Just how (Travel) Smart are Australian universities when it comes to implementing sustainable travel?

Carey Curtis and Carlindi Holling

Address for correspondence
Carey Curtis
Curtin University of Technology, Perth, Western Australia
<c.curtis@exchange.curtin.edu.au>
http://www.curtin.edu.au
Carlindi Holling, Curtin University of Technology, Perth, Western Australia

Abstract

Australia, like the United States, the UK and Europe, has seen the development of policies for sustainable travel in the past decade. Although not a new approach, Travel Demand Management Plans are one tool seeking to manage commuter travel for transport sustainability. Australian universities generate substantial commuter trips which result in a significant impact on transport infrastructure and on the community. Travel planning for universities needs also to be cognizant of the particular characteristics which set universities apart from other large employers.

The paper reviews international literature on TDM at universities in order to establish the extent to which TDM actions have been implemented. This provides a benchmark with which to compare action taken by Australian universities. The survey findings indicate that implementation of TDM in Australian universities is still in its infancy with only six of 25 surveyed universities developing TDM plans. The main focus of these plans is on improving public transport access. None seek to implement disincentives for access by car despite the heavily car dependent nature of those universities in suburban locations. Universities are reliant on individuals to champion the cause in the absence of federal legislation requiring such action. Such legislation may now be required in order to accelerate progress towards sustainable travel practices at Australian universities.

Keywords

Australia, TDM, Travel Demand Management, Universities travel.

Introduction

There has been little progress with sustainable travel practices at most Australian universities despite over a decade of national and state policy statements urging the need for sustainable travel in Australia (Department of the Environment and Heritage, 1992; Department of Transport, Ministry for Planning, Main Roads Western Australia *et al.*, 1996; Western Australian Planning Commission, 1997; Queensland Transport, 1998; National Transport Secretariat, 2003). Passenger transport is responsible for over half of Australia's road transport emissions, and the emissions from this sector are increasing more rapidly than total greenhouse emissions (Bureau of Transport and Regional Economics, 2002). The need to reduce the contribution motor vehicles make to greenhouse emissions is recognised both federally and internationally (Kemp, 2003; Whitelegg, 2003). The 2004 Australian Road Summit noted that road transport faced enormous pressures and that strategies emphasising travel behaviour change and TDM are now high on the agenda of transport agencies (Smart Urban Transport, 2004).

Travel demand management is one approach aimed at achieving more sustainable travel patterns by influencing a reduction in the number of car trips. TDM Plans or Green Commuter Plans are most applicable for institutions generating a high volume of vehicular trips. Regulatory and incentive levers are used to achieve a redistribution of trips from low occupancy car travel to the more sustainable travel modes of walking, cycling, public transport and high occupancy vehicles.

Action to manage travel demand is more common throughout the United States, United Kingdom and Europe where government policy (and legislation in some cases) encourages business uptake of commuter plans (DfT, 2002; Rye, 2002; Rose and Ampt, 2001; Coleman 2000; Environmental Resources Awareness Group & Conservation Council of Western Australia, 1999). In Australia, to date, there has been an absence of federal government legislation encouraging travel planning in the workplace. State governments have addressed the issue, and most are devoting some resources (albeit limited) to TDM planning. Commuter plans have been trialled through the Australian Conservation Council's Smogbusters program. However, the catalyst for developing a commuter plan has usually been the desire by individual businesses to address greenhouse gas emissions, on-site parking issues and to a lesser extent, congestion on the surrounding road network (Estill Associates & Department for Planning and Infrastructure, 2003; Mason, 2000).

Australian universities are significant travel generators. Campuses usually have a student and staff population in the thousands, and attract a large number of daily visitor trips in addition to staff and student travel. Curtin University of Technology in Perth, Western Australia estimated 32,400 car trips were made daily during the 2001 teaching semester (BSD Consultants cited in Curtin University Access and Parking Committee, 2003). Like Curtin University, tertiary institutions located on suburban sites are experiencing growing parking demands. Surrounding road networks suffer high traffic volumes during peak hours that delay public transport services and discourage walking and cycling.

Travel planning for universities needs also to be cognizant of the particular characteristics which set universities apart from other large employers. Extended hours of operation generate travel demand during times of low frequency transit service outside of peak transit periods. Within university departments, teaching schedules of faculty staff can vary significantly presenting particular constraints to developing shared transport programs. Students are often time poor, their travel is constrained by cost and influenced by work and other commitments outside of university study. The diversity of ages, life styles, cultures and occupations contributes to complex travel patterns at universities and presents a particular challenge to implement special forms of TDM programs.

This paper reviews international literature in order to establish the extent of TDM action by leading universities across the world. This provides a benchmark with which to compare the extent of action taken by Australian universities as a whole. The paper then reports on the findings of a survey which examines whether Australian universities have recognised the need to manage travel, and if so, to what extent they have taken action to manage the transport demands of staff and students.

The need for Commuter Travel Management for large employers

Large employers generate a significant proportion of employee trips to and from the workplace during the morning and evening periods. There is also some inter-peak travel for business trips, private trips by employees and visitor business trips (Environmental Resources Awareness Group & Conservation Council of Western Australia, 1999; DfT, 2002). Much of this travel is undertaken by motor vehicles with a high proportion of trips as driver only (Environmental Resources Awareness Group & Conservation Council of Western Australia, 1999). The predominance of car travel for commuting is exacerbated by business decentralisation to suburban and light industrial areas (Banister, 2002), i.e. locations that are often poorly serviced by public transport and have limited infrastructure for walking and cycling.

Employees lacking adequate transport alternatives will commute by car, a practice that contributes to congestion during peak hours, and creates a significant demand for on-site parking. Within Australia the mode share for travel to work by car was 64% in 2001, having grown from 55% in 1991 (Australian Bureau of Statistics, 1994; Australian Bureau of Statistics, 2001). High levels of car use add to global greenhouse emissions and diminish local air quality. Congestion during peak periods reduces the efficiency of road transport networks and undermines the amenity of local areas (Newman & Kenworthy, 1999).

Developing and implementing a TDM plan has the potential for considerable economic, environmental and social benefits. A 'TravelSmart' initiative in South Perth, Western Australia, aimed at encouraging households to reduce their car trips, demonstrated a private user benefit of AUD$2.54 million for the 35,000 people participating (Ker & James, 1999). This is equivalent to a saving of approximately AUD$76 per person per annum. There are also cost savings coming from reduced investment in, and maintenance of road and car parking infrastructure. Furthermore less car parking contributes an opportunity for more productive use of land. Other benefits include improved health of staff, as well a marketing edge of a sustainable, accessible environment. Institutions with travel plans contribute to a wider community benefit via increased public transport patronage and associated revenue gain, reduction in road building and maintenance through a reduced rate of traffic growth and reduced air pollution.

TDM Plans are a tool for employers to manage the travel choices of their employees and to some extent, of business visitors (Environmental Resources Awareness Group & Conservation Council of Western Australia, 1999; Enoch & Potter, 2003; Rye, 2002). The aim is a reduction in the number of car trips to the workplace, with an increase in employee travel by other modes. Plans can be developed either by the employer or by a consultant in conjunction with the employer, or by an employer/employee partnership and respond specifically to the site and employee travel characteristics. The key is in providing an integrated package of measures that support the aim of the plan (Environmental Resources Awareness Group & Conservation Council of Western Australia, 1999; Rye, 2002). The approach to influencing employee travel behaviour is three pronged: information and education; incentives; and regulation or disincentives. This framework is applied across the actions of the plan. The actions should address public transport discounts, walking, cycling and flexible work practices, onsite car

parking availability and cost, company car provision and usage, and car pool schemes.

University TDM: International best practice

A literature review of international best practice at universities shows that there is a wealth of solutions that can be implemented to achieve sustainable travel practices. Some universities stand out as leaders in TDM: University of British Columbia, University of Washington and Oxford Brookes University (Australian Greenhouse Office, 2003). Often such progress is made through individuals acting as champions, but the task has been made easier where government policy underpins TDM practice. Our review found that developing a TDM Plan involves three key steps: understanding the issues facing sustainable travel at the university; finding the champions for the TDM Plan; and taking action to achieve desired outcomes. Our review is framed around these three steps.

Understanding the issues

Understanding how a TDM plan relates to the broader sustainability issues within the university will assist in setting the context for the planning process. Universities may have policies and practices that present additional barriers to be addressed in travel planning. These may include incentives for car use via salary packaging, priority and seniority allocation of car parking, reimbursement of car travel expenses, and lack of reimbursements for travel by other modes. The student union/guild may subsidise student parking permits. The absence of information and support and facilities for more sustainable transport modes is another barrier.

Finding Champions

Gathering support for travel planning requires that staff, students and stakeholders are involved in the plan's development. Where staff, faculty and students have not been included in planning phases, little participative support and even obstruction to implementation has occurred (University of Western Australia, 2003; Curtin University Access and Parking Committee, 2003). Endorsement of the TDM plan will be necessary by senior staff within the university. High level decision-makers in appropriate departments should be targeted to ensure their support for the plan. Universities should also aim to find a champion for the plan, a person who is willing to participate in the plan actions and promote the TDM plan at orientation days, induction days and relevant functions.

Involving stakeholders is an important component of travel plans. Establishing good relationships with local authorities, public transport service providers, neighbouring businesses and government will be necessary to successfully achieve off-site infrastructure improvements (DfT, 2002). Universities with the greatest successes from travel planning established Transport Committees for the regular participation of stakeholders. The Committee focuses on 'problem diagnosis, policy development and introduction of implementation measures' (Oxford Brookes University, 1999), ensuring stakeholder resources and time are used effectively.

Taking Action

The third step in planning for sustainable travel involves: auditing the university site and surrounds; surveying staff and students; devising the travel plan; and monitoring and evaluating the outcomes. Conducting an audit of the existing transport infrastructure suggests that pedestrian infrastructure is assessed to a distance of 2km, cycling infrastructure to a distance of 5km, whilst public transport (and multi-modal with bicycles) is assessed for the metropolitan or regional area, and that all modes should be accessible for people with a disability. An access audit should consider the performance criteria described in Table 1.

The audit of pedestrian routes also requires assessment of route safety. A 'SAFE Assessment' (Table 2) considers Safety, Amenity, Friendliness and Efficiency and should include both day and night time analysis. After-dark SAFE assessments should include campus bus stops, shuttle bus waiting areas, bike and walking paths, bicycle parking areas and car parks. It is recommended women and people with a disability conduct SAFE audits. This will ensure the campus meets the safety needs of the gender more vulnerable to opportunistic crime.

In addition to the 'users audit', undertaking a survey of staff and student travel patterns is fundamental to understanding how the existing transport infrastructure is utilised and facilitates identification of users' real needs (rather than those perceived by administrators or auditors or consultant experts). A survey also presents the opportunity to identify attitudes towards potential initiatives of the TDM Plan. Attitudinal information and infrastructure changes indicated by staff and students can be utilised to justify proposed actions in the plan. The overarching purpose of the questionnaire is to guide the actions of the plan and generate baseline data against which change can be measured.

To reduce the impacts of the university on its locality TDM Plans need to address the variety and level of service of transport modes available to the university and adjoining areas, and in conjunction with disincentives for motor vehicle use, offer incentives for travel by more sustainable modes. For pedestrians, safe and convenient infrastructure must be available and its provision can be linked to the university's bike plan for

Table 1. Infrastructure criteria to be assessed for each transport mode.

	Access Audit Performance Criteria
Pedestrians	• Number and location of dedicated pedestrian routes
	• Number and location of pedestrian crossings on roads on and off site (immediately adjacent to site)
	• Pedestrian crossings located at high demand access points ie: between student housing and campus
	• Pedestrian crossings are raised ie: pedestrian plateaus and signed for drivers
	• Pedestrian routes are safe, visible, well lit, high amenity, connective, with rest points (seating and water fountains) at intervals
	• All routes are accessible for people with disabilities
	• Emergency telephones for medical or police emergency
	• Number and location of information points (map of campus with pedestrian paths, dedicated and share use, rest points, paths of steep gradient, emergency telephones)
Bike	• Number of parking racks
	• Type of parking racks ie: toaster, U rail, lockers or lidded parking
	• Location of parking – visible for security, close to each building or building cluster
	• Number of shower and change rooms
	• Number of lockers (for clothes) available for cyclists
	• Number of cycle routes on & off site including shared paths & on road cycle lanes, & slow speed areas
	• Campus cycle routes connecting to wider cycle network
	• Lighting, visibility and amenity of cycle routes
	• Parts or repair shop on campus (with space for DIY)
	• Incentives to cycle (mileage allowance, depreciation, staff loans to buy bikes, free clinics on bike riding, bike repair clinics, bike user groups, cycle buddy, safety information)
	• Number and location of information points (showing map of campus, bike routes and parking)
Bus	• Number of bus routes servicing site
	• Frequency of services
	• Coverage of services, radial and cross-town routes
	• Connectivity of services (eg: with train stations, other major land uses in area)
	• Location of bus stops to university buildings (pedestrian catchment)
	• Shelter, lighting, safety and comfort of bus stop
	• Safety, amenity and connectivity of route from bus stop to site
	• Incentives to travel by bus ie: discounts, 10th trip free
	• After-dark shuttle bus within campus and to nearby destinations (ie: student housing, train station, residences within 3km of campus)
	• Number and location of service information points on site
	• Services are accessible for people with disabilities
Train/tram	• Location of station or stop relative to site
	• Frequency of service
	• Connectivity with other services if necessary ie: bus services, shuttle bus
	• Provision for bikes on train/tram
	• Safety and comfort of station
	• Safety, amenity and connectivity of route from station/stop to site
	• Incentives to travel by train/tram (eg: no charge for bike, bulk purchase discounts, 10th ride free)
	• Number and location of information points on site (ie: information on public transport services, pedestrian and cycle maps, car pooling)
	• Services are accessible for people with disabilities
Car	• What is the number of parking bays on and off campus?
	• What is the cost of parking on and off campus (are daily fees higher than the cost of an all-day transit pass)?
	• What parking controls exist on and off site? (ie: time monitored or user restricted)
	• What is the utilisation of parking capacity on and off site?
	• Are there incentives for car travel by staff and students (free parking, mileage allowance, car loans, leases, company cars, etc)?
	• Parking and access is accessible for people with disabilities
Traffic Calming	• What is the designated road speed for campus roads?
	• Is this speed limit enforced?
	• Are there signed pedestrian and cyclist crossings?
	• Are pedestrians a designated priority at the crossings and across campus?
	• Are internal roads designed to slow traffic near pedestrian areas (10km shared zones)?
Car Pool	• Number of dedicated parking bays for car pooling
	• Cost of parking (lower fees than cost for Single Occupant Vehicle)
	• Location of parking bays (closer to buildings than SOV parking)
	• Incentives to car pool (cheaper parking, more convenient parking, guaranteed ride home, occasional SOV parking for slightly reduced rate)

Source: Australian Greenhouse Office, 2003 (Adapted from: Manners 2001; Curtis & Coleman 1996; Coleman 2000).

Table 2. SAFE Assessment criteria for university campuses

	Safe, Attractive, Friendly, Efficient Assessment Criteria	Score Good 1	Medium 0.5	Bad 0
Safe	• 'eyes on the street', frontages/windows to increase personal safety… buildings fronting streets provide good day and night surveillance; • good footpath design… footpaths are preferable on both sides of the street, clearly defined dual use paths for pedestrian and cyclists, paths of sufficient width and construction, lowered and tactile kerb paving and street crossings; • pedestrian street crossings/traffic safety… streets should be detailed to allow ease of at-grade pedestrian crossing and normal target traffic speeds; and • cars parked on-street… parked cars act as a buffer between moving traffic and pedestrians on the footpath.			
Attractive	• vibrant destinations… alfresco eating areas, views and opportunity for 'people watching'; • sheltered footpaths… shade trees or verandas; and • good pedestrian amenity, level of interest and event… places to sit along the way, active land uses, attractive building frontages, no graffiti or vandalism.			
Friendly	• inviting streets… walking for leisure, to work places and daily needs shopping; • no isolated points… poorly lit bushy areas that are perceived as dangerous areas; • no isolated walking environments… such as unsurveilled footpaths and separated pedestrian walking ways; and • legibility/site responsive streets… streets that lead directly to destinations and which respect local landmarks.			
Efficient	• good street design… traffic lights at busy intersection, median strip, tight corner radii and on-street parking to slow traffic, appropriate landscaping; and • availability of transit… access to a station or bus stop.			
'SAFE' Total	For each street add the above scores			

Source: Department for Planning and Infrastructure, Western Australia

efficient use of resources. Incentives to support and encourage walking to university include a night shuttle bus which will transport staff and students to their doorstep within a certain distance of the university (for example up to 1.5km), and take passengers to other key destinations including student housing and nearby commercial areas. On-campus security for pedestrians is imperative and should include emergency phones monitored by closed circuit television and security officers available to provide an escort through the campus at night.

Transport networks to the university must provide a safe and convenient environment for the novice cyclist. This requires that heavily trafficked roads have shared cycle/pedestrian paths available adjacent to the carriageway or bike lanes. For on-road cyclists, busy intersections require advanced stop lines ahead of motor vehicle traffic. Ensuring cyclists move through an intersection and into bike lanes ahead of motor vehicles reduces the potential for conflict between cyclists and cars and improves efficiency of all traffic movement at intersections (Poinsatte & Toor, 1999; Main Roads Western Australia, 2002). On campus, cyclists require parking in a visible location outside faculty buildings (for passive surveillance of bicycles) and lockable compounds for storage of more valuable bicycles.

End-of-trip facilities (ETFs) are essential for both pedestrians and cyclists, and are best located within faculty and administrative buildings for improved personal safety (University of Western Australia, 2003). Ideally ETFs will include full height lockers which can store clothes and cycling equipment. Some North American universities (for example University of British Columbia) run a bike shop through the student union, providing space to carry out minor bike

repairs and also offer tool hire and an on-site mechanic for a reasonable fee (Poinsatte & Toor, 1999). All cyclists invariably encounter mechanical faults that can be alleviated by an on-campus commercial outlet stocking bicycle repair kits and parts, and staffed by personnel knowledgeable in bike repair. Such a shop becomes the point for all information on cycling groups, buddy schemes, safety and education programs. The university can further support cyclists by bulk purchasing insurance and passing on the discount when selling insurance to individual staff and students (DfT, 2002).

Universities should work closely with service providers to ensure public transport provides good penetration into the university campus, as this will improve accessibility and provide a high profile for this mode. Public transport service providers will largely dictate service improvements to the university unless the university provides full or partial service funding. Greater leverage may be achieved with a Universal Pass (U Pass) scheme or integrated ticketing by providing an assured capital stream to the public transport service provider. U Pass schemes are common in the U.S.A. where the schemes are structured around compulsory student membership which then provides free or subsidised public transport, access to all other initiatives in the TDM Scheme and discounts at sponsoring businesses. The compulsory purchase of the U pass guarantees the university and participating service providers' predictable annual revenue regardless of the frequency with which U Pass cards are used. Such a scheme provides the university with persuasive power during negotiations for public transport improvements. Universities can also get some leverage by charging higher parking fees.

Coupled with incentives to use public transport and non-motorised modes, regulation of single occupant vehicles (SOVs) must also form part of the TDM Plan, although consideration must be given to the potential for SOVs to compete with public transport. Permits offer a mechanism to limit parking availability to SOVs. Parking charges must also be applied. In the UK Oxford Brookes University (1999) distributes parking permits based on three categories of 'need':

- operational needs – if staff must regularly travel off campus for work related duties;
- special needs – if staff or students have a physical disability or carer responsibilities;
- distance of residence from the university.

When applying for parking permits, staff and students should be required to provide information about the availability of public transport services (DfT, 2002). This process may reveal to the applicant there is little need for car travel to the university.

Permits can be made more readily available to car pool vehicles. Carpool parking should be located most conveniently in the university and the cost of daily car pool parking lower than for SOVs. Car pool participants must have access to a guaranteed ride home if the pool vehicle is not available and participants should also have access to a limited number of single use parking permits enabling them to occasionally drive their own vehicle. University vehicles should be available to staff during the day for work-related travel whilst a shuttle bus to the nearest commercial district can provide transport for staff and students errands. The key to car pool programs is to remove the barriers that discourage people from car pooling (Poinsatte & Toor, 1999).

The final step in a TDM Plan is monitoring and evaluation. Monitoring involves periodically collecting and reviewing information whilst evaluation focuses upon determining how well the plan's objectives are being achieved (Morrison & Pearce, 2000). Monitoring requires that staff and students are resurveyed to ascertain their travel patterns and attitudes to transport initiatives (University of British Columbia & Translink, 2002; DfT, 2002; University of Western Australia, 2003; Roads and Traffic Authority, 2002). Infrastructure audits can be addressed in the questionnaire through specific questions regarding 'missing links' in the transport network. Audits of parking supply and parking controls should be undertaken annually in conjunction with local residents and/or businesses to ensure any new or de facto off-site parking locations are not undermining restrictions on campus or impacting negatively on the locality. To determine the extent of the plan's success evaluation will compare the results established from the monitoring against the plan's objectives. Where results show limited success this can assist to provide the justification for future stronger actions.

The extent of TDM action by Australian universities

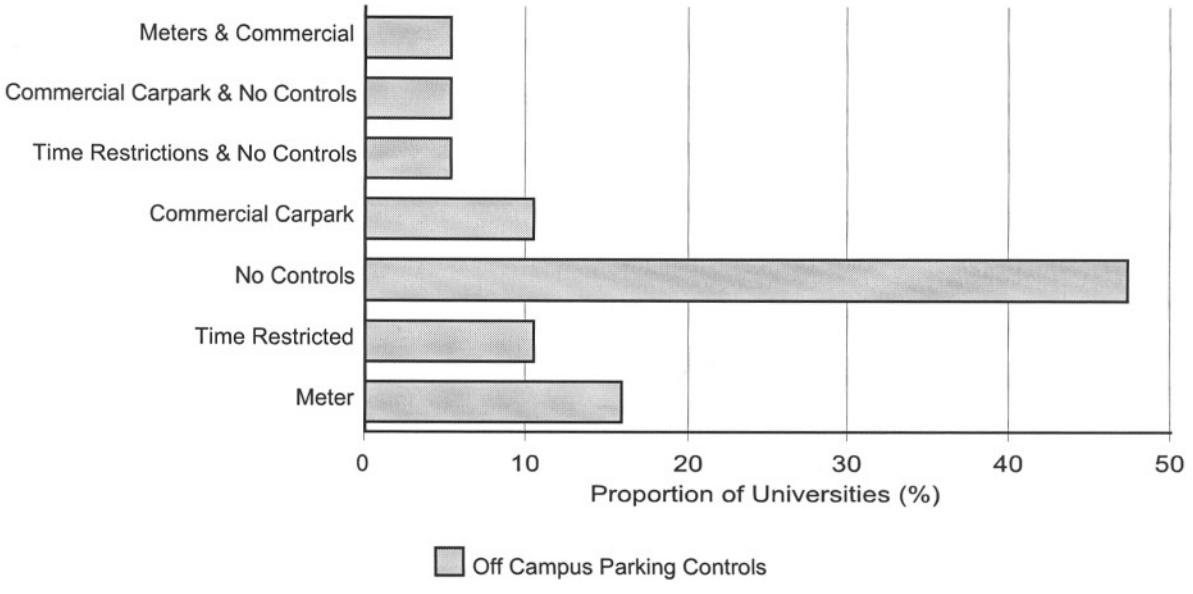
Given the array of solutions that some universities have implemented towards more sustainable travel practices, our research sought to explore the extent of action across Australian universities as a whole. To determine how universities were addressing their transport impact, a postal survey was undertaken to ascertain the current state of travel planning in Australian universities. The questionnaire focussed on three key aspects:

first, assessing the existing transport infrastructure available at each university's main campus;

second, how universities managed staff and student use of that infrastructure; and

finally, what methods (if any) were utilised to influence modal choice of people accessing the university site.

Figure 1. Off-campus parking controls at Australian universities



The survey sought information about travel to the main university campus, which was defined as the campus with the largest total student and staff population. The survey focussed only on main campuses for a number of reasons. Firstly, developing and implementing a TDM plan has an associated cost and greatest cost effectiveness will be achieved where a large number of participants are assured. In this regard, it was expected larger campuses were more likely to have undertaken some travel planning. Secondly, university campuses with a large staff and student population are more likely to have experienced pressure on available transport infrastructure. This pressure may have prompted some interventionist action to address network problems.

Questionnaires were issued to 40 Australian universities achieving an initial 40% response rate. Universities that did not respond to the first questionnaire were sent a second survey. Twenty five usable questionnaires were returned, giving a response rate of 63%. The majority of responding universities indicated the main campus is situated in a suburban area (14 universities) with a further five campuses each located in the city or rural/regional areas. One university defined its geographical location as that of the city fringe.

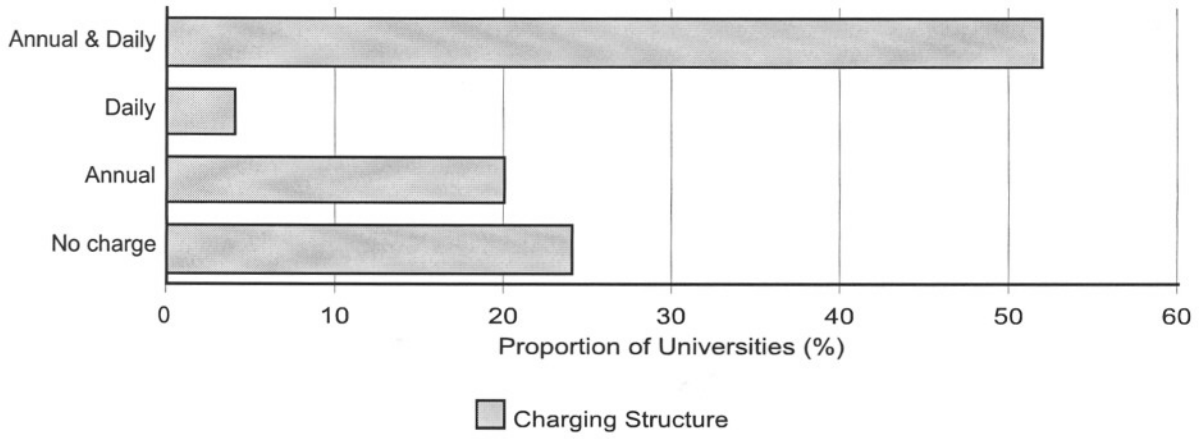
Transport Infrastructure and Management – existing access arrangements

Geographical location appears to strongly influence the amount of car parking available. Three of the five city campus universities provided no parking whatsoever. Of the campuses with less than 500 bays of car parking, 75% were situated in a city. Campuses providing more than 4,000 parking bays were predominantly located in suburban areas (75%).

The majority of universities provided car parking for students (84%) and all provided parking for staff. Of the four campuses that did not provide student car parking, three were located in the city and one on the city fringe. It is not surprising that city campuses provide the least amount of car parking and imposed some restrictions on student use of the parking as they are spatially constrained with limited opportunity for expansion of car parking. Existing infrastructure must be used more efficiently, achieved partly by limiting availability to certain sectors of the university population.

The literature review of best practice indicated that restricting parking availability also requires that areas not designated for car parking should not be used for demand overflow. However six of the responding universities allowed overflow parking within areas on campus, with much of this occurring at the university union or student college (50%) or university ovals (33%). Streets and parkland within the campus site also absorbed some parking demand. Overflow parking often occurs in inappropriate locations that inconvenience pedestrians and cyclists, and an absence of formal thoroughfares between such car parks and buildings can create dangerous conditions during peak periods. Overflow parking also implies that car drivers can have unfettered access to the university, conveying preferential treatment for car travel. If universities are to reduce motor vehicle trips to the campus, areas utilised for overflow car parking must be restricted. The grounds management and

Figure 2. Car park pricing controls at Australian universities



environmental costs of use of such areas should be regarded as a monetary subsidy favouring car use.

Off-campus parking usually also operates to meet excess parking demand. 76% of responding universities have nearby areas of off-campus parking. Almost half (47%) of the off-campus parking sites offered unrestricted parking (by time or by cost). 11% of universities indicated off-campus parking is inconsistently regulated with a mix of parking controls in some locations and an absence of restrictions in other areas. For those universities with off-campus car parking subject to some form of controls, metered street parking and time restricted parking spaces were most common (see Figure 1). Ensuring appropriate controls are applied to off-campus parking requires dialogue between the university, local government and local land users. A good TDM Plan will involve all relevant stakeholders to ensure that parking sites adjacent to the university campus are subject to regulations supporting the aims of the travel management plan.

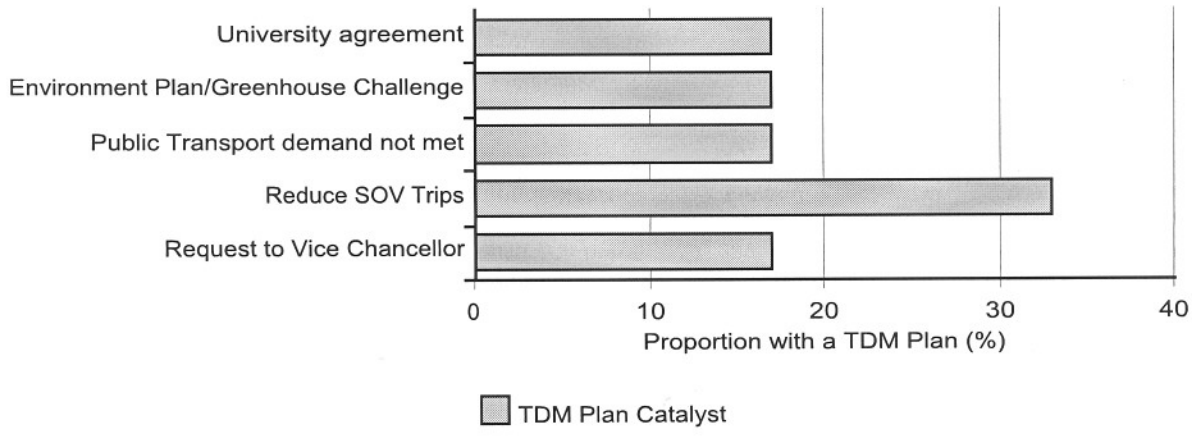
The pricing structure applied to on-campus parking for staff and students can be seen in Figure 2. While the majority of universities (76%) employ pricing controls for campus car parking, a quarter continue to provide free car parking despite its role in promoting car use. 52% of universities indicated they utilise both annual and daily charges. Annual car parking charges alone, applied by 26% of universities, can actually act as an incentive to parking on campus. Once the initial purchase has been made there exists a financial incentive to use the pass and appropriate its full value. Daily parking charges, particularly when set at an hourly rather than daily rate, encourage the use of parking occasionally for a limited period and are possibly the most effective disincentive to parking on-campus (DfT, 2002). However, only 5% of universities utilised daily charges.

The application of parking controls also varied between parking allocated for staff and students. In comparison with students, more universities required staff to purchase annual parking permits (8% and 24% respectively). 12% of universities required students to pay daily charges, while only 4% applied daily charges to staff parking. The difficulty with any such variation in parking controls is that it could be argued that one sector of the university population receives preferential treatment. Unless a justifiable basis can be established for variations in parking controls, the same charging regime should be applied to all staff and students.

In addition to parking provision for access by car, most Australian university campuses are served by a range of public transport and non-motorised infrastructure. Almost all of the universities provided outdoor bicycle racks (96%) with half also providing indoor parking or lidded bicycle racks. On reflection the survey should have assessed adequacy of supply and suitability of locations.

Almost one quarter of the universities lacked high frequency public transport services (those with a frequency of 15 minutes or less). Public transport services running at least every 15 minutes offer flexibility comparable to the car (DfT, 2002; Estill Associates & Department for Planning and Infrastructure, 2003). For universities attempting to reduce car trips to campus, frequent public transport services are a basic necessity to attract ridership. For those universities with public transport services (75%), bus access predominated, indicative of the high level of road infrastructure available in Australia. In contrast access by train was limited. Three universities had no railway station at all in the locality; five did not have a train station within comfortable walking distance of the university (1km). Eleven universities

Figure 3. Catalyst for initiating a TDM Plan at Australian universities



had a station within 6 km of campus; to take advantage of this would require good integration with other transport modes such as cycle and bus.

Achieving frequency improvements and services dedicated to meeting the transport demand at the campus may require promotion and support or funding directly from the university. Half of the university campuses had one or more buses directly servicing the campus, with almost a third of these universities partly or fully funding the service. Some universities indicated a dedicated bus was a night shuttle bus, a service that transports staff and students around campus, to student housing and car park areas after dark. Such a service although necessary, is not adequate to meet the wider transport needs of a university seeking more sustainable travel patterns. They should not be seen as a substitute against safer cycling and walking facilities. Reductions in car trips to campuses will only occur if this and regular and frequent public transport services are available to and from the residential areas of university staff and students.

Achieving reductions in car trips also requires that staff and students are aware of alternative travel modes, and how to use these modes. Surprisingly, a third of the universities do not promote travel by non-car modes. Given that 88% of the universities had one or more public transport services within proximity to the campus and 96% provided facilities for bicycle parking, failure to at least promote these modes is an important oversight. Providing on-campus information (e.g.. web-based maps and guides) about the available non-car transport infrastructure as well as about car parking availability is possibly the least expensive step in travel planning.

TDM planning at universities

Not surprisingly given the slowness to embrace commuter planning in Australia, only six of the twenty-five universities had TDM Plans. Half of the plans had been initiated very recently (2003). Three plans were initiated in consecutive years between 1997 and 2000. The primary reason for initiating a TDM Plan was to reduce SOV trips (2 out of 6 universities) with a variety of catalysts for the remaining plans (see Figure 3).

None of the plans directly tackled the need to reduce single occupant car journeys in the described actions, instead the plans showed a preference for focusing on improvements to public transport and cycling infrastructure. All of the plans lacked specific actions to manage the availability, convenience and cost of car parking at the universities, with the exception of two plans that were still in the development phase. International best practice indicates that by managing parking with restrictions and pricing disincentives, greater reductions in SOV trips are achieved (DfT, 2002). Clearly, in Australia this needs to be supported by improvements for other modes at the same time.

Improvements to infrastructure for sustainable travel modes were noted as part of the actions for all TDM Plans. One university plan also included actions to provide a maintenance course for cyclists. All the plans described actions to provide information and promote sustainable transport modes. The overriding finding from the six plans is that infrastructure improvements for walking, cycling and public transport are necessary at all universities, and the six universities recognise the need for ensuring staff and students are better informed about sustainable transport. It is clear that these universities have chosen these actions as priorities before tackling the disincentive approaches relating to car access.

Decision making

In developing the TDM Plans, some described the need to create a framework for policy and procedure that would work to deliver it effectively. All universities saw management of the TDM Plans as being undertaken by the universities alone. Only one university involved the state transport department in the decision making process for the plan. Without adequately involving stakeholders outside of the university, it is unlikely a TDM Plan will achieve any significant and long-term changes to the modal distribution of travel patterns. Off-campus infrastructure must be available for sustainable transport modes, and must provide an environment that is conducive to various combinations of walking, cycling or public transport. For this to occur, car traffic needs to be managed and increased priority given to pedestrians, cyclists and public transport services. Such changes will require the university to collaborate with stakeholders (including state and local government) with short and long-term benefits available from involving these parties at the outset.

Action outcomes of existing TDM plans

Of the three university travel plans initiated prior to 2003, results indicate achievements in infrastructure improvements and travel behaviour change. Two of the three universities have gained more frequent public transport services resulting in a higher proportion of trips to the university by this mode. One university also reported an increase in the proportion of carpool trips. Improvements in ticketing and information associated with the transport services were also reported. Other achievements reported include the creation of a dedicated transport office, and changes to the university vehicle fleet aimed at reducing greenhouse gas emissions.

Overall there is limited detail as to the individual plan successes at the universities and this may be related to the paucity of rigorous evaluation and monitoring. No university described a systematic process of monitoring and evaluation as part of the TDM planning process. One university currently developing a TDM Plan indicated monitoring would occur by undertaking transport surveys at relevant times to assess the degree of modal change. However, two universities with existing TDM plans do not undertake any monitoring, one indicated they would 'review' the plans achievements, but provided no further detail as to what the review process entailed.

Evaluation enables measurement of a plan's progress towards set targets. It brings rigour to plan design and can help decision-makers maintain a plan that is responsive to changes in travel demand and travel patterns (Bridgeman & Davis, 2000). Results of the evaluation can be utilised for promoting the success of the plan, securing new infrastructure or further financial support. Where benchmarks have not been met, the survey results can be utilised to justify further action to achieve change (Roads and Traffic Authority, 2002). Evaluation and monitoring are therefore an essential part of travel plans and efforts should be extended to developing a program in the early phases of TDM planning.

Conclusion

In Australia, the last decade has seen the development of policies for sustainable travel emanating from federal and state governments. This is mirrored in the United States, where further weight is given through legislation and funding, and in the United Kingdom and in Europe. However, while there is evidence of real action and implementation of sustainable travel practices elsewhere, Australian universities as a whole are in their infancy in TDM. Only a quarter of surveyed universities are taking action to manage travel demand. Of these universities, half have only recently embarked on developing TDM plans indicating a slowness to embrace commuter planning.

Australian universities are significant trip generators, and many are located in suburban areas with poor access by non-car modes. Consequently, universities contribute a significant and negative impact, through congestion on the local road network and ever growing demands for on-site and off-site car parking. Current access to these universities is heavily car dependent. Yet of the few TDM plans that have been developed little action is taken to create a disincentive to car travel by addressing parking provision and charges. Instead these TDM plans focus on improving access by public transport. None see the need to take action on both fronts. Until it is recognised that the potential public transport market is the existing car commuters who are encouraged to drive to university by car by cheap, ample car parking, the likelihood of success in changing travel patterns is limited.

The review of best practice indicated a wealth of solutions, but more importantly the need for a comprehensive approach. This approach required three steps. First understanding the issue, which involves the university assessing its current practices and policies to see if they pose barriers to travel behaviour change. Second the need to find champions for the approach. This means gaining support not only from persons targeted for behaviour change, but also by partnering with local government and public transport providers and advocates and researchers within and outside the universities. The final step, taking action, focuses on devising the TDM plan, implementing its actions and evaluating the outcomes. When considered

in the context of Australian universities, two key findings need attention. Universities with TDM plans were seeking to improve public transport access, but their success will be hindered by the lack of awareness of the need for dialogue with public transport service providers and adjoining local government. It is also imperative to ensure that high priority, safety and convenience for walking and cycling is maintained or provided up to 5km from campus to reduce the number of short car trips and to not overload public transport. Furthermore, if TDM planning is to be seen as a long term solution, the need for clear monitoring and evaluation is important, yet universities with TDM plans have failed to take this into account.

An opportunity exists now for Australian universities as a whole to become leaders in sustainable travel management, and for leading universities to lead not only other universities and similar large organisations, but the whole community by way of example. However, the incentive for them to do so needs to be clearly articulated. This may require directive or legislation at a Federal level or funding for demonstration projects. Without this universities will continue to rely on individual champions to act as the catalyst, and the evidence to date shows this to be a slow process. Universities are charged with educating and researching; they should also be practicing and demonstrating cutting edge leadership in TDM.

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