POLICY POSITION PAPER

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Interreg North Sea Region AVATAR

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Sustainable urban freight transport with autonomous zero-emission vessels

EUROPEAN UNION

How to foster urban freight transport using waterways?

How can (highly) autonomous zero-emission vessels play a role in that?

In this paper, we have summarized key policy-related findings of the Interreg AVATAR project.

1 | Economic viability of urban freight distribution solutions on waterways are highly dependent on municipal and regional transport policy

The AVATAR project has shown that sustainable city freight distribution on waterways can be economically viable today but remains a challenge, regardless of whether automated ship operations are used or not. However, active management of inner-city accessibility for commercial road traffic is essential for this. Cities in which this accessibility is limited by regulations or infrastructural features, have established urban waterway transport solutions significantly more often.

💡 | *It is not enough to have mobility transition strategies in place. Free accessibility for trucks will always result in high shares of truck deliveries.*

💡 | *Establish active policies for a mobility transition to foster urban IWT[1], such as zero-emission zones, (temporary) access restrictions, inner city tolls or sustainability incentive schemes in your city.*

2 | See the big picture with regard to socio-economic and environmental benefits vs. economic viability

When it comes to socio-economic & environmental benefits created by zero-emission urban IWT, the zero emissions

[1] Inland waterway transport

(avoided GHG & pollutants) are only one aspect of those benefits. In contrast to urban IWT, road freight transport generates significant external costs that have to be borne by society, such as health (noise, accidents & fatalities) and congestion. For example in Hamburg – one of the project partner regions - 20 people died in 2021 due to road traffic accidents. In the same year, total accidents involving trucks increased by 8.4%.[2]

💡 | *Cities and municipalities should ensure that they take external costs into account when assessing the benefits of an urban waterway transport solution.*

💡 | *When and where possible, external costs of a mode of transport should be internalised, especially in commercial transport, e.g. through infrastructure usage fees.* [3] *In no mode of transport does this happen to such a small extent as on the roads.*[4]

3 | Infrastructure needs to be in shape

The decades-long focus on car-oriented cities has led to so-called lock-in effects, which now make it more difficult for alternative modes of transport to establish themselves, for example due to neglected infrastructures (urban canals, quays etc.).[5]

The same is true for last mile distribution via cargo bikes, necessary for many use cases related to urban IWT. When bike lanes are in bad shape or non-existent, this will cause disadvantages for the implementation of use cases.

For (highly) autonomous inland shipping, infrastructure will also have to be adapted accordingly.

💡 | *Sustainable car-independent last mile delivery solutions need sufficient infrastructure maintenance and public investments.*

💡 | *Sufficient and efficient loading and unloading facilities need to be created in cities as part of the public waterways and canal system infrastructure.*

4 | Autonomous (inland) shipping needs a legal framework

Many research and innovation initiatives are being pursued worldwide for the development of autonomous and unmanned ships, from global supply chain context to urban IWT use cases. However, these ships' wider adoption is limited by the existing regulatory framework, which presently does not provide clear guidelines and requirements for the design and operation of

[2] Free and Hanseatic City of Hamburg: Verkehrssicherheitsbilanz 2021, 02/2022
[3] Germany, Umweltbundesamt: Auf dem Weg zu einer nachhaltigen urbanen Mobilität in der Stadt für Morgen, 05/2021
[4] CE Delft, DG MOVE (European Commission): Handbook on the external costs of transport
[5] Research Group DynaMo: THESEN ZUR NACHHALTIGEN MOBILITÄTSWENDE IN STÄDTEN, 09/2021

autonomous ships. Current regulatory barriers that need to be overcome are[6]:

💡 | *Currently, a number of authorities are regulating the operation of the IWT vessels. Existing rules and regulations do not allow for the operation of unmanned vessels on European level as they ex- or implicitly refer to the presence of humans, so adaptations in the regulations are required.*[7]

💡 | *Existing rules and regulations allow testing of unmanned vessels, but within limited scope and area. Wider area testing would require adaptations of the existing regulations, too.*

💡 | *Wider adoption of unmanned IWT vessels would require the development of novel design codes for autonomous ships at national and European level and their continuous update.*[8]

💡 | *Moreover, it is important to assure uniformity between waterways authorities (Belgium for example has different ones) or even countries connected by waterways in regulating autonomous barges. Otherwise, hurdles & costs will raise for ship-owners & discourage them from pursuing businesses with autonomous vessels.*[9]

5 | Liability frameworks need to be revised for autonomous (inland) shipping[10]

As the role of actors will change fundamentally when inland shipping becomes autonomous, the conventional risk distribution or allocation of liabilities amongst the different stakeholders will not be accepted anymore.
The liabilities framework must be ascertained regarding not only shore / remote control centre responsibilities but also all the ecosystem actors, also traditional ones. The application of current rules to autonomous barges may have disruptive consequences in terms of risks and cost inhibiting the introduction of autonomous systems.

💡 | *New definitions of responsibilities are required for the IWT operations and the definition of responsibilities of the Remote Control Centre.*

💡 | *Crucial actors for the deployment and adaption of liability frameworks, such as insurers, need to be involved in automated inland shipping pilots & legal framework adaptions as early as possible.*

[6] World Maritime University (WMU): Regulatory framework analysis for the unmanned inland waterway vessel, Journal of Maritime Affairs, May 2021
[7] More specifically, regulations require the existence of an operator on the vessel for the functions related to navigation, monitoring, emergency and waste management.
[8] R. Negenborn, F. Goerlandt et al: Autonomous ships are on the horizon: here's what we need to know, in: Nature, 27.02.2023
[9] S. Orzechowski (IDIT) & C. Domenighini (University of Antwerp), MSCA EU AUTOBarge project
[10] S. Orzechowski (IDIT) & C. Domenighini (University of Antwerp), MSCA EU AUTOBarge project

6 | Pilots, pilots, pilots

Pilots bring insights. Whether it is technical concepts, their TRL[11], use cases, operational experience or liability and risk distribution frameworks. Only by supporting pilots and living labs, innovative solutions like the AVATAR concept can be adopted in the long run. This is true for both, technical testing as well as economic-operational user tests. Like automation, adaption of such innovations is happening in a multi-stage process. Each level of maturity requires further pilots.

💡 | *Cities & regions need to actively support and encourage pilots on zero-emission urban IWT, if they want them to happen in their city or region.*

💡 | *Cities & regions should facilitate cooperation between shippers of goods in order to stimulate bundling of freight flows (e.g. via a neutral distribution hub). Facilitating cooperation can also be translated in supporting the sharing of company specific shipping data, co-investing in transhipment locations and/or infrastructure.*

💡 | *This should be accompanied by sufficient funding schemes on regional, national or transnational level.*

💡 | *Including co-creation and active involvement of citizens and end users can boost their interest and demand for new solutions, increasing their chances of success and at the same time assuring user-centred solutions.*

💡 | *Best practice: Flanders is a pioneer in legislation and permits for smart shipping pilots, making the legislator the true accelerator for innovation in shipping.*[12]

7 | Leading by example – Cities need to get active with their own use cases

Amongst others, the AVATAR Market Review[13] has shown, that various use cases exist, that are very well fitting for public stakeholders and municipalities to implement use cases themselves. This is either true for public investments like infrastructure works, public buildings or service logistics like waste disposal or return flows.

💡 | *Cities can and should implement their own use cases in order to serve as a role model and thus promote the establishment of zero-emission urban IWT.*

💡 | *Suitable use cases are in particular building material transports, construction site logistics or waste disposal/return flows in the context of public service logistics operations.*

💡 | *In addition, cities/municipalities have the possibility to impose conditions on private construction projects in order to promote the use of such applications (e.g. with quotas).*

[11] Technology Readiness Level
[12] SEAFAR / AVATAR project
[13] AVATAR project: : Market review on city freight distribution using inland waterways, 2021

💡 | *Hint: Mapping existing regional or municipal sustainability and mobility transition strategies (SUMPs etc.) with such regional use cases/pilots on urban IWT can help to learn more about their target contributions to those strategies and also their benefits with regard to external costs of public actions (see point no. 2).*

8 | Bureaucracy and fragmented responsibilities prevent the implementation of innovative solutions

Cities need to give benevolent support and act as enablers instead of brake blocks, especially when it comes to new solutions for which no processes in the regulatory or administrative approval framework are (yet) in place.

💡 | *The mere implementation, administration and control of existing regulations is not sufficient to establish urgently needed innovations.*

💡 | *In particular, the complexity of managing the mobility transition is forcing municipal actors to recalibrate & to readjust their role.*[14]

💡 | *This is where the biggest gap currently exists, as municipal actors only very rarely (want to) act as pioneers and enablers in this field.*

💡 | *In addition, there is an urgent need to establish better coherence and multi-level governance from the EU level down to the municipalities, as the latter are the decisive key to implementation!*

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About the Interreg AVATAR project

AVATAR – Autonomous vessels, cost-effective transhipment, waste return. AVATAR is a project co-funded by the INTERREG North Sea Region Programme 2014 - 2020.

The AVATAR project aims to tackle challenges of city freight distribution by developing, testing and assessing adequate technologies and business models for urban autonomous zero-emission IWT. Through this, the project unlocks the economic potential of urban vessels and corresponding waterways, increases available solutions for full-cycle automation and sets up a sustainable supply chain model for urban goods distribution and waste return. Further information and project news can be found on the project website and LinkedIn

https://northsearegion.eu/avatar

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[14] Research Group DynaMo: THESEN ZUR NACHHALTIGEN MOBILITÄTSWENDE IN STÄDTEN, 09/2021