TEACHING MATERIAL GUIDANCE

1) Title of the material

Blitz, A.; Lanzendorf, M. Mobility design as a means of promoting non-motorised travel behaviour? A literature review of concepts and findings on design functions. J. Transp. Geogr. 2020, 87, 102778, doi:10.1016/j.jtrangeo.2020.102778.

https://www.sciencedirect.com/science/article/pii/S0966692319306866

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

The authors presented a review of the literature related to mobility management (factors that allow promoting non-motorised travel). Therefore, the article can be linked to the second, third, fourth, fifth and sixth 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.), vision and strategy development (arguments for stakeholders – subsection 5.1) and setting targets and indicators (setting indicators for all targets - **subsection 6.1.**).

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

It is related to urban and spatial planning (section 3 of the Mobility Manager competencies). The report has also a direct reference to Section 1, especially 1c (understanding of travel behaviour) and 1e (Evaluation of transport measures).

4) Problem approached and content overview

Problem approach – general understanding of mobility design from different perspectives. This paper presents an analysis of recent findings on the impact of mobility design on non-motorised travel behaviour in urban environments, discussed from a design theory perspective. In contrast to previous reviews, the authors have analysed which of the three functions of design (practical, aesthetic or emblematic function) are taken into account and which corresponding effects can be studied. The authors refer to the results of empirical studies, assigning the design elements involved in each function. For each study, the considered functions of the design elements have been analysed in detail, as well as the relevant study method, data information, dependent variables and observed results.

The research results collected by the authors of this paper include findings on elements of mobility design that, according to the respective authors, encourage more non-motorised travel. The results are based on a variety of research methods and include both quantitative (e.g. statistical models) and qualitative analyses. The methods for investigating the elements of mobility design included in the research are described by three different categories. Studies assigned to the category "respondent observations"

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derive their data on the presence and characteristics of design elements directly from the study participants (e.g. by asking them which design elements surround or influence them). "Author observations" refer to design elements observed by the authors (e.g. by mapping the elements of the built environment in a particular neighbourhood). Studies assigned to "secondary data" contain information about design elements based on georeferenced parcel data, census data, or photographic records that were not obtained from study participants or observed by the authors.

Four main types of mobility design elements included in the study were identified: (i) land use, (ii) street network, (iii) pedestrian and cycling facilities and (iv) public space qualities. To identify and distinguish the included design functions, it was examined how the effects of the included design elements were evaluated in the respective study: in terms of travel effort, aesthetic perception or evoked associations. Assessments of the effect of mobility design on travel efforts, such as measurements related to travel distances or route directness, were assigned to the practical function. These specifically include evaluations of factors discussed in the usability theory studies. Studies relating to the influence of aesthetic features on walking and cycling, e.g. investigating the feelings evoked by the surrounding architecture of buildings, have been assigned to the aesthetic function. Studies on travel behaviour influencing the associations evoked by elements of mobility design, for example, the influence of associations with insecurity, have been assigned to the emblematic function. The selection also includes studies covering several functions simultaneously. From a mobility design perspective, the review findings highlight a gap in comprehensive research on the effects of the aesthetic and emblematic functions of the built environment. The review shows the multiplicity of factors influencing the choice of transport mode and the modal split of travel.

5) Who could be interested in this material?

This article is addressed to students and those looking for a well-structured and concise introduction to transport infrastructure and mobility management (in terms of the influence of many factors on modal split) and the factors influencing an environmentally friendly modal split. Students specialising in public transport and cycling may be interested in broadening their view of urban mobility as a complex system with many actors and factors. The article contains many references to scientific literature in the mobility management research area. Design features provide a better understanding of the interaction of the built environment with cognitive processes and individual decision-making. In this way, the approach can guide further research into the impact of the built environment on non-motorised travel.

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

The presented typology of reviewing the elements of mobility design provides a good overview of the object of research and facilitates the identification and systematic discussion of the design functions identified by the authors. The analysis of selected studies concerning mobility design and its impact on non-motorised travel behaviour provides some key insights into the causal relationships of certain factors and the impact

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of design on human behaviour in general. Gaps in the research presented can be identified. These include (i) the choice of design types and functions assessed, (ii) the method of data collection, (iii) the comparability of results, (iv) the regions studied and (v) the influence of other influencing factors.

This paper aimed to contribute to this stream of research by combining a mobility design perspective with 'built environment and travel behaviour' research beyond traditional utility theory. The authors of the article provided new insights by discussing the three main functions of mobility design for promoting non-motorised travel: the practice includes making walking and cycling possible, easy and safe; the aesthetic contributes to the perceived attractiveness and appeal of a place; the emblematic evoke symbolic associations or provides signs for interaction with the environment. An analysis of 56 recent studies showed that studies of travel behaviour focus on the practical function: the proximity of destinations resulting from the distribution, density and variety of land uses; the directness, consistency and variability of routes depending on the layout of the street network; the presence of dedicated facilities for walking and cycling; and the provision of microproject elements to facilitate travel (e.g. benches, lighting). Less attention was paid to the aesthetic function in the studies, although the positive impact of greenery, high visual connectivity and attractiveness of urban space are mentioned. Finally, the findings on the impact of the emblematic function of the project were very limited. Only associations of the built environment with safety and walkability are mentioned, as well as the presence of traffic lights and road signs.

The article includes a description of factors and indicators useful for evaluating proposed improvements to the transport system. The proposed indicators may also be useful in monitoring the effects of measures planned or implemented as part of the SUMP. The article contains many references to the scientific literature on the impact of the built environment on the efficiency of the transport system in an urban environment. These references may be useful in the framework of projects and theses being developed.

7) Limitations

Most of the studies presented in the literature review refer only to the practical effects of design elements (39 out of 56), mainly examined based on objective features of land use and street networks, or the presence of pedestrian and cycling facilities. Consideration is therefore given primarily to the impact of design on traditional utility theory factors such as travel distances and required travel time. Less attention is paid to aesthetic and symbolic functions. These are represented only by a small number of variables, partly captured by a direct enquiry about subjective impressions. Thus, the results of interactions related to emotions or symbolic associations are very limited. The idea of "human-centred design" creating liveable and attractive spaces and the hypothetical influence of the quality of open space, architecture and micro-project elements on individual behaviour, especially these functions require further research and new methodological approaches. Another reason may be related to data collection challenges. As aesthetic or symbolic evaluations may vary from person to person and are

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based on the combined influence of different features, partly on a small scale, more sophisticated research methods are required. However, most studies include information about the built environment by reference to secondary georeferenced data obtained from external sources, e.g. census data or parcel data that have been processed using GIS software. Mainly correlations of these data with travel behaviour data are analysed using statistical methods (e.g. regression) to conclude the impact of design elements. Partial use was made of aerial photography and satellite imagery as well as the authors' on-site observations. To provide data that also includes aesthetic or emblematic qualities, an interview survey approach seems appropriate, as it identifies subjective perceptions rather than objective characteristics. Furthermore, the papers deal with urban spaces in different regions of western society. All these regions differ in their historical development and dependence on pathways, which is also reflected in the mobility planning of their cities and the built environment, particularly manifested in the architecture and structure of the street network. Therefore, studies in different regions may reveal different results. Finally, it is important to bear in mind that beyond the functions of mobility design, other factors influence non-motorised travel behaviour. For example, physical limitations may hinder active travel or low income may prevent people from buying a car, forcing them to walk or cycle. Also, non-building factors that define the urban environment and mobility culture must be taken into account. These include urban regulations, policies, discourses, social environments and norms as well as individual preferences and attitudes, for example, related to different modes of transport or environmental issues. Other research shortcomings identified include the use of inappropriate data, difficult comparability due to varying characteristics of the sample and dependent variables, as well as the influence of unbuilt influential factors. To assess the impact of mobility design on travel behaviour, techniques are needed to detect relevant elements and to capture individual perceptions and actions. It seems useful not only to rely on census data or parcel data but to involve other methods such as photo analysis. These methods also include some techniques not mentioned in the selected studies, for example, wearable cameras and sensors capturing point-of-view impressions and LIDAR detecting spatial structures with laser sensors. Certainly, further research is needed in an efficient way to detect feature interactions. Comparable methods and test elements are needed. Furthermore, the interaction of mobility design functions with individual attitudes and needs, reasons (e.g. self-selection of residence) and non-physical features of the environment (e.g. regulations and policies, social norms or discourses) must be taken into account. They also include mobility services that are related to encouraging sustainable travel, such as sharing systems and apps that facilitate seamless mobility. Limitations of this review relate to the selection of included studies. The inclusion of additional search terms, as well as a wider evaluation period, would have resulted in a greater number of matches, allowing for a more comprehensive look at the design elements and functions considered to date. Furthermore, specific searches for design element detection techniques or demand models analysing behavioural impacts could reveal further implications for possible methodologies. Another limitation of this review is related to the comparability of study results due to the omission of relevant

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effect size values. Consequently, it is not possible to determine which elements are more effective concerning the promotion of non-motorised travel. The reason for this is the variety of methods used in the selected studies, which do not always provide statistically significant values, in particular qualitative survey data. However, such precise effect sizes are interesting, especially in the context of implementing design elements and interventions. They are therefore an important issue for further research.

Nevertheless, the approach to the topic and the indicators and factors considered, as well as the references to scientific literature, are a valuable source of inspiration for preparing SUMPs or for research on the impact of different factors on modal shift.

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