TEACHING MATERIAL GUIDANCE

1) Title of the material

Behrendt, F. Cycling the Smart and Sustainable City: Analyzing EC Policy Documents on Internet of Things, Mobility and Transport, and Smart Cities. Sustainability 2019, 11, 763. https://doi.org/10.3390/su11030763

https://www.mdpi.com/2071-1050/11/3/763

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

The authors presented a review of the state of the European Commission (EC) documents on cycling, a sustainable form of urban mobility in the context of smart cities and the Internet of Things (IoT) with relation to the discussion on cars. Therefore, the article can be linked to the third, fourth and fifth 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 Smart Cities idea and Internet of Things in cycling, a sustainable form of urban mobility. Sustainable forms of transport, such as cycling, are a key issue for cities around the world, including smart cities, while transport is increasingly becoming part of the Internet of Things (IoT). This article contributes to the understanding of how cars and bikes are discussed in this context. For this purpose, relevant EC policy documents were identified (2014-2018). The results show that the vast majority of policy discussions in this area revolve around cars (including autonomous cars and smart vehicles), while cycling is barely considered, with a strong affinity between IoT and cars. Furthermore, recent EC policy debates revolve more around IoT than around Smart Cities, while sustainability is not much considered in the context of IoT. The conclusion highlights the consequences of the absence of sustainable urban transport modes, such as cycling, in the IoT/Smart Cities debates, including lack of policy visibility and funding opportunities, and provides policy suggestions to address these issues and future research.

The focus on the European Commission allows analysis of policies that are relevant to 28 countries but represents a Western and European perspective. All policy documents selected for this article are listed in the 'Reports and Studies' section of the European

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Commission website. The period covered is January 2014 to June 2018, to cover the period when all search terms were relevant, to include contemporary articles, but also to cover four years, and to provide enough documents for analysis. Three topics relevant to this article - smart cities, transport and mobility, and the internet of things - were used for the document search.

The results focus on how often selected documents to mention the keywords related to cycling, vehicles and automotive vehicles, Smart City, IoT, transport and mobility as well as sustainability. The author explores how mentions of bicycles and cars compare in the context of Smart Cities and IoT. The paper contains also a more detailed analysis of twelve documents to show how these patterns play out in examples from the documents.

5) Who could be interested in this material?

The article is aimed at students and those looking for inspiration in implementations in Intelligent Transport Systems services, Smart Cities and IoT solutions when such measures are applied in SUMP.

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

The results show that in the 39 relevant EC policy documents for 2014-2018, cars are discussed very often, while cycling is almost not mentioned. Furthermore, there is a strong link between cars and "IoT"/"Smart Cities", while considerations of cycling concerning "IoT"/"Smart Cities" are almost absent.

These results illustrate that discussing smart mobility with a strong focus on cars, without any mention of cycling, is a common theme in many documents. In most documents, mobility is equated with the automotive industry and "mobility" is confused with "automobility". A common theme in IoT discussions is the use of cars as IoT examples and use cases and definitions, and in only one document is the bicycle mentioned as part of an IoT case study (e.g. GPS tracking and smart locks). Discussions of connected and autonomous vehicles concerning collisions (and their recording) with cyclists is another topic where cycling is addressed. This is an important discussion about making vehicles 'smarter' to avoid injury and death to cyclists, but there is a lack of consideration of 'smarter' bikes.

On the rare occasions when cycling is mentioned in the context of IoT or intelligent transport elements, mainly shared or public bike systems are noted, while discussions of cars mainly cover individual use and only some shared use.

The question posed in one of the papers treats bicycles as a potential threat to innovation related to connected vehicles, rather than as an opportunity for innovation in itself - as "smart cars" are treated. The only paper on cycling (and walking) does not mention 'IoT' or 'Smart Cities', although it does discuss data. This exemplifies how little is said about IoT and Smart City in the context of cycling, and the rather clear divide between documents on cycling and those on IoT/smart elements and cars. This conclusion from policy documents combines with the way cycling is treated in much of the academic literature

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on it, where it is also largely seen as an 'off-grid mode of transport, and with academic visions of smart and green mobility, which are also often very car-centric, as well as IoT-related work such as a recent paper on Smart Cities and IoT, which also uses car-centric examples for transport.

This shows how automobility, "a self-organising autopoietic, non-linear system that spreads across the globe and includes cars, car drivers, roads, oil supply and a host of new objects, technologies and signs" is entering the 'smart' era, and this article contributes to the critical literature on automobility, especially to emerging work in mobility studies on 'smart' mobility. Furthermore, it contributes to digital culture studies, where 'smart' and 'IoT' elements are discussed, but transport and mobility are rarely considered.

The results show how further research on cycling in the context of the smart internet and IoT is urgently needed to build on work emerging from academia, industry and the third sector to create a more meaningful research area that resonates with the current car-focused perspective.

The discussion of the results provides a counterpoint to the current focus on 'autonomous cars' in the discussion of smart urban mobility. The comparison of cars to bikes poses a critical challenge to the current continuation of car culture in policy documents. This is important because increasingly only those modes of transport/mobility that are smart and use data are 'visible' in socio-economic and political contexts. This poses a new challenge for sustainable transport modes such as cycling. If they are not discussed in the context of smart technologies such as IoT, they are not visible in policy and are less likely to receive related funding. This paper, therefore, suggests that sustainable transport modes such as cycling should be more consistently and centrally addressed in documents on the Internet of Things, smart cities, connected vehicles and intelligent transport systems, smart cities, connected vehicles and (smart) transport.

7) Limitations

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