Australian Institute of Traffic Planning and Management
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AITPM Victorian Branch ½ day seminar

CLIMATE CHANGE -
THE TRANSPORT RESPONSE

Tuesday 16 October 2007, 2.00pm – 5.15pm

Department of Infrastructure Theatrette. Level 29, 80 Collins St. Melbourne
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<td>2pm</td>
<td>Dr Ray Brindle, Chair</td>
<td>Welcome &amp; Introductions</td>
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<td><strong>Session 1</strong></td>
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<td>2.10 – 2.45</td>
<td>Dr Ian McPhail</td>
<td>Victorian Government Sustainability Commissioner</td>
<td>Victorian transport scene. Recent report findings &amp; recommendations.</td>
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<td>2.45 – 3.00</td>
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<td>Break</td>
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<td><strong>Session 2</strong></td>
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<td>3.00 – 3.45</td>
<td>Adele McCarthy</td>
<td>Public Transport Division; Department of Infrastructure</td>
<td>What are we doing? – Let’s hear from the key Government agencies.</td>
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<td>Sharon MacDonnell</td>
<td>Acting Director of Corporate Planning and Policy; VicRoads</td>
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<td>Genevieve Overell</td>
<td>General Manager, Planning, Heritage and Urban Design; Department of Planning and Community Development</td>
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<td><strong>Session 3</strong></td>
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<td>4.00 – 4.30</td>
<td>Cr Janet Rice</td>
<td>Councillor; City of Maribyrnong and Chair of the Metropolitan Transport Forum</td>
<td>A Local Government perspective</td>
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<td>John Stanley</td>
<td>Executive Director; Bus Association Victoria</td>
<td>A Public Transport Operators’ Association view</td>
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<td>4.30 – 4.45</td>
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<td>4.45 – 5.00</td>
<td>Dr Ian McPhail</td>
<td>Forum wrap up / Overview</td>
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<td>5.00 – 5.15</td>
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Dr Ian McPhail AM
Public Transport and Climate Change

Adele McCarthy

Public Transport Division
Outline

(1) GHG emissions from the transport sector

(2) Relative efficiency of public transport

(3) Likely GHG savings from a mode shift to public transport

(4) Improving the environmental performance of PT

(5) Conclusions
GHG emissions from transport sector

Transport Greenhouse Gas Emissions - Victoria

Source: Victorian Greenhouse Office
GHG intensity = GHG emissions per person kilometre

\[
\text{Emissions of GHG per person kilometre} = \frac{\text{Total no. of vehicle kilometres} \times \text{GHG emitted per vehicle kilometre}}{\text{Total number of person kilometres}}
\]
Average GHG intensities

PT is performing 30% better than cars at average occupancy rates
Incremental GHG intensities

- While the average intensities are useful for assessing current performance, they do not provide sufficient information to evaluate the GHG benefits of a mode shift.

- **Incremental** GHG intensities are the additional emissions created per additional person-kilometre of travel, taking into account:
  - Available capacity on the public transport system (off-peak);
  - Additional congestion effects of increased car use.
Evaluating the GHG benefits of a mode shift

- People who shift from cars to PT can make substantial savings in their transport GHG emissions:
  - 65% less emissions for peak travel;
  - 95% less emissions for off-peak travel;
  - 75% less emissions on average.
Evaluating the GHG benefits of a mode shift

- For an increase in PT patronage of 10% at the expense of car use (~1% decrease), we would save 70,000 tonnes CO$_2$-eq/year (or 1.5 billion black balloons).
  - This equates to a 0.75% decrease in overall passenger transport emissions.

- A single-occupancy car user who made the switch to PT for 100km of travel per week would save 1,300kg of CO$_2$ per year, on average (or 26,000 black balloons).
  - This is equivalent to 30% of the emissions an average person produces in the home.
Travel behaviour is strongly affected by urban form

Household GHG emissions from transport

Source: VATS 97-99 (travel behaviour)
Travel behaviour is strongly affected by urban form
Meeting Our Transport Challenges

- The biggest single transport investment program in Victoria’s history is underway

- 25 year strategy, with $10.5 billion invested over the next 10 years for transport projects, two-thirds of which will be directed to public transport

- The major finding boost includes:
  - $1.4 billion to develop better cross town public transport network;
  - $2 billion for rail network and service improvements; and
  - $1.33 billion for new trains and trams.
Transport Energy Branch

- Recently established within Policy & Intergovernmental Relations Division of DOI.

- Working to identify how to reduce GHG emissions from transport sector and what Government will need to do.

- A range of initiatives will be needed for a substantial cut in emissions. These are likely to include initiatives associated with transport vehicles, the energy sources used to fuel them, the trips that are made and the way that the urban space is used.

- TE Branch also coordinating an initial risk assessment into climate change impacts on the portfolio’s activities and assets.
Improving the performance of Melbourne’s public transport system

In order to improve the environmental performance of PT, we should follow the EPA’s Carbon Management Principles:

**Step 1**: Minimise direct GHG emissions/energy consumption

**Step 2**: Switch to renewable energy

**Step 3**: Offset residual emissions

ITERATE
Identifying priority initiatives for managing PT to reduce future GHG emissions

- Initiatives fall into two categories: technical solutions (e.g. vehicle efficiencies) and behavioural change solutions (e.g. mode shift).
Renewable energy

- The environmental performance of electric trains and trams is strongly linked to the efficiency with which their power was produced.
- Because they are connected to the electricity grid, trains and trams have the opportunity to run on renewable/low emission energy sources.

Wind-powered light rail in Calgary, Alberta
Renewable energy

- 100 wind turbines would be required to power Melbourne’s trains and trams – equivalent to a large wind farm.

- Purchasing wind energy for 100% of PT requirements would cost in the order of $15-20m p.a. and save 500,000 tonnes of CO2e p.a. (or around $35-40/tonne CO2e saved).
Conclusions

• Climate change is possibly the biggest challenge humanity has faced;

• Public transport will be part of the solution;

• Substantial investment is being injected into PT in Victoria;

• We are working to better manage the environmental footprint of PT, to maximise the benefits obtained by mode shift.
Climate Change –
The Transport Response

16th October 2007
Introduction

- Integrated land use planning
- Making better use of the road network
- Encouraging modal shift public transport
- Greening the vehicle fleet
- Resource efficiency
Energy industries: 54%

Manufacturing and construction: 4%

Fugitive emissions: 1%

Industrial processes: 2%

Agriculture: 13%

Waste: 3%

Transport: 16%
  - Transport: Civil aviation: 0.8%
  - Transport: Shipping: 0.5%
  - Transport: Railways: 0.2%
  - Road: Heavy Vehicles: 2.6%
  - Road: Light Commercial Vehicles: 2.3%
  - Road: Cars: 9.6%
Integrated Land Use Planning
(Managing Travel Demand)

- Melbourne's population growing by more than 1000 people per week- over half of this in outer growth areas.
- Over 90% of motorised trips do not involve the CBD. More and more trips are short trips within local area.
- Greater focus on the coordination and integration of transport and land use planning activity across Government.
Making better use of the road network

- Hierarchy of road use
- Changing how motorists access to road network and road space is allocated
- Intelligent transport systems
- Road user information
Improving public transport & cycling
Existing situation

- 12 million trips are made each day in Melbourne, including walking and cycling (83% by car)
- 88 per cent of all public transport trips on road
- 20 per cent reduction in traffic entering and leaving CBD (1995 to 2006)
- 33 per cent growth in people cycling to work (2001 to 2006)
Improving public transport & cycling Initiatives

- $50 million Think Tram program
- $660 million SmartBus program
- $100 million over 10 years to improve bicycle and pedestrian facilities
- Park and Ride facilities
- $135 million expansion of the Travel Smart Program
Greening the Vehicle Fleet

- New standards for passenger and heavy vehicles that set stricter emission requirements
- $50 registration discount for hybrid vehicles
- Over 2,300 hybrid vehicles registered in Victoria
- Victorian Government fleet
  - Commitment for 150 hybrids in Core Departments
  - VicRoads has 56 hybrids
Greening the Fleet
(Our Environment Our Future Commitments)

- Biofuels Action Plan
- Government fleet to use ethanol blended petrol
- $500,000 trial for hybrid buses in Melbourne
- $300,000 to develop low emission technology in local automotive industry

- Transport Energy Branch (DOI)
Resource Efficiency
Understanding our Impact

- Greenhouse Gas Inventory:
  - Street lights and traffic lights
  - Offices, depots and Customer Service Centres
  - Vehicle fleet
- Road construction:
  - Framework for calculating carbon footprint
  - Direct, indirect and embodied carbon
Resource Efficiency
Technology

- Potential for c.30,000 tonnes carbon savings per year in traffic lights
- Potential for up to 25 per cent energy savings in street lights
- 50,000 black balloons saved from solar panels at Tullamarine-Calder Interchange
Adapting to Climate Change

- Working with DSE and DOI on climate change and infrastructure risk assessment:
  - What effect will more extreme temperatures have on roads?
  - Will flash floods become more intense and more frequent?
  - Will climate change affect ground conditions?
The Victorian Government is responding to the challenge by:

- Making better use of the existing road network;
- Making public transport more flexible, more reliable and more attractive;
- Making cycling a viable alternative;
- Making freight more sustainable;
- Greening the vehicle fleet; and
- Improving resource efficiency.
Climate Change Planning Response

AITPM Victoria Branch Seminar - CLIMATE CHANGE – THE TRANSPORT RESPONSE?

Genevieve Overell
General Manager
Planning, Heritage and Urban Design
Department of Planning and Community Development
There are many types of climate change impacts that will have implications for the built environment …
Science is continuing to build our understanding of climate change risks

Infrastructure and climate change risk assessment for Victoria
A key part of addressing the challenge is managing Melbourne’s growth in a sustainable manner.

Melbourne 2030 provides the principles and the policy framework.
Many initiatives are underway, for example:
- Transit cities
- Activity Centre structure planning
Expert Assistance Program
Melbourne 2030 audit
The Victoria Planning Provisions (VPPs) provide important guidance.
There are many types of land use planning responses that can address travel demand.
There has been a very large recent increase in patronage of the public transport system…
Integration and coordination across government will be critical
In summary, planning has an ongoing key role which includes both mitigation and adaptation responses
Achievable, Affordable, Essential Sustainable transport for Melbourne

Cr Janet Rice
City of Maribyrnong
Chair Metropolitan Transport Forum
Vice President VLGA
The science is clear.
If we want to give ourselves a 50-50 chance of avoiding dangerous climate change ie:

- Global temperature increases of 3-5°
- six metre rises in sea levels
- massive extinctions
- billions of deaths

We need to reduce emissions globally by 60% by 2050.

This means reducing emissions in Australia by 80-90%.
Fossil fuel emissions per person

- Australia
- Global average emissions
- Earth’s net carbon sink: amount of human-produced CO2 the earth can absorb without increasing greenhouse gas levels

- Australian emissions 2005
- Australian emissions 2050

2005: 95% cut
2050: 70% cut

Fossil fuel emissions (tonnes/year)
Transport emissions

- Energy for electricity generation and industry
- Energy for transport
- Losses in fossil fuel processing
- Non-energy industrial emissions
- Agriculture
- Waste (primarily methane from landfill)
- Land clearing

Mt CO2e 1990 vs 2020 projections (including current abatement measures)
How to reduce green house gas emissions from transport

1. ‘Cleaner car-use’
2. Fewer and shorter trips
   - Physical changes
   - Reduced need to travel
3. Fewer trips by car
1. Cleaner car use

- Fuel efficiency has been constant over last 40 years - to decrease will require strict regulation and changes to industry policy

- Fuel substitution – long timelines, and unlikely that any fuel will support current levels of travel
2. Fewer and shorter trips

2a Physical changes to reduce car trips

- Urban consolidation has potential to reduce trip numbers and length (noting however current densities are high enough to support economically viable public transport services)
- But it needs excellent public transport and excellent walking and cycling facilities
- And changing densities is a long term project
2. Fewer and shorter trips (cont)

2b Reduced need to travel

- Important but long term
- Starting from a very low base
3. Many, many fewer trips by car
The good news

Average public transport mode share = 56%!!!
Learnings from my MAV/ McArthur fellowship trip

What

1. Public transport that competes with the car
2. Pedestrianisation
3. Great bike facilities
4. Less parking & more expensive parking
5. A vibrant, more compact city
Lessons (cont.)

How

1. Stop planning for car domination.
2. Great community engagement processes
3. Make the most of other supportive factors (eg health, liveability)
4. Mobility management
5. Institutional arrangements to support sustainable transport
Policy priorities for Melbourne

1. Climate change and peak oil considerations to drive policy development. That means:
   - Urban development planned around sustainable transport modes
   - Sustainable freight movement systems
   - Investment decisions driven by sustainability

2. Management and governance of public transport so that the design and operation of the network is managed in an integrated, accountable and transparent way
Following those policy priorities would make it clear how to address this problem.
Can we fix it?
Yes we can!

All we need is leadership and political will
Local government’s transport roles

- Provider of transport infrastructure – roads, bike paths, footpaths, urban environments
- Facilitator of sustainable and equitable transport
- Land use planner – statutory and strategic
- Parking provider, planner and regulator
- Community education and engagement
- Advocate
Helping governments develop leadership and political will!

Local governments can:
- Improve community knowledge & build community support.
- Use transparent consultative processes as part of this.
- Promote all the benefits of sustainable transport.
- Cost social & environmental impacts from transport.
- Undertake the research to do this as required.
- Encourage beacon projects - pick some winners, do these projects well and promote the outcomes.
- Lobby for projects to be done on a trial basis if resistance.
- Implement integrated planning and transport to the best of our abilities.
- Collectively be prepared to do something that hasn't been done before.
- Help and support political champions to grow.
Climate change: directions for the land transport sector

John Stanley and Chris Loader
October 2007
Transport emissions: Australia’s 3\textsuperscript{rd} largest and 2\textsuperscript{nd} fastest growing sector for GHG

Transport represents 14.4\% of Australia’s emissions

Source: AGO 2007
Victorian Transport Emissions

Victoria’s Transport Greenhouse Gas Emissions

Source: AGO 2007
Road transport is key to Australia’s transport emissions

Transport emissions - actuals and forecast

AGO projected total: 62% above 1990 level (with measures)

88% road transport

Source: AGO 2006
Also, most growth in transport emissions will come from road transport

Forecast growth in annual transport emissions 2005-2020

- Light Commercial Vehicles: Additional Mt CO2-e
- Passenger cars: Additional Mt CO2-e
- Trucks: Additional Mt CO2-e
- Rail: Additional Mt CO2-e
- Aviation: Additional Mt CO2-e
- Buses: Additional Mt CO2-e
- Shipping: Additional Mt CO2-e
- Motorcycles: Additional Mt CO2-e

Source: AGO 2006
Current measures will have only a small impact

Figure ES.1 Greenhouse gas emissions from the Transport sector
Mt CO₂-e

Measures include:
- Voluntary new vehicle fuel efficiency targets
  (15% by 2010, over 2002)
- Biofuels initiatives
- Fuel conversion program
- Travel demand management
- Urban development
- Transport investment
- PT, walking, cycling promotion

Source: AGO 2006

**Note 1** WM = ‘With measures’ best estimate. BAU = ‘Business as Usual’.

**Note 2** High and low scenarios are variations on the ‘with measures’ scenario.

Stage 1: A modest target for road transport: 2020 = 2005

17 Mt further reduction measures required
Four measures to reduce transport emissions

1. Increase PT mode share
2. Increase car occupancy
3. Increase freight efficiency
4. Increase fuel efficiency
Further measures 1: mode shift to public transport

Mode shift to public transport can arrest car travel volumes, despite population growth

Achievement of such a target in all Australian cities = 3.8Mt net annual reduction
Melbourne PT mode share

“Growing Victoria Together” goal: 20% by 2020

Source: Vic Budget 07-08, BusVic projections

Average 7.2% annual patronage growth required

Target
Reported

PT mode share of motorised trips

%
Further measures 2: increase car occupancy

Melbourne car occupancy rates

Increasing car occupancy by 10% = 3.6Mt net annual reduction

Source: VicRoads
Further measures 3: freight efficiency

- 49% of truck container slots around the Port of Melbourne are empty
- 74% of containers have unproductive ‘interim’ moves
- A 10% decrease in truck fuel usage = 3.6 Mt net annual reduction
- Can be achieved by improving truck efficiency and shifting freight from road to rail

Average greenhouse emission rates on major Australian freight corridors

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<th>Mode</th>
<th>Emission Rate (g/tonne-km)</th>
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<td>Intermodal (inc rail)</td>
<td>15</td>
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<tr>
<td>Artic truck</td>
<td>35</td>
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<td>B-Double</td>
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Source: QR 2002
Rail mode share of freight tonnes to Port of Melbourne

Source: Vic Budget 07-08
Further measures 4: fuel efficiency

- Overall fuel efficiency is showing little improvement
- A 10% reduction in total fuel consumption rate from 2005 to 2020 = 7.5 Mt net annual reduction
- Would probably require mandatory targets (BTRE projections are for less reduction)

Source: ABS SMVU
Car fuel economy targets

Source: International Council on Clean Transportation 2007
Adding up the measures

Net annual emission reduction of 17Mt+
i.e. 2020=2005

Measures 1, 2, 3 almost certainly require comprehensive road pricing, including congestion charging.

Many other measures also available
Stage 2: from 2020 to 2030:

- Target is a further net reduction of 12-13Mt
- With projected traffic growth driving increases of about 17-18Mt, gross reductions of about 30Mt will be required from 2020 to 2030
Measures 1 and 2

• Target no growth in emissions from cars, at 2020 fuel economy levels (implies about 5-6Mt of required “savings” against gross emission trends)

• Achieved by
  – PT mode share target of 30/2030 (saves ~4Mt)
    • offsets much of the projected growth in car travel (e.g. 14% growth @1.325% pa)
    • increasing urban densities will be critical to this result
  – increased car occupancy rates to deliver remaining reduction (needs to deliver ~1.5Mt)
Measure 4: fuel economy

• Target ~16Mt reduction over decade
  – through improved fuel economy
  – implies 2030 fuel efficiency about 30% below 2005 levels (at least 10% lower by 2020)

• Australian new vehicle (car) average 176gCO₂/km by 2010 is mid-range internationally

• EU averaged 160g for new cars in 2006
  – canvassing 95g in 2020 and 70g by 2025

• Should be mandatory standards, with tax measures to further reinforce the push for consumers towards more fuel-efficient vehicles
Measure 3: freight efficiency

- The preceding measures contribute gross reductions of ~22Mt
  - 8Mt short of requirements
- The additional reductions will need to come from initiatives such as
  - reducing the need to travel and trip lengths
  - improved freight efficiency
  - mode shift from cars to cycling and walking
  - even faster improvements in fuel economy
Two key opportunities

• Congestion (road) pricing
  – to be the world leader in developing and applying congestion pricing in a non-European/Asian (low density) city

• Urban densification
  – to set new standards in applying integrated land use and transport planning/policy measures to develop a more ecologically sustainable city from a low density base
Implementation of measures

- Requires both behavioural and technological changes
- Behavioural change measures can be implemented relatively quickly
- Need an early start on technological improvements due to time lags
- Mandatory fuel economy standards, congestion pricing and urban densification will be key policy levers