

Transport, Environment and Health in Australia

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Abstract

Sustainability is a word that means different things to different people. The National Committee on Transport (NCTR) of Engineers Australia has been developing position papers on several aspects of sustainability. This paper is based on one of them. The paper begins by describing the urban context in Australia. It describes the impacts, at different scales, of transport activities on the environment and on public health. Environmental impacts are distinguished according to their geographic scale – global, regional, local, while public health impacts are distinguished according to their time scale – long term, medium term, short term. The paper reviews estimates of the scales of these impacts in Australia. It pleads for greater rigour when using the concept of sustainability. It concludes with ten pointers which, if followed by engineers, would allow the transport system to perform its functions with lower impacts on the environment and on public health.

Keywords: sustainability, environment, public health

1 Introduction

The National Committee for Transport (NCTR) of Engineers Australia has been developing position papers on various transport issues. Five issues have been identified as meriting priority. They are:

- Road safety
- Changing travel behaviour
- Transport infrastructure funding
- Transport infrastructure – fit for purpose?
- Transport, environment and health

This paper is based on the fifth position paper, with amendments to make the arguments more comprehensible for an international audience.

1.1 Structure of paper

The original practice note reviews the relationships between transport and the environment and between transport and public health. Then after a short discussion of the meaning of sustainability – a heavily used but little understood concept in transport planning - it concludes with ten suggested policy directions. If transport engineers work within the framework that these provide, the outcome will be lower environmental impacts, better public health and - possibly – a move in the direction of transport sustainability.

1.2 Australian context

Despite its vast size, Australia is one of the most urbanised countries on earth. Over 80% of the Australian population (20 million by December 2003) live in settlements with population over 25,000, as the estimates for 2001 and 2011 show in Table 1. Moreover, about 60% of the population live in the five mainland state capital cities – Sydney (4.2 million as at June 2002), Melbourne (3.5 million), Brisbane (1.7 million), Perth (1.4 million) and Adelaide (1.1 million). This means that most medium- and small-scale environmental and public health problems attributable to transport are urban problems. (The large-scale problems affect all areas). Perhaps the one exception is the road toll, where roads outside urban areas are relatively more dangerous to drivers than roads within. Most fatalities of non-motorists (pedestrians and cyclists) occur within urban areas.

Table 1: Australian population disaggregated by settlement size (000)
Source: CSIRO[1]

Settlement size	2001 est.	%	2011 est.	%
>1 million	11,517	59.7%	13,002	61.9%
80,000-1 million	2,601	13.5%	2,915	13.9%
25,000-80,000	1,282	6.6%	1,349	6.4%
Subtotal	15,400	79.8%	17,266	82.2%
Other	3,897	20.2%	3,751	17.8%
Australia total ¹	19,297	100.0%	21,017	100.0%

¹ National total calculated by different method from settlement size totals

1.3 Governance

The dividing line for responsibility between the federal government and eight state and territory governments in regard to environmental and public health effects is unclear. In theory one would expect the large-scale effects to be national concerns and the medium- and small-scale effects to be state concerns, but there is a policy vacuum at national level in regard to the issues raised here.

2 Environmental effects of transport

Transport affects the environment in many ways and it is useful to distinguish between macro, meso and micro effects. Various techniques exist to minimise the impacts at each geographic level and should be used provided any side-effects are acceptable.

2.1 Macro level environmental effects

At the macro level:

- Greenhouse gas emissions from transport accumulate in the upper atmosphere and contribute towards anthropogenic climate change. The current consensus of scientific opinion is that human activities are accelerating the rate of global warming.
- Transport requires energy. Where that energy is provided from non-renewable sources, there are issues of resource depletion associated with transport.

2.2 Meso level environmental effects

At the meso level there are impacts over a wide region but they are not global. They will be associated with physical entities like regional airsheds or water catchment areas.

- Some emissions from transport will adversely affect regional air quality, by combining in the atmosphere under sunlight to form smog.
- Run-off from the hard surfaces of transport infrastructure will cause an accumulation of contaminants in regional water systems.
- More generally, transport infrastructure can have a severing effect on areas through which it runs.

2.3 Micro level environmental effects

Many effects, however, are essentially local in nature and therefore particularly amenable to mitigation through engineering design. These include:

- noise annoyance
- visual intrusion
- health irritants (such as soot particles from vehicle exhausts)
- destruction of habitat (hence reduction of biodiversity)
- erosion or destruction of heritage
- physical impacts on hydrology or hydrogeology.

2.4 Environmental mitigation measures

Transport will never be impact-free but the effects can and should be mitigated by appropriate design measures, commensurate with available resources, at the meso and micro levels. At the macro level, the effects are more an issue of energy efficiency and should be tackled by giving greater emphasis to improving

modal energy efficiency and where possible some shifting of demand to the more efficient transport modes of rail and urban public transport. This is with a view to reducing both greenhouse gas emissions and dependence on imported oil.

3 Public health effects of transport

Health issues are wide-ranging. Information recently published by the Warren Centre [2] included estimates that hospital and health care for the effects of metropolitan road crashes for Sydney alone costs in the order of \$1.3 billion a year, and that in 1993-94 the costs to the Australian health system of cardiovascular and respiratory illnesses partly attributable to pollution caused by road transport was around \$6.2 billion. (All costs quoted here and below are in Australian dollars). For public health it is perhaps more meaningful to distinguish between short-term, medium-term and long-term effects than between effects at different geographic scales on the environment.

3.1 Short term health effects

The most immediate impacts of transport on public health are the deaths, injuries and associated traumas resulting from effects of accidents, especially road accidents. These were estimated by the Bureau of Transport and Regional Economics (BTRE [3]) at about \$15 billion a year nationally in the late 1990s.

3.2 Medium term health effects

In the medium term, the less direct impacts of regional pollution will cause circulatory, respiratory, cognitive and other medical complications in vulnerable people.

A further BTRE [4] paper, drawing in part on a European assessment [5], notes mid range estimates for the economic burden of adverse health impacts due to air pollution from motor traffic in Australian capital cities amounting to \$3.3 billion for the year 2000. This comprises \$1.6 billion for mortality (premature death as a result of air pollution) and \$1.7 billion for morbidity (quality of life and production capacity of people impaired or reduced).

The Bus Industry Federation [6] in 2001 put the costs of air pollution and noise in urban areas at about \$5 billion per year.

3.3 Long term health effects

In the long term, the high level of car dependence and consequent lack of opportunity for active transport will increase the propensity to adopt a sedentary lifestyle and lead to lifestyle-related conditions such as obesity and diabetes in those who fail to take other precautions (eg regular exercise) against such conditions.

One estimate [7] of the increased health cost of lack of physical activity due to excessive car use is about \$0.8 billion per annum in Australia.

4 Sustainability

Sustainability is a much-used buzzword in transport planning. Few people would argue for an unsustainable system over a sustainable one. But how you recognise a sustainable system is more of an art than a science, a situation engineers should not accept.

4.1 Definitions

Sustainability is an attribute of a society in general rather than simply a transport factor. All powered transport is unsustainable per se practically by definition, unless the energy is derived wholly from renewable sources.

A useful definition of a sustainable society is a society that can function, change and adapt without damaging its capacity to further renew itself.

4.2 Relative or absolute sustainability?

Sustainability is sometimes used in a relative sense – one system of transport might be considered more sustainable than another if it either offers more accessibility for a given level of environmental impact, or has a lower environmental impact for a given level of accessibility (or more accessibility AND lower environmental impact). The result might still be unsustainable in absolute terms.

4.3 Need for greater clarity

Because sustainability means different things to different people, when promoting sustainability it is important to understand exactly what is being discussed. Therefore such promotion should never be done without a statement of what sustainability should be taken to mean in any particular case. Sometimes it is used exclusively in an environmental or ecological sense and sometimes it also includes concepts of economic or social sustainability - or both.

In particular, simplistic proxy measures (eg mode shares for commuter transport) should not be used without prior explanation of what they measure and justification as to why they are relevant.

5 Ten recommendations

The National Committee for Transport believes that the following ten policy directions would provide an appropriate framework for developing Australia's transport systems in line with aspirations for the national environment and public health. These do not, of course, replace any statutory requirements for environmental protection, which must be adhered to at all times. A detailed case for some of the points below is documented by IEAust [8], and Laird et al [9,10].

5.1 Vehicle size

Vehicles that are bigger than necessary for the task in hand are wasteful of energy. The sustainability of a society ultimately comes down to its consumption of water and energy and its treatment of its waste. The strongest link with transport is with energy. Much of the energy consumed by transport is devoted to moving the containers (vehicles) rather than the contents (people or payloads). The imbalance is particularly evident in urban use of cars. The use of a high-powered vehicle weighing more than a tonne – three tonnes in some cases – for short-distance travel not requiring the seating or carrying capacity or power of such a vehicle is extravagant. While congestion is not strictly speaking an environmental problem, it is often a consequence of this imbalance. There are many ways of influencing this behaviour – for instance by the provision of cycling infrastructure, by the provision of appropriate public transport, by the management of scarce road space to favour multi-occupancy of conventional vehicles, and by the promotion of low-energy vehicles such as mopeds.

5.2 Pricing settings

Current pricing and charging settings for transport are not immutable. Pricing reform is generally recognised as a necessary condition for significantly lower environmental impacts, but few can agree on the nature of such reform and because of its sensitivity there is little political support for it in any form. Nevertheless it should be recognised that the existing system is itself a pricing and charging regime, which emphasises access rather than use for private transport, and use rather than access for public transport. The undesirable environmental and public health impacts of this are evident. Several pricing reforms could be made, including:

- the replacement of all government “road funds” by “transport funds”
- all cities to impose CBD parking fees with the proceeds used to improve urban public transport
- all States to ensure that their capital cities use some congestion tolls
- federal taxation benefits for cars to be reduced and urban public transport tax benefits to be allowed

5.3 Importance of freight

Movement of goods and services is an important part of the transport task. Because the personal transport sector tends to be much better understood by planners than the commercial sector, the latter receives relatively little attention. Yet it is the larger loads carried by the commercial sector that impact to a disproportionately greater extent on the environment. Given the current state of knowledge on commercial transport, the principal practical way forward is to remember that this sector exists and constantly to seek to increase the amount of available information shedding light on how it does what it does. The modal options for freight movement should be assessed holistically, on the lines promoted in the Federal Government's *AusLink* Green Paper of November 2002 (DOTARS [11], Kilsby [12]). Freight-related recommendations include:

- shifting of some freight from road to rail as a road safety measure
- lifting the aggregate level of road cost recovery from heavy vehicles
- establishing a National Bureau of Transport Statistics to improve transport data (data on land freight transport being particularly woeful at present)

5.4 Public transport

Public transport cannot be designed to meet the needs of its users until there is clarity about what it is for. Public transport is generally considered a mode to be promoted in pursuit of environmental and public health goals. However it can potentially serve several functions. In small conurbations it tends to take on a welfare flavour by providing mobility and accessibility for those without access to private transport. As the population increases, so additional functions appear related to peaks in the transport task – for example taking children to and from school, taking commuters to and from work. Ultimately in a large metropolitan area public transport could be a feasible alternative to private transport for most of the people most of the time - though it would need to be designed for this task, with high frequencies and easy interchanges, on weekends as well as weekdays. It is important to be clear about what the public transport system is expected to do in each particular case.

5.5 Private vehicle ownership and usage

Usage and ownership of private vehicles do not necessarily have to go together. "Private" transport is usually taken to be transport privately owned, not privately controlled by the user. Because of the emphasis on system access in the charging regime and the capital cost of the vehicle itself, ownership of a vehicle will heavily influence mode choice for any trip (in favour of the continuing use of the owned vehicle). The success of "car clubs" in socially disciplined European countries suggests that the nexus between ownership and use can be broken, with results that are beneficial to the environment (through lower vehicle use) and to individual health (through more active transport, if appropriate).

5.6 Community awareness and responsibility

The community should be aware of environmental and health issues associated with transport and individuals should accept personal responsibility for their actions. It is the choices of myriads of transport users – individual businesses or private users - that generate the environmental and public health impacts of public transport. While engineers can influence these decisions by the provision (or non-provision) and management of infrastructure, vehicles and services, those individual choices still have to be made. Lack of full information on the consequences may lead to sub-optimal choices based largely on financial criteria, already distorted by current charging regimes. Community awareness campaigns - especially those involving schoolchildren, tomorrow's adults – are an essential element if public behaviour is to be influenced towards better environmental or health outcomes (or both). Ultimately individuals and businesses must recognise their own responsibility for achieving the outcomes they face, especially if they do not like the current outcomes. Lifting the level of public debate on transport issues would be supported by more and better transport data. This could be facilitated by establishment of a National Bureau of Transport Statistics.

5.7 Management of road infrastructure

The road system should not be expected to be all things to all people all the time. The road network is an infrastructure system, and motorised road users are predominantly private individuals or businesses licensed to use it in the vehicles of their choice (subject to appropriate regulation by the infrastructure owner). But many road users are unmotorised and unlicensed, and indeed many roads are also places where people live. In contrast, train services and rail infrastructure tend to be well integrated in the rail network, even when the trains are privately operated, with rigorously controlled access. Some elements of the road system are managed for subsets of road users – for instance motorways, where no pedestrians will be found – and the environmental and health consequences of this for the beneficiaries are evident (for instance higher road safety on motorways). Road design engineers should reflect that they are providing infrastructure for a wide range of potential users and should consider whose needs should take priority. In subdivision design, for instance, it is important to include routes for pedestrians, cyclists and buses instead of expecting them to manage on infrastructure designed for the private motorist.

5.8 Regional self-sufficiency

Regional self-sufficiency can reduce growth in the transport task and hence its environmental impacts. Forecasts are not facts. In particular extrapolations of current growth rates will tend to produce high estimates for the future transport task, especially for freight, which will only be realised if inter-regional interaction increases. Designing to cater for such growth is likely to result in a self-fulfilling prophecy : it can also be dampened by designing for regional self-

containment rather than regional interaction. Conflict is liable to arise between proponents of environmental and economic goals and the engineer should accept neither view uncritically.

5.9 Energy requirements

A holistic systems view when planning would need to consider energy requirements as well as financial requirements. Transport systems tend to be evaluated in economic terms, implying that the costs of environmental and health degradation have to be allowed for in monetary terms. Appropriate knowledge on which to base this approach is still embryonic and does not reflect the sustainability aspect of transport. Given that sustainability –however defined - is heavily inter-related with energy use, a holistic energy profile of an infrastructure option (allowing for embodied as well as operational energy) is likely to be more relevant to assessing its sustainability than an economic one. The continuing development of appropriate techniques should be encouraged.

5.10 Learning from others

It is not necessary to re-invent the wheel – Australia should adopt “world’s best practice” where appropriate as a short-term method to raise performance. Areas in which this would be particularly appropriate include the environmental regulation of new road vehicles, with a view to reducing greenhouse gas emissions; the development of urban public transport in major urban areas; upgrading of substandard sections of intercity rail track and the adoption of stronger road safety measures.

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