New Study
„Autonomous Vehicles' Impact on Port Infrastructure Requirements"
- Brief Information -

The Port Planning and Development Committee of the International Association of Ports and Harbors (IAPH) as the worldwide port representation has asked itself what impact the development of highly automated or even autonomous vehicles will have on ports. How should ports, understood as the community of companies and organisations operating in them, prepare for the arrival of automated or autonomous vehicles? What are the infrastructural requirements, what knowledge do port administrations and operators need in order to successfully master the challenges? And how can ports play a crucial role in developing and building an environment for autonomous vehicles?

Answers to these questions and further recommendations are now provided by the study "Autonomous Vehicles' Impact on Port Infrastructure Requirements". The study was financed by the IAPH and the Hamburg Port Authority (HPA). The study was prepared by the Fraunhofer Center for Maritime Logistics and Services CML with the joint support of the HPA and IAPH. The study was presented for the first time at the IAPH Guangzhou 2019 World Ports Conference from 6 to 10 May 2019.

The study provides a comprehensive and critical overview of technology and development of autonomous vehicles in road, rail, air and sea transport. As the analysis shows, not many mature autonomous technologies have yet been developed. There are many open questions, not only about technological development, but also about existing and future infrastructure, IT requirements, cyber security and legislation. Nevertheless, the study recommends that ports develop their own strategies for coping with automation in the coming years.

In the following areas, the study provides indications on how ports can prepare for the coming vessels:

- Infrastructure requirements
- Technological requirements
- Regulatory requirements
- Data protection requirements
- Additional services and business models

While the development of autonomous vehicles is in a development phase, today's recommendations to ports are as follows:

For the road infrastructure:

- Preparation of roads with high quality road surfaces.
- Ensuring high quality of contrast of road markings.
- Provision of further supporting road guidance systems and road boundary markings.

For rail infrastructure:

- Tracking and preparing the technologies used in the main railway network, such as sensors and additional data transmission systems.

For waterborne infrastructure:

- Preparation of land control stations for remote-controlled and autonomous vessels.
- Implementation of powerful data acquisition and data transmission technology systems to support autonomous shipping within vessel traffic services.
- Preparation for the use of auto mooring systems for autonomous ships at the terminals.
- Planning the training of the personnel involved for the upcoming new processes.

For aircraft:

- Preparation of the installation of air corridors for the flight of Unmanned Aerial Vehicles (UAVs) to ensure their safe operation.

With regard to the digital infrastructure, no statement can yet be made today on the question of which systems are necessary and to be installed. As the autonomous systems are not yet fully developed, they need supporting networks or sensors, for example, which could soon be obsolete. Suggested measures may include the following:

- Providing low-latency communication networks such as 5G or wireless standards such as G5.
- Preparation of the handling of public data generated by V2X infrastructures (vehicle-to-everything communication, e.g. with infrastructures, people, other vehicles) in accordance with national and international law.
- Preparation of the data acquisition of HD maps (digital maps with extremely high level of detail for autonomous driving) for the respective port traffic infrastructure.
- Consideration of the expected increasing security requirements of the ports' IT systems.

As far as the legal aspects are concerned, it is proposed to set up regulatory sandboxes. Ports and other involved parties from industry, administration, associations and, if necessary, research could discuss solution approaches in such a forum and virtually test and prototype their implementation. In this way, the legal requirements of the new applications can be tested and valuable inputs for the design of new, collaborative regulations can be collected.

The study can be downloaded as pdf in the member area of the IAPH website.