

Spatial Planning and the Demand for Travel

Based on research undertaken by Halcrow Transport Research (Catherine Seaborn, Senior Consultant) in association with the University of Oxford (Dr Robin Hickman, Senior Research Fellow) and Oxford Brookes University, this is a shortened version of a paper presented by Ellery Salida, (Associate Director Transport Planning, Halcrow) at the [Australian Institute of Traffic Planning and Management \(AITPM\) conference, August 2011](#).



INTRODUCTION

This paper reports on a study, '[Planning for Sustainable Travel](#)', undertaken for the Commission for Integrated Transport in the UK analysing settlement patterns and the demand for travel. The analysis covers the difficult empirical issues of causality and self selection and is placed within the context of achieving an 80% reduction in carbon dioxide emissions by 2050. The relationships evident between urban structure and travel illustrate the important role that spatial planning can play in enabling greater travel sustainability.

The context in which practitioners operate is thus very important. Current and future attempts at influencing land use patterns and promoting more sustainable travel need to be seen against this background, often where ingrained, dominant and long term trends are involved.

In empirical terms, the most significant associations are found when a range of urban planning, socio-economic and attitudinal variables are considered relative to travel behaviour.

The implications for practice are that packages of interventions (density, location, accessibility, neighbourhood design) need to be considered when planning for greater sustainability in travel.

The strategic transport impacts of differing development locations and forms, in particular, are given little attention in practice. There are numerous opportunities for land use and transport planning practitioners to influence positively the built environment and broader spatial planning policies to enable sustainable travel.

“... numerous opportunities ... to influence positively the built environment ...”

Development location and transport investment decisions made today are critical; they will influence travel patterns for many years to come.

While planning constraints and, indeed, targets for carbon dioxide emissions in Australia may differ significantly from those in the UK, the principles of research and policy are substantially similar. Thus the conclusions drawn here can effectively contribute to our own urban planning debate.

Urban structure and mobility appear to be inextricably linked. Planning for more effective urban form and layout is at the heart of the challenge to achieve sustainable mobility – however the effective integration of spatial planning and transport has proved difficult to achieve in practice.

In the UK the debate has recently focused on reducing the need to travel, especially by car through improving choice for different means of travel, anticipating that this will lead to gains in sustainability long-term.

This, however, is a step removed from targeting a reduction in actual travel by car. Such 'exhortation at the margins' only takes us so far on the pathway towards sustainable travel - the scale of traffic growth in the UK has arguably reduced as a result of policy initiatives, especially in urban centres, but congestion and carbon dioxide (CO₂) emissions continue to rise in many areas.

In most places walking, cycling and bus use are currently static at best and often still in long-term decline. Car dependency is often 'built in' under current and envisaged development patterns. Present policies are hence not achieving greater sustainability in travel behaviour.

Both Melbourne and Canberra, however, have seen increases in commuter cycling in recent years, though from a very low base ([Cycling Infrastructure for Australian Cities](#), 2009, p14).

1. Drivers for an improved approach

Growth in motorised traffic has existed since the development of the mass produced car in the early 1900s. The origins of the 'transport planning profession' lie in attempts to separate automobile and other traffic flows, with the aim that cars would not be slowed by other road users; and in providing knowledge concerning how to expand road infrastructure post-1945 when automobile ownership and use began to expand.

Many of the problems of unsustainable travel are an outcome of actions to address these outmoded agendas.

A number of background drivers mean that using spatial planning more effectively to reduce travel becomes increasingly important.

- **The climate change imperative:** the UK government has recently adopted an 80% CO₂ emission reduction target by 2050 on 1990 levels (Climate Change Act, 2008). Urban planning is one tool available to help achieve this challenging target. (At present in Australia there is no more than a 'commitment' to a 5% reduction in emissions by 2020, on the way to a 60% reduction "by mid-century").
- **A greater strategic focus on analysis and implementation in the planning and transport fields is required:** this contrasts with the present micro-level focus on the design of internal layouts. At such a level the pattern of trip-making is effectively pre-ordained (by the strategic framework) and the practicable extent of influence at the lower scales is limited to reducing the car modal share by a few percentage points at most.



- **Reducing per capita car use:** while the overall rate of traffic growth in the UK has already slowed during the last decade, there is no sign of any such slowing in traffic growth in Australia. Indeed, forecast population growth in Australia's cities suggests continuing pressure on an already congested road network – residents of Sydney, particularly, will no doubt readily concur with this statement. A greater focus and requirement to deliver reduced per capita car use at the area-wide level may help us improve efforts in planning for less travel.

- **New means of car access:** if the immediate objective is to lessen per capita car use, then policies may be better framed to impact on the most important contributing factor, namely levels of private car ownership.

Relinquishing, or not acquiring, a private car will be most attractive in situations where people do not need to use a vehicle on a daily basis. School and workplace travel plans, including arrangements for business journeys, have a significant contribution to make here.

If the need for car use can be removed from these journeys, then households have the opportunity to review their car ownership and travel arrangements more broadly, resulting in lower overall levels of car use.

- **Longer term aspirations:** any consideration of spatial planning needs to reflect longer term prospects because of the length of time which developments undertaken will remain in existence. The increment of change brought about by developments within a single planning period (normally 15 years or so, or less in local transport planning terms) is small compared with the continuing influence of the established building stock and patterns of activity and travel associated with it.



2. Opportunities to influence planning decisions in favour of sustainable travel alternatives

There are numerous opportunities for land use and transport planning practitioners to positively influence the built environment and broader spatial planning policies such that the outcomes enable sustainable travel. Based on an extensive literature review as well as interviews with practitioners working at various levels of government across the UK, we present below some key generic principles for enabling sustainable travel patterns.

“...maximise the proportion of new development ... adjacent to larger towns ...”

2.1 Settlement Size

Settlement size refers to the total population or number of dwellings within a contiguous built-up area. Larger settlements provide an opportunity for greater self-containment and a mix of uses offering access to a range of services and employment within the built-up area, thereby reducing the need for inter-urban travel. We should aim to maximise the proportion of new development which is allocated within or immediately adjacent to larger towns and cities.

Hence in regional and sub-regional planning, decision-makers should consider the advantages of locating development in selected larger urban areas which will both reduce the need to travel and make the support of public transport provision viable. Such development will:

- Increase the likelihood of residents finding jobs and utilising facilities, or of services drawing their employees and customers, from within the same urban area
- tend to have higher development density
- create higher volumes of travel demand on the main corridor, requiring a managed approach to car parking which itself contributes to lower car ownership and use

It may not always be practicable or desirable to maximise development in or adjacent to the largest urban areas within any region/sub-region because of the local incidence of housing need, support for smaller communities and their services, restricted land availability and/or environmental or infrastructure constraints. However, expansion of larger settlements is generally preferable to 'leapfrogging' development to smaller towns or 'spreading' development across a number of settlements.

2.2 Strategic Development Location

Strategic development location refers to the selection of areas for major new residential and non-residential development (employment, leisure and retail), including the spatial distribution of housing and employment within or between growth centres (New South Wales) or activity centres (Victoria).

There is strong linkage with development site location, which takes place lower down the strategic scale, where the apportionment of development between districts and integrating development into the existing urban fabric is considered.

"... development locations which may encourage long distance journeys by car should be avoided ..."

To promote sustainable travel, the aim should be to locate development where travel generation is likely to be minimised, such as where there is good public transport accessibility, particularly for short trips to existing or new centres. Development locations which may encourage long distance journeys by car should be avoided, including at or near to intersections on strategic roads. The aims of good development location include:

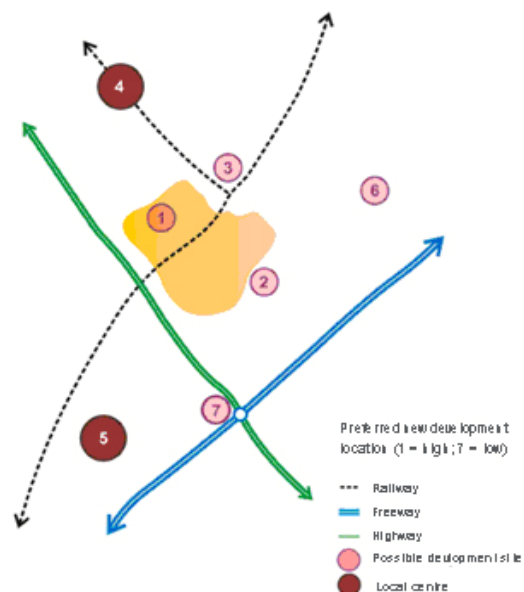
- Car travel minimised both in terms of trip length and mode share
- Developing opportunities to promote the use of non-car modes
- Good accessibility is available without requiring car use or relying on local public transport services which depend on subsidy over the long term

- Improving the sustainability credentials of urban locations through the application of local travel demand management measures, including travel plans
- Avoidance of non-central locations, close to intersections with freeways unless they enjoy exceptional public transport accessibility (e.g. at rail 'park and ride' stations). See figure 1, below.

This will discourage short and medium-distance travel by car on strategic highways and is especially important in cases where new housing is likely to be attractive as a 'dormitory community' for people working in major urban areas accessible by the route.

- Where significant out-commuting is perceived as inevitable, new housing should be located in settlements which already enjoy good, or can receive improved, public transport accessibility to the relevant external destination(s), for example by virtue of a rail service or express bus route.

Figure 1 Strategic Development Locations and Travel



2.3 Strategic Transport Network

The strategic transport network refers to transport infrastructure that supports medium and long-distance travel, generally between towns and cities or along major corridors in urban areas. It can be conceived as an integrated network of different modes and ownership – with combined conflicts and opportunities.

Built-up areas are not generally ‘self-sufficient’. To increase the sustainability of long-distance travel between settlements, the aim should be to:

- Increase the efficiency and reliability of the existing public transport network (rail and bus) and invest in public transport infrastructure improvements.
- Create development patterns that support public transport usage and discourage the use of the strategic highway network for short, medium and long distance travel (e.g. commuting). Major development should hence be located near to public transport nodes where capacity exists or can be developed.

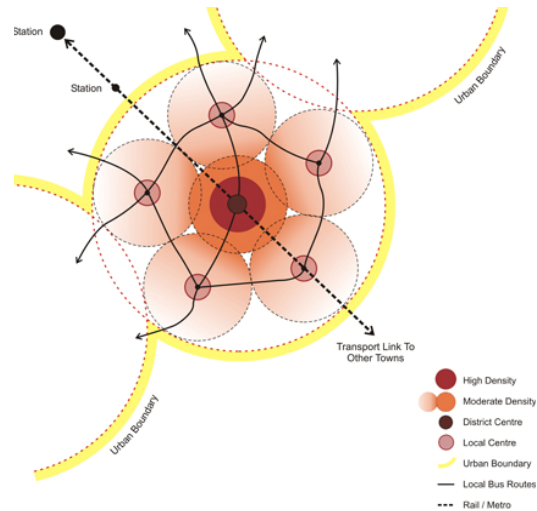
2.4 Density

Density refers to the intensity of use of land. In UK planning practice, density is generally measured in dwellings per net hectare, where the area includes developable residential land. In Australia there are a number of density definitions, ranging from site density to community density. The principles remain valid, however, for the discussion which follows.

There has been much previous work on the density and sustainability topic. [Newman and Kenworthy \(1989, 1999\)](#) famously developed the density and energy consumption argument, maintaining that higher density development influences the demand for travel.

A number of principles can be derived, with a focus on raising the density of development, particularly around public transport nodes (Figure 2):

Figure 2 Density and Travel



Source: Based on Roger 1997

- Transport energy consumption and CO₂ emissions are generally lower at higher densities.
- Higher densities lead to greater scope for viable public transport services.
- Density can be an important factor in reducing car use in terms of both mode share and distance travelled.

“...areas around public transport nodes ...can be the focus for highest density development”

A set of density ranges can be developed for each local area reflecting contextual issues. In regional, sub-regional and local planning, practitioners are advised to:

- Build to the highest density possible consistent with density range, and given quality of life and public transport availability considerations (existing and future). Increased densities need to be consistent with liveability objectives. The areas around public transport nodes (the 10 minute walk or approximate 800 metre radius catchment) can be the focus for highest density development.

A good example of this is the development of residential units at Camberwell Junction in Melbourne, close to both rail and tram services.

- Consider the interrelationships between public transport accessibility, parking and density in the early stages of strategic planning processes. Where new public transport capacity is built, the development form should be re-configured to support patronage, particularly where suburban, low densities surround routes.
- Ensure that local plans maximise the density of residential and commercial development while taking into consideration neighbourhood design and other constraints.

2.5 Jobs-housing Balance

Jobs-housing balance refers to the approximate distribution of employment opportunities and workforce population across a geographic area. It is usually measured in terms of the proportion of jobs per household. For example, a jobs-housing balance of 1.25 means there are five jobs for every four households. Qualitative matching between skills, aspirations and job type is critically important as well as numerical balance.

The aim of jobs-housing balance is to provide local employment opportunities that may reduce overall commuting distance among residents (and also the reverse – to provide homes near to workplaces).

Like most of the urban structure variables, it is a necessary, but not sufficient condition for reducing the need to travel. Arguably it is more important at the strategic travel to work area level, or in peripheral and remote urban areas where opportunities for cross-area commuting are less.



Planners therefore need to consider the different scales over which a jobs-housing balance is best achieved. This can initially be conceived at a regional and travel to work area level.

- Existing commuting patterns, planned residential and employment locations and workforce characteristics can all be examined to ensure there are no mismatches which may encourage car dependency and long journey distances. Effective jobs-housing balances are in the range 1.0-1.5. Increments of new growth should be of sufficient mix to provide balance at the strategic level.
- Large employment generators should be located at the most accessible locations by public transport, walking and cycling (which are the areas with large population catchments), and vice versa.
- Housing type and affordability needs to be consistent with local employment opportunities in order to discourage in/out commuting.

2.6 Accessibility of Key Facilities

Places that are highly accessible can be reached by many people quickly, whereas inaccessible places can only be reached by a few people in the same amount of time. There are urban and rural dimensions to accessibility planning.

“... accessibility of key facilities is of particular importance because they are major travel generators ...”

Key facilities serve a wider catchment than the immediate neighbourhood in which they are situated. Examples include employment centres, shopping centres, hospitals, educational institutions, leisure centres and cultural attractions.

The accessibility of key facilities is therefore of particular importance because they are major travel generators (for both employees and patrons) and wider access has strong additional social benefits.

To encourage sustainable travel, the aim should be to locate and manage key facilities so that they will:

- Be conveniently accessible by public transport by users and employees within their planned catchment area
- Support and facilitate the improvement of public transport services
- Reduce average travel time and distance
- Maximise the proportion of travel by non-car modes
- Complement land use and transport policies, travel demand management strategies and investment programmes being pursued in the area more generally.



2.7 Development Site Location

Development site location refers to the selection of sites for new housing allocations or other new developments. It may often be a catalyst for transport interventions, helping to justify or making viable a new transport service.

The aim of good development site location in relation to sustainable travel should be to locate new housing where:

- The amount of travel by car (trip length and mode share) is likely to be low.
- Good accessibility is available or can be created by sustainable modes to:
 - employment and other main facilities in the town or its immediate vicinity
 - a railway station or other public transport interchange where good services are available to other (larger) centres within the sub-region
 - community facilities within the development or the surrounding neighbourhood
- Opportunities exist to:
 - promote the use of walking, cycling and public transport
 - provide an attractive level of public transport service which does not depend on (additional) subsidy over the longer term
 - utilise and support existing public transport services and community facilities in the locality
 - incorporate services or facilities within the development which will improve accessibility by sustainable modes

2.8 Mix of Uses

The aim of mixing land uses is to provide opportunities for individuals to undertake multiple activities in one trip (as opposed to increasing accessibility), and to encourage non-motorised trips through a diverse urban environment.

In planning developments consideration should therefore be given to:

- Locating essential community facilities (e.g. shops, local schools, bank) within walking distance of all homes in a neighbourhood in order to reduce travel distances and discourage car ownership. This will require a certain density of housing in order to concentrate demand sufficiently for the shops and services to be economically viable.
- Identifying complementary uses such as a day-care and fitness centre or bookstores and cafes and support building types that facilitate co-location so that individuals can reach more activities per trip.
- Where public transport is available, promoting retail uses that complement employment centres in order to increase public transport mode share.

2.9 Neighbourhood Design and Layout

Neighbourhood design describes the scale, form and function of buildings and open space (including streetscapes). Street layout refers to the pattern of local streets, for example as 'traditional' grid networks, cul-de-sacs or hybrid forms. Both can have an impact on generated travel patterns.



(Based on Duany, Plater-Zyberk and Speck, 1992)

Sustainability objectives move transport planning beyond increasing throughput, to include consideration of transport routes as 'places' as well as 'links'.

So a good neighbourhood design plan should:

- Encourage walking, cycling and public transport use (where applicable) through permeable, well-connected, 'traditional' grid street networks.
- Avoid circuitous, 'suburban', cul-de-sac street networks with few access points and lengthy routes to nearby locations.
- Provide safe and high-quality walking and cycling environments throughout.
- Integrate the new development with adjacent built-up areas in terms of street network, public transport services, footpaths/cycle routes and design standards.

2.10 Travel Demand Management

Travel demand management (TDM) covers a wide range of measures aimed at reducing the adverse impacts of car use. They are thus complementary measures to spatial planning.

“...travel demand management ... complementary to spatial planning ...”

There are three broad categories of TDM: organisational, financial and those based on infrastructure.

Organisational:

- Travel plans (workplace, school, residential, area-wide), personalised travel planning
- Car pooling, car sharing and car clubs
- Home working
- Tele-activities and interaction
- Transport optimisation, peak congestion avoidance

Financial:

- Pricing regimes, including (where applicable) road user cordon charging, area-licensing schemes, continuous (time and location) charging.
- Vehicle ownership taxes.
- Public transport investment/subsidy.

Infrastructure:

- Improved public transport facilities
- Demand responsive transport
- Park and ride
- Road space re-allocation and priority, traffic calming, access control and restrictions.

At the regional, sub-regional and local levels, TDM means developing and implementing a strategy, including the strategically and locally important infrastructural, organisational and financial policy levers.

This will include major walking, cycling and public transport investment, ‘smarter choice’ soft behavioural measures, marketing campaigns and, potentially, pricing and subsidy regimes.



2.11 Parking

Parking provision can be used to encourage less car use in order to improve traffic and environmental conditions in an area and to contribute to broader transport and sustainable development objectives.

The restriction of spaces for cars and/or pricing of spaces typically complement a variety of measures designed to promote the use of non-car alternatives.

Both the amount of parking space and the form in which it is provided have implications for, and need to be consistent with, wider issues of neighbourhood design and street layout.

Car free and low car housing developments have been built in a number of locations in the UK and a [recent office development in Melbourne](#) provided no car spaces at all.



Distinct parking considerations apply to the main categories of development: business; retail and leisure; residential. All can be conceived in relation to density and public transport accessibility.

Business (excluding retail and leisure):

- Explore the potential for reducing car commuting through the management of publicly available space and through the adoption of travel plans by employers. If pursued collectively on a neighbourhood basis this facilitates economies of scale in the provision of non-car alternatives
- Develop coordinated parking strategies for Travel to Work Areas
- Set maximum parking standards for new employment development in relation to park and ride sites and any other major public car parks
- Design policies and proposals for controlled parking zones, workplace travel plans, workplace parking levies where applicable, and complementary transport improvements.

Retail and leisure:

- Align the provision and pricing of public parking spaces with the opportunities available for access by non-car modes (since the car and non-car modes will be in more direct competition than is the case with commuting) having regard to the scale and nature of any competition between out of town developments with free parking and town centre policies.

“Align the provision ... of public parking spaces with the opportunities available for access by non-car modes ...”

Residential:

- Include maximum parking standards for new residential development.
- In controlled parking areas, potential measures to encourage reduced levels of car ownership and smaller, more fuel efficient vehicles include the pattern of charges set for residents' permits, a

programme of personalised travel planning, the promotion of car club and car share schemes, walking and cycling and local public transport services and the preferential allocation of public parking places (e.g. provision for low emission vehicles).

“ ... parking provision utilised as a key tool in managing the demand for travel ...”

An important issue is to coordinate strategies across local authority boundaries, and within and between settlements. There has been a recent trend to relax parking standards within some local authorities – this should be resisted, with parking provision utilised as a key tool in managing the demand for travel.

All types of development should provide adequate access and temporary parking for delivery vehicles, but especially new residential development with reduced accommodation for household car ownership, where applicable, should also include, or make accommodation for, future charging sites for electric or other alternatively fuelled vehicles.

“All new developments should include ... future charging sites for electric vehicles ...”

3. Conclusion

Despite much scepticism, it appears that spatial planning has an important role to play in helping to achieve sustainable travel. There is certainly an important socio-demographic input to the rationale for travel, and attitudes to certain types of travel and living circumstance are beginning to be better understood. However physical urban structure appears to remain important in setting the envelope for travel.

'Integrating land use and transport planning' is often put forward as a policy objective, but little follows in practice (beyond perhaps a limited thickening of densities around key public transport interchanges in urban areas).

Too often new development is spread around an area, often reflecting the historical urban pattern. The impact of new development on travel patterns is very often overlooked, certainly at the strategic level, and at best it is very much a second order consideration.

Designing development location and form in relation to a range of variables, including settlement size, density, jobs-housing balance, accessibility, mix of use, neighbourhood design and street layout, travel demand management and parking [whilst still achieving wider policy objectives] can help in moving towards greater sustainability in lifestyles.

"... the physical urban structure appears to remain important in setting the envelope for travel"

Recent history has demonstrated that the transition to achieving sustainable travel is very difficult, certainly beyond the limited successful experience in the central parts of selected urban areas.

The debate over relationships between the built environment and travel will continue to develop, with increasing sophistication: however, the application of this knowledge in practice is perhaps where most effort is required.

If you would like to read the complete paper, please [contact us](#) and we will email you a copy.

