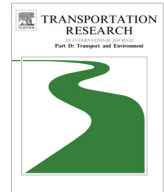




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Influence of housing development designs on household vehicle miles traveled: A case of Iskandar Malaysia

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ABSTRACT

Demand for housing in Malaysia grew noticeably in 1960s and expanded rapidly in the late 1980s and beyond as a result of rapid urbanization. The same scenario repeats itself in Iskandar Malaysia, a southern development corridor located in Johor, Malaysia where close to three hundred housing developments have been launched from pre-1980s to 2000s. These housing developments are believed to have undergone a layout design evolution affecting land use distribution, road network design, density and many other neighborhood metrics. Thus, this study investigates the impact of housing development designs on vehicle miles traveled (VMT) as they evolve over the decades. Evolution in layout design is discussed in terms of the 4Ds of urban form factors: density, diversity, design (street connectivity and intersection density) and destination accessibility (proximity). Twenty four housing areas developed within decades of pre-1980s to the 2000s were selected and travel diaries of their randomly selected households were recorded. The results obtained show that urban form and demographic factors explain almost 87% of the variances in household VMT and the three main design factors influencing VMT are housing density, proximity index (destination accessibility) and diversity index. The findings of the study show that there is a decreasing trend in density, (land use) diversity, connectivity and destination accessibility of the housing areas. While the results obtained confirm the prevalent theory on the relationship between neighborhood design and VMT, unfortunately for the study area the average VMT has been increasing with the recent housing areas.

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Introduction

Demand for houses in Malaysia started to grow noticeably in 1960s (Yusof, 2007) and expanded rapidly in the late 1980s as a result of rapid urbanization (Ithnin, 2006). Rapid urbanization has also reached Iskandar Malaysia, a southern development corridor located in Johor, Malaysia where more than three hundred housing areas or subdivisions have been developed from 1960s to 2000s. Over the decades, steady growth in housing development brings with it the inevitable changes in the layout and physical design of a typical neighborhood. Kassim (2012) for example, found that mixed-use development as a type of developments has been on the decrease while exclusively-zoned single-use neighborhoods are on the increase. On the decrease too are close proximity of houses to commercial centers and the connectivity indices of neighborhoods

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(Aziz, 2012; Rusman, 2012). These changes in built environment tend to reduce walkability and encourage more automobile use by residents, i.e. higher VMT. VMT represents the number of miles (or kilometers) driven by individual or household. It is partially influenced by factors such as household size, age distribution, as well as the number of vehicles per household. However, the greatest factor by far is how built environment (land uses and urban form) are arranged and developed. Nonetheless, more and more neighborhoods are designed with non-grid street pattern and low land use diversity, making the effort to reduce VMT ever more difficult. Therefore, the main objective of this study is to investigate how changing designs of housing development in Iskandar Malaysia over the decades have influenced household VMT. The changing designs are described in terms of quantifiable characteristics including size of housing development, distance to commercial zone, density, land use diversity, etc.

Vehicle miles traveled

VMT refers to the total miles traveled by vehicles and is influenced by travel behavior as well as travel demand. Travel is meanwhile influenced by many factors including socio-economic characteristic of the travelers, characteristic of the transportation system and other factors relating to culture, economic conditions and public policy (Polzin, 2007). Fig. 1 below illustrates conceptually major VMT growth drivers. The context factors are broader societal conditions that influence travel while the indirect factors are more specific conditions known to influence travel. The indirect factors are divided into three major categories, which are (1) socio-economic conditions, (2) land use conditions, and (3) transportation system conditions. VMT is also influenced by direct factors such as trip rates, trip length and mode selection.

Several researchers have identified the effects of various urban forms on VMT, including Ewing et al. (2001), Miller and Ibrahim (1998) and McCormack and Rutherford (2001). Land-use patterns are one aspect of urban form, which also encompasses characteristics of the link between urban form and travel behavior. Urban form is thus a composite of a multitude of characteristics. Fig. 1 in general indicates that socio-economic conditions will generate the demand for activities and the ability to afford and encourage travel. Land use pattern and performance of the transportation system, in turn, affect how that demand translates into specific demand for travel to various locations at various times via specific modes i.e. car, walking, cycling, or even by public transport.

Although many factors have been known to have influences on VMT and travel behavior, this paper focuses specifically on the urban form factors known as the Ds factor. They are density, diversity, and design (Cervero and Kockelman, 1997) as well as destination accessibility and distance to transit (Ewing and Cervero, 2001; Ewing et al., 2009).

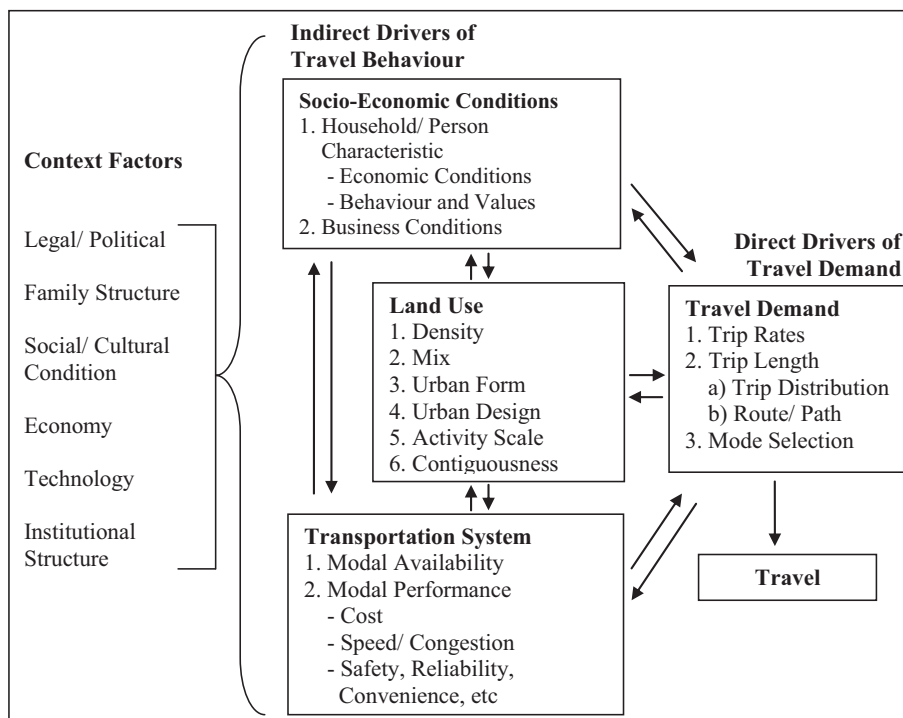


Fig. 1. Conceptual model of VMT growth drivers. Source: CUTR Conceptualization of VMT Growth Drivers.

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