TRAVEL DEMAND MANAGEMENT: AN APPLICATION BY UNIVERSITY OF NEW SOUTH WALES (UNSW) AS A LARGE TRIP GENERATOR

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ABSTRACT

Major trip generators should adopt an organisation-based program for travel demand management (TDM) and form alliances to support government initiatives in achieving more sustainable cities. Responsibility for changes to travel behaviour is a shared one, signalling a departure from traditional approaches to urban transport planning and management. The context for this paradigm shift is described with reference to TDM and sustainable transport, and to NSW government policy. Overseas experience with trip generators and TDM, and "green transport plans" (also known as "mobility management") is outlined before describing initiatives taken by the UNSW Transport Program. These include: introducing with Sydney Buses crowd management at bus stops, communicating with public transport users, promoting new services, advocating for more bus priority measures, and making the explicit link between transport and health by promoting physical activity through 'active transport' choices. Crowd management has substantially reduced delays and uncertainty in queues; and UNSW promotion of a new service was cited as the second most important source of information to users. Potential exists for sharing experience and improving program effectiveness. We recommend building TDM programs into the existing communication networks of major trip generators.

1) INTRODUCTION

In Australia, changes in the urban transport sector are influenced by the structure of government with local, State and the Federal spheres having significant fiscal, taxation, regulatory and policy influence. The sector has also been influenced by the professional and industry groups, such as the Institution of Engineers Australia, National Committee on Transport, and, in NSW in particular, the NRMA - a large road service and car insurance company, especially through its information services about relative travel times, car travel costs, and the 1994-1999 Clean Air 2000 campaign. The IEA National Committee on Transport issued its policy on TDM in urban areas, in 1996 and shortly afterwards a policy on Sustainability, referring to the expectations under UNCED's Agenda 21 for involvement of stakeholders. The IEA advises that its TDM policy be read in conjunction with its newer policy on Sustainability.

Sustainable transport and Travel Demand Management (TDM) are two inter-related themes high on the policy agenda of governments worldwide. We are confident that the momentum to achieve more sustainable development, more sustainable cities and more sustainable transport is likely to increase into the next century (Newman & Kenworthy, 1999). Applying sustainability to transport and to other sectors of the economy continues as a 'hot issue' in the work of academics, practitioners and policy makers. Efforts to meet undertakings to reduce greenhouse gas emissions made under the Kyoto Protocol can be expected to put the pressure on curbing discretionary emissions from the transport sector. Further, reducing the use of fossil fuel in the transport sector is compatible with the multitude of perspectives – reduced traffic congestion, reduced road expenditure, reduced vehicle emissions and the use of 'active transport' for improved health and social inclusion.

Responsibility for changing travel behaviour will be a shared one. We argue that Travel Demand Management requires strategies to be formulated not only by government but also by major trip

generators, such as the University of New South Wales. For institutions to bring different interests together, to become responsible and to influence travel decisions is a radical departure from the conventional approach to urban transport management taken by governments.

This paper documents some aspects of the UNSW Transport Program that indicates the scope of work that could be undertaken by a large trip generator as an innovator in TDM. The development of TDM and the subsequent support for ecological sustainability principles has led logically to trip generators holding a significant key to the management of travel demand and cultural change. As context for the UNSW's program, we set out the NSW Government's policies on transport and other relevant sectors and comment on the valuation of time in travel, taxation and parking as distortions to TDM objectives.

2)   TRAVEL DEMAND MANAGEMENT (TDM)

The Institution of Engineers Australia adopted the definition of TDM used in the AUSTROADS (1995) Guideline:

> "...intervention (excluding provision of major infrastructure) to modify travel decisions so that more desirable transport, social, economic and/or environmental objectives can be achieved, and the adverse impacts of travel can be reduced."
> (Institution of Engineers Australia, National Committee on Transport, 1995, p. 3)

TDM unequivocally rejects a 'business-as-usual', or the conventional 'predict and provide approach' to expanding road capacity, to allow unrestrained growth of private car travel (Owens 1995).

Demand management, of course, is more familiar to many people in Sydney in its application to water, electricity, and even for materials through the hierarchy of waste minimisation. Strategies for managing demand have to be comprehensive, although the most visible part is for the end user. Thus, pricing structures applying the user pays principle or behavioural change programs do not sit in isolation from the capacity to provide and manage the service. As for these other sectors, TDM strategies need to set targets and performance measures. Monitoring of the system to establish performance against objective becomes an important component of plan implementation.

Travel demand management differs from road-based solutions to managing traffic. Post-war road traffic planning in many western countries can be best described as one of extrapolating or predicting the growth in road traffic and expanding road capacity to meet that demand. We comment later on the distorting role of travel time savings in the transport evaluation phase.

"Transport system management" (TSM) in the 1970's was one policy response to the *energy crisis,* at least in the USA. (Black 1981, pp. 181-185). In September 1975, the US Federal Highway Administration and the Urban Mass Transportation Administration made TSM a prerequisite for Federal certification of local area planning processes in U.S. cities of populations over 200,000 (Gakenheimer and Meyer, 1978). The different elements used to achieve the aims were predominantly road-based solutions traffic engineering, bus priority, truck routes, traffic restraint, and parking controls (May and Westland, 1979). Pedestrian schemes and public transport pricing and marketing were also included. Such policies were primarily the management of motorised road traffic. An Australia example, prompted by the NSW Government, unable to afford freeway and expressway plans (with some additions to the rail network) recommended in the Sydney Area Transportation Study (1974). A TSM-type strategy

was adopted from which SCATS has emerged as an internationally recognised urban traffic management and control system.

A major contribution in Australia to the understanding of TDM as distinct from TSM was *Road Transport Future Directions* (Travers Morgan, 1991) undertaken for the NSW Roads and Traffic Authority. Although it predates significant policies and legislative amendments, this Report is robust conceptually. It identified road transport issues and deficiencies in institutional relationships such as those preventing the effective integration between landuse and transport. It examines factors influencing future travel demand, such as prices charged to users of the networks (fares, motoring costs, parking fees). Above all, it indicated that the continuation of 1991 travel trends would result before 2016 in:

- a 600% increase in time lost through congestion during the morning peak;
- a 67% increase in total road travel demand;
- a significant deterioration in metropolitan air quality;

Despite these dire projections, it is important to point out how the transport appraisal and decision making process tends to favour road solutions. As urban road projects have been justified largely on savings in user travel time, it is important to understand that traditional approaches to TDM are underpinned by assumptions on the nature of travel time. We believe that TDM objectives and outcomes are distorted by assumptions about travel time, taxation concessions, and subsidies to car parking.

TDM programs are affected by travel time assumptions. Transport overcomes distance by providing an important attribute: a service in which travel times (and out-of-pocket expenses) are embodied. Such attributes are long established and are described by transport engineers in terms of the "disutility" of travel (see, for example, Warner 1962). From this traditional conception of the problem, a large academic literature deals with modal travel times as 'disutilities' together with behavioural weightings which mitigate against taking public transport, walking, and cycling, the 'active transport' modes in contrast to car travel, the sedentary, or inactive, mode. Thus the weightings are greater than unity for access time to public transport and transfer and waiting time for public transport when compared with in-vehicle time (see, for example, Quarmby 1967). This concept is entrenched in practice. Economic benefits, implicitly reducing the "disutilities", of transport improvements include "savings" in travel time expressed in monetary units by the monetary value of travel time. Furthermore, research evidence suggests that people are already aware of the environmental consequences of their choice of transport mode but overestimate the time to travel by public transport, and underestimate the time by car.

Walking, as a mode is disadvantaged in conventional modelling procedures used by transport professionals. Walking with its relatively slow speeds (4.8km/h) 'attracts' high behavioural weighting (2.5 to 3 compared with in-vehicle time). Walking from car parking appears not to attract the same weighting. Of course, in human terms, walking confers benefits not "disbenefits" when health and fitness are substituted as the socially relevant criteria for assessment. So the challenge for health promotion is to reframe the time taken climbing station steps, walking to the bus stop and the actual destination as a positive health benefit. The time on the train can be promoted as desirable: reading, sleeping, and talking.

Significantly, the UK Department of Transport, Environment and Regions (UK DETR 1996) has produced a major review of travel time and anticipates that the subject will be kept under review in light of developments. We concur it is important to review how transport/traffic planners

conceptualise and assess the time (and hence monetary) value of using different modes of transport.

Taxation issues have not received much prominence among traffic engineers. In Australia, however, Fringe Benefit Tax concessions to companies provide economic incentives for their employees to lease and use company cars and parking space. No equivalent concession is available for loans to employees purchasing seasonal passes for public transport. Further, investors in private-sector transport infrastructure investors have tax benefits withheld if 'shadow tolling' is used to supplement to the fare box for concessional travellers such as students and pensioners. In Canada, Litman (1997) has made important connections between employer subsidies for parking, as one form of underpricing car travel, which detracts from TDM options for promoting public transport travel and non-motorized travel.

The UK Inland Revenue (1999) has removed tax burdens, such as taxing employer subsidies to public bus services so long as employees pay full fare. It also introduced positive tax measures, supporting employers with TDM strategies, such as exemptions on beneficial loans for employees buying public transport seasonal tickets, tax free mileage rate of 12p per mile for business cycling, workplace parking for bicycles (and motorcycles), and a concession to employers paying tax free for alternative transport to get car poolers home when exceptional circumstances mean that normal arrangements break down.

3) SUSTAINABLE TRANSPORT

Sustainable transport can be regarded as providing a broader framework than TDM because of principles invoked (e.g. polluter pays and inter-generational equity), and the link to Local Agenda 21 (incorporating health and social development at the local level), that are not necessarily included in the objectives for TDM.

In 1992, UNCED declared the need for ecologically sustainable development (ESD), truncated to sustainability in much of the literature, by pursuing a set of principles. At the crest of the environmental movement, Australian governments adopted the Inter-governmental Agreement. In NSW, ESD was included in the objects of new legislation to protect the environment, and ESD has progressively been incorporated in many other statutes as for environmental planning. Essentially, this discourse focuses attention on the viability of patterns of resource use and waste generation.

The 1991 *Road Transport Future Directions* report for NSW (Travers Morgan 1991) was the harbinger of rising consumption levels in transport, but particularly in car travel - a phenomenon noted in Europe and in North America. OECD (1996) reported that growth in the number of motor vehicles was much faster than growth in population: annual growth rates for motor vehicles of about 5 per cent; for population this is only 2 per cent. Most national forecasts anticipate significant further growth in the next 25 years. Car ownership has increased and vehicle occupancy rates declined. Public transport use, and infrastructure, has seen a decline or relatively little growth in most western countries. Once the adverse economic, environmental, health and social impacts of this trend are joined up it becomes inescapable that the current trajectory contravenes inter-generational equity, an ESD principle directed to meeting the needs of the present without compromising the ability of future generations to meet their own needs.

It is not merely the environmental warrant but the limits of the transport system and of the capacity for technological fix that point to the need for adopting a new paradigm (Bein 1996). These reasons, and the popular desire for solutions that shape transport to a new set of priorities for managing demand, sharpen the focus onto the concept of sustainability in transport. Whitelegg (1993,p.299) has characterised sustainable transport in terms of:
1. policies that work to achieve objectives and targets;
2. protection of human health and nature conservation;
3. the development of economic activity.

In some cities and countries, people and professionals recognised that the traditional 'predict and provide' approach had to be abandoned for a 'predict and prevent' approach to growth in car travel. In the UK a series of studies, reports, policy guidances, and bi-partisan agreements have comprehensively looked at a number of problems and provided a rigorous analysis, as well as evaluations of the proposed solutions over almost a decade. The Royal Commission's follow-up report in 1997 stipulated the need for new machinery which at the local level

> "To be environmentally sustainable, a transport system has to be planned in such a way that it will improve and protect air quality, reduce exposure to noise, reduce carbon dioxide emissions and contribute to the other environmental objectives identified in the [1994] report." (UK Royal Commission on Environmental Pollution 1997 section 7.31, page 97)

The British Government's White Paper, *A New Deal for Transport* (UK DETR, 1998) is based on a consensus for radical change in transport policies. Green modes of transport - public transport, cycling and walking - are to be developed through Local Transport Plans and Green Transport Plans. In urban centres road pricing and a tax on employer commuter car parking is to be implemented to constrain the use of private motor vehicles. Revenue from road pricing and parking at the local government level will be allocated to green transport modes. The UK Government, then, in setting the framework for radical changes also recognises that partnerships are needed for shared responsibility to tackle problems.

Shared responsibilities are reflected in the statement that transport is to contribute to the quality of life not detract from it. The way forward is an integrated transport policy that connects within and between modes, with the environment, with land use planning and with policies for education, health and wealth creation (UK DETR, 1998, p13). This foundation enables and encourages inter-sectoral involvement and joined up policy illustrated by the recent WHO (1999) Charter for Transport, Environment and Health. The UK Health Education Authority (1998) observed that health and transport policy-makers alike, at least in England, now recognise that:

- it is not possible to build enough roads to meet demand: even if the economic, environmental and health costs were ignored. Consequently, the demand for road space must be managed, and emphasis placed on efficient use of existing road space.
- the need for motorised travel, or to drive longer distances, should be reduced by landuse planning, so that walking, cycling and public transport can be real choices.
- Transport and health are integrally connected. Transport can have both health-promoting and health-damaging effects.

As the Health Education Authority observed, the UK White Paper makes explicit the links between transport and health in a way which previous transport policy papers failed to do and highlighted the Authority's 'Active for Life' campaign. Greater priority will be given to walking

and cycling, including by health services as trip generators, for their employees, patients, and visitors.

In Britain, too, European influences are playing an important part in creative programs for trip generators as we describe below.

4) TRIP GENERATORS AND TDM

In Australia, State and local governments, are the main players in the implementation of transport policies and programs. The TDM Guideline (AUSTROADS 1995), however, recognises that enterprises – functioning as trip generators - have a significant role in travel demand management in addition to all spheres of government. It also describes how 'trip generators' may form associations of organisations with TDM plans, usually in a geographic area, or along a common public transport corridor, to implement programs to reduce car-based travel and to comply with trip reduction ordinances. The Guidelines also refer to Australian Councils placing conditions on developments to restrict parking and reduce the number of car trips on streets surrounding the development.

In the spirit of TDM for organisations, Hynes and Rose (1998) set out a model TDM program for Australian university campuses.

In Sydney, the Olympic Roads and Transport Authority has highlighted the capacity for 'trip generators' to apply TDM to 'special events' or their daily activities in order to reduce the share of trips made by car. The public has now experienced several test events in preparation for transport arrangements for the Sydney Olympics 2000. It is apparent that wherever large 'trip generators' attract a lot people together in one place, mass transit is the most efficient solution. The Olympic Roads and Transport Authority has supported several trip generators, notably the Royal Agricultural Society hosting the 1998 Royal Easter Show at Homebush Bay, to manage those trips. It achieved 85% share of trips to public transport, while achieving record attendance (NSW Government 1998c). Strong promotion of public transport through quality travel information and services at stations, advice about the limited car parking and cost, and not promoting car access contributed to the success of the Royal Agricultural Society's sustainable transport strategy.

Organisations have the capacity to exercise their influence over the travel of its visitors and employees. Such interventions are consistent with the internalisation of environmental costs, applying the 'polluter pays principle' in which the polluter bears the cost of pollution (WHO, 1999). Of greater importance to the organisation is the opportunity of building good relations with its staff and its clientele by providing information and ensuring good accessibility that is not dependent upon car use, or at least car-as-driver.

While the reasons for organisations to adopt a plan for TDM are many -
• improve transport accessibility
• reduce local traffic congestion and be a good neighbour
• desire to expand the organisation while containing the parking space
• save costs of parking provision
• reduce pollution and greenhouse gas emissions
• event management
• protection of natural areas for tourism, and
• socially inclusive

- reasons for a particular organisation depend upon its function, its particular needs, and availability of existing services.

Major trip generators adopting TDM strategies engage in marketing, and their role can extend to productive partnerships with public transport suppliers, and to representing the 'demand side' of public transport, such as pricing policies for parking and for tickets.

The European Union funded several demonstration projects on mobility management to be run at different sites over the last three years. Lane and Bradshaw (1998) provided a synopsis of "mobility management" and one of the European Union's demonstration projects, Mobility Strategy Applications in the Community (MOSAIC). MOSAIC projects aimed to assess and implement a range of strategies for reducing car use. For example, a demonstration project in Nottingham, England involves a partnership between the City Council and other organisations generating 40,000 travellers. One employer, with 6,000 employees, has a 3-year plan for a 10% reduction in car use by a modal shift to bus and cycling. The European Union is to set up an electronic European Platform to encourage the dissemination and adoption of successful approaches to TDM across Europe.

As a distinct, but compatible initiative, the British government produced model Green Transport Plans for adoption by trip generators aiming to reduce car trips for differing types of organisation: government departments, employers, schools, higher educational institutions, health services, and local councils. They promote replacing the reliance on car travel by mass transit, walking, and cycling. They increase physical activity, reduce pollution and social exclusion, enhance social capital and save money and parking space.

Trip generators, taking this approach, contributed to local transport plans developed by local authorities. But with the release of the UK 1998 White Paper and the guidance note to local authorities on preparing their provisional local transport plans, local authorities are required to encourage organisations to develop green transport plans as well as to develop plans for their own sites. The local authorities are expected to include separate targets for modal shift in school journeys. Evidence of partnerships with key transport operator to facilitate in mobility management is also required, ensuring the plans deal with service arrangements as well as people's adaptation to them. GTPs address cultural norms (Dietz, 1999), particularly when applied within health authorities (Transport 2000 Trust, 1999), and in combination with local transport plans have the capacity for changing the relative budgets and improving infrastructure for 'active transport'. Appraisals of both local transport plans and green transport plans were reported at the September 1999 European Transport Conference (e.g. Bradshaw, 1999; Ferrary, 1999).

5) POLICY CONTEXT FOR TDM IN NSW

Before addressing the case study of UNSW as a major trip generator, we refer briefly to the policy context in NSW. The Inter-Governmental Agreement on ESD gave some impetus to government policies to apply the principles of ESD. In 1993, for example, the Premier released his Government's policies on transport and urban planning both of which referred to ESD and TDM. The Integrated Transport Strategy for Greater Sydney interpreted the "environmental" objective as "minimising the environmental impact of transport" - a primary goal of the move towards travel demand management. The strong message from the transport and urban planning policies was that transport demands are derived from landuse decisions. Specifically, the policies recognised the connections between housing, employment, and transport. However, the technical

decisions and processes for decision-making through local Traffic Committees and the State Environmental Planning Policy on Trip Generating Developments continued as before.

Following growing public concern about smog and the declining quality of Sydney's air led to the development of a new policy. Comprehensive research into air quality and health effects in the Greater Sydney metropolitan area demonstrated that the projected increase in vehicle emissions caused by the growth in the number and length of trips could no longer be contained by emission controls and a long-term strategy of transit-oriented development.   In 1998, the NSW air quality management plan, *Action for Air*, set regional air quality goals, which warranted the strategies to break the trend of higher reliance on cars. It sets two challenging targets, intended for use as performance indicators for programs across government:

1. reducing vehicle-kilometres-travelled (VKT) to achieve
    *   zero growth in per capita VKT by 2011
    *   zero growth in total VKT by 2021; and

2. a threefold increase in bicycle use statewide and a 5% reduction in accidents by 2011(NSW Government 1998a).

Later in 1998, the NSW government released its policies on urban planning, *Shaping our Cities*, and on transport, *Action for Transport 2010* (NSW Government 1998b and 1998c). This transport plan recognised that to meet the government's air quality targets "dramatic changes are needed to the way we travel and how we use public transport." This text is consistent with TDM such as locating trip generators close to centres with good accessibility for public transport; requiring Councils to regulate development to manage travel demand, and reducing car dependency. It also listed the new public transport infrastructure to be constructed after decades of neglect during urban expansion. However, in the next State budget, much greater expenditure on public transport infrastructure, relative to road building, is necessary to allow travel choice in some areas of Sydney. The travel speed of buses relative to car travel is another area needing expenditure and greater commitment since it is now reported as the area of least satisfaction of transport service efforts and achievements (NSW Council on the Cost of Government 1998).

In addition to these three policies, the NSW plan to promote physical activity, *Simply Active Everyday* recognised 'incidental activity' and the potential for a program linked to the transport sector and urban planning (NSW Government 1998d). In one survey, 40% of respondents described as 'insufficiently active' gave lack of time as the main barrier to achieving adequate levels of regular physical activity.

6) UNSW AS A MAJOR TRIP GENERATOR

Consistent with NSW Government policy to reduce car dependency and increase patronage on pubic transport and to encourage walking and cycling we describe the programs taken by UNSW as a major trip generator. These include overcoming some of the obstacles to public transport developing a communications strategy to produce user-friendly public transport information and to increase the awareness of transport activity.

The University of New South Wales (UNSW) is one of Australia's largest universities and is located in Kensington, 6km south-east of central Sydney. 25,000 people travel to the campus daily. Although the Kensington campus is located in the Eastern Suburbs, the transport catchment covers the entire metropolitan area. The capacity of UNSW to attract students and to enable

equitable access to the range of studies and activities means that UNSW is dependent on the efficient functioning of the public transport system. Most people, staff and students, travel by public transport. The UNSW's modal split is 53% public transport, 29% car, 16% walking and 2% bicycle (Sharp & Lee, 1998). As yet, no rail line connects UNSW to the Sydney CBD or Bondi Junction, and 15,000 people arrive by bus every day. Around 7000 people use train/bus connections and catch UNSW Express buses from Central Railway station. Importantly, commuters are not the only user group on these services. Part-time students, part-time staff and visitors to both UNSW and the Randwick Health Complex, comprising the four hospitals, use these bus services. The University Union shops provide public transport information, and in the last financial year they sold over $1m worth of tickets. Organisations are better placed than public transport operators to know the transport needs of their customers and distribute information.

The Vice-Chancellor formed the UNSW Transport Reference Committee late in 1997 to secure better transport access. This Committee has wide representation including University Council, the Facilities Department, the UNSW Environment Program, the Student Guild, and academics from several disciplines. UNSW recognises that improving transport access is essential in order to maintain a competitive advantage as one of Australia's leading universities. Prospective students rate access to transport as an important factor in choosing a university and consider transport access a weakness of UNSW (UNSW, 1994). In 1997/98, the Committee developed a draft Integrated Transport Strategy to better manage transport access to the campus while reducing reliance on car use. In mid-1998, the Committee hired staff and established the UNSW Transport Program. The establishment of a committee, staffing, and developing a program is consistent with mobility management practice worldwide.

UNSW's Transport Program has adopted a Travel Demand Management (TDM) approach. Its interventions aim to modify travel decisions, by user-friendly communications and to influence improvements to the transport system itself. The 1996 survey provided information about travel patterns as well as deficiencies in infrastructure and services and economic disincentives to switch to 'active transport' modes. If these deficiencies were overcome, major improvements would result in travel times, service quality, opportunities to cycle, and ultimately reduced car use.

The Program, above all, needed to demonstrate its practicality. It needed to communicate with the University community about transport, changes to services, and to earn credibility with people already knowledgeable and skilled as public transport users through their experience of commuting, and with cyclists. The initial priority for the Program was overcoming long-standing problems: crush conditions for bus passengers and the lack of comprehensive transport information.

6.1 Trip Generators role in reducing long-standing transport problems

a) Introducing crowd management

First, the Program had to tackle the infamous "scrum" to get onto a bus in the mornings at the interchange at Central Railway station. Overcrowding during the morning peak had been an ongoing problem for two decades and had earned public transport a bad reputation in the eyes of people travelling between Central Railway and UNSW. The UNSW 1996 travel survey

confirmed that overcrowding at the bus stop at Central Railway station was the main deterrent to people catching public transport to UNSW.

In September 1998, Sydney Buses introduced a simple queuing system in conjunction with the UNSW Transport Program that has successfully ended the crush conditions and provided the capacity for a reliable service. The majority of passengers was very pleased with the changes and recognised the improved safety and amenity of the queue. In late 1998 travellers sent enthusiastic comments – "I'm over the moon - the service is great now." With the queue system in place, the variance of waiting times was reduced and passengers are experienced a more consistent journey time, and a more comfortable service. The number of passengers waiting more than 5 minutes was halved: 39% before the queue and 21% with the queue system (UNSW 1999).

In early part of 1999, these waiting times lengthened and passengers found they had to arrive at the queue early to be sure of reaching UNSW on time. Although many factors contributed, the lack of bus priority measures, including enforced bus priority lanes, was an obvious defect if the policy of giving priority to moving people, rather than merely moving vehicles, is to have effect.

It was fortunate that State Transit introduced a new, cross-regional bus service (the 370), running between Coogee Beach (east of UNSW), UNSW, the University of Sydney to the inner west. Some passengers travelling to UNSW from the inner west, were diverted from the interchange at Central, and benefited by the replacement of a train-bus trip with a single bus trip. However, passenger numbers at the Central interchange continue to be high, and other strategies are being developed to relieve the congestion.

For the return journey from Anzac Parade – the main arterial linking UNSW to Sydney CBD - crowd management has been greatly improved by a installing a new bus stop thereby separating two services to important destinations: Central; and Circular Quay and elsewhere. In addition, more express services from High St – a local street - were introduced which had the beneficial effects of reducing the volume of passengers at Anzac Parade during the afternoon peak and of serving the upper campus with a closer bus service.

b) Communications: information, varied demand, marketing services

The UNSW Transport Program produces user-friendly information about public transport to assist journey planning and accessibility to the campus.

 In the past, many Sydney-based students reported that it had taken them up to 6 months to work out the best ticket to buy. Staff also report that they use public transport while travelling in Europe without a problem but cannot understand their own public transport network and consequently prefer to drive to work.   International students are often familiar with sophisticated public transport networks elsewhere yet they are confused by the Sydney system.

UNSW now publishes a brochure providing comprehensive transport information about public transport routes, frequency of services, tickets, restricted parking, and the value of walking for health. It is distributed through Union shops, the Library and other information points across the campus. It has been well received by thousands of people enquiring about how best to access UNSW. We are pleased that other organisations are emulating our practice of providing passenger-friendly information by customising their own information for use in brochures, invitations, stationery, business cards, and electronic texts. Aside from its practical use, we

believe that such information is likely to contribute to cultural change - making more visible the sustainable modes of transport and querying the assumption that people will depend on private cars to arrive. It is also socially inclusive.

The Program also seeks to cater for information needs and for changes to services in response to the varied demand arising from exam periods, major conferences, and events. For a major international conference, the conference organisers advised prospective attendees about public transport and accommodation. The organisers took up the suggestion to give each hotel or college accommodation a 'transport accessibility' rating, the more Ts meant better access to UNSW by walking or by bus.

Trip generators can play a powerful marketing role as we showed by promoting the new cross-regional bus route (370) earlier this year. A Sydney Buses' passenger survey showed that UNSW played a significant role in marketing the service. Passengers were asked how they first heard about the new service and 42% reported having seen the bus on route, the next highest category, 13% reported that they had heard about the service through UNSW, that is promotions by the Transport Program. We consider that the marketing of this service could be pitched strongly to other trip generators along the corridor, to increase patronage and meet latent demand. The extension of the service to weekends, for trips to Coogee Beach, and re-routing through the regenerated cuisine and commercial centre of Leichhardt could possibly be brought forward with co-operative marketing.

6.2 An opportunity for promoting physical activity for health

For many health reasons, public health practitioners have long recommended urban consolidation and strategies, now bundled as TDM (McMichael 1993, p. 306).

Evidence for the protective role of physical activity for health, both physical and mental, is compelling (US Surgeon General 1997). 'Transport exercise', or 'active transport' refers to the physical activity in walking, cycling, and in walking or cycling to bus stops and stations and climbing the stairs. Conversely, travelling by car is sedentary or inactive transport. Exercise of moderate physical intensity, such as a brisk walk, cycling, climbing the station steps contributes to the total of 30 minutes, moderate daily activity sufficient to maintain health and reduce the risk of future health problems (NSW Government 1998d). People appear to find it easier to fit 'transport exercise' or 'active transport' into everyday life, taking exercise in this incidental way - buying some bread, or taking a child to school – than making extra time for physical recreational exercise (US National Heart, Lung and Blood Institute, 1999).

Although 16% of travellers to UNSW already walk there, 500 staff live within 5km radius of the campus and drive to work. The opportunity exists for some staff to walk, or walk-bus to the campus, at least on some days (Mackett, 1999, pp. 379-390). In the 1997 Travel Survey, 20% respondents who drove to the campus, said they would be willing to cycle if safe cycling routes existed (Sharp & Lee 1998). For this option to be available, Randwick City Council (UNSW is located in this LGA) will need to incorporate bike-friendly design into new roadworks, and in implementing its bikeplan.

The UNSW Transport Program is collaborating with UniGym to identify the (human) energy expenditures of typical walks by public transport travellers. For example, what is the energy expenditure for a typical set of railway station steps, the walk between the University library and bus stops at Anzac Parade and at Randwick Junction, and climbing the infamous Basser Steps?

The UniGym's health assessment program for staff will include questions about transport, recognising that active transport can substitute for some car trips and also be able to guide participants about the health and fitness benefits of making an active transport choice.

Like the IEA's policy on TDM, the Public Health Association of Australia (PHAA) sees a role for their individual members as well as their organisation to raise sustainability in transport where it is not being addressed. The PHAA 1998 policy states that all health professionals should be encouraged to consider their educational role in the promotion of participation in physical activity and strongly supports sustainable transport and local government-based approaches. It observes that the greatest public health benefits for the community are likely to result from encouraging those who are sedentary to participate in regular moderate exercise, such as 'transport exercise'.

6.3 Broader contributions of UNSW Transport Program to TDM

Submissions on public transport fare increases and on proposed urban developments – have been essential to represent the need to preference, or at least remove the disincentives to public transport travellers. Despite the apparent intent of State policies, many processes such as assessing development applications and reviewing public transport fares (IPART, 1999) remain unchanged so that the net result continues to preference road solutions and private car travel.

The State and local governments produce policies and plans for bike routes, pedestrian and mobility access, pedestrian priority zones, sharing main streets, and urban designing for young people. All these good intentions, however, can be undermined unless they are mainstreamed into professional practice, legislation, roads authorities guidelines and budgets, for otherwise the achievements will remain paltry. Between June 1996 and June 1997, the length of bus lanes (mostly in the Sydney CBD) increased by 13km (47%) (Council on Cost of Government, 1998) and the Program has been pressing for extensions to bus priority measures. Unfortunately, the UNSW Transport Program has had to direct considerable energy to avoiding threats to existing services by proposed or actual decisions!

7) CONCLUSIONS

Sustainable transport and Travel Demand Management (TDM) are high on the policy agenda of governments. We have argued that in order to fulfil the potential of behavioural change in the transport sector, governments must form strategic alliances and that major trips generators are well placed to participate in partnerships. We have drawn the distinction between traditional transport system management and Travel Demand Management and shown how sustainability considerations have generated more inclusive approaches of trip generators becoming mobility managers. Specifically, we have set the policy context for TDM in NSW so as to locate the initiatives of the UNSW Transport Program across a number of important government sectors.

That UNSW is a major 'trip generator', and identifies itself in this way, enables the needs and views of existing State Rail and State Transit travellers, and potential travellers, to be represented. Since government construes transport as a market, the 'demand side', the people travelling or would-be travellers can be given visibility by a transport program. Decision-makers are encouraged to take a more systematic approach to transport and to remove the current economic incentives for cars and parking, not available for 'active transport' travellers, and to advocate on behalf of, and speed-up improvements to the infrastructure for public transport, including enforced bus priority measures. The emergence of this transport function by the UNSW is equivalent to the practice of 'mobility management' by universities and hospitals in England and North America and by sites, city and regional government in Europe and North America, and increasingly around Australia.

In our view, 'mobility managers' (running transport programs for organisations) think and work internally across a number of inter-connected areas of policy within the organisation. In addition, they need to
- champion 'green modes' or 'active transport';
- relate to transport service providers;
- build alliances amongst each other;
- develop strategic partnerships with governments;
- grow patronage along transit corridors;
- be aware of local government parking policies and other policies;
- be critical of their own policies especially if they promote car-based access;
- and connect with other policy arenas (for example, environment, urban planning and health).

Organisations concerned with TDM must advocate for revisions to federal taxation policies, which are currently distorting and deterring the use of public transport in Australia.

The UNSW Transport Program has also found it necessary to represent the needs of cyclists and walkers to Councils, engineers, architects, and proponents, when urban design and landuse changes are mooted. These remedial functions are still necessary while organisations have inadequate mechanisms for implementing their bicycle policies; professionals are not undergoing practical, continuing education. At the time of going to press, the State government has not yet detailed a Travel Demand Management strategy. In addition to the complementary measures for TDM, the Program is also advocating the need for a heavy rail link for UNSW as proposed (NSW Government 1998c). To this end, UNSW as one of the major trip generators in the corridor is liaising with other trip generators to constrain parking and to build public transport patronage in the corridor in order to bring forward the timetable for feasibility studies and possible construction.

From our experience, we recommend that governments adopting policies for TDM recognise the potential for 'mobility management' by organisations, which are so well placed to improve transport accessibility while reducing car use. Our experience indicates the potential for public transport service providers to liaise with 'trip generators' more actively – to enable the services to become more responsive to the needs of travellers and to increase patronage. We also wish to thank the major players – notably State Transit, Randwick, Sydney and South Sydney City Councils, the Department of Transport, the Roads and Transport Authority, and State Rail, as well as neighbouring trip generators – without whose initiatives and collaboration our Program would have achieved little. These partnerships have been important. We recognise the value of 'trip generators' to adopt an organisation-based program for TDM and welcome other organisations and Councils to this rewarding field.

REFERENCES

AUSTROADS (1995) *Travel Demand Management Guidelines*, AUSTROADS. (ISBN 0 85588 460 6).

Bein Peter (1996) *Transportation, global warming and business as usual*, Ministry of Transportation and Highways, BC, Canada, Revised November.

Black J. (1981) *Urban Transport Planning: Theory and Practice*, Baltimore: John Hopkins University Press.

Bradshaw R. (1999) The future of mobility management in the UK, *European Transport Conference*, Cambridge, Proceedings of Seminar B: Transport Planning, Policy and Practice, pp.157-168, London:PTRC Education & Research Services Ltd.

Dietz WH & Davis R. (1998) Lessons from a cyclist: doctors should do more to promote physical activity, *British Medical Journal*, Editorial, 199:319:334-334 (7 August).

Ferrary C.(1999) New directions in appraisal for Local Transport Plans, *European Transport Conference*, Cambridge, Proceedings of Seminar B: Transport Planning, Policy and Practice, pp.319-330, London:PTRC Education & Research Services Ltd.

Gakenhimer R. and Meyer, M. (1978) *Transportation System Management The Record and a Look Ahead Summary Report*, Washington D.C.: Department of Transportation.

Hynes J. and Rose G. (1998) Travel Demand Management and its application at Australian university campuses, CD ROM Proceedings of the 19th ARRB TR Conference.

Institution of Engineers Australia, National Committee on Transport (1995) www.ieaust.org.au/policy/pol_TravelUrban.html (accessed at 21/10/99).

Independent Pricing and Regulatory Tribunal of New South Wales IPART (1999) *Public Transport Fares from 1 August 1999: CityRail and STA Buses and Ferries*, Sydney www.ipart.nsw.gov.au (accessed at 21/10/99).

Lane R. & Bradshaw R. (1998) Mobility management - a new approach to TDM, in Z.Yang, K.Wang, & B. Mao (eds), *Traffic and Transportation Studies*, Proceedings of ICTTS'98, Beijing: American Society of Civil Engineers.

Litman Todd (1997) Policy implications of full social costing, *Annals, American Academy of Political and Social Science*, 553, September.

Mackett R.L. (1999) Reducing the number of short trips by car, *European Transport Conference*, Cambridge, Proceedings of Seminar B: Transport Planning, Policy and Practice, pp.379-390, London:PTRC Education & Research Services Ltd.

McMichael AJ (1993) *Planetary overload: global environmental change and the health of the human species*, Cambridge: Cambridge University Press.

May A.D. and Westland, D. (1979) Transportation System Management: TSM-Type Projects in Six Selected European Countries, *Traffic Engineering and Control Supplement,* London: Printerhall.

NSW Council on the Cost of Government (1998) *Transportation: service efforts and accomplishments 1997,* Sydney: NSW CCG.

NSW Government (1998a) *Action for Air: NSW Government's 25-year Air Quality Management Plan*, Sydney: Environment Protection Authority, Sydney. .

NSW Government (1998b) *Shaping our Cities,* Sydney:Department of Urban Affairs & Planning.

NSW Government (1998c) *Action for Transport 2010: an integrated transport plan for Sydney,* Sydney, NSW Department of Transport.

NSW Government (1998d) NSW Physical Activity Task Force, *Simply Active Everyday: a plan to promote physical activity in NSW 1998-2002*, 'Active Australia', (NSW Government initiative), Sydney: NSW Health Department, Public Health Division, September.

OECD (1996) Towards Sustainable Transportation, Paris: Organisation for Economic Co-operation and Development.

Owens S. (1995) From 'predict and provide' to 'predict and prevent'?: pricing and planning in transport policy, *Transport Policy,* Vol.2, No.1,pp.43-49.

Quarmby D.A. (1967) Choice of travel mode for the journey to work, *Journal of Transport Economics and Policy*, Vol 1,pp.273-313.

Sharp L. and Lee, A. (1998) A proactive approach to transport needs of a large organisation, *Australian Transport Research Forum*, September, Sydney.

Sydney Area Transportation Study (1974) *Sydney Area Transportation Study*, Vol 1-4, Sydney: NSW Government Printer.

Transport 2000 Trust (1999) *Healthy Transport Newsletter*, Summer.

Travers Morgan Pty Ltd, Sinclair Knight & Partners Pty Ltd, Booz- Allen and Hamilton (1991) *Road Transport Future Directions: Summary Report on Options* , Commissioned by the Roads and Traffic Authority of New South Wales Sydney: Elro's Printing Service.

UK Department of Transport Environment and Regions (1998) *A new deal for transport: better for everyone: the Government's White Paper on the Future of Transport*, London: HMSO.

UK Department Transport Environment and Regions (1996) *The value of travel time.* Prepared by Accent Marketing and Hague Consulting Group, Authors: Hugh Gunn, Rob Sheldon.

UK Health Education Authority (1998) *Transport and Health: a briefing paper for health professions and local authorities*, London: Health Education Authority.

UK Inland Revenue (1999) *Budget 99: Help for Green Transport,* 9 March.

UK Royal Commission on Environmental Pollution (1997) *Transport and the Environment - Developments since 1994*, Twentieth Report (Chair: Sir John Houghton), London: HMSO.

University of New South Wales (1994) *UNSW in the community context,* Sydney.

University of New South Wales Transport Program (1999) *Eddy Ave bus stop report: Evaluating crowd management measures at Eddy Ave, Central Station, for UNSW express bus services*, Sydney: UNSW.

US Dept of Health and Human Services (1997) *Physical Activity and Health, a report of the Surgeon-General*, Atlanta, GA.

US National Heart, Lung and Blood Institute (1999) *Simple lifestyle changes boost physical activity/cardiovascular health*, www.nhlbi.nih.gov (accessed 21/10/99).

Warner S.L.(1962) *Stochastic choice of mode in urban travel: a study of binary choice*, Evanston, Illinois: Northwestern University Press.

Whitelegg J. (1993) *Transport for a Sustainable Future: The Case of Europe*, Belhaven Press, London.

World Health Organisation (WHO) Europe Office (1999) *Charter on Transport, Environment and Health*, www.who.dk (accessed 21/10/99).