : 54+54 = 108

Dual cycling : 64

Time saved 108-64 = 44

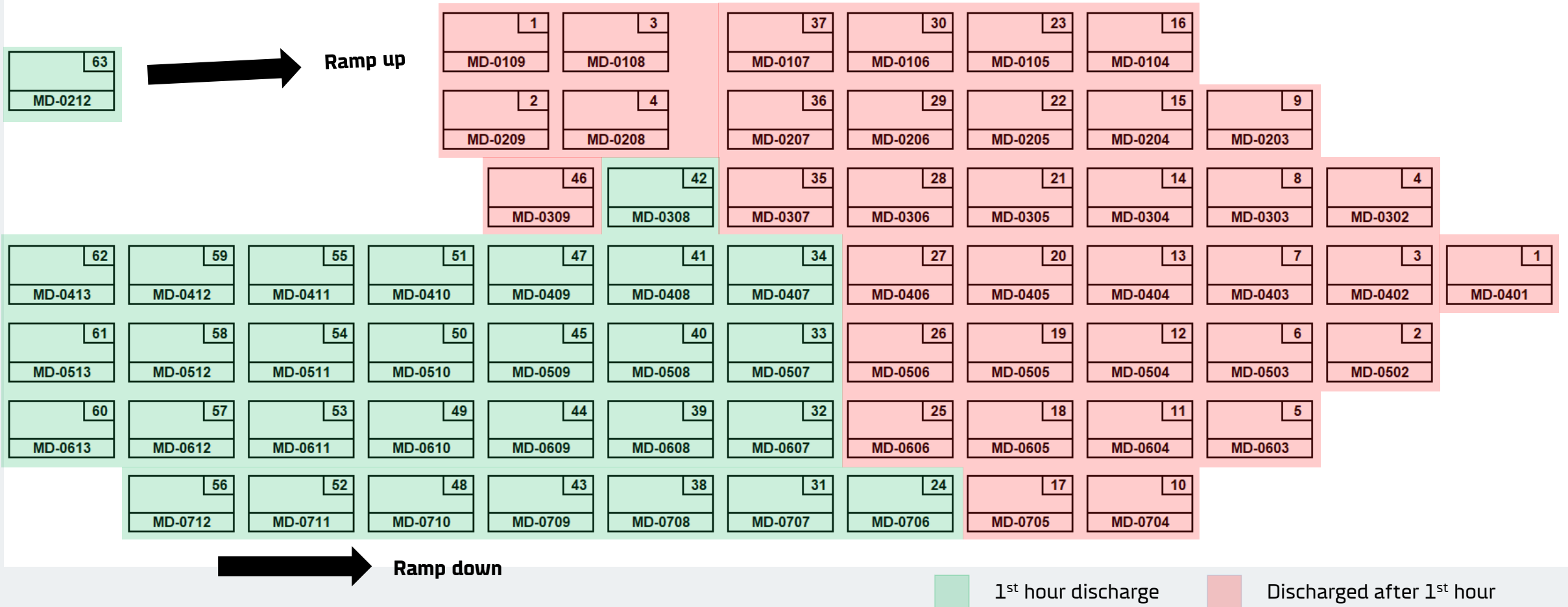

Vessel

unload   load

Yard

(a)

Vessel

unload   Unload & load   load

Yard
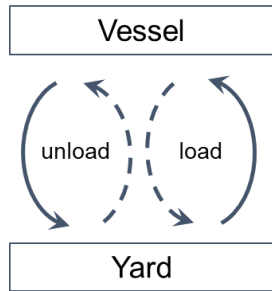
(b)

→ with cargo
⇢ without cargo

Forecasting discharge time

Main Deck

Ramp up

Ramp down

| | 1st hour discharge | | Discharged after 1st hour |

AEGIS

AEGIS – Autonomous ships meet automated ports
EU project 2020-2023
Budget 7,5 MEUR
Case A: Short sea terminals
Case B: Short sea and inland shipping interface
Case C: Revitalizing regional ports and city center terminals

- Decongest road and/or city infrastructure;
- reduce the CO_2 and air pollutant emissions of intra-European freight transport;
- substantially increase the amount of freight fed from intercontinental European ports using waterborne transport;
- modernize, increase the reliability and competitiveness of Intra-European Waterborne transport;
- increase the quantity of freight moved by Inland Waterways or Short Sea Shipping

Image: OpenStreetMap

ROROGREEN

The project in brief – inspiration

- 5-20% reduction of consumption and emissions per ferry route achievable with digitalization

- Reduction in cargo handling time
- Competitive service

- Cargo shift from road to sea

Expected results

"" The aim of this project is to bring Denmark a step closer to sustainable RoRo shipping through cost-efficient emission reduction.

Expected emission reductions: 80.000 tons/year
Expected cost savings: 100 mil. DKK/year

Tools:
- Automated data capture systems
- Data storage and sharing infrastructure
- Decision support tools for cargo stowage
- Decision support tools for cargo handling & forecast
- Emission dashboard & monitoring

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