

# MODULE 4

## WORKSHEET 2: INTEGRATION OF WMS AND TMS WITH IOT AND AI IN HYDROGEN LOGISTICS

### Substantive introduction

Modern logistics transcends traditional warehouse and transportation management. Thanks to advances in technology such as the Internet of Things (IoT) and Artificial Intelligence (AI), WMS and TMS systems are becoming even more intelligent and autonomous.

**The IoT (Internet of Things)** is a network of physical objects (e.g., sensors, vehicles, tanks) equipped with sensors, software, and other technologies that enable them to connect and exchange data with other devices and systems via the internet. In hydrogen logistics, IoT sensors can monitor key tank parameters (pressure, temperature, hydrogen level), vehicle location, and the technical condition of warehouse infrastructure. This data is then transmitted to WMS and TMS systems, providing them with real-time information.

**AI (Artificial Intelligence)** is a field of computer science that focuses on creating machines that can mimic human intelligence. In logistics, AI can be used to analyze large data sets (obtained, for example, from the IoT) to optimize routes, predict demand, detect anomalies, automate decisions, or even manage autonomous transport vehicles. AI algorithms can learn from historical data, improving their predictions and recommendations.

**Integrating IoT and AI with WMS and TMS** in the hydrogen economy opens up new opportunities for safety, efficiency, and sustainability. It enables predictive maintenance, dynamic planning, and real-time process optimization.

## Task: The Role of IoT and AI in Improving Hydrogen Logistics

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**Task objective:** Understanding how IoT and AI technologies can increase the efficiency and security of WMS and TMS systems in hydrogen logistics.

### Instruction:

In groups, based on the above introduction and your own knowledge, answer the following questions:

- Give two examples of IoT sensor applications in a hydrogen warehouse. What data can they collect, and how can they support WMS?
- Give two examples of IoT sensor applications in hydrogen transportation. What data can they collect, and how can they support TMS?
- How can Artificial Intelligence (AI) help optimize hydrogen transport routes based on IoT and TMS data?
- How can AI support hydrogen storage management, for example in the context of predicting demand or detecting potential problems?
- What are the benefits of combining WMS, TMS, IoT and AI for hydrogen supply chain security?

### Tips:

- **Think about** how data collected by IoT can be used to make better decisions through AI.

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