The NOVIMOVE project and foreseen solutions to cope with varying water levels

NOVIMOVE
smart & sustainable waterways

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NOVIMOVE project

- EU funded research and innovation project
- Collaboration of 21 partners from 6 european countries
  - The partners are: Universities, Knowledge institutes, System developpers, Logistics operators, Port Authorities
- Goal = to increase competitivity of inland waterborne transport in front of road and rail
- By addressing inefficiencies in seaport and hinterland logistics through innovations

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NOVIMOVE project. Innovations

- Cargo reconstruction → raise container load factors
- Mobile terminals → avoid long waiting times in ports
- New climate-resilent ships designs
- Smart navigation system → with real-time water depth data
- Dynamic scheduling system → better corridor management

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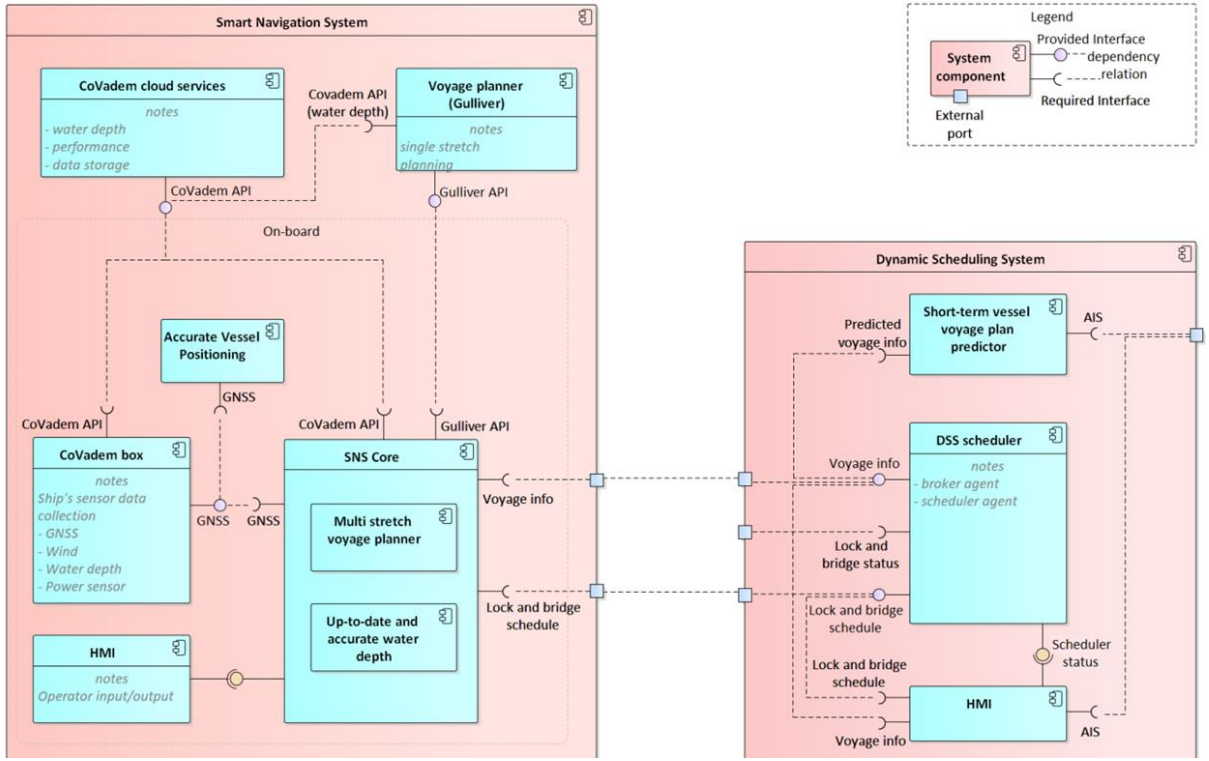
SRNS – Smart River Navigation System

- Two subsystems:
- SNS – Smart Navigation System
  - Goal to optimise the operation of vessels
    - Reduce fuel consumption
    - Increase cargo load
    - Minimise waiting times at locks & bridges
- DSS – Dynamic Scheduling System
  - Goal to provide an optimized scheduling locks & bridges
    - Reduced waiting times
    - Reliable journey plans
- Connected + Interfaces HMI

Human Machine Interface



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SNS – Smart Navigation System

- River Depth info up-to-date
  → Covadem Box + Covadem Cloud services
- Accurate Vessel Positioning
  → GNSS (GPS or Galileo) + EGNOS + INS
- Voyage planner
  →Gulliver + Optimisation Algorithm

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DSS- Dynamic Scheduling System

→**Use of intelligent agents + corridor models**

One scheduler → computationally demanding → Not quick

→divide IW network into smaller sections ← **corridor models**

→each section → one scheduller agent ← **intelligent scheduler agents**

→**Use of open standards and protocols**

→Integration and operatibility with other systems and services

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Inland ship design until 2018

Federal Ministry for Digital and Transport

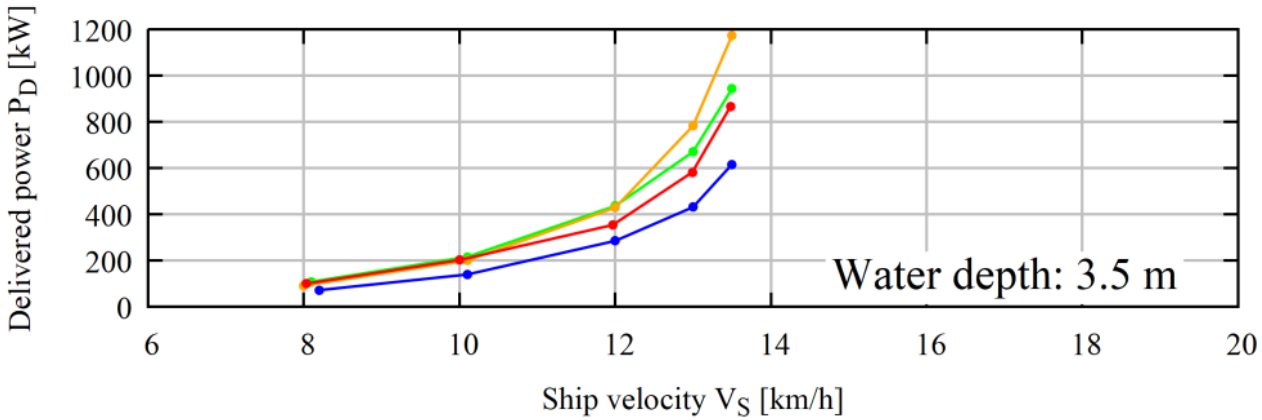
Bestimmung des effektiven Propellerzustroms für die Binnenschifffahrt
Project: 97.357/2015

- Size limitations
  - Waterways, locks
  - Regulations
- CAPEX-oriented optimisation
  - Maximising capacity
  - Full Forms, straight surface preferred
- Economies of scale
  - Large Rhine ship (CEMT Va) not large anymore
- Comparison of power demand at trial conditions
  - High water depth
  - Loaded vessels
  - → Large Propellers

- Nevertheless diverse fleet
  - 4 representative hull shapes

	M2051	M2052	M2053	M2054
# Prop.	1	1	2	2
Ø Prop. /m	1.76	1.76	1.60	1.60
Volume /m³	3088	3150	3162	3129
C_B	0.88	0.89	0.90	0.89

  - Shallow water case: 3.5 m
  - Huge differences in power demand



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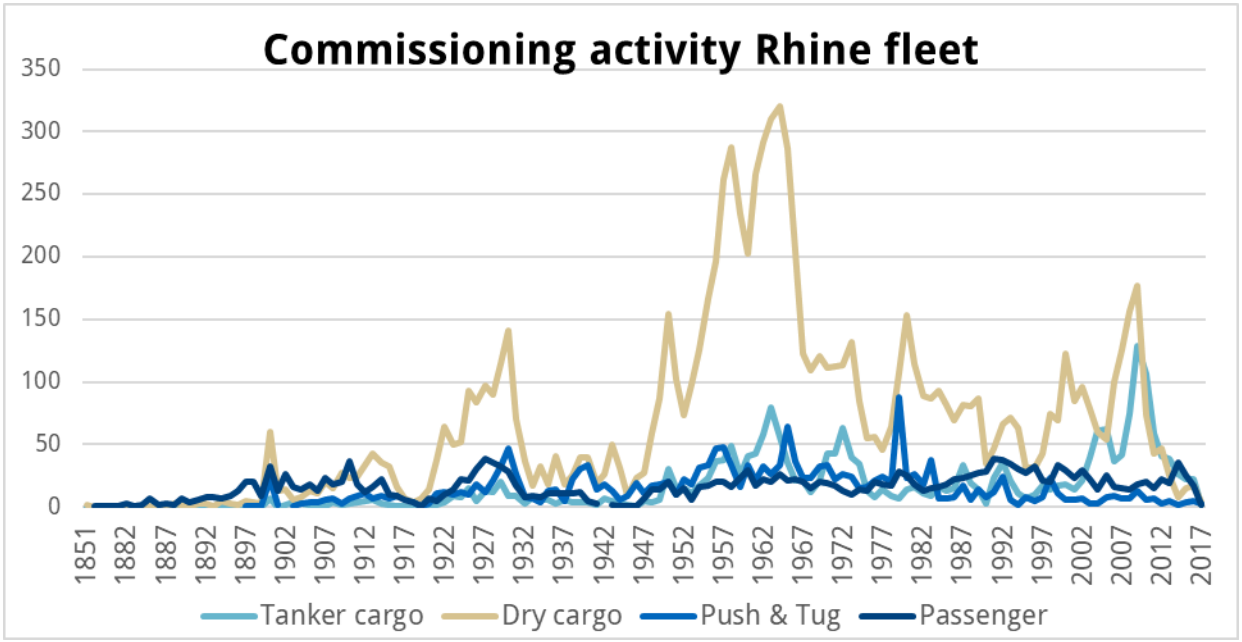
Measures to increase resilience

- Improved infrastructure
- Dedicated new-build ships
  - Optimised hull shape + propulsion
  - Reduced max draught
  - Tailored hull girders
  - Weight-Watching
  - Smaller ships
- Retrofits
  - Propulsor
  - Aft-ship
  - Added buoyancy



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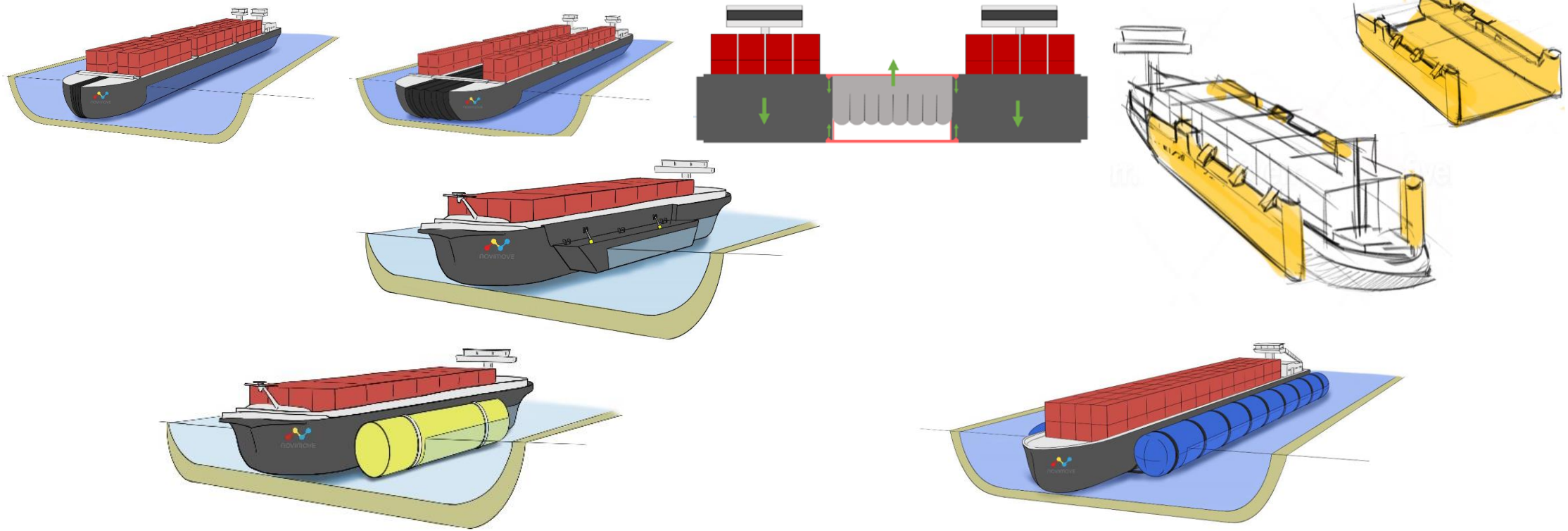
Added buoyancy

- “Innovative vessels that can adapt their physical properties (buoyancy) and maintain an economic feasible payload in low water conditions.”
- First Concepts (w/o existing solutions like coupled convoys):



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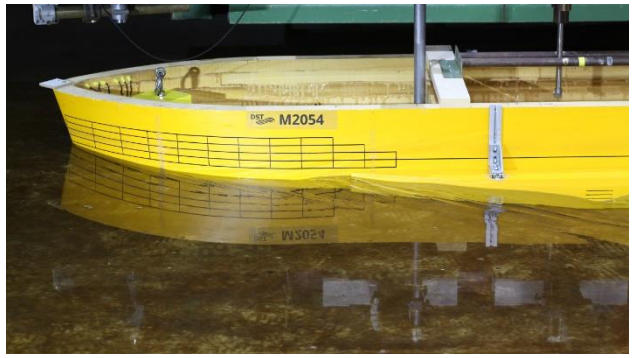
Hydromechanics

- Quantification of power demand for several variants, ventilation limits..

Draught [m]	Hull only [t]	Boxes [t]	2 PBB [t]	1 PBB [t]
1.2	1262	1719	1765	1699
1.8	1946	2556	2521	2697



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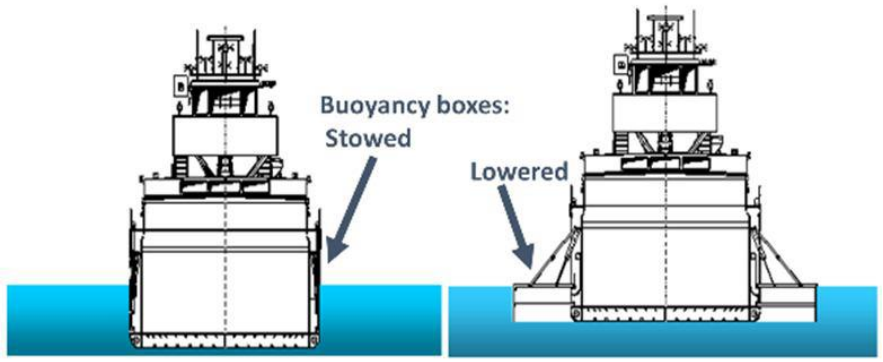
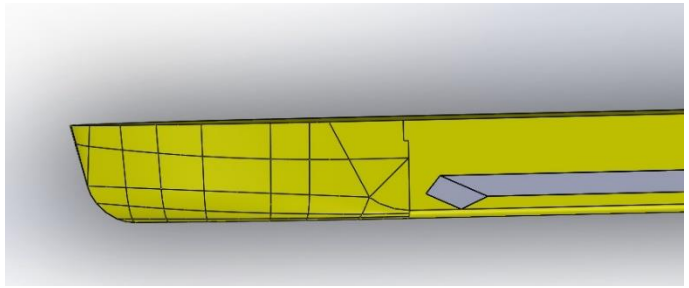
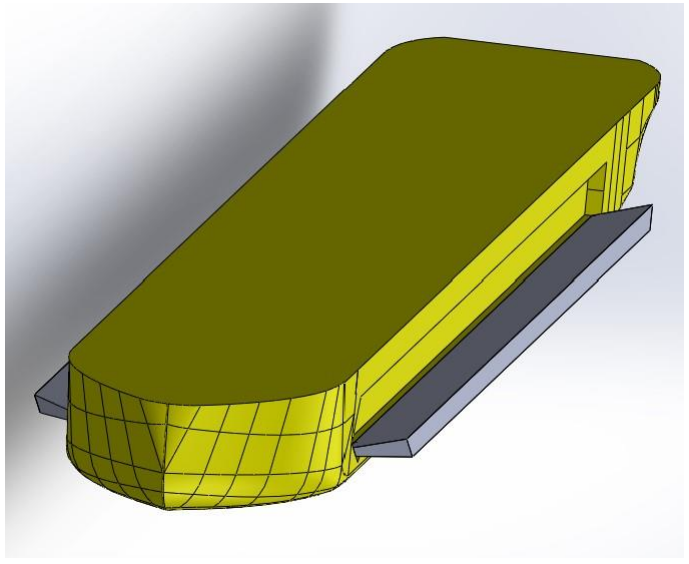
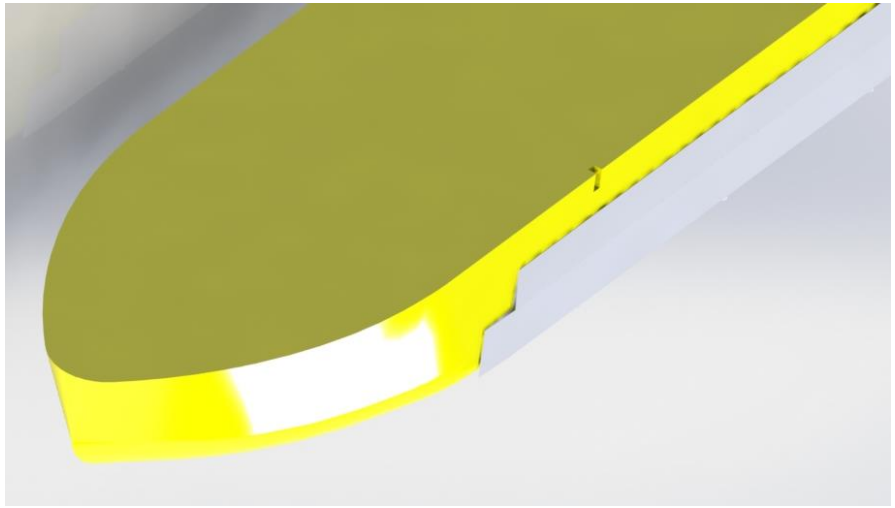
WIP to help increase the resilience of IWT in a holistic approach

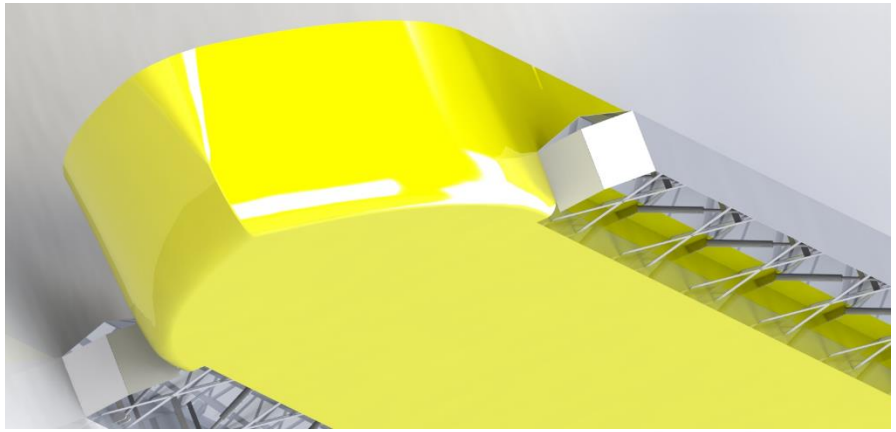
- Regulatory aspects
- Stability
- Structure & strength
- Operational guidelines
- Kinematics of side-boxes
- New business models











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