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**Paper title:**                    **Achieving sustainability through integrated transport and land use planning in the three largest Australian cities**

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**Abstract (200 words):**

The traditional urban transport planning process has given rise to unsustainable transport systems. Higher car ownership, more and longer trips and lower public transport are the direct outcomes of traditional transport planning. This has brought about astronomical community costs in road fatalities and injuries, congestion, massive capital investment and environmental degradation. The recent transport plans in metropolitan cities in Australia have been developed within the integrated transport and land use framework and are a crucial part of the strategic plans for improving the quality of life and liveability in the cities. Key set of goals aimed at enhancing sustainability include (a) increased share of public transport modes, cycling and walking and (b) improving air quality and reducing greenhouse gas emissions. To ensure the achievement of these objectives, massive investments and expansion of public transport systems are being pursued. In this paper, it is aimed to examine the action plans for achieving the key objective of sustainability. The discussion focuses on targets, plans and measures for achieving the desired outcomes as well as the alignment of transport plans with related environmental management strategies for the cities. These are brought out through detailed examination and evaluation of the recent urban transport plans of the three largest Australian cities (Brisbane 2002-16), Melbourne (2030) and Sydney (2010).

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### **Introduction**

The failure of integrating land use and transport planning in traditional transport planning in cities has resulted in a declining share of public transport and ever increasing dominance of car mode. This has been accompanied by increased emissions and degradation of the ambient air quality in cities. Most cities have witnessed a significant decline of urban amenities and accessibility for many of their residents. The ever-expanding urban road transport system has been accompanied by exorbitant community costs in road fatalities and injuries, congestion, massive capital investment and environmental degradation.

Transport plans are now becoming integral part of the strategic plans for improving the quality of life and liveability in our cities. Specific goals include reducing reliance on private car, increasing public transport share of urban travel, providing for cyclists and walkers, improving environmental quality, enhancing residential amenity and ensuring sustainability.

The significant transformation in the objectives and processes of urban transport planning are evident in recent transport planning in Australian metropolitan cities. The emphasis is on sustainable urban transport. Revival of public transport and development of cycling strategies are given major emphasis in the process. Transport investments for improving and expanding public transport infrastructure and services are getting a greater share of the total transport expenditure than over the past half a century. The overall objectives are to improve the amenity and liveability in cities, maintain or improve the environmental quality, and achieve sustainable urban transport systems.

### **Integrated transport planning: objectives and processes**

#### Rationale for integrating transport and land use

The relationships between land use and transport networks have a fundamental influence on the overall level of demand for travel, patronage of various travel modes, accessibility, travel distances and costs of travel, as well as the ongoing cost of providing essential infrastructure and services. It is, therefore, crucial that decisions about transport and land use should be considered together. Transport and land use planning must work together to develop a coordinated and integrated transport network.

Unfortunately, transport and land development decisions have all too often been regarded as distinctly separate issues in analysis, planning, design and evaluation. Disregard of this crucial link has contributed to adverse consequences of transport. It is, therefore, imperative that this link must be explicitly considered in transport planning for cities.

#### Integrated transport planning framework

#### Integrated transport planning includes

- (1) integrating the transport system
- (2) integrating transport and land use, and
- (3) integrating transport and other planning.

Integrating the transport system requires the integration of infrastructure and services across all modes to create an interconnected and coordinated transport system thus providing real travel choices for people and goods. Integrating transport and land use strives to match land use activity, location, densities and design with transport routes and services to ensure efficiency, connectivity and amenity. It anticipates and influences transport needs and impacts of future developments. Transport decisions must be made in cognizance of other planning and priorities of industry and governments.

#### Integrated transport planning framework – New South Wales

Transport NSW, the Department of Urban Affairs and Planning and the NSW Roads and Traffic Authority have jointly prepared planning guidelines for improving travel choices and managing travel demand to improve the environment, accessibility and liveability. The integrated land use and transport planning policy, released by the New South Wales Government (2001) on 11 September 2001, aims to

- improve access to housing, jobs and services by walking, cycling and public transport
- increase the choice of available transport and reduce reliance on cars
- encourage people to travel shorter distances and make fewer trips
- support the viable operation of public transport services
- provide for the efficient movement of freight.

#### Integrated transport planning framework – Melbourne, Victoria

The Melbourne City Council (1997) has promoted the establishment of an integrated transport system through the implementation of its Transport Strategy 1997. Council is currently developing a new integrated transport strategy with sustainability as its main theme. It encourages pedestrian activity, cyclists, and the use of improved public transport services. It is also incorporating the use of qualitative indicators initially to generate sufficient data for a greenhouse gas reduction to be determined and reported in future years.

#### Integrated transport planning framework – Queensland Transport

Queensland Transport has taken a lead role in land use planning to ensure that urban and regional development is environmentally, socially and economically sustainable.

The Queensland Government (2003) has developed an Integrated Transport Planning Framework to serve as a guide for transport planning in Queensland. It sets out a collaborative, consistent and sustainable approach to transport planning. It is a tool for transport and land use planners and decision makers in state and local government and industry offering 'hands on' advice for integrated transport planning across urban, rural and remote locations. It is a joint initiative of Queensland Transport, Department of Main Roads, Department of Local Government and Planning and the Local Government Association of Queensland.

Transport and land use are managed to create a preferred urban form that increases accessibility and connectivity, and supports sustainable travel behaviour.

## **State of urban environments in the three largest Australian cities**

### Urban environment in Sydney, New South Wales

The pollution problems of greatest concern in the Sydney area are photochemical smog and particulate pollution. These are caused by ground level ozone, nitrogen dioxide and total particulate matter.

Sydney's air quality is under pressure from pollution from more cars travelling further. Almost half of reactive organic compounds in the Sydney area are produced by the transport activity with 70% of emissions coming from light vehicles. Transport also produces 82% of NO<sub>x</sub> in Sydney with 48% contribution from light duty vehicles and 38% from heavy duty vehicles. One quarter of total suspended particles emissions are produced by motor vehicles of which 80% come from diesel emissions. The Sydney transport system also produces 12% of New South Wales greenhouse gases and transport sector contributes to 14% of Australia's greenhouse gas emissions, and is the most rapidly growing source.

The concentration of ozone and nitrogen dioxide in the Sydney urban area have exceeded National Health and Medical Research Council standards and the World Health Organisation (WHO) goals several times during the last decade. Concentrations of ozone in the Sydney region has exceeded WHO goal of 0.08 ppm on up to 31 days in a year. Over the last decade, the WHO goal of 11 ppm for nitrogen oxides has also been exceeded quite frequently. According to the Environmental Protection Authority, NSW (1998), the annual average concentrations of PM<sub>10</sub> have generally remained below the NSW goal of 30 µg/m<sup>3</sup>.

### Urban environment in Melbourne, Victoria

In Melbourne, on a typical summer week day, almost 90% of CO, 44% of VOC, 25% of particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) and 97% of lead come from motor vehicle emissions. Only on one day, the 4-hour ozone measure exceeded the objective of .08 ppm between 1999-2002.

Airborne particles are emitted from motor vehicles (especially diesel and poorly maintained engines) as well as from industry and other sources. The smaller particles PM<sub>2.5</sub> reduce visibility. To maintain an objective of 20 km visibility, the Airborne Particulate Index based on PM<sub>2.5</sub> should not exceed 2.35. On 31 days, this level was exceeded during 2002 with a maximum of 13 exceedences at any individual monitoring station. The goal is not to exceed the index beyond 2.35 at three occasions in any year. The PM<sub>10</sub> level has exceeded the goal of 50 µg/m<sup>3</sup> on several occasions but overall considered to be reasonably stable, as observed by the Melbourne City Council (2000).

Melbourne has acknowledged that over-reliance on motor vehicles has been costly on the environment and is not sustainable.

## Urban environment in Brisbane, Queensland

Brisbane is the third largest city in Australia after Sydney and Melbourne. The rapid growth of this vibrant city has made traffic and transport as one of the most important issue. It has been recognised that the increased pressure on Brisbane's air quality can be attributed to growing vehicle emissions which account for 57% of all air pollution and 70% of smog-forming emissions. The share of public transport has continued to decline as a direct result of the increasing dispersed population and employment and an increasing dependence on the private vehicle. The current travel behaviour in Brisbane is not considered to be sustainable. Brisbane has now planned to year 2016 to provide a reliable and efficient transport system, and enhance sustainability.

Pollutant levels in Brisbane are not higher than other cities of comparable size and generally much lower than Sydney and Melbourne. There has been little change in the levels of ozone, nitrogen dioxide, sulphur dioxide and particulate matter during the past ten years.

The emission inventory developed by the Brisbane City Council (2004) gives a good estimate of the current sources of pollutants and their emission levels. Key findings are

- (a) motor vehicles account for 62% of emissions of NO<sub>x</sub>, 68% of CO, and highest non-natural emitters of VOC.
- (b) diesel vehicles make up 10% of the vkt in the region but contribute to 75% of all motor vehicle emissions of PM<sub>10</sub>.
- (c) motor vehicles are the predominant source of toluene and benzene – 43% more than industry
- (d) most SO<sub>2</sub> emissions are generated by industry

The annual total emissions in the region in 2002-3 were as follows:

NO <sub>x</sub>	97,385 t
CO	617,530 t
VOCs	378,266 t
PM <sub>10</sub>	23,906 t
SO <sub>2</sub>	24,855 t

## Emphasis on sustainability in integrated transport and land use plans

A key goal in integrated transport and land use planning is to improve the urban environment by reducing emissions, improving accessibility to all groups, and endeavoring cleaner and greener personal transport.

### Sustainability through transport planning for Sydney

A key strategy in the 2010 action plan for Sydney, developed by the New South Wales Government (2001), is to integrate future urban development in Sydney with the expansion of the city's public transport services and infrastructure. New developments are to be provided with equitable access to roads. Sydney's action plan targets

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- i reducing traffic congestion
- ii improving air quality
- iii reducing greenhouse emissions
- iv increasing public transport use
- v expanding CityRail capacity
- vi making freight more competitive, and
- vii improving road safety.

Sydney's transport plan aims to improve air quality in Sydney by

- (1) reducing the growth in vehicle kilometres travelled (vkt) by halting the growth in per capita vkt by 2011 and in total vkt by 2021. This translates into a massive 43% reduction in overall growth of vkt between 1991 and 2021.
- (2) increasing the share of public transport trips from the current 20% to around 30% during the plan period. This is to be achieved through investment in new public transport infrastructure by providing more of reliable, safe and clean train and bus services.
- (3) using cleaner fuels and controlling vehicle emissions. The NSW government is determined to ensure that cars, buses and trucks are cleaner and comply with their original emission standards. It has set up an emission inspection and maintenance program.
- (4) special action on inspection and maintenance test for diesel vehicles because of their disproportionately high contribution to particulate matter and NO<sub>x</sub> emissions.

By expanding and maintaining CityRail and transitways, Sydney is committed to cutting air pollution and protecting the environment. It believes that reducing the current rate of growth of car use, especially for journey to work, is essential to improve air quality. Low emission compressed natural gas buses are being built in Sydney. Hybrid, low emission electric buses powered by 40 rechargeable batteries have been trialled and the government will consider and introduce new environmental technologies where feasible. Sydney is planning to spend \$404 million to protect the environment and heritage including planting of one million trees and shrubs in urban areas and adding traffic noise controls on new and many existing roads. Spending to improve Sydney's environment include

Cutting vehicle emissions	\$50 million
Water quality, erosion control	\$50 million
Biodiversity	\$33 million
Landscaping	\$30 million
Research and development	\$6.75 million
Heritage protection	\$700,000
Recycling measures	\$150,000

The government plans to encourage walking and cycling quality environments for pedestrians and cyclists by eliminating gaps between cycle/walking routes and providing clear signs and maps, well lit and maintained pavements, and safe, well marked crossings.

Among other measures, the Cross City Tunnel will provide fast link under the city for east-west traffic, reduce congestion through the city, reduce journey times, and improve the urban amenity in the CBD area. The tunnel will be an exclusively electronic tollway. It will greatly improve city bus services by reducing traffic in east-west direction.

On the surface, the Cross City Tunnel will allow major pedestrian movements to be made by closing some lanes on Park Street, Elizabeth Street and William Street. Less traffic in the city will result in fewer accidents and safer streets for pedestrians.

The NSW government is determined to ensure that cars, buses and trucks are cleaner and comply with their original emission standards. The Road and Traffic Authority has a three stage plan to cut vehicle emissions from passenger and light commercial vehicles. These include testing of smoky vehicles in Sydney from 1998, testing all passenger and light commercial vehicles, 4 or more years old from 2000 for Sydney and from 2004 for the hinterland.

NSW is the first state in Australia to set up emission inspection and maintenance program for passenger and light commercial vehicles.

### Sustainability through transport planning in Melbourne

Sustainability is a primary principle for the future of Melbourne. Achieving sustainability requires an integrated approach to decision-making which means taking a long-term view while ensuring that economic, social and environmental implications of its strategies are adequately considered. The core objectives of its sustainability strategy are to

- i safeguard the welfare of future generations
- ii improve equity within and between generations
- iii protect biological diversity and maintaining systems essential to support life.

In its planning document entitled Melbourne 2030, the State Government of Victoria (2002) has developed criteria against which the principle of sustainability is supported. These include

- i protecting and, where appropriate, conserving the natural resources and infrastructure resources
- ii reducing waste and wastefulness in infrastructure construction, development, management and maintenance
- iii reducing and, where possible, eradicating sources of pollution and excessive noise
- iv reducing the ecological footprint of the urban area in the region.

Melbourne's principles for sustainable cities, developed at a UN-sponsored workshop attended by 40 international experts, helped by EPA Victoria, supported by a number of local governments around the world, and adopted by Melbourne City Council, include

- i the need for a city to define a vision that involves its citizens in sharing of aspirations, responsibility, and opportunity
- ii an understanding that economic strategies must not impede basic human rights of sustenance, hygiene and shelter
- iii respect for nature and a commitment to its care
- iv definition of the ecological footprint of a city and a commitment to reduce this impact – problems should be tackled locally and now, rather than elsewhere and in the future
- v a continual process of benchmarking, monitoring and measuring progress

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### Sustainability through transport planning for Brisbane

Brisbane has recognised that the current travel behaviour in Brisbane is not sustainable. Traffic congestion, mostly made up of private vehicles threaten Brisbane air quality and liveability. In 1998, the Brisbane City Council launched its five-year integrated transport strategy and delivered a number of major projects. The objectives include the coordination of transport and land use, developing sustainable transport system, and providing for pedestrian and cyclists. The Transport Plan sets focused targets for public transport patronage and an acceptable level of service on roads. It is aimed to provide for increased accessibility to employment, entertainment, medical, education and community facilities. To this end, Brisbane will be providing the community with more travel choices – flexible, high quality public transport services, more bike and walking paths, and better connected roads as part of an integrated transport solution.

In 2002, Brisbane City Council (2002) launched the Brisbane Transport Plan 2002-2016. Its aims at *'a vibrant and prosperous Brisbane, where all people have high quality access to facilities and services, while the city's environmental quality and liveability are maintained'*. Some key features of this plan include

- i reliable, frequent public transport to improve accessibility and reduce private car use by providing viable alternatives
- ii balancing road capacity by taking existing lanes for bus lanes, bus priority measures, and bike lanes

Soundly based transport investment and policy in the 2002-16 Transport Plan for Brisbane is designed to provide the following benefits for the community:

- i improving air quality
- ii reducing greenhouse gases
- iii safeguarding Brisbane's liveability and
- iv improving accessibility

Brisbane council aims to stabilise greenhouse gas emissions in Brisbane at 2000 levels by 2010. This is supported through clean and green travel options, public transport and travel demand management measures. Pursuing the objective of more clean and green transport for Brisbane, the Council recognises that cycling and walking are activities that are affordable, healthy, sustainable, and accessible to most of the community.

The 2016 walking and cycling mode share targets of 15% and 8% respectively, of all trips directly support Council's Air quality strategy, Sustainable Energy and Greenhouse Action Plan and Clean Air Campaign (Brisbane City Council, 2002). Brisbane has more than 10,700 km of formed and unformed footpaths, and more than 500km of on and off-road bikeway. It plans to enhance the on and off-road infrastructure to complete the Brisbane's cycle network. About 295 km of off-road paths and 905 km of on-road bikeways are required to complete the Brisbane's cycle network. The walking and cycling experience will be improved by providing shade and safety along shared cyclists and pedestrian pathways. The RiverWalk strategy will create a pedestrian and cycle network along the Brisbane River. It will also encourage more people to walk and cycle more often through education programs to promote active transport.

In summary, the possible solutions to reduce air pollution proposed in the Brisbane City Council's Transport Plan include

- (a) a larger, safer and more reliable public transport system
- (b) improved town planning to include higher density living, careful siting of industry and use of buffer zones
- (c) continued monitoring and control of emissions and air quality, and
- (d) greater cooperation between Commonwealth, State and local governments to plan regional transport requirements.

## Conclusions

Urban development and transport network in many cities in the world have gone their separate ways and have lacked coordination and integration. This had drastic consequences – heavy reliance on cars, decline of public transport, continually increasing congestion, environmental degradation, accidents and casualties, and depletion of scarce non-renewable resources.

The current state of the urban environments in three largest cities in Australia has been examined and it has been recognised that our travel patterns and habits are largely to blame for decline in the quality of urban environment and the air we breathe. The integrated land-use transport plans in these cities have set out to improve the situation and have formulated policies that will reduce reliance on private cars, encourage the use of public transport, cycling and walking which will bring in significant improvements in the quality of urban environment. The integration of transport and land use is expected to alleviate the undesirable consequences of our travel patterns and create transport and land use systems that are efficient, safe and sustainable.

Numerous programs have been specifically developed and funded as part of the sustainable strategies for the three largest Australian cities. These are incorporated in the integrated transport and land use framework being adopted for transport planning in the three cities. Sustainability, liveability and improving amenities and quality of life in these metropolitan cities are some of the key objectives of transport planning.

## References

Brisbane City Council (2002), *Transport Plan for Brisbane 2002-2016*, Brisbane: City Council

[http://www.brisbane.qld.gov.au/\\_downloads/transport\\_plan\\_full\\_document.pdf](http://www.brisbane.qld.gov.au/_downloads/transport_plan_full_document.pdf)

Brisbane City Council (2004), *The Brisbane Air Quality Strategy*, Brisbane: City Council

[http://www.brisbane.qld.gov.au/about\\_council/plans\\_strategies/air\\_quality.shtml](http://www.brisbane.qld.gov.au/about_council/plans_strategies/air_quality.shtml)

Environmental Protection Authority, New South Wales (1998), *Action for Air*, Sydney: EPA

<http://www.epa.nsw.gov.au/air/actionforair/index.htm>

## *10 Sustainability through transport planning*

Melbourne City Council (1997), *Transport Strategy: Moving Melbourne into the Next Century*, Melbourne: City Council

Melbourne City Council (2000), *Environmental Indicators for Metropolitan Melbourne*, Melbourne: City Council

New South Wales Government (2001), *Action for Transport 2010: An Integrated Transport Plan*, Sydney, Sydney: NSW Govt.

[http://www.transport.nsw.gov.au/pubs\\_legal/act2010syd.pdf](http://www.transport.nsw.gov.au/pubs_legal/act2010syd.pdf)

New South Wales Government (2002), *Integrated Land Use & Transport: A Planning Policy Package*, Sydney: NSW Govt.

Queensland Government (2003), *Integrated Transport Planning Framework*, Brisbane: Queensland Transport

<http://www.melbourne.vic.gov.au/upload/AirQuality.pdf>

State Government of Victoria (2002), *Melbourne 2030: Planning for sustainable growth*, Department of Infrastructure, Melbourne: State Govt.

[http://www.dse.vic.gov.au/melbourne2030online/content/implementation\\_plans.html](http://www.dse.vic.gov.au/melbourne2030online/content/implementation_plans.html)