



**Arab Academy**

for Science , Technology and Maritime Transport



The International Maritime Transport  
and Logistics Conference

**“MARLOG 13”**

**Towards \_\_\_\_\_  
Smart Green Blue  
Infrastructure**

3-5 March 2024 - Alexandria, Egypt





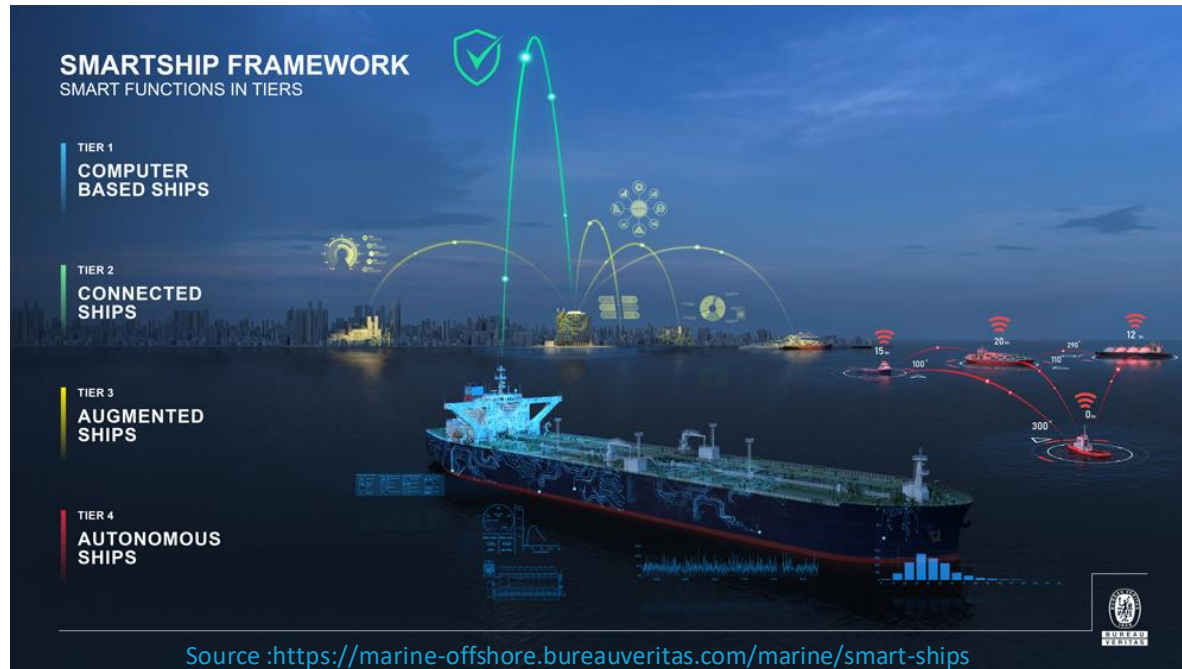
# Autonomous Ships in Confined Areas

Dr. ir. Thibaut Van Zwijnsvoorde





All companies have different visions on *smart shipping*



ng to  
CS



Sources : ReVolt (DNV website) , Mayflower (Artificial Intelligence news, 2021)  
Yara Birkeland (Yara website) , Asko (Masterly website), Meguri2040 (Nippon website)

*Maritime Autonomous Surface Ship* concept has delivered promising results



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*Autonomous shipping* is often presented as a dream scenario



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pics





Ships however face many challenges such as locks



Foto: Dr. Lic. Kapt. J.W.P. Prins



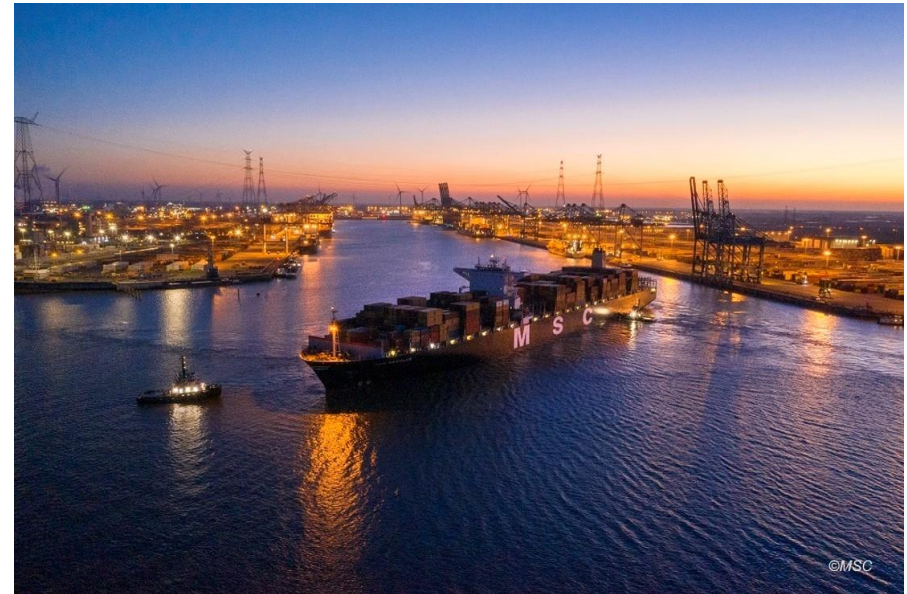
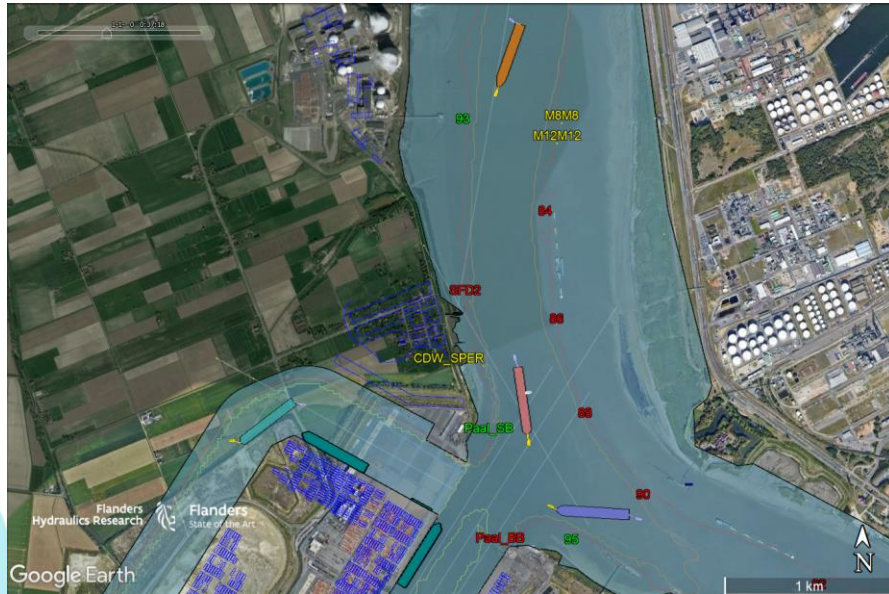


Ships need to interact with each other





## Ships need to manoeuvre in busy port environments



Source :Flanders Hydraulics simulator (left) ; Antwerp Port Authority from MSC (right)





Ships make use of canals to optimise their journey

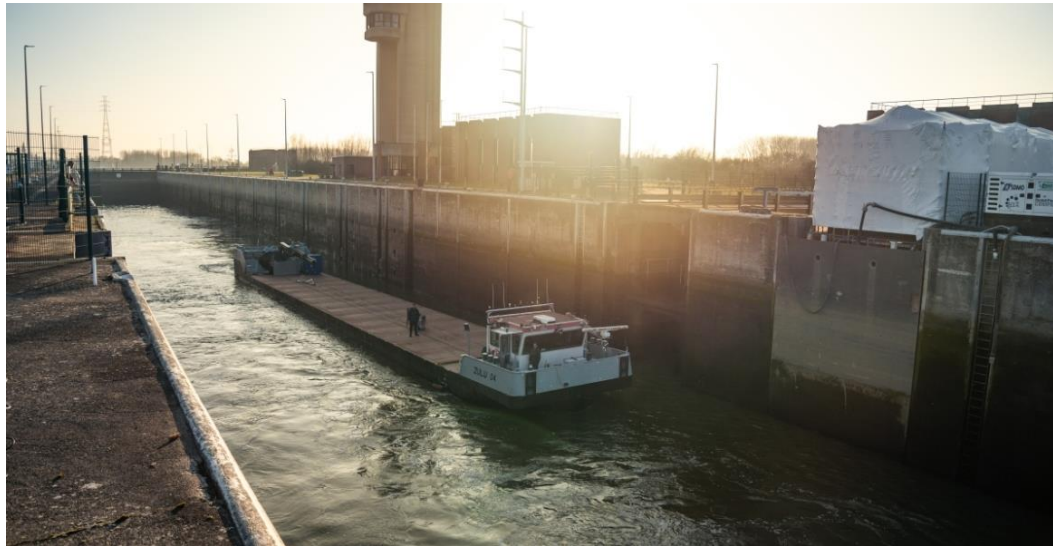


Source : Suez Canal Authority website

# How do we test a complex scenario?



Projects on national waters (example of Belgium) can fall under local legislation



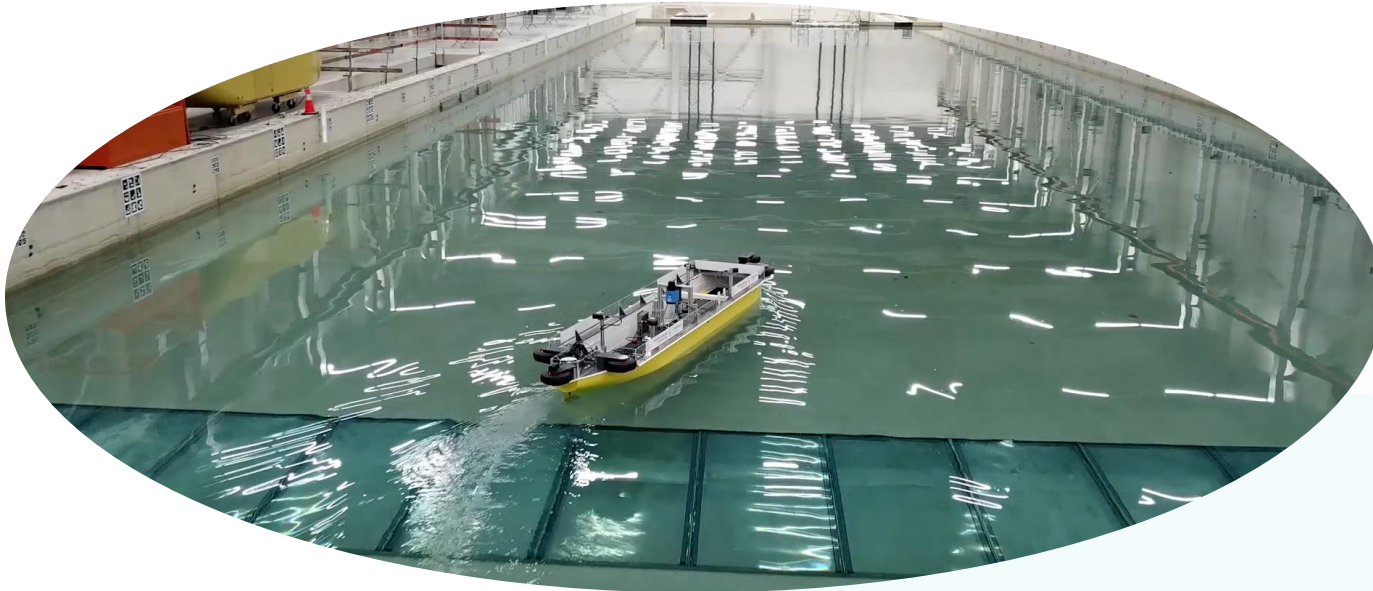
Source : Zulu - Binnenvaartkrant, 02/06/2023

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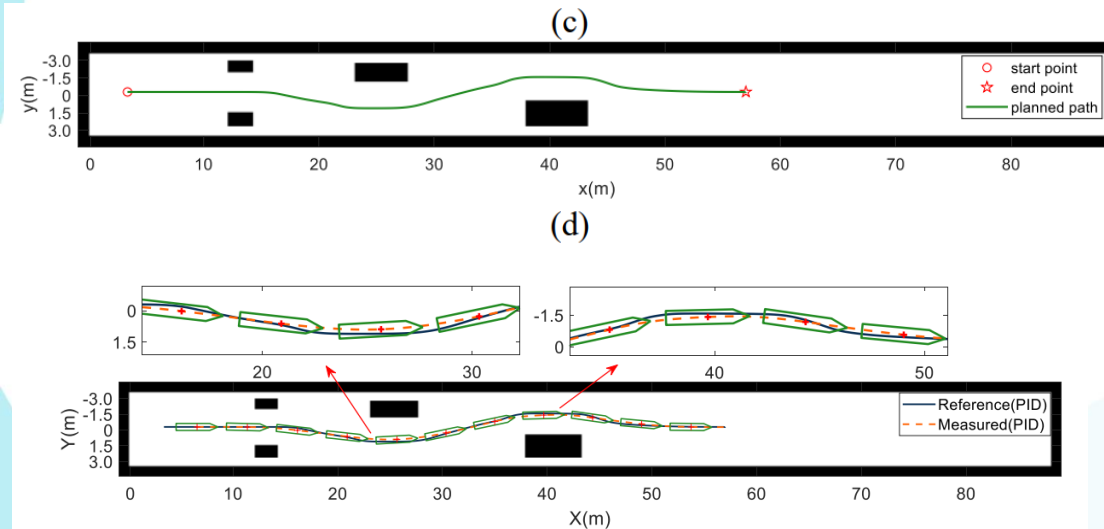
Scale model facilities excel in providing safe test platforms for autonomous shipping  
New exciting development at Flanders Hydraulics, a 20 m wide shallow water towing tank



Source :Towing tanks Flanders Hydraulics



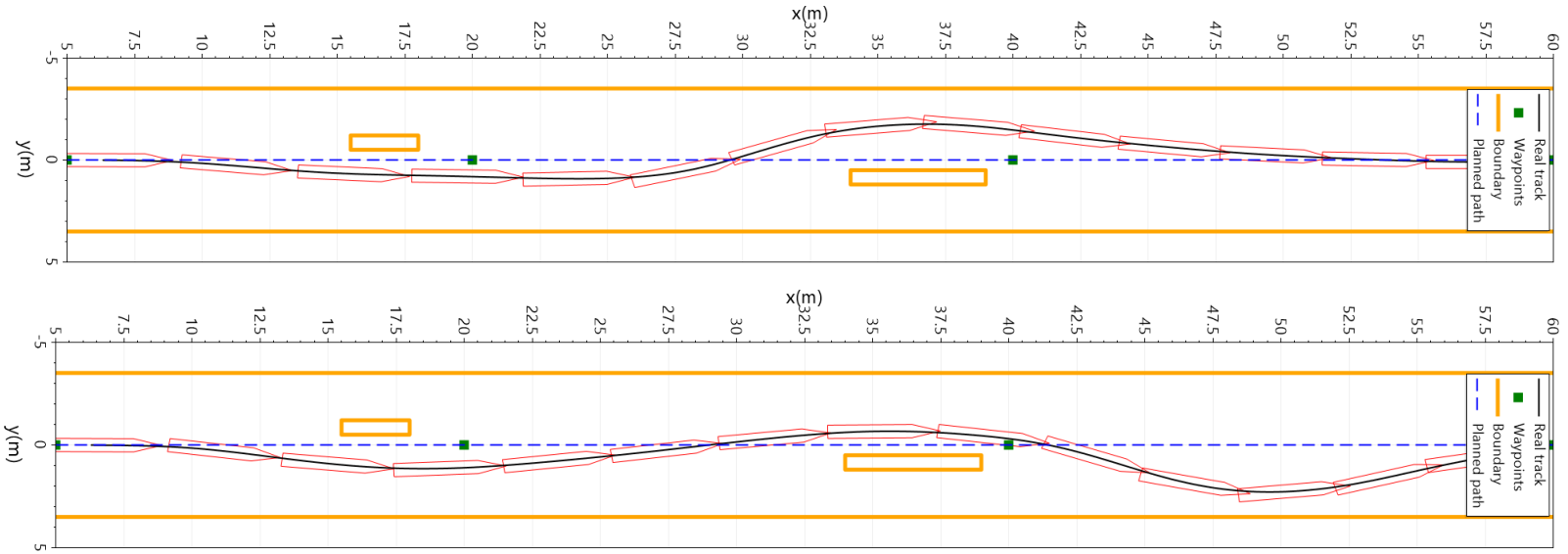
Autonomous ships should be able to correctly respond to obstacles (virtual)



Source : towing tank tests at the medium shallow water towing tank  
part of PhD research Changyuan Chen, Ghent University

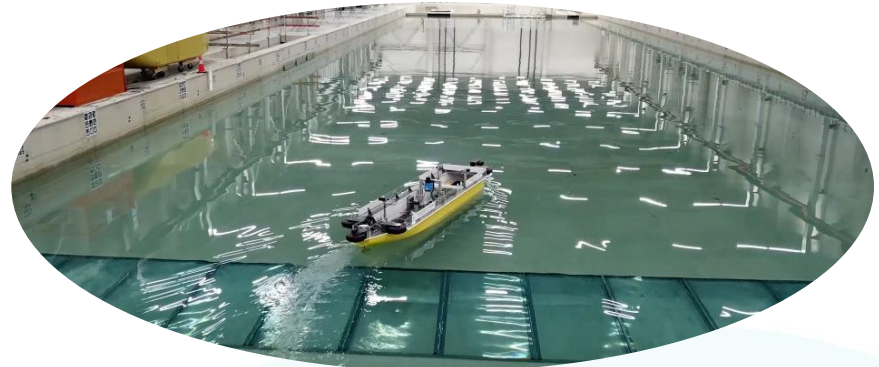
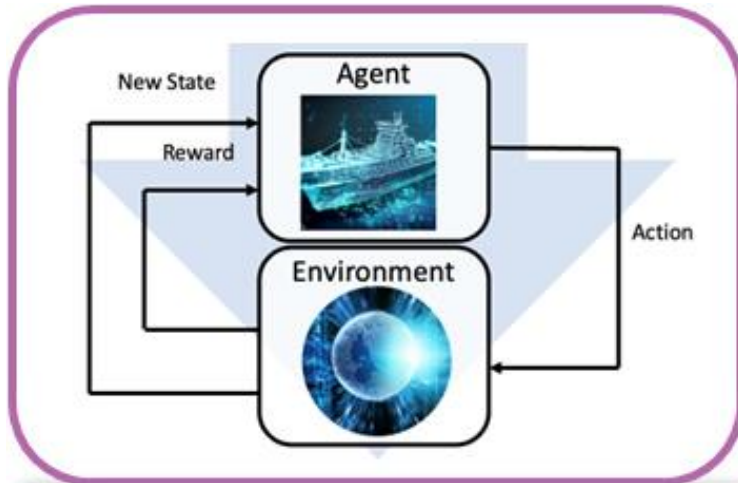


## The hydrodynamic impact of obstacles cannot be neglected



Source : towing tank tests at the medium shallow water towing tank  
part of PhD research Hongwei He, Ghent University

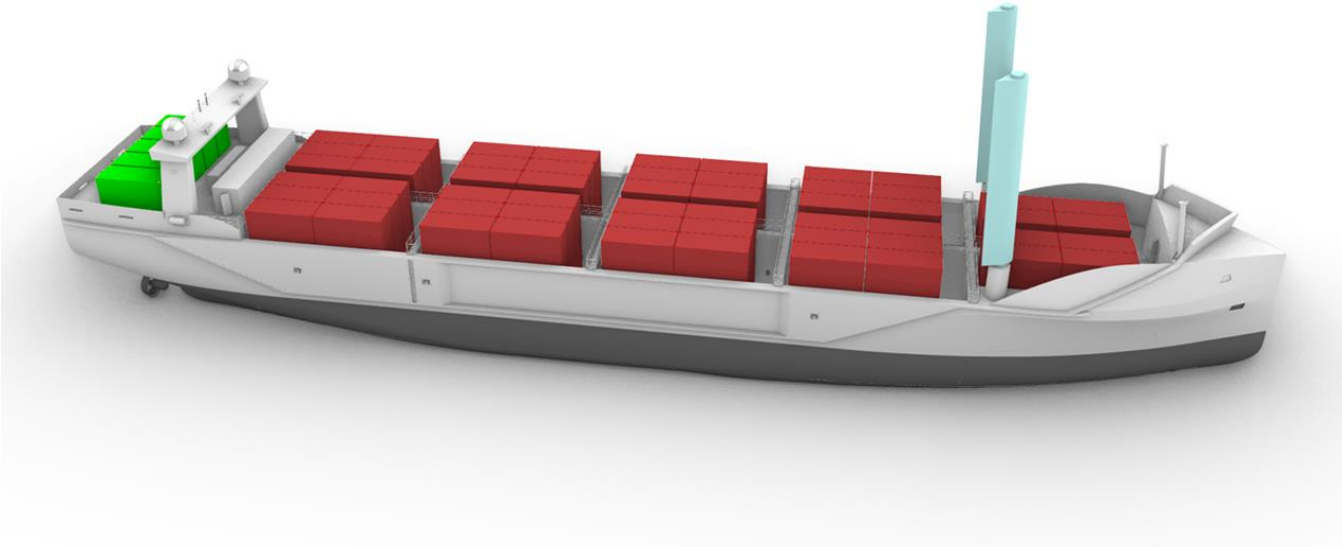
Data driven solutions are sought, but require further investigation



**WP3: Control through model based reinforcement learning**



Smart and green shipping go hand in hand



Source : Zulu Associates







“Flanders Hydraulics is the preferred scientific partner of the Flemish Waterway and coastal authorities, and the port of Antwerp-Bruges.”

**Flanders  
Hydraulics**



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*Thank You*

