Transport Policy 26 (2013) 54–65

Contents lists available at SciVerse ScienceDirect

Transport Policy

journal homepage: www.elsevier.com/locate/tranpol

The influence of neighbourhood design on travel behaviour: Empirical evidence from North East England

Paulus Teguh Aditjandra [a,*], Corinne Mulley [b], John D. Nelson [c]

[a] NewRail-Centre for Railway Research, School of Mechanical and Systems Engineering, Newcastle University, Stephenson Building, Claremont Road, Newcastle upon-Tyne NE1 7RU, United Kingdom
[b] Institute of Transport and Logistics Studies (ITLS), University of Sydney Business School, Newton Campus, 144 Burren Street, C37, The University of Sydney, NSW 2006, Australia
[c] Centre for Transport Research, College of Physical Sciences, University of Aberdeen, Fraser Noble Building, Aberdeen AB24 3UE, United Kingdom

ARTICLE INFO

Available online 22 June 2012

Keywords:
Neighbourhood design
Land-use
Travel attitudes
Multi-variate analysis

ABSTRACT

This paper investigates the factors that affect travel behaviour within neighbourhoods in Tyne and Wear, North East England while accounting for differences in attitudes and perceptions. Ten different neighbourhoods have been carefully selected to characterise the two different types of traditional and suburban neighbourhood street layouts. A self-administered questionnaire has been delivered to 2200 households to capture neighbourhood design, travel patterns, travel attitudes and socio-economic characteristics. Multivariate analysis of cross-sectional data shows that some socio-economic variables as well as travel attitudes and neighbourhood design preferences can explain the differences in travel patterns between the two distinct neighbourhood designs. The results show additionally that the traditional neighbourhood group is more sensitive to factors of perception and attitudes in relation to neighbourhood design that lead to walking, cycling and public transport use travel patterns, suggesting that land-use policy designed to accommodate lower carbon-based travel together with measures to encourage active travel will have greater impact on the traditional group than the suburban group. This finding suggests that generic measures imposed by many governments, and certainly implied by current UK land-use policy, to promote sustainable mobility should be selectively targeted.

1. Introduction

Suburban living is often blamed for causing increasing dependence on the car. An alternative planning approach to halt sprawl and improve urban liveability has been associated with the compact city movement, particularly in Europe. Sustainable urban development, within a holistic planning approach, needs to consider the transport aspects and, in particular, to understand the evidence as to whether sustainable urban development can improve the quality of life by not simply reducing overall car travel but by promoting walking, cycling and more public transport use. In the "compact city" approach, the intention is to bring activities closer to residents so that they can fulfill their needs and, because the distances are smaller, this allows slower modes (walking and cycling) and public transport to play a bigger role in their travel alternatives. However, it should be acknowledged that the term compact city is to many more than just a travel-related issue: it extends to consideration of the wider regional aspects including issues surrounding the conservation of the countryside, more efficient utility and infrastructure provision and the revitalisation and regeneration of inner urban areas (Howley et al., 2009). The compact city model has attracted criticism especially in relation to its links with high density urban development which some argue can be achieved only at the expense of people's quality of life (Neuman, 2005).

Extensive studies from the US show that land-use has only a small impact on travel behaviour (Handy, 1996; Badoe and Miller, 2000; Boarnet and Crane, 2001; Cervero, 2002). These findings also echo early European studies (see for example: Stead (2001), Dieleman et al. (2002), Naess and Jensen (2004)). More recent studies find that there are other factors, such as socio-economic characteristics, individual attitudes/preferences, and residential self-selection, which contribute to a causal relationship between land-use and travel behaviour change (Handy et al., 2005; Naess, 2006; Cao et al., 2007, 2009; Hickman et al., 2010). Despite limited evidence as to the cause, the US Environmental Planning Agency (EPA) acknowledges that the smart growth strategies reflecting the 'New Urbanism' approach can be an effective tool for improving air quality as cited in Handy et al. (2005).

The UK White Paper "Planning for a Sustainable Future" (HM Government, 2007), embedding the findings of recent UK reports from Eddington (2006) on transport, Barker (2006) on land-use planning and Stern (2006) on the economics of climate change represents an attempt to influence the future direction of different types of sustainable development. On one hand, the transport and land-use reports prioritise the future in terms of a sustainable

* Corresponding author. Tel.: +44 191 2225997.
E-mail address: paulus.aditjandra@ncl.ac.uk (P.T. Aditjandra).

0967-070X/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.tranpol.2012.05.011

economy while, on the other hand, the climate change report advocates that greenhouse gas emissions, including CO_2 pollution, must be addressed to avoid major environmental consequences in the future. Breheny (1993), in one of the earliest UK studies searching for the appropriate urban form within the sustainable city paradigm suggested that urban regions designed and managed to minimise resource use and pollution could be a major contribution to relieve global environmental problems. That said, in anticipating increases of CO_2 emissions, transport and land-use planning have to be more sensitive to the built environment characteristics if these characteristics are demonstrated to contribute to the resulting travel pattern. This is interpreted by many planners, particularly in Europe, as a cue to adopt urban compaction policies as the counter strategy to urban decentralisation and inner-city decline; thereby reducing the need to travel and creating quality neighbourhoods in cities to maintain and promote communities (Banister, 1997).

This paper reports the analysis of British evidence of the relationships between urban form and travel behaviour in the context of selected communities in the North East of England. Tyne and Wear was chosen because this metropolitan area is typical of a medium sized British city and thus can provide evidence that may transfer to other similar areas. The study examines the role of neighbourhood design in influencing peoples' travel and discusses the relationships revealed between dimensions involved in the transport/land-use interaction. The paper provides an understanding of these interrelated issues and an evidence base of how planning can contribute to a long-term goal of sustainable communities. This paper adds to the analysis of previous publications (See for example: Aditjandra et al. (2007, 2009a, b, 2012)) by bringing new insights to differences underlying the travel behaviour of 'traditional' and 'suburban' residents based on an innovative methodology for selecting neighbourhood 'hotspots' for data collection. The analysis concentrates on the connections between Vehicles Miles Driven (VMD) and neighbourhood design characteristics so that the discussion can enrich the current transport policy debate.

The paper is structured as follows: the next section gives a brief overview of the state-of-the-art in research into British spatial policy as background to promoting sustainable urban development. This is followed by sections defining the elements of the built environment that are considered in this study, the methodology and the analysis of results. The final section discusses the results and concludes, on the basis of the presented evidence, with recommendations of how to enhance the likelihood of sustainable development in neighbourhood design.

2. UK spatial and transport policies in pursuit of a low carbon future

In the UK, the advent of the sustainable city debate is associated with the arguments proposed in the Brundtland Commission Report (WCED, 1987). This was followed by the momentum created by the Rio Earth Summit in 1992 and the Kyoto Protocol in 1997 emphasising the need to reduce increasing greenhouse gas (GHG) emissions. Against a background of evidence that transport activities account for approximately 14% of global GHG emissions, and up to 27% in the more developed nations (Shaheen and Lipman, 2007), the UK Government introduced a Transport White Paper (DETR, 1998) which promoted the creation of the Planning Policy Guidance in Transport (PPG 13, DETR, 2001). PPG 13 was designed to be sensitive to the need for the promotion of low carbon-based (sustainable) travel with special reference to active transport, that of walking, cycling and the use of public transport. However, early European based studies that looked at the synergies between transport, energy and urban form were inconclusive in terms of the extent that density and size and amount of open space were found to be contributing to observed variation in energy use (Banister et al., 1997; Naess, 1993). Jenks et al. (1996) observed that the 'compact city versus urban sprawl' debate of the 1990s and early 2000s relied on assertions and assumptions of the social impacts of different urban forms but with limited empirical evidence, whilst recognising that urban forms cannot be considered sustainable if they are not acceptable to people as places in which to live, work, and interact or if their communities are unstable and dysfunctional.

At the implementation level, the UK Commission for Architecture and Built Environment (CABE) has introduced a 'Design Code' practice guidance that promotes development reflecting PPG 13 and the ideas of the 'Compact City' concept. However, a UK CABE report (2004) on monitoring this design code shows that the built environment characteristics to promote sustainable travel have been less frequently implemented confirming there are not yet strong synergies between the various actors involved in the promotion of sustainable urban development. This experience has been repeated elsewhere in developed countries such as in Australia (Curtis, 2008).

Research funded by the UK Government to look at how planning policies might encourage sustainable urban development can be seen in the City Form and the SOLUTIONS projects. The City Form project (started in 2001) aimed to investigate how urban form (at the neighbourhood level) can contribute to sustainability from environmental, social and economic perspectives. One of its main conclusions is that the simple features of the compact city – high residential density with mixed land uses, efficient public transport and an urban layout which encourages walking and cycling – are both complex, and open to some degree of interpretation (Dempsey, 2010). At a local neighbourhood level, this study found that compact cities are not addressing all dimensions of sustainability but that reductions in transport emissions have to be weighed against social criteria (Bramley et al., 2009).

The Sustainability Of Land Use and Transport In Outer NeighbourhoodS project (SOLUTIONS) (started in 2004) aimed to test city planning scenarios to create economically efficient, socially inclusive and environmentally sustainable suburbs through an integrated land-use and transport modelling framework. The study used a regional framework, as opposed to the local case study framework used in the City Form Project discussed above. SOLUTIONS's main finding is that the 'compact city' approach, as compared to market led-dispersal and planned expansion approaches, is shown to trigger overcrowding, traffic congestion and higher overall economic costs, despite more people using active transport and lower carbon emissions (Echenique et al., 2010). This follows from a lack of environmentally attractive land being supplied for development which pushes up property prices and wage demands. In turn, worsening traffic congestion adds to the operation costs of employers with increasing travel demand. The SOLUTIONS results identified that land-use and transport planning can have a huge impact on population and socio-economic change but achieve only a small carbon emission reduction. Technological improvements (switching to non-fossil energy sources) and individual behaviour change (shifting from car to public transport) are thus identified to be the key towards a low carbon future (ibid). However, these conclusions must be understood in the context that technological gains are often offset by the increase in travel distance or by the purchase of larger and heavier vehicles (Hickman and Banister, 2007).

The study presented in this paper attempts to address the gap in understanding the role of individual travel behaviour change. The level of analysis is similar to the City Form project, in that the