Project AVATAR

Last mile innovation through urban highly autonomous & zero-emission inland waterway transport solutions

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QUICK FACTS (I)

- EU **innovation project** on **urban, highly autonomous & zero emission** water-bound cargo transport solutions for last mile distribution
- Funding scheme: **co-financed by the European Union** from the EU Interreg North Sea Region (European Regional Development Fund)
- Project period: May 2020 - June 2023
- Project budget: Total EUR 2,83 million, 50% of which EU (ERDF) funding
- https://northsearegion.eu/

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European Regional Development Fund
Sustainable urban freight transport with autonomous zero-emission vessels
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QUICK FACTS (II)

- **10 project partners from 4 countries** (Netherlands, Germany, Sweden, Belgium): *of which*: 3 universities, 5 SME's & 2 cluster organisations / innovation agencies
- Combined economic, engineering and energy expertise (multidisciplinary approach)
- **A**utonomous **V**essels, cost-effective tr**A**nshipmen**T**, w**A**ste **R**eturn

POM Oost-Vlaanderen
Logistics Initiative Hamburg
KU LEUVEN
Carl von Ossietzky universität Oldenburg
HOUT & BOUW Opleidingscentrum
www.vanwingen.be
TU Delft
SEAFAR
SSPA Your Maritime Solution Partner
URBAN WATERWAY LOGISTICS

WHY URBAN IWT?

MOTIVATION

- Many European cities have a large & branched waterway network (< CEMT I) that was built for and originally used for cargo transport
- Today: Predominantly recreational navigation / use, waterways generally not economically viable for freight distribution → underutilised
- At the same time: road congestion, increasing competition for urban space and need for sustainability in urban commercial transport
- AVATAR project **aims to tackle those challenges by developing, testing and assessing adequate technologies and business models for urban autonomous zero-emission IWT**


Ghent

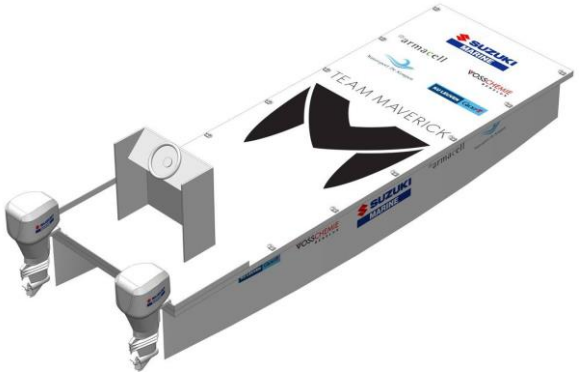

Amsterdam


Hamburg

DEVELOPMENT OF

AUTONOMOUS VESSELS (I)

Source: KU Leuven



- AVATAR develops 2 vessels for pilots in a 3-step approach
- In a **first step**, AVATAR is currently converting an existing 1 ton vessel (“MAVERICK”) and expanding the automation level (0 → 2 to 3) of this vessel in Leuven (Belgium)
- **The MAVERICK test catamaran** from KU Leuven is currently being equipped with perception sensors (LiDAR, stereo cameras, GNSS, IMU), fully electric drive system & onboard computer + PLC

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DEVELOPMENT OF

AUTONOMOUS VESSELS (II)

- In a **second step,** a newly built vessel with a capacity of approx. 25 tons is being developed
- Currently, the aluminum hull is being built in a Dutch shipyard, the fully electric drive system will be integrated in Ghent (Belgium) starting in Q3/2021
- Expected completion: Q2/2022
- For this vessel, the sensor technology and learnings from the Maverick will be scaled up and subsequently implemented onto the new vessel
- SEAFAR will implement their existing technology
- SSPA is experienced in logging and analyzing all movements of the vessel

The AVATAR vessel will be similar to the „Green Wave“ vessel from the #IWTS2.0 project

Source: #IWTS2.0 project

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DEVELOPMENT OF

AUTONOMOUS VESSELS (II)

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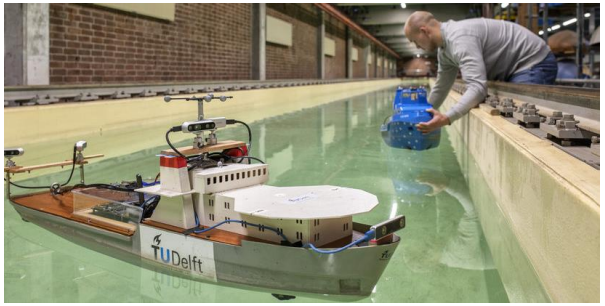
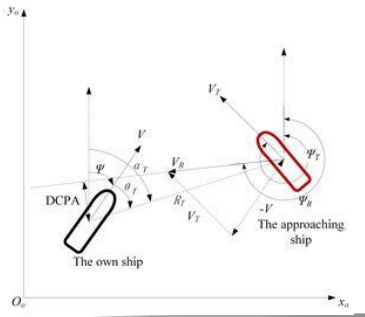
DEVELOPMENT OF

AUTONOMOUS VESSELS (III)

RAS RESEARCHLAB AUTONOMOUS SHIPPING

- In parallel, as a **third pillar**, research on vessel-to-vessel communication & multiple vessel coordination is being carried out with small-scale research vessels developed and equipped at the TU Delft Research Lab for Autonomous Shipping (RAS)
- University of Oldenburg is researching and developing remote control systems (control center, vessel-to-shore communication & communication layer) for the project





Source: TU Delft, University of Oldenburg

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PILOTING AND TESTING THE

AUTONOMOUS VESSELS

- After finalizing the development of the 1 ton Maverick vessel as well as the 25 ton vessel, both **vessels are planned to be tested within several pilot demonstrations** in the project partner regions in 2022/23
- Testing locations for those demonstrations are either already available or are currently being defined in Ghent, Leuven, Delft and Hamburg
- At least 3 pilots will be carried out, depending on the findings of use case development and local interest

USE CASE & BUSINESS CASE DEVELOPMENT

MARKET REVIEW

- Some solutions already exist today, where barges are being used for city freight distribution
- AVATAR has published a market review (30+ cases) on this matter → available online https://northsearegion.eu/avatar/activities/results/
- Currently, AVATAR project partners are identifying and developing use cases for Ghent & Hamburg and assessing the benefits of highly autonomous vessels in terms of economic viability
- **AVATAR invites any stakeholder, public or private, interested in discussing potentials of such transport solutions to get in touch!**

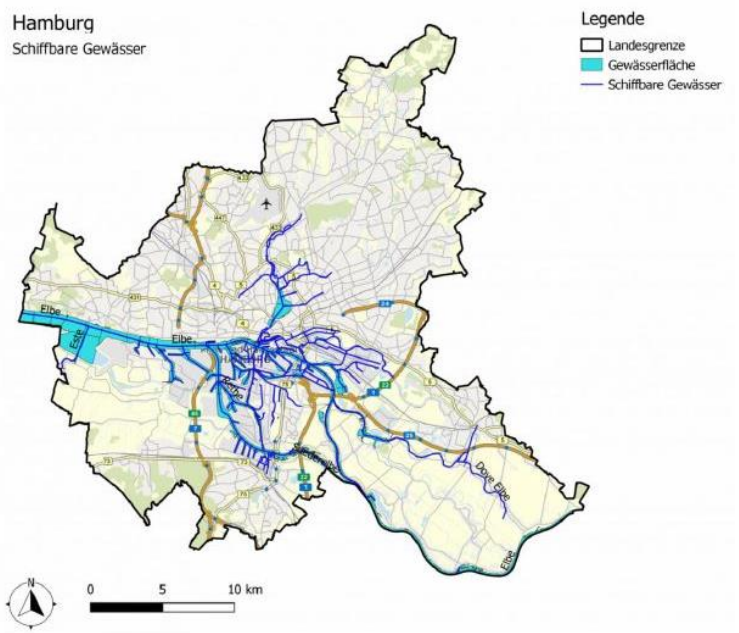
AVATAR is a project co-funded by the Interreg North Sea Region programme 2014-2020

STATUS

HAMBURG USE CASES

WaCaBa Water Cargo Barge

- Logistics Initiative Hamburg and City of Hamburg have partnered for the identification of use cases by creating the “**WaCaBa” concept**
- For this, an in-depth Feasibility Study has been carried out by the researchers from Fraunhofer
- The **study** has been published in 02/2022 and is **available online here**



Source: City of Hamburg

- Workshops & discussions with possible local users have been jointly carried out and led to two use cases that are currently developed into follow-up projects (CEP service providers, retail food & non-food)

STATUS

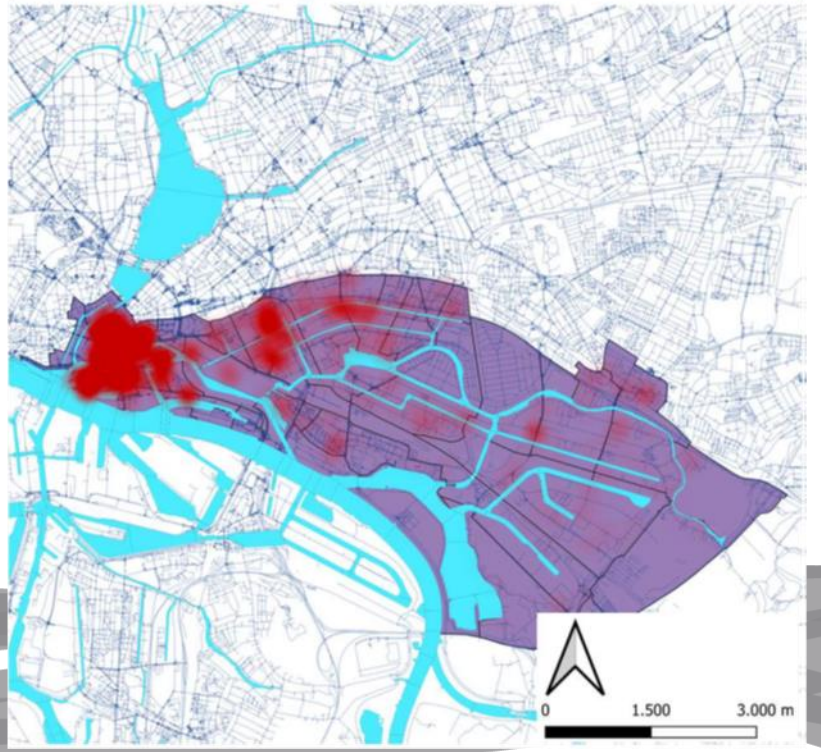
HAMBURG USE CASES

WaCaBa Water Cargo Barge

"WaCaBa" Feasibility study key learnings:

- The technical and legal feasibility could be confirmed, a "reference barge" has been identified with 107 tons respectively 64 tons max. load capacity based on local infrastructure
- The area of Billbrook, Hammerbrook with the City Süd including the tidal canals on the Elbe, the Bille and the Hammerbrook canal system (purple) has been identified as most suitable area of application within Hamburg.

Company density (red) in Billbrook and Hammerbrook (purple)



Source: Fraunhofer, based on Hoppenstedt Firmendatendank, 2021

STATUS

HAMBURG USE CASES

“WaCaBa” Feasibility study key learnings:

WaCaBa Water Cargo Barge

- In terms of economical feasibility the concept as of now shows higher operational costs for the IWT city freight distribution than for truck/van distribution, but also very different specific economic valuations, depending on the transported goods and the relation.
- This means that an economic viability could be achieved for suitable goods on suitable routes in conjunction with corresponding control effects of transport policy (e.g. zero emission zones, truck ban zones).
- In terms of unmanned shipping, there is currently a lack of regulatory framework, not only on local level, but on EU level, which will needs to be addressed in the future.
- CO2 savings have been confirmed for all possible relations and case studies investigated within this study.

STATUS

GHENT USE CASES: TRANSPORT AND ENERGY

- Close alignment with City of Ghent - 2 year exemption permit for a testbed has been approved
- Energy use case: Business case development to **integrate hydrogen powered charging stations** in one or more cases, pilot in preparation for 2023
- Solution: ICE CHP (Internal combustion engine & combined heat and power) system running on H2
  - Opportunity: storing green electricity produced in Ghent during the day to charge electric vessel(s) at night
  - Use of waste heat e.g. in logistics buildings to increase (cost) efficiency
  - Determining location and users of charging station

Source: E. van Wingen

OTHER TOPICS

DESK RESEARCH

- Innovative transhipment techniques
- Last mile distribution
- Open source vessel
- Artificial intelligence and computer vision
- Urban IWT alliance partnership

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NEWSLETTERS

PROJECT NEWSLETTER NO. 1
July 2021

Welcome to the AVATAR Newsletter | First year of project work, first publications | Solar Impulse Effcient Solution Label | Multi-project webinar on autonomous shipping

On our own account: AVATAR Newsletter launched

Picture: AVATAR project

09.07.2021 – The AVATAR project has now been running for about one year and the first results and deliverables have recently been published. To mark this occasion, the AVATAR project consortium is now publishing project newsletters at regular intervals, about three to four times a year, in which the main events, results, progresses made and general topics relating to the project are going to be addressed. You can find this and all subsequent newsletters on the AVATAR website.

Read more here: AVATAR website

Project partner E. Van Wingen awarded with "Solar Impulse Efficient Solution" Label

Picture: Solar Impulse Foundation

02.07.2021 - AVATAR project partner E. Van Wingen has been awarded the "Solar Impulse Efficient Solution" label for its solution of environmentally friendly energy and heat production using an ICE-CHP system. The same system will be used in the future within the AVATAR project to power the vessel currently under construction.

Read more here: LinkedIn & E. Van Wingen website

PROJECT NEWSLETTER NO. 2
November 2021

Welcome to the AVATAR Newsletter No. 2 | New project partners | Presentations and meetings | Learning from each other

On our own account: AVATAR Newsletter No. 2 launched

Picture: AVATAR project

22.11.2021 –The AVATAR project consortium is publishing project newsletters at regular intervals, about three to four times a year, in which the main events, results, progresses made and general topics relating to the project are addressed. In this newsletter, 3 new project partners are welcomed, an overview of presentations and meetings is given and it is shown how project partners align and interact.

Read more here: AVATAR website

AVATAR welcomes 3 new project partners

Picture: AVATAR new project partners

01.09.2021 – AVATAR welcomes 3 new project partners: SEAFAR, SSPA and Urban Waterways Logistics. Welcome on board! Thanks to Interreg North Sea Region, it was possible to extend the current AVATAR project.

In the project extension, focus lies also on innovative transhipment techniques, last-mile distribution, open source vessel, artificial intelligence, computer vision and the creation of an urban IWT alliance partnership. All themes are related to the setup of a market proof foundation of an autonomous fleet.

SEAFAR is a Belgian, innovative independent ship management company, offering services to operate unmanned and crew-reduced vessels for ship owners and shipping companies. SEAFAR develops technology to remotely operate automated vessels for inland and coastal shipping. Introducing SEAFAR represents the possibility to scale up the project by an industrial partner. SEAFAR will test the new AVATAR vessel with their equipment.

GET IN TOUCH

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https://www.linkedin.com/company/avatar-interreg-north-sea-region