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Special issue: built environment and travel behaviour

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The current special issue has been inspired by a selection of papers presented at the World conference of transport research (WCTR), held in Rio de Janeiro, Brazil in July 2013. Selected papers focus on relations between the built environment and travel behaviour. The contributions complement each other as they come from different geographical origins, apply different methodological approaches and address travel behaviour with a focus on a variety in transportation modes. Together they address various interesting and subtle relationships between infrastructure and the built environment and the one hand and travel behaviour (mostly mode choice) on the other hand.

The effect of the built environment on travel behaviour has been widely acknowledged and studied (e.g. Zhang et al., 2012; Handy et al., 2005; Cervero & Kockelman, 1997; Hong et al., 2014; Saelens et al., 2003). This relationship is addressed at different spatial levels – micro (street and immediate surroundings), meso, and macro (municipality characteristics or larger) level. The selection of the level of the spatial characteristics is often compromised by data availability, and the levels of the spatial data differ even within one study (Hong et al., 2014). Travel behaviour can also be studied at various levels - the level of an individual or on an aggregated level, such as cities or countries.

Numerous studies have shown that people living in neighbourhoods with higher density and with higher land-use mixture tend to walk more and drive less than do residents of low-density, low mixture of land-use neighbourhoods (e.g. Duncan et al., 2010; Frank et al., 2006). On a meso/macro spatial level the effect of the street network (e.g. connectivity) have been less clear (Leck, 2006), but some research shows that better connectivity corresponds with higher levels of cycling and walking (e.g. Cervero et al., 2009) and a reduction of the amount of vehicle miles travelled (Ewing & Cervero, 2010). Other research supports the idea that individuals residing in more attractive neighbourhoods are more likely to walk (Michael et al., 2006) and that living closer to 'formal parks' increases the likelihood of having more physical activity (Coombes et al., 2010), however the evidence of these characteristics of attractiveness on travel behaviour is sparse.

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While most studies discussed so far all appear to suggest that the built environment influences travel behaviour, this direct causal connection is still questioned. The research design and data used in many of those papers are often not suitable to test causality. The data are often cross-sectional and the direction of the relationship could therefore be in both directions. Also several variables have remained untested. Moreover, other variables may be associated with both the behaviour and built environment (confounding variables). Therefore, alternative explanations could in some cases explain the reported association. One aspect has received much attention in this debate on the relationship between the built environment and travel behaviour: residential self-selection– the idea that individuals/households select a residential area based on (transport mode) preferences (Mokhtarian & Cao, 2008; Cao et al., 2009; Næss, 2009). This line of research assumes that the individual transport preferences affect both the choice of residential location and mode choice, e.g. someone with a strong preference for travelling by public transit being more likely to select a residential location with good public transport facilities nearby. Because of these shared determinants (preferences of modes) the reported association between the built environment and travel behaviour could possibly (at least partly) be a result of these shared determinants. Numerous studies have addressed this complex relationship directly and many studies control for self-selecting by various methodologies: 'direct questioning, statistical control, instrumental variables models, sample selection models, propensity score, joint discrete choice models, structural equations models, mutually-dependent discrete choice models, and longitudinal designs' (Cao et al., 2009). A mismatch between the preferred neighborhood and preferred mode of travel has been found to be another potential threat for determining the relationship between the built environment and travel behavior. Schwanen and Mokhtarian (2005a and 2005b) found that one aspect of self-selection is the resident's preference for a neighborhood types and the degree of dissonance; people with preferences for urban environments travel less by car than people with preference for suburban environments while people with suburban attitudes travel more by vehicle in both urban and suburban environments. What is not known is how stable these choices are over time. In other words, are there limits on self-selection? Do individual adjust to their residential neighborhood over time? Individuals may still travel with a certain mode of transport despite the environment not supporting it – which complicates distinguishing the separate effects of the built environment and individual preferences. In addition to the issues of determining causality several other gaps in our knowledge are present. One cause of this may be the unequal attention devoted to the different travel modes and the consequently larger gaps in our knowledge regarding less researched modes. Car and public transport mode choice and motorized distance travelled have historically received more scientific attention than active transport/non-motorized transport. This emphasis is amplified as a result of a research focus on the main mode of transport of a trip, ignoring the legs made by other (access) modes.

The papers in this special issue all individually contribute to this debate by addressing specific issues of the relationship between the built environment and travel behaviour. Olaru and Curtis compare the effect of accessibility of railways on the change in travel behaviour patterns over time. By comparing three differently developed areas in the proximity of public transport stops they try to determine the spatial characteristics that contribute to a modal shift from motorized transport to active or public transport. They report that walking and cycling to shops and recreation spaces is determined by comfort and convenience of pedestrian facilities and the distance to them, whereas public transport use is determined by the presence of benches and shelters, along with more frequent bus services to shops and schools. Better accessibility to non-residential activities and improved quality of transport infrastructure is associated with a reduction in of car-based travel of the residents of that area, consistent with the concept of transit-oriented development (TOD). Also La Paix Puello and Geurs focus on railways, and address the role of relatively intangible factors such as perceptions and attitudes on the mode choice to a

train station in a Dutch context, together with the facilities at train stations. They conclude that both attitudes and observable travel-related elements are important in the decision whether or not to cycle to the station. The role of intrinsic evaluations is also addressed by Parady et al. in their paper 'On the effect of the built environment and preferences on non-work travel: Evidence from Japan'. They investigate the relations between preferences and the built environment on non-work trip frequency in Japan. Their results indicate an association the built environment and non-work trip frequency: higher population density was associated with lower car trip frequencies and higher frequencies by public transport. The effect of variables on preference were modest, however. These last two studies thus try to capture intrinsic evaluation of the environment and control for this while determining the effect of the built environment. Kamruzzaman et al. approaches the relationship differently by looking at residential dissonance- the mismatch in land use patterns between individuals' preferred neighbourhood type and the type of neighbourhood where they actually reside. This paper investigates whether dissonance results in a difference in travel behaviour in Australia, and evaluates whether individuals with a dissonant preference adjust their attitudes and consequently, travel behaviour over a two year period. Their findings suggest that preferences regarding transport are more important than the built environmental factors on mode choice. The last contribution, from Block-Schachter and Zhao on 'Hysteresis & Urban Rail' starts from a different angle and takes an historic approach. They address whether past access to rail still affects travel behaviour, by studying the long-term effect of rail infrastructure on urban land-use in Northern America. They conclude that past rail access continues to reverberate in current residential location and travel behaviour, particularly this access results in higher density and lower levels of auto ownership.

The current issue features research findings from over the world: Japan, Australia, the Netherlands and the United States of America; This geographical variation contributes to an understanding of the relationship between land use and travel behaviour. Differences in findings between locations could indicate location-specific determinants or may provide evidence for the existence of confounders or effect-modifiers. If the results have limited variation between locations this could indicate a universal relationship between land-use and travel behaviour. The findings in this special issue mostly support the latter argument as the evidence presented is not in contrast with existing world-wide research findings. However, to confirm a causal effect of the built environment on travel behaviour, research in and within different continents should be directed towards longitudinal analysis on the same individuals, incorporating the dynamics in cofounding variables.

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