TEACHING MATERIAL GUIDANCE

1) Title of the material

Hasan, U.; Whyte, A.; Al Jassmi, H. A Review of the Transformation of Road Transport Systems: Are We Ready for the Next Step in Artificially Intelligent Sustainable Transport? Appl. Syst. Innov. 2020, 3, 1. https://doi.org/10.3390/asi3010001

https://www.mdpi.com/2571-5577/3/1/1

2) Which section of the SUMP it is relevant to?

The authors presented a review of the state of the current research on the artificially intelligent transportation system (ITS) and autonomous vehicles (AVs) through a critical evaluation of peer-reviewed literature. Therefore, the article can be linked to the second, third and fourth sections of the SUMP circle related respectively to the determination of planning framework, analysis of the mobility situation (in particular the analysis of problems and opportunities for all modes of transport - **subsection 3.2**.), scenario building and joint evaluation (development of scenarios of possible futures - **subsection 4.1**.) and vision and strategy development (arguments for stakeholders – **subsection 5.1**).

3) Which Mobility Manager knowledge this material is the most relevant to?

It is related to Transport and mobility planning (section 1 of the Mobility Manager competencies) especially 1b (employment of ITS/ICT and smart measures).

4) Problem approached and content overview

Problem approach – general understanding of the role of the artificially intelligent transportation system and autonomous vehicles and applying them to city management. The results show that AVs have the potential to reduce emissions per mile by over 80% if powered by alternative energy sources (e.g. natural gas, biofuel, electricity, hydrogen cells, etc.) Not only can private vehicle ownership be reduced through the introduction of ridesharing, but average miles travelled (VMT) should also be reduced through improved public transport. The literature identified travel time, congestion, cost and environmental factors as the main benefits of adopting AVs. The findings revealed barriers such as technological uncertainty, lack of regulation, lack of awareness among stakeholders and privacy and security concerns, and that the lack of simulation and empirical model data from pilot studies limits its application. It was also concluded that autonomous public transport vehicles (AV-PT) are the most sustainable strategy in dense urban areas to transfer trips from private vehicles.

This paper aims to critically review peer-reviewed research in the field of vehicle automation to determine the status of autonomous urban transport, and in particular to ask how driverless vehicles are changing the way we think about artificially intelligent transport systems. The question of smart cities of the future and the technological transformation of urban road systems is also closely related to a sustainability approach

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based on three pillars: cost, environment and social interactions. This study aims to serve as a platform for a pilot exploration study of artificially intelligent sustainable urban transport with Abu Dhabi city as a case study. Twenty-two primary and 79 supplementary studies referred from Google Scholar and ScienceDirect were analysed.

The literature review presented in this article includes the following dimensions of Artificially Intelligent Transport Systems:

- On-Demand Mobility Solutions
- Shared Autonomous Mobility Solutions
- Autonomous Public Bus Transport
- Lane Control, Remote Sensing and Vehicular Guidance System: Vehicle to Infrastructure Communication
- Traffic Congestion and Travel Time Reduction
- Incident Management
- Tackling Problem of Parking

In addition, the article presents issues related to Long-Term Implications (the Question of Urban Development and Sustainability):

- Urbanism and Urban Sprawl
- Cost Implications
- Environmental Implications

Future research directions were also indicated in the paper.

5) Who could be interested in this material?

The article is aimed at students and those looking for inspiration in ITS and AV implementations in Intelligent Transport Systems services when such measures are applied in SUMP.

6) What is worth mentioning as an innovative factor for the reader?

The results of the review show that it is expected that autonomous vehicles could become a reality on public roads in the next thirty years or so. Research on private autonomous cars concluded with a positive forecast for SAV mobility if electric/hybrid autonomous cars are the driving force of the system. The situation of future transport systems is further complicated by the social, environmental, political and, above all, budgetary constraints of transport agencies, making sustainability a major issue.

The results of this review have shown that automated urban public transport can also be a promising alternative to individual travel, where users can subscribe or operate on a pay-as-you-go basis without the need for a driver or companion. The expected benefits of AV-PT are reduced land use, elimination of traffic congestion, low cost of use, less time delay and environmental burden, mobility solutions for elderly and disabled people in the form of efficient and safe transport. The integration of shared mobility solutions with

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automatic gateways and autonomous public transport systems has also been studied to some extent in the literature.

Traffic simulations, analytical reviews and surveys of stated preferences and limited archival data were used to conduct scenario analysis of different AV systems, to scenario analysis of different AV-based PT and ITS strategies in the existing transport literature. However, the review also showed that most of the literature lacks a concise integration of stakeholder engagement, real traction data, cost and emission models and detailed traffic simulation modelling for the lifecycle implications of ITS and AVs in transport.

The results also show that there are technical, technological and political barriers to the practical implementation of large-scale automated public transport. This is further complicated by the fragmentation of the government agencies involved, the distance between research and the spectrum of stakeholders, and divided public opinion. A triple bottom line sustainability approach can be used to determine the long-term impacts of autonomous public transport. Accordingly, this study, which provides a platform to describe the current status and need for a life cycle analysis method for evaluating the application of autonomous rapid public transport, identifies that there may be potential for autonomous bus rapid transit (BRT) services to increase efficiency, energy and fuel savings, as well as safety of urban transport systems. urban transport systems.

7) Limitations

The problem was analysed at a high level of generality. Nevertheless, the presented general conclusions may serve as an inspiration for Polish cities regarding problems that may occur during ITS and AV implementations.

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