Strategies for Sustainable Travel

Wednesday 2\textsuperscript{nd} March 2010, 5:00 pm – 6:30 pm
Department of Transport Theatrette, Level 5, 121 Exhibition Street

Our speakers this evening are…

Dr Robin Hickman
Research Fellow University Of Oxford Transport Studies Unit & Associate Director, Halcrow

Fiona Calvert
Director, Sustainable and Active Transport Policy, Department of Transport
Planning for Sustainable Travel
Integrating spatial planning and transport planning

Dr Robin Hickman
Associate Director, Halcrow Group
Research Fellow, University of Oxford, Transport Studies Unit

Outline

- Context and key issues
- The literature
- Urban structure and travel
- A wider mobilities rationale
- Urban planning and low carbon transport
- Emerging thoughts
Context and Key Issues

- Increased travel distances year on year, car dependency [for a large cohort of the population]
- Aspirations towards sustainable mobility
- But little idea as to how we might get there
- The role of planning in enabling sustainable mobilities – apparent weak relationships [Urban planning sets the ‘envelope of possibilities’?]
- Social, cultural and experiential factors also important
- As well as context – socio-economic characteristics, trip purpose, infrastructure

**Key problem:** How can we further understand, and use better, the policy levers available to better enable sustainable mobility?
The Context

- PPG13 “Reduce the need to travel”
- Mass car ownership
- Counter-urbanisation (low density suburban growth)
- Some decentralisation/sub-regional concentration of facilities
- Selective ‘urban renaissance’
- ‘Many to many’ origins and destinations
- Trip length ‘explosion’; car dependence
- Certain cohorts more receptive to changed behaviour than others
- Added policy drivers – climate change, oil prices, developmental agenda (3 million houses by 2020)

> Greater impetus for urban planning to contribute to reducing demand for travel

Key Drivers

- Trip length explosion
- CO2 emission targets and wider transport impacts
- High housing growth pressures

DESPITE:

PPG13 aim “to reduce the need to travel” (2001)
Some classic debates:

Increasing population and employment densities reduces energy consumption by transport – hence a strong inverse relationship between density and travel (Newman and Kenworthy, 1989).

“The idea of planners turning our lives upside down in pursuit of a single-minded goal is as horrible as it is alien. Newman and Kenworthy’s world is the Kafkaesque nightmare that Hayek always dreaded, a world where consumers have no choice, relative prices have no role and planners are tyrants … Newman and Kenworthy have written a very troubling paper. Their distortions are not innocent, because the uninformed may use them as ammunition to support expensive plans for central city revitalisation and rail transit projects or stringent land use controls in a futile attempt to enforce urban compactness … perhaps Newman and Kenworthy would be well advised to seek out another planet, preferably unpopulated, where they can build their compact cities from scratch with solar powered transit.” (Gordon and Richardson 1989).
Urban Structure and Travel: Conventional Literature Coverage

- Much US material
- Dearth of UK evidence
- A complex subject (the rationale for travel)
- Various urban structure/socio-economic/attitudinal variables associated with travel
- Increasing sophistication of analysis over time
- Some institutional use studies
- Some difficult empirical issues (co-linearity/ causality/self selection)

Urban Planning and Travel: Analytical Framework
Settlement Size & Annual Travel Distance

- Area type and travel distance/car mode share: [broadly] inverse linear relationship
- Inner London (4,673m); rural areas (9,806m);
- Non Met urban areas similar (no differentiation between), except below 25k

Multi-Variate Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>General Model</th>
<th>Journey Variables</th>
<th>Land Use Variables</th>
<th>Socio-Economic Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>City, 50-250k</td>
<td>-0.038 ***</td>
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<tr>
<td>City, 25-50k</td>
<td>-0.040 ***</td>
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<tr>
<td>City, 25k or less</td>
<td>0.119 ***</td>
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<td></td>
<td></td>
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<tr>
<td>County population density</td>
<td>0.001</td>
<td></td>
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<tr>
<td>Public transport accessibility</td>
<td>0.004 ***</td>
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<tr>
<td>Income</td>
<td>0.203 ***</td>
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<tr>
<td>Sex (female)</td>
<td>-0.145 ***</td>
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<tr>
<td>Jobs-to-housing ratio</td>
<td>0.131</td>
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<tr>
<td>Journey made by car</td>
<td>0.448</td>
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<tr>
<td>Car access</td>
<td>-0.065 ***</td>
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<tr>
<td>Business trip</td>
<td>0.423 ***</td>
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<tr>
<td>Education trip</td>
<td>-0.529</td>
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<tr>
<td>Escort education trip</td>
<td>-0.930</td>
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<tr>
<td>Shopping trip</td>
<td>-0.386 ***</td>
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<tr>
<td>Other escort trip</td>
<td>-0.509</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Other personal business trip</td>
<td>-0.491</td>
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<tr>
<td>Visit friends at private home trip</td>
<td>-0.161</td>
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<tr>
<td>Visit friends elsewhere trip</td>
<td>-0.226</td>
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<tr>
<td>Entertain/public activity trip</td>
<td>-0.211</td>
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<tr>
<td>Sport participate trip</td>
<td>-0.347</td>
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<tr>
<td>Holiday base trip</td>
<td>1.159</td>
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<tr>
<td>Day trip</td>
<td>0.195</td>
<td></td>
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</tr>
<tr>
<td>Year</td>
<td>0.010 ***</td>
<td></td>
<td></td>
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<tr>
<td>Constant</td>
<td>6.742 ***</td>
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</tbody>
</table>

Adjusted R-squared | 0.125 | 0.006 | 0.110 | 0.033
Observations : 1,292,333
Range of effect (contribution)
Min | 0.000 | 0.086 | 0.010
Max | 0.006 | 0.110 | 0.033

Notes:
***=Significant at 1%, **=Significant at 5%, *=significant at 10%
Base is 'other trip' in city of population >250k

Dependent variable: journey distance
Urban structure – 10-20% variation in travel
Data only allows limited exploration
**Current Practice Advice: Key Themes**

1. Settlement Size
2. Strategic Development Location
3. Strategic Transport Network
4. Density
5. Jobs-Housing Balance
6. Accessibility to Key Facilities
7. Development Site Location
8. Mix of Uses
9. Neighbourhood Design and Street Layout
10. Traffic Demand Management
11. Parking

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**Practice Advice: Key Themes**

**Theme 2. Strategic Development Location**

- Locate major development in existing centres or at other locations easily accessed by public transport
- Avoid development close to junctions with motorways, except where exceptional public transport accessibility
- If significant out-commuting is inevitable, new housing should be located in settlements which already enjoy good, or can receive improved, public transport accessibility
Practice Advice: Key Themes

Theme 3. Strategic Transport Network

- Create development patterns that support public transport usage and discourage the use of the strategic highway network
- Focus development at key nodes to make use of capacity
- Develop sub-regional and city-regional governance structures (e.g. strategic coordination authorities) that support an effective process for achieving integration

Practice Advice: Key Themes

Theme 4. Density

- Distance travelled by public transport increases with density, particularly over 30 persons per hectare (pph) and walking distance is similar over all densities except the highest – over 50 pph
- PPS3 (DCLG, 2006) advises a “working minimum of 30 dwellings per hectare” (dph) but much higher densities can be achieved
- Public transport nodes (approx. 800 metre radius catchment) can be the focus for densities of upwards of 50-100 plus dph, depending on context.
Practice Advice: Key Themes

Theme 9. Neighbourhood Design and Street Layout

- Encourage walking, cycling and public transport use (where applicable) through permeable, well-connected, ‘traditional’ grid street networks
- Ensure integration with surrounding street network and services
- Design transport routes as ‘places’ as well as ‘links’ (‘Link and Place’, Jones, Boujenko and Marshall, 2008; Manual for Streets, DfT, 2007)

Case Studies

Sherford (Plymouth, UK)

- Planned new settlement, 5-6,000 dwellings, schools, retail, 6km from Plymouth – Prince’s Foundation EbD and masterplan
- “exemplary” aspirations
- Complement to growth within urban boundary, town and country executive housing
- HQPT (12 buses per hour)
- Internal MfS-style layout; weak TDM – parking lax (Sherford and Plymouth)
- Optimistic developer TA – 60% car mode share, high self containment
- Cross-authority working
- Good practice for the UK, not for Europe, e.g. Vauban, Freiburg
How far do social and cultural factors over-ride the physical location of activities, i.e. people go to the activity that they choose, and not the nearest?

But Would This Help?

A Wider Mobilities Rationale

- Different motivations may underlie choice processes – mediated through social factors, personal beliefs, attitudes and values, information and marketing
- Importance of social networks – as a ‘mediator’
- Social contact, and changed norms, are an output of travel
- If a norm is to not prefer PT usage, the user will not use PT whatever the urban form (and vice versa)
- Use of the car is indispensible to some lifestyles (a large cohort)
- Emotional dimensions of car use: ‘freedom’, ‘power’, ‘control’
- The car (and other modes) as productive time – ‘frontstage’ rather than ‘backstage’ support to other activities
- Ignoring these factors may over-estimate the degree to which urban structure drives mobility practices (or indeed under-estimate if synergies are evident)
- BUT – multi-directional relationships – the context (urban structure and travel network) also affects the attitude to travel
Personal Factors Affecting Car Use

(Jones and Lucas, 2009)

Urban Planning within a Mobilities Framework?
Objective: a 60% reduction in CO2 emissions in the transport sector in London by 2025 and 80% by 2050

- Baseline
- A range of policy packages (including urban planning – but also much wider ..)
- Level of application
- Target achieved/ achievable?
The VIBAT Policy Packages

Enabling Mechanisms?
Carbon rations
Oil price sensitivities

TC-SIM London
Emerging Thoughts?

- The challenges of sustainable development (and climate change) demand we are more successful in achieving sustainable mobilities.
- We are a long way from achieving CO2 reduction targets.
- Urban structure has an important role to play – urban form and layout.
- Urban planning is a key tool within transport planning.
- Rational choice framework to decision-making is not always apparent.
- Policy interventions tailored more to specific contexts and norms, rather than ‘one size fits all’.
- Interventions and incentives can target particular norms – bringing ‘good travel practices’ into wider use.

MAJOR innovations in thinking: to better shape interventions in rationale decision-making and modify cognitive reliance on cars – much greater role for dialogue and participation.

Melbourne 2011

Planning for Sustainable Travel
Integrating spatial planning and transport planning

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Transport Environmental Sustainability
Fiona Calvert, Director Sustainable and Active Transport Policy
Purpose of the Sustainable Transport Framework

Provide a strategic framework to:
• Deliver transport’s contribution to broader environmental objectives
• Spell out what is needed to meet the objectives of the Transport Integration Act (Victoria 2010)

Challenges addressed by the Sustainable Transport Framework

• Energy security / resilience
• Climate change
  – Greenhouse gas emissions
  – Adapting to changing climatic conditions
• Air pollution
• Noise
• Protection of natural systems and assets
Transport is not immune from a changing climate

Reduce distances travelled

Use sustainable transport more

Make transport resilient to a changing climate

Make transport infrastructure practices environmentally friendly

Make the use of transport environmentally friendly

Environmental Sustainability Framework
Greater use of sustainable transport

public transport, cycling, and walking

Energy use by mode

<table>
<thead>
<tr>
<th>Mode</th>
<th>Megajoules per vehicle-km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Vehicle</td>
<td>4.78</td>
</tr>
<tr>
<td>Bus</td>
<td>10.31</td>
</tr>
<tr>
<td>Tram</td>
<td>10.74</td>
</tr>
<tr>
<td>Train</td>
<td>42.60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mode</th>
<th>Megajoules per passenger-km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Vehicle</td>
<td>3.19</td>
</tr>
<tr>
<td>Bus</td>
<td>1.32</td>
</tr>
<tr>
<td>Tram</td>
<td>0.43</td>
</tr>
<tr>
<td>Train</td>
<td>0.40</td>
</tr>
</tbody>
</table>
The efficiency of each mode matters

Average passenger car emissions of GHG

- Australian manufactured cars
- Australian sales weighted average cars
- European sales weighted average cars
- European sales weighted target
Transport Infrastructure Practices...
for example, reducing emissions from construction
Reduce distances travelled

Make transport resilient to a changing climate

Use sustainable transport more

Make transport infrastructure practices environmentally friendly

Make the use of transport environmentally friendly

Environmental Sustainability Framework

Influence of Urban Form

- Are differences in energy use/greenhouse gas emissions explained by macro urban form indicators?
  - Location – distance from CBD
  - Population density – transport zone resident population/ area
  - Employment density – transport zone employed persons by area
  - Level of Public Transport service – number of services in walking distance of train stations (800m), bus stops (400m) and tram stops (400m)
- Micro urban form factors also make a difference (street permeability, pedestrian amenity & safety, cycle links)
  - but not covered in this study

Transport Energy vs Distance from Melbourne CBD

Transport Energy vs Population & Employment Density


Transport Energy vs Public Transport Service Levels

**Transport Energy v Public Transport Mode Share**


**Scenario Development**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Current Trend/Case</td>
<td>Continued urban development according to current patterns, with no change to existing policy or implementation programs.</td>
</tr>
<tr>
<td>2 Non-Intervention</td>
<td>Current policy and implementation programs are assumed and development occurs without high-level planning intervention or Urban Growth Boundary (UGB).</td>
</tr>
<tr>
<td>3 Activity Centres (AC) Growth Areas Plus</td>
<td>Strong infrastructure investment, and high-level planning interventions as proposed in Melbourne 2030, including development of urban fringe growth areas.</td>
</tr>
<tr>
<td>4 Super CBD</td>
<td>Half of future population growth and all future employment growth to be concentrated in an enlarged CBD.</td>
</tr>
<tr>
<td>5 Super CBD – Parking Prohibition Variant</td>
<td>As above, but with no new off-street parking permitted in this larger CBD area.</td>
</tr>
<tr>
<td>6 Inner City</td>
<td>Urban growth directed toward major outer suburban centres, while primacy of CBD maintained.</td>
</tr>
<tr>
<td>7 Polycentric City: Outer Centres</td>
<td>Urban growth directed toward major outer suburban centres, while primacy of CBD maintained.</td>
</tr>
<tr>
<td>8 Polycentric City: Middle Centres</td>
<td>Urban growth directed toward major middle ring suburban centres, while primacy of CBD maintained.</td>
</tr>
<tr>
<td>9 Polycentric City: Middle Centres – Orbital Rail Variant</td>
<td>As above, but with an underground orbital rail line connecting major middle ring Activity Centres.</td>
</tr>
<tr>
<td>10 Linear Development</td>
<td>Large-scale residential and employment development to be confined to within 400 metres of a railway station or tram stop, with expansion in public transport capacity.</td>
</tr>
</tbody>
</table>
Scenario Results, Variation from Base 2031


Reduce distances travelled
Use sustainable transport more
Make transport resilient to a changing climate
Make the use of transport environmentally friendly
Make transport infrastructure practices environmentally friendly

Environmental Sustainability Framework