

How to Use this Kit

This Resource Kit contains three parts, or action steps:

Step 1: Understanding the issues

Outlines the benefits and costs to the university and the individual of adopting TDM Plans. This is set in the wider context of how these plans relate to 'big picture' transport problems. The challenges faced by universities in becoming TravelSmart are also outlined.

Step 2: Finding the "champions"

Outlines how to initiate university TDM Plans, and who should lead and participate.

Step 3: Taking Action and Getting Outcomes

This section provides a practical 'how-to guide' including planning, implementation, monitoring and evaluation.

A number of examples of good practice in universities are also provided. You can click on these from here. A list of selected references is also provided.

The Big Picture

More information about the big picture of where TravelSmart comes from and how it relates to addressing our transport problems can be found at: <http://www.travelsmart.gov.au/training/bigpic.html>

About the Authors

This Resource Kit has been produced by the Australian Government through Carey Curtis and Carlindi Holling from the Planning and Transport Research Centre (PaTReC) at Curtin University. The project was managed by PaTReC, a research centre jointly operated by the four public Universities in Western Australia – Curtin University of Technology, Edith Cowan University, Murdoch University and the University of Western Australia.

Carey Curtis is a Senior Lecturer in the Department of Urban and Regional Planning at Curtin University. She is a Commissioner on the Western Australian Planning Commission, and also on the Transport Committee of the Commission. Her research interests focus on sustainable transport and include the areas of transport policy, travel behaviour, travel demand management, land use and transport integration. Carey is a member of the Planning Institute Australia and the Royal Town Planning Institute, UK.

Carlindi Holling has worked on this project as a research assistant with the Planning and Transport Research Centre. She is a final year Honours student in Urban and Regional Planning at Curtin University. Her research interests specialise in transport planning, including transport management plans and travel accessibility to local centres.



ACTION STEP 1 – UNDERSTANDING THE ISSUES

Benefits and Costs of Travel Demand Management Plans

Developing and implementing a plan to manage travel to and from universities has both benefits and costs. A **benefit-cost appraisal** provides persuasive evidence that the benefits outweigh the costs, by demonstrating the high costs of catering for car demand and the potential cost reductions possible by redistributing this demand to other travel modes. This helps to provide justification for proposals and is important in convincing management and funding providers a TDM plan can deliver economic benefits to the university and the wider community.

The **benefits from TDM plans** include considerable cost savings where a university decides to discontinue catering for car travel. Benefits typically also include reduced costs for provision of car parking, improved local air quality and health benefits to students and staff, as well as the marketing edge of a sustainable, accessible and equitable university environment.

The **costs resulting from planning and implementation of TDM** will vary between universities depending on the potential for mode shifting, the availability of existing infrastructure, costs for providing new infrastructure, and the extent to which outside funding can be secured. Some costs and benefits may be incurred directly by the university such as those related to the cost of car parking, while other costs may be shared with other stakeholders (e.g. a new bus service), while others may occur as indirect costs and benefits, e.g. reduced air pollution and noise.

How to assess benefits and costs

Table 1 summarises the overall framework for assessment of benefits and costs. This is a guide only, and should be verified in each location. You are urged to make use of expert resources in transport and traffic planning, economics, urban planning and other relevant disciplines available within the university community to assist in preparing benefit-cost appraisals for their particular circumstances and proposals. Costs and benefits will vary from one location to another, reflecting the infrastructure requirements of each university campus and the local cost of materials, labour and construction. Similarly the magnitude of benefits will vary in response to the local economic factors.

To estimate the net benefit from a proposed scheme, calculate the individual benefits and costs shown below and sum, i.e. $Net\ Benefit = (B1 + B2 + B3) - (C1 + C2)$. Care must be taken to avoid double counting or counting one-off costs as annual costs or annual costs as only one-off costs.

If the proposed term of the scheme is envisaged as say 10 years, **it is necessary to 'discount' the stream of annual benefits and costs** over this term of years by the 'social time preference' approximately equal to the rate received on cash bank deposits, say 4% in 2003. Benefits or costs received or incurred in equal annual amounts of say \$10,000 over ten years will have a present value (viewed from year 0) of \$81,000, not \$100,000, because dollars received in future years are worth less than dollars received now. Where benefits and costs are incurred in unequal amounts per year (e.g. lumpy up-front costs or increasing benefits in future years), the effect of discounting must be calculated, and can significantly affect the balance between total future benefits and costs.



As shown in Table 1, in addition to the benefits afforded to the university, it is also possible to calculate 'Private User Benefits' and benefits for the wider community.

Table 1: Guidelines for Benefit-Cost Appraisal of a University TDM Plan

BENEFITS FROM IMPLEMENTATION OF TDM PLAN			
B1. Financial Costs Avoided by University:			
Type of Cost Avoided	Cost avoided or benefit gained	Calculating the cost or benefit	Typical Value
Car Parking	Capital expenditure on multi-storey car parking. These may be large.	Annualised cost (capital repayments and interest – real or implied)	Annualised cost of initial outlay of \$20,000 / car space
Land for car parking (where car parking is out-of-doors at ground level)	Opportunity cost of land. Potentially medium/large.	Annualised cost of land valuation that must be purchased or leased for other activities	Depends on value of land
Parking maintenance	Annual cost of maintaining and providing security in multi-storey or at-ground parking facilities. Potentially large.	Average annual cost per parking bay	\$100/bay p.a.
Reduced staff sick leave	Reduction in lost productivity resulting from more physical activity by staff and students	Each staff member avoids 1 day / year lost time; say 10% take up TDM scheme	\$200 / day / person X 10%
B2. Financial Costs avoided by travellers:			
Car travel	Cost of fuel, vehicle maintenance, insurance & depreciation on motor vehicles used for travel to and from university. For students & staff potentially medium/large	Unit cost per passenger-km, based on average occupancy and average cost per vehicle-km	\$0.6655 /km
Accident costs avoided	Cost of road trauma, fatalities and property damage from road crashes avoided, as a result of fewer veh-km.	Unit cost per pass-km.	\$0.09 /km /per capita
B3. Costs avoided by the Community:			
These are frequently difficult to quantify. For a university estimating its own net financial benefit from TDM, it is likely very little weight will be given to these 'external' benefits. Estimates of these benefits also vary widely in the literature, but we have provided some guidance for those wishing to use these to bolster their case for TDM)			
Reduced Greenhouse Gas emissions (GHG)	The avoided cost of government programs for GHG abatement	Net present value of average cost per vehicle-km	2¢/veh-km (some studies put these costs as high as 17.22¢ gross (i.e. without taking

			account of changes in road use if this amount were included in the price charged for road use)
Reduced local air quality degradation	Health system costs avoided by reduced exposure to air pollution	Average net present value per veh-km of cost of related respiratory and cardiovascular hospital admissions	0.54¢/veh-km
Avoided costs of insufficient personal physical activity	Health system costs avoided	Average net present value of avoided hostile admissions for life-style diseases	Reliable estimates per veh-km or person-hr not available
Avoided community costs of traffic noise	Avoided effects on health (eg elevated blood pressure and minor psychiatric illness), & less clear effects on urban amenity		Up to 0.5¢ / veh-km
C1. COSTS FROM IMPLEMENTING THE PLAN			
Foregone revenue from visitor parking charges	Foregone revenue from typical high-turnover visitor car park	Approx \$1.50/hr; 2.5 cars per space per day; 3 hrs occupancy /veh.	\$11.25 / bay / day
Foregone parking permit revenue - staff	Foregone revenue. Some staff will purchase permits for occasional use, so even though they are users of TDM strategies, the revenue from this source will not be lost		\$100 / permit p.a. (applicable rate for use in appraisal will vary between universities and car park 'level')
Foregone parking permit revenue - students	Foregone revenue. Some students will purchase permits for occasional use, so even though they are users of TDM strategies, the revenue from this source will not be lost		\$90 / permit p.a. (applicable rate for use in appraisal will vary between universities and car park 'level')
C2. Costs of Travel plan – typical one-off and annual costs (must be verified for local situation)			
Conduct travel demand survey (one-off initial cost only)			\$8,000
Introduce and manage car pooling scheme and review after 12 months			\$5,000 p.a.
Operate shuttle bus service			\$250,000 p.a.
Publish and distribute Access Guide (one-off initial cost only)			\$25,000
On-going information and advertising program			\$10,000 p.a.
Provide additional bike bays (one-off initial cost only)			\$120/bay
Install bike lockers in end-of trip areas (one-off initial cost only)			\$400 per bike

Install showers in new building with dedicated hot water (one-off initial cost only)	\$6000 per shower
Build new share paths (one-off initial cost)	\$80/linear metre
Employ TravelSmart Officer (varies by location)	\$45,000 p.a.

In a recent example shown in Table 2, the TravelSmart initiative in South Perth, Western Australia demonstrated a private user benefit of \$2.54 million for the 35,000 people participating. This is equivalent to a saving of approximately \$76 per person/annum.

Research by ARRB Ltd (ARRB 2002) sets out the benefits to the wider community including financial gains to the State in revenue from conversions of car trips to public transport; annual health service cost savings due to the improved health and fitness of the community through exercise and reduced air pollution; reduction in costs of road building through a reduced rate of traffic growth.

Table 2: South Perth TravelSmart - Private User Benefits and Costs

Benefits and Costs	Value (a negative value is a cost reduction)
Private vehicle operating costs	-\$3.53m
Public transport fares	+\$0.62m
Cycling costs	+\$0.05m
Walking costs	Not estimated
Health and Fitness	-\$0.58m
Perceived cycle/walk injury risk	+\$0.90m
TOTAL NET COST REDUCTION	-\$2.54m

Challenges to sustainable transport in Universities

Universities face particular challenges in moving towards more sustainable transport solutions. There are several factors which impact on university travel patterns. In order to get a comprehensive solution, each of the following factors should be addressed in a TDM Plan.

Geographical location of the University

Travel patterns generated by a university are affected by its location. The surrounding land use and transport resources contribute to the transport choices available:

City centres campuses usually have limited on-site parking, and little space for its expansion. Conversely, city campuses usually have better access to public transport and infrastructure for walking and cycling. As a result it is normal for travel to city campuses to rely more on non-car and non-motorised transport.

Suburban campuses are usually well serviced by roads (including road-based public transport) but may be inadequately served by rail. Roads near suburban campuses often carry high peak traffic volumes, discouraging pedestrians and cyclists and delaying bus services, affecting transport choices. Public transport services may be limited by lack of patronage outside peak periods.

Regional or rural campuses are usually well serviced by roads, have ample car parking available and (usually) access to sufficient land to meet foreseeable parking demand. However, travel distances are generally longer and infrastructure for walking and cycling to and from campus are limited.

Campus facilities

Staff and students who stop en-route to university during car-based trips for shopping and other personal business, discourages the use of public transport or non-motorised modes for commuting (Department for Transport 2002a). On site facilities including cafes, convenience shops, post office and banking can reduce the need to for car travel.

Distance

Distance is a deterrent to non-motorised travel and is cited as the reason people do not walk or cycle to university (Poinsatte & Toor 1999; University of Western Australia 2003). As distance of residence from the university increases, the proportion of people walking and cycling declines. Poor amenity along pedestrian and cyclist routes can also be discouraging. Visually interesting routes, with low traffic volumes and reduced traffic speeds can be important for encouraging walking to university (Poinsatte & Toor 1999).

Car pooling is also affected by distance. It is made less attractive by long deviations to drop off or collect passengers (Curtis & James 1998).

Parking

The availability of free or cheap and plentiful parking within university sites and on surrounding streets is a significant challenge to reducing car travel. More universities are charging staff and students for parking on university grounds, but these charges are often low.

Free parking in nearby streets limits the impact of parking restraints. The success of parking controls depends on appropriate management of off-site parking in addition to on-site restrictions. This may require cooperation with local authorities and residents.





Parking restrictions at aged persons residence – Curtin University at rear

Some universities have parking permit systems for staff and students. These systems are usually aimed at covering some of the costs of maintenance of parking infrastructure, not at travel management. This reflects that once a parking permit has been purchased, the marginal daily cost of parking is zero (Poinsatte & Toor 1999; Department for Transport 2002a).

'Pay per day' charging schemes are a daily reminder of the cost of car parking, and discourage its regular use (Department for Transport 2002a), particularly where charges are higher than the cost of an all-day public transport ticket.

Convenience of parking to the destination compared with the inconvenient location of public transport stops also contributes to the attraction of car travel (Poinsatte & Toor 1999). Car parking located within university grounds is often a short and convenient walking distance, but public transport stops may be located on the periphery of university campuses and in some cases one stop services a whole site.

Public transport

Infrequent public transport and inadequate service coverage are deterrents to public transport use. Services every 15 minutes or less are considered to offer flexibility comparable to a car (Estill and Associates and Department of Transport 2003), but must be available to patrons from close to home locations.

Lack of traffic priority for public transport in the surrounding transport network also deters to its use, if travel times are increased. Late buses and long journey times created much dissatisfaction amongst patrons at the University of NSW and contributed to the poor opinion of bus services at that University (Black, Mason & Stanley 1999).

Walking and cycling

Several obstacles discourage greater use of walking and cycling for staff and students residing within suitable distance from the university. Obstacles include the absence of safe crossings over busy roads, bike lanes that end at roundabouts, on-road cycling on heavily trafficked roads, lack of shared paths and inadequate bicycle parking. (Poinsatte & Toor 1999; University of Western Australia 2003).



On-Road bike lane ends at roundabout entrance to Curtin University



Poor pedestrian access linking student accommodation to campus across main access road to Curtin University (speed limit 70kph)

Transport integration

Lack of integration of transport modes to facilitate inter-modal transfers is a challenge. Most Australian transport services do not provide for bike-bus or bike-train journeys. By integrating these forms of transport the potential catchments for public transport can be significantly enlarged.

The Western Australian Public Transport Authority has 'counter-flow' allowances for bikes on trains at peak times, and allows bikes on trains in any travelling direction outside peak hours (Department for Planning and



Infrastructure 2003). Counter-flow travel allows cyclists to take their bikes onto trains travelling in the opposite direction to the peak during the 7 - 9 am and 4.30 - 6.30 pm peak periods. There is no charge for travelling with a bike on Perth trains, presenting an opportunity for universities in Perth to promote cost effective multi-modal travel to staff and students.

Similar initiatives are required for bus travel that will enable bikes to be taken on buses, as is the case in Canada and some areas of the USA. Brisbane is trialling a bus scheme between November 2002 and October 2003.



Policy and Practice Constraints

Some challenges to adopting sustainable transport practice lie in the policy and practice of universities:

Timetables and Schedules: A daily 13-hour teaching window creates variance in individuals' daily schedules and different schedules between individuals makes shared transport logistically difficult (Kaufman n.d.).

Car use incentives: Incentives to staff for car use including salary packaging of cars, which offers a financial incentive for extensive car use from fringe benefit tax rate reductions in line with increased annual vehicle mileage (Bureau of Transport and Regional Economics 2002; Curtin University 2003b), not matched by similar benefits for travel on other modes (Bureau of Transport and Regional Economics 2002).

Parking incentives: Student Guilds may offer financial incentives to students through parking permit subsidisation, e.g. free permits offered as prizes during orientation week (Curtin University 2003a). This promotes the use of car transport to and weakens the potential for financial levers to favour sustainable modes.

Information: Lack of information about non-car modes presents another challenge to the use of these modes. Surveys have found that providing personalised public transport timetables, and maps of public transport and cycling routes is successful in encouraging a switch to these modes (Socialdata Australia 2000; University of Western Australia 2003).

Lifestyle/preference choice of the individual: Lifestyle barriers related to household and carer responsibilities are more common to staff and postgraduates (Oxford Brookes University 1999). 'Taste' preference is common to undergraduates, evident in the desire to avoid unfashionable compulsory helmets and therefore not cycling (University of Western Australia 2003).

ACTION STEP 2 – FINDING THE CHAMPIONS

The initial impetus to develop a university Travel Demand Management (TDM) Plan may come from interested staff or students, or from outside agencies such as local government or state transport agencies. This section should enhance your understanding of how to find and bring others with you to work through the university decision-making structures and processes to develop a TDM Plan, and the information you will need if you are to gain support.

Establishing administrative support in the university

Generating administrative and financial support for development of a TDM Plan will need to be justified by benefits to the university. This should be supported by evidence of financial accounting benefits, supplemented by social and environmental benefits included as a triple bottom line assessment. A suggested framework for calculating the benefits and costs to the university is set out under 'Benefits and Costs of Travel Demand Management Plans'.

Working Groups

Further evidence of the demand for travel planning should also come from support among the administrative staff, teaching faculty and student population at the university (Woolmer 2003). Establishing a working group of interested participants should provide the platform for informing staff, faculty and students, and facilitate gathering 'grass roots' support.

The working group can comprise of interested faculty and other staff, student representatives and transport user groups (if any exist) such as Bicycle User Groups. The University of British Columbia (Vancouver campus) also trained interested staff and students as 'Go Green Coordinators', to provide an information conduit between the larger University population and those developing the transport plan (UBC TREK Program Centre 1999).

Targeting the university organisation

After establishing a working party, gathering support from the wider university community and articulating benefits to the university, the next step must be to obtain official assistance to develop a TDM Plan. Finding the appropriate departments and personnel within the university structure to assist in preparing the plan and to target its outcomes is fundamental to efficiently progressing plan development and acceptance.

Each university has variations in its organisational structure, and travel planning functions are often fragmented across a number of administrative departments. See for example www.ecu.edu.au/fas/organisation_goals.html. The key is to gain managerial support within the departments responsible for parking, projects, grounds development and other relevant departments. It is important to gain the support from the administrative chief executive, general manager or similar top-level official.

Champions for the 'cause'

Finding support from senior staff in the early stages of seeking support for the Plan provides a significant boost to the campaign's progress. It is very beneficial to the successful development of a TDM Plan if contact is made with a variety of senior staff in the early stages, gaining their commitment to support the plan.



The UK Department for Transport describes how staff can make presentations on the proposal to senior management, how senior management can publicly support the plan through participating in events or provide signed statements in support of the travel plan proposal (Department for Transport 2002a p39).

The Vice Chancellor of Oxford Brookes University provided a statement in support of the Green Commuter Plan (Oxford Brookes University 1999). At the University of Bristol the Vice Chancellor walks to work and the Assistant Director of Facilities has undertaken the role of champion for the University's travel plan (Department for Transport 2002b).

Facilitating participation by the university community and stakeholders

Successfully implementing TDM initiatives, especially controversial ones such as parking restraint, require that both staff and students support the principles and objectives of the transport plan. To engender support, "consultation is essential – both to shape the plan and gain acceptance and ownership for new initiatives" (Department for Transport 2002a p26). Where past initiatives have not included staff, academic faculty or student consultation, there is little participative support (University of Western Australia 2003) or even obstruction to implementation (Curtin University 2003a).

Agreeing common goals is fundamental to successful progress and implementation. Developing relationships with stakeholders outside the university is also a critical step in participative planning. Establishing good relationships with local authorities, transport service providers, community organisations and neighbouring businesses or land uses is necessary to achieve off-site infrastructure improvement (Department for Transport 2002a).

Transport Committees

Universities that established a formal process for regular involvement with non-university stakeholders have more often secured improvements in off-site infrastructure and services. A review of national and international university travel plans revealed a variety of structures and dialogue processes for stakeholder involvement.

To develop and implement a plan delivering changes to travel patterns in a university environment, a Transport Committee or Working Party is needed. Committees should comprise senior representatives from university departments, non-university stakeholders and representatives from staff and faculty unions and student unions/guilds. Experience shows that the role of non-university stakeholders varied from one of regular participation at committee meetings, to contact as required.

For efficient use of stakeholder resources and time, working groups should focus on "problem diagnosis, policy development and introduction of implementation measures" (Oxford Brookes University 1999).

Involving transport operators and the local council in developing a public transport access guide to the university site can facilitate services and infrastructure support essential to achieving on-site transport aims (Roads and Traffic Authority n.d.). There should also be a focus on working with the local authority to restrict parking and enforce the restrictions in surrounding streets (Department for Transport 1999).

Local authorities can also provide advice on developing transport plans, specific planning and roads issues and may be a source of funding for on-site infrastructure development (Department for Transport 2002a)

Transport Co-ordinators / TravelSmart Officers

For effective implementation it is important to establish ongoing participation and information sharing. In Western Australia this has become the role of a Transport Coordinator or TravelSmart Officer. Funding sources can comprise state government, local government, or university, or a combination of these. The officer takes on the role of coordinating the implementation of the plan and liaising with relevant government departments and interest groups. Transport Committees then meet less frequently. Their role is to update the TDM Plan and develop new initiatives to achieving sustainable travel change.



ACTION STEP 3 – TAKING ACTION AND GETTING OUTCOMES

Developing a University Travel Demand Management Plan

Developing a Travel Demand Management (TDM) Plan is a three-stage sequential process. This section provides a guide through every stage in the development and implementation of a plan and describes how plan makers can carry out the required work.

Examples of good national and international practice in universities, to be a catalyst for ideas and innovation, and facilitate access to further information, are demonstrated in this section.

Stage 1: Planning

- Access audit of site and surrounds
- Survey of staff and student travel patterns
- The Transport Access Plan: infrastructure provision for travel modes
- Segmenting the market of potential travellers
- Targeted messages to market segments

Stage 2: Implementation

- Implementation of TDM Plan
- Media Development: Promotion and Information for TDM Plan
 - Strategic Marketing
 - Promotion
 - Passive Information Strategies

Stage 3: Monitoring and Evaluation

Stage 1: Planning

Access Audit

Stage 1 in developing a TDM plan is to conduct an Access Audit that is an inventory of existing transport infrastructure on the university site and its surroundings. Table 3 lists the matters to be described and evaluated. Audit sheets should have enough space to record information and make comments.



Table 3: Access Audit

ACCESS AUDIT ASSESSMENT CRITERIA	
Pedestrians	<ul style="list-style-type: none"> • Number and location of dedicated pedestrian routes • Number and location of pedestrian crossings on roads in and off site (immediately adjacent to site) • Pedestrian crossings located at high demand access points (between student housing and campus) • Pedestrian crossings are raised (pedestrian plateaus and signed for drivers) • Pedestrian routes are safe, visible, well lit, have high amenity, connective, have rest points (seating and water fountains) at intervals • All routes are wheelchair friendly • Emergency telephones for medical or police emergency • Number/location of information points (map of campus with pedestrian paths, dedicated and share use, rest points, steep gradients, emergency telephones)
Bike	<ul style="list-style-type: none"> • Number of parking racks • Type of parking racks (toaster, U rail, bins 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 available for cyclists • Number of cycle routes on and off site including shared paths and on road cycle lanes • 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	<ul style="list-style-type: none"> • Number of bus routes servicing site • Frequency of services • Coverage of services, radial and cross-town routes • Connectivity of services (with train stations, other major land uses in area)

	<ul style="list-style-type: none"> • Location of bus stops to university buildings ('pedshed mapping' assessment) • Shelter, lighting, safety and comfort of bus stop • Safety, amenity and connectivity of route from bus stop to site • Incentives to travel by bus (discounts, 10th trip free) • After-dark shuttle bus within campus and to nearby destinations (student housing, train station, residences within 3km of campus) • Number and location of service information points on site • Wheelchair friendly services
Train/tram	<ul style="list-style-type: none"> • Location of station or stop to site • Frequency of service • Connectivity with other services if necessary i.e. 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 (e.g. no charge for bike, bulk purchase discounts, 10th ride free) • Number and location of information points on site (information on public transport services, pedestrian and cycle maps, car pooling) • Wheelchair friendly services
Car Traffic Calming	<ul style="list-style-type: none"> • The number of parking bays on and off campus • The cost of parking on and off campus (are daily fees higher than cost of all-day pass on public transport) • Parking controls on and off site (time monitored or user restricted) • Utilisation of parking capacity on and off site • Incentives for car travel by staff and students (free parking, mileage allowance, car loans, leases, company cars etc) • Designated road speed for campus roads • Enforcement of speed limit • Signed pedestrian and cyclist crossings • Pedestrians designated priority at the crossings • Internal roads designed to slow traffic near pedestrian areas



Car Pool	<ul style="list-style-type: none"> • Number of dedicated parking bays for car pooling • Cost of parking (lower fees than cost for Single Occupant Vehicle SOV) • 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)
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Adapted from (Curtis & Coleman 1996; Coleman 2000; Manners 2001).

Pedestrian access should be assessed to a distance of 2 km, cycling access to a distance of 5 km, and public transport access should be assessed for the metropolitan area or near rural area (Socialdata Australia 2000).

Assessment of pedestrian routes requires description of route safety. Safety is subjective and the analysis should take into account the variation in safety with time of day and with the perspective of gender. The SAFE Assessment Tool can aid this analysis. After-dark SAFE assessment should also include campus bus stops, shuttle bus waiting areas, bicycle parking areas and car parks.

Survey of Travel Patterns: how the existing infrastructure is being used

A survey of staff and student travel patterns is important to gain an understanding of how existing transport resources are being used. This survey can also identify the actual needs of users, rather than those perceived by administrators or surveyors. The survey should also be used to identify user group attitudes to aspects of the potential TDM Plan.

The purpose of the survey is to collect travel information specific to the university organisation. Journey and other travel behaviour information (e.g. position in the university (general or academic staff, student) time of travel, persons per car, parking used, public transport modes used, working hours and type of employment (full/part time, casual)), provides a baseline measure to test post-implementation changes against planning targets. Attitudinal information and suggestions for infrastructure changes made by staff and students can also be used to evaluate proposed TDM travel initiatives.

Survey methods

A survey should be designed to collect quantitative and qualitative data. Quantitative data is “factual information” whilst qualitative seeks to discover the “opinions, attitudes and perceptions” of respondents (Kumar 1999 p118). Quantitative data is obtained through closed questions where respondents indicate appropriate answers in check boxes. Open-ended questions facilitate qualitative data by providing space for respondents to answer the question in their own words. Open-ended questions are useful for understanding the perceptions of respondents. However, these questions should be used sparingly because they are time consuming to answer (and hence may reduce response rates) and time consuming to code for later analysis.

Before developing the survey questions, consider how the survey will be conducted and how the information collected will be collated and used (Kumar 1999).



If using an 'intercept' survey – in which potential respondents are approached at random during travel or other on-campus activity – the number of questions, especially open-ended questions must be limited. Respondents will generally be unwilling to answer a long questionnaire. Intercept surveys should be kept to a maximum of ten minutes.

If the survey is to be distributed to students through classes and to staff via internal mail, it can be completed at a time convenient to the respondent, giving more scope for open-ended questions.

If questionnaires are self-completed a covering letter must explain the survey purpose, include a contact number for any queries and the required return date (Kumar 1999), and a statement that individuals' responses will be confidential. Offering a prize draw for those completing the survey can improve the response rate.

The questionnaire order should place easy factual questions first as 'warm up questions'. In-depth, open-ended questions can be dispersed through the middle of the survey, with demographic information (age, gender, location of residence, occupation) collected near the end of the survey.

Questions must be clear and concise, and free of technical jargon (Kumar 1999). Avoid double-barrelled and ambiguous questions. Do not ask leading questions, make assumptions, or ask questions based on assumptions (Kumar 1999).

More information on constructing a questionnaire and transport surveys can be found in:

- Kumar, R. (1999). *Research Methodology: a step by step guide for beginners*. Sage Publications, London.
- Kitchen, R. and Tate, N.J. (2000). *Conducting Research in Human Geography: theory, methodology and practice*. Pearson Education Limited, Essex, UK.
- Richardson, A.J., Ampt, E.S. and Meyburg, A.H. (1995). *Survey Methods for Transport Planning*. Eucalyptus Press, Parkville, Victoria, Australia.

After developed the questionnaire a small 'pilot' survey should be conducted, to ensure the questions are appropriate for gathering the required information, and to test the proposed survey process (Richardson, Ampt & Meyburg 1995).

The pilot survey should be conducted in the actual research setting as a "dress rehearsal" (Richardson, Ampt & Meyburg 1995 pg. 215). It can take a number of pilot surveys to ensure an effective questionnaire design. At the University of New South Wales the questionnaire was piloted four times before distribution to all staff and students (Sharp & Lee 1998).

Types of questions

Curtis & Coleman (1996) identify the type of information to be sought in a travel questionnaire on staff and student travel patterns including:

- Employment status (full, part time or casual)
- Set times for work period or flexi time
- Is teleworking available to staff, how often do they telework, what prevents more teleworking
- Mode of travel to and from campus, times of arrival and departure

- Activities conducted on the trip to and from work i.e.: shopping, collect/drop off children;
- How long journey takes to and from campus
- How much does daily travel cost
- What is the potential for changing travel mode – have people considered another mode, could they feasibly use another mode, what other modes could they use, what is their attitude to change
- Ease of daily travel – could journey be made easier through different working arrangements, changes to car parking facilities, cycle facilities, transport conditions or any other suggestions

An example of a travel questionnaire will assist in developing an understanding of the type of questions and answer format common to surveys of travel behaviour.

Using the survey information

Collating and using data gathered by the survey will require various formats of presentation depending on the target audience.

If your university wishes to establish a new bus service, spatial representation of staff and student residential locations and travel patterns would provide further justification to estimated patron numbers.

The University of New South Wales combined data from the 1996 travel survey with staff and student residential address's to develop a geographical information system (GIS) that could provide spatial analysis of data (Sharp & Lee 1998). The maps allowed the University to better identify areas of inadequate infrastructure and high transport demand and target its efforts to improve the transport network (Sharp & Lee 1998). Collection of vehicle data and conversion of this to emission ratings enabled the University to monitor its contribution to environmental emissions (Sharp & Lee 1998). Updating the data occurs annually with transport information collected from students during the enrolment period (Sharp & Lee 1998).

The Transport Access Plan: Infrastructure Provision for Travel Modes

The following methods and examples for providing infrastructure have come from the scan of best practice in transport planning at universities and businesses. This section is organised as follows:

- Pedestrian Needs
- Cyclist Needs
- Improving Public Transport
- Managing Car Infrastructure and Demand
- Flexible Work Practices
- Land use and transport integration



Pedestrian needs

Pedestrians require environments that are connective, safe, well lit and of high amenity. A pedestrian plan assesses pedestrian needs in a comprehensive fashion (on and off-site) (Department for Transport 2002a).

An effective pedestrian plan should be linked with other initiatives such as a university bike plan and local authority bike plan, to make more efficient use of financial resources and infrastructure. Good partnerships with non-university stakeholders including local government and adjacent businesses can assist to disseminate the university's plans and discourage work such as car park expansion that may undermine the push for more sustainable travel (Department for Transport 2002a).

The UK Department for Transport (2002b) recommends establishing a dialogue with relevant local councils to ensure the university is informed of works that may affect access routes to the university. At night, safe transport home is essential for encouraging walking to the university during the day.

A number of universities have implemented night shuttle buses providing a guaranteed ride home to the doorstep for pedestrians living within 1 mile of the university; see for example University of Washington and Cornell University. The service is offered free for 'U Pass' holders or holders of staff and student ID cards. The Australian National University operates a night security bus service for staff and students which serves sites around campus.

Additional support for pedestrians at night time comes from increased security measures. University of California (Berkeley campus) installed emergency phones at locations throughout the campus with a specific focus at the night shuttle bus stops and in car parking areas (Poinsatte & Toor 1999). Curtin University of Technology in Western Australia will provide on request a security officer to escort pedestrians within campus grounds at night, and emergency telephones on campus are viewed by monitored CCTV (Curtin University 2003c).

Cyclist needs

Off-site infrastructure and local bike plans

Safe cycling routes to universities are very important to encourage cycling. Roads with high traffic volumes are unpleasant and unsafe (University of Western Australia 2003), and the absence of complete, connective shared paths further discourages cyclists. Safe routes should incorporate shared paths along streets with high peak traffic volumes to provide for novice cyclists. Local streets with lower traffic volumes are suitable for on-road cycle lanes.

Existing cycle networks in the wider urban area should guide provision of shared paths and development of a connective cycle network around the university. Contact the local and or regional government to discover if there is a current local or regional bike plan (South West Group of Councils & Department for Planning and Infrastructure 2003). Where a bike plan exists, the university can work with local and regional councils to obtain funding and construct the necessary infrastructure. If there is no local bike plan, the access survey of off-site infrastructure could be used as a starting point to develop a local bike plan in conjunction with relevant councils (South West Group of Councils & Department for Planning and Infrastructure 2003).





Contra flow cycle lane – Murray Street, Perth



On- road cycle lane

If suburban and city-centre university universities find the surrounding road network has insufficient space for shared paths adjacent to the road carriageway, on-road cycle lanes will be necessary.

Special bike signals enabling cyclists to cross the intersection a short time prior to the green signal for motorised traffic will improve cycling safety. The University of California (Davis) facilitated the installation of a bike signal at a busy intersection as a five-year experiment. This has significantly improved the efficiency and safety of cyclist and traffic movement with a reduction in collisions (Poinsatte & Toor 1999). Main Roads Western Australia is implementing Advanced Stop Lines (ASL) at signalised intersections for road cyclists. ASL incorporates a bicycle stop line four metres in front of the stop line for cars (Main Roads Western Australia 2002) which improves the visibility of cyclists and gives them a head start on the green-turning traffic signal.



On-site cycling infrastructure – networks, parking, end-of-trip facilities and repair areas

To support cycling, three types of infrastructure are required on university campuses:

- cycling networks (paths and road lanes)
- bicycle parking and
- end-of-trip change facilities.

On-campus cycle lanes and shared paths should clearly and safely connect to the off-campus cycle network. The network must also connect to bicycle parking. Where access to parking areas requires cyclists to use some paths not designated as shared use, there should be clearly marked dismount zones outside main pedestrian areas.

Signage is needed to enhance safety and information for pedestrians and cyclists, and should include (BSD Consultants 2001 p35):

- route identification signs (bike and pedestrian symbols on paths)
- directional signs (to buildings, shops, student housing)
- orientation signs (maps of campus pedestrian and cycle paths)
- traffic control signs (e.g. stop, dismount, speed limit)
- advisory signs (e.g. shared bike path, pedestrian zone).

Australian or international standards for these types of signs should be used (Austroads 1999).

Bike parking should be located adjacent to buildings or building clusters in convenient, secure, high-visibility locations (University of Western Australia 2003). Good quality, secure bike parking areas are essential.

The University of Bristol constructed a compound for motorbikes and bicycles where access was gained via a security swipe card system (Department for Transport 2002b). The University of Southampton offers staff and students a similar facility at a cost of £12.50 per annum, which includes up to £500 of cycle insurance (University of Southampton Bicycle User Network 1998). The University of Western Australia provides a variety of parking options to cyclists. U rails are readily available free of charge, and lockable, bike lids are available in some locations. Staff and students can rent lids for a charge of \$20 per semester (University of Western Australia 2003).

Other end-of-trip facilities will also encourage bicycle use. The University of Western Australia (2003) has a policy requiring that end-of-trip cycle facilities be included in all new and refurbished buildings. The University also recommends lockers be provided in changing room facilities for clothes storage and for cyclists to store equipment. Shower and changing facilities provide better personal safety if located in faculty buildings rather than dedicated end-of-trip complexes.

Punctured cycle tyres and mechanical malfunctions are also a risk, so a bicycle shop or spare parts service on campus can be useful. The University of California (Davis) has a 'Bike Barn' run by the student guild which has space for bike repairs, lends repair tools, and provides free advice, assistance and bicycle repair classes (Poinsatte & Toor 1999).

Creating and sustaining a cycling culture

Much can be done to create a cycling culture at your university. Support groups and services of the kinds mentioned above encourage novice cyclists and signal to the broader community that your university is committed to cycling priority.

Cycling groups are an important source of information, support and social contact for new and experienced cyclists. The Water Corporation in Perth, Western Australia established a Cycling Buddy Group (CBG), which involves an experienced cyclist 'buddying' a novice to ride the best/safest route to work and to provide assistance and advice. The CBG is also an opportunity for people to partner for daily cycling and improve safety through larger, more visible groups. The Water Corporation intranet was used to establish the group and send information on proposed activities (Environmental Resources Awareness Group and Conservation Council of WA 1999). University intranets and e-newsletters offer an accessible forum for conveying information on a CBG.

Similar to CBG are Bicycle User Groups (BUGs). These are common within organisations and communities and can be a valuable source of information for establishing cycling groups. The website of CAMWEST, a bike group in Sydney's western suburbs is a good source of information, ideas for starting a BUG or new ideas for existing groups.

On campus security for bicycles is a key issue in all universities, and several provide security against bike thefts. The UK Department for Transport (2002b) describes bike 'tagging', using security ID numbers inscribed on bike frames, to assist return of recovered stolen bikes. The program is conducted with the local police department as a free service to cyclists. Additionally discounted insurance schemes could be offered to staff and students for bicycle insurance.

Your university may also bulk purchase bike insurance, and pass discounts to staff and students (Department for Transport 2002b).

As with salary-packaged cars, your university may offer incentives to encourage staff to cycle to work. These may include an allowance for bike travel to work and a per-kilometre-based reimbursement for bike travel in work hours (Department for Transport 1999).

Special programs can introduce car-driving staff to alternative transport and the associated health and fitness enhancements. The 'Cycling 100' program for non-cyclists living between 5 and 15 km from the campus of the University of Western Australia was aimed to encourage cycle commuting by University academics and other staff. Each volunteer was given a bicycle, all equipment needed, a bike gauge to calculate the greenhouse emissions saved and training for road cycling (Department of Environmental Protection 2000). Eighteen staff participated in 2001 and funding for an additional 10 staff was allocated in 2002 (University of Western Australia 2003).

The University of California (Davis) encourages cycling in the wider community as part of its leadership role in developing a bike culture. Funded by the California Office of Road Safety, a 'Bike Right' safety and education program is run by the University's Student Health Centre. This program aims to teach cyclists road rules and bike safety through education, information and special safety events (Poinsatte & Toor 1999). There are also bike repair and maintenance courses at the University's Bike Barn, a Bike Traffic School for cyclists violating campus bike laws and a Bike Rodeo at primary schools run by the Davis Police Department (Transportation and Parking Services 2001). The Davis City Council also rents bike helmets for US\$1/day, and auctions unclaimed and abandoned bikes, enabling students and residents to purchase inexpensive bicycles (Poinsatte & Toor 1999).

Buses in the City of Eugene (Oregon, USA) can carry bikes on front-mounted racks, enabling students and staff at the University of Oregon to commute by bicycle in the morning and (if they wish) to travel home by bus in the evening (Poinsatte & Toor 1999). Bikes on buses also enable travel by a combination of the two modes for increased distance coverage (Poinsatte & Toor 1999), extending the reach of cycle-based commuting.

Similar schemes can be effective for rural/regional university campuses in Australia, with buses bringing students from outlying areas to the outskirts of towns, from where they can cycle to university. A trailer modified with bike rails would allow a number of students and their bikes to be collected.

The University of British Columbia (UBC) established the AMS Bike Co-op and the Bike Kitchen, to increase the opportunity for sustainable travel between areas of its large and dispersed campus. The Bike Co-op has a pool of 50-100 purple and yellow bikes on campus which can be unlocked from parking rails and ridden to another destination on campus. Access to the bike pool is available to members of the co-op in return for volunteering 3 hours of time to the co-op plus a nominal fee of \$10 for students and \$20 for faculty and staff. Membership also gives a 10% discount on bike parts from the Bike Kitchen, mechanical help and free admission to weekly one-hour 'Bike Care Clinics' (UBC TREK Program Centre 2002).

The UBC Bike Kitchen is a retail shop and bike repair centre. The Kitchen is a not-for-profit branch of the AMS Bike Co-op and sells new and used parts and second hand bikes. Staff at the Kitchen will repair bikes for \$18/hr or DIY repairs can be conducted at the Kitchen for \$6/hr. Bike mechanics will instruct cyclists on bike repairs for \$12/hr (UBC TREK Program Centre 2002).

Bike culture can be further enhanced by offering the free CanCart, a hand cart that may be attached to the bike seat post and rolls behind the bike. The UBC Cancart storage component is a little larger than an Australian milk crate and can carry up to 45kg, and so able to carry books or other heavy loads. The carts have been designed to fit through supermarket checkouts (UBC TREK Program Centre 2002), so encouraging the use of bike travel for shopping trips.

Improving Public Transport

Many Australian university campuses are not serviced by convenient train or tram routes, so planning should focus on establishing and improving the convenience and reliability of bus services.

Infrastructure and services

A university operated and funded shuttle bus service is one solution. A basic service should run from morning to early evening carrying passengers between car parks, student housing and a limited number of campus shuttle stops.

The University of Washington also operates an extensive 'Night Ride' shuttle bus, servicing north, east and west areas, with colour coded buses for easy identification. The buses operate on a 15 minute service frequency and collect passengers from 5 stops in each area, for staff and students travelling to student housing, transit stations, shopping districts. The services will drop patrons at their doorstep within 1 mile (1.6km) of the campus. The doorstep drop-off is a guaranteed safe ride home, enabling people to walk on days when they finish after dark (University of Washington 2003). Similar shuttle services operate from Cornell University, the University of Minnesota and University of California.

Where state government or private agencies provide bus services, universities have established working relationships with these service providers, to proactively participate in providing new services or improving existing services.

In 1997 the University of New South Wales (UNSW) secured improvements to bus services and waiting areas to improve safety at the Central Railway Station bus stop where approximately 7,000 University commuters transferred between trains and buses. With Sydney Buses, UNSW also implemented a queuing system for passengers to reduce crush conditions for arriving buses. This also improved the efficiency of bus loading, reduced passenger waiting times and improved the overall comfort levels of waiting passengers (Black, Mason & Stanley 1999).

Integrated ticketing

Universal passes which provide discounts on public transport, access to other travel initiatives at universities and discounts at sponsoring businesses are common to universities in America.

The University of Washington U Pass enables the bearer to receive full fare cover on three bus companies and one commuter train, free car pool parking, free travel on the 'Night Ride' shuttle bus, subsidised van pooling, discounted occasional single occupant vehicle parking and discounts at sponsoring businesses (Poinsatte and Toor 1999; University of Washington 2003). The program is an outstanding example of incentives promoting sustainable travel and opportunities for synergies with local businesses.

The University of Washington U Pass requires compulsory student membership to ensure sufficient revenue to operate the scheme with a large range of benefits. Non-mandatory U Pass programs exist at other universities, but the benefits to users are limited to public transport discounts and access to university initiatives such as car pooling and shuttle buses. The non-mandatory programs use cost incentives only. A U Pass at the University of Minnesota saves about 20% on the monthly cost of bus transport (University of Minnesota 2002). A compulsory Universal Pass model may be able to give greater benefits to students but may be opposed by some students.

Reduced public transport costs are obtained by the University of Bristol by bulk purchasing public transport tickets at a discounted rate from various bus companies. Staff members are able to buy public transport tickets from the university at a discount of 10%. An additional 10% saving can be obtained by purchasing a public transport season ticket through the university. An interest free loan of up to £1, 500 is available for staff to buy tickets, and repayments can be salary packaged as a further benefit (Department for Transport 1999).

Managing car infrastructure and demand

Three key tools are commonly utilised to manage car travel:

- parking management
- car pool programs and
- van pool programs.

Parking management and car pooling are common at Australian universities. Some American universities have employed all three tools.



Parking management – pricing, availability and convenience

Parking management involves “pricing, availability and convenience” (Poinsatte and Toor, 1999:39). It is best to introduce pricing charges over a number of years while at the same time improving other travel options. Gradual change is necessary to allow staff and students time to adjust and find new ways of commuting.

Pricing and availability can be controlled by parking permit systems and additional daily parking charges. Parking permits are a mechanism to limit or discourage parking availability for single occupant vehicles via higher charges. Permits can also be restricted to staff and students based on residential location and year of study.

The University of Western Australia does not issue car parking permits to first year students, or to staff and students living in postcode areas adjacent to the University or close to public transport services connecting with the University (University of Western Australia 2003). Presently car parking on streets and public car parks adjacent to the University are used by staff and students, but the University is working with the local council to establish short term metered parking in these areas to discourage overflow parking (University of Western Australia 2003).

The University of Bristol allocates parking permits to staff on a needs basis. A ‘need’ is established by a temporary or permanent disability, caring responsibilities, dependants, school travel needs and peak period journeys of more than 30 minutes. Within the University, category A parking spaces are individually allocated for temporary or permanently disabled and for formal car poolers. Category B spaces are allocated to staff with caring responsibilities or those with school travel needs or who have more than 30 minutes peak travelling time. Category C spaces require a permit but space is not guaranteed. When staff apply for category B or C permits they must provide information about public transport services and availability as part of their case for a permit, to encourage greater awareness of non-car transport options (Department for Transport 2002b p123).

Oxford Brookes University (1999) notes that in imposing parking controls there must be “clear objectives, [sensitivity] to household roles and responsibilities of the commuters, and ... be managed in the most equitable way possible”. The University allocates parking permits for staff based on operational and special needs, and staff may not purchase a permit if living within 3 miles of the University. Student parking is not allowed on the main campus and is restricted to students with an identified need at its other two campuses. Parking is available to post graduates living a certain distance from campus, to recognise that post graduates may have family and carer responsibilities similar to staff (Oxford Brookes University 1999). Permit refusals may be appealed.

Car drivers habitually underestimate the cost of car travel by up to 60% (Curtis & James 1998). Using daily parking fees encourages occasional rather than regular car use by raising the perceived marginal cost of each occasion when parking is used. Using a parking coupon designed to ‘scratch and display’ can have a similar impact on perceived costs (Department for Transport 2002b).

Providing an annual parking permit discourages the occasional use of car parking as purchasers may wish to get ‘value for money’ from the permit, and in any case lowers the perceived cost of parking.

Use of cars by staff for university business-related travel can also be influenced by the level of car mileage allowances and revising or removing petrol reimbursement rates for car travel (Department for Transport 1999).



Car pooling

There are three key elements to car pool programs:

- parking charges for car pool vehicles lower than for single occupant vehicles (SOV),
- car pool parking more conveniently located than SOV parking, and
- car pool participants' access to a guaranteed ride home (GRH) if they work late or miss the car pool vehicle.

Carpool program participants should also have access to a limited number of single use parking permits enabling them to drive their own vehicle occasionally. University vehicles should be available to staff during the day for work-related travel needs, and a shuttle bus should be available to the commercial district during the day for staff and students errands (Poinsatte & Toor 1999).

The University of Bristol car pooling program requires staff travel in a share car for a minimum of three days per week. Car sharing is organised over the University Intranet. Incentives to encourage staff participation include a guaranteed ride home for unforeseen circumstances and a guaranteed parking space. Daily parking charges are a percentage of the lowest employee salary in the car. Car pooling program participants are also entitled to 10 days free parking for times when the share car is not available (Department for Transport 2002b).

The University of California (Los Angeles) requires a minimum of 3-day sharing for participation in the car pool program. Permit pricing encourages higher occupancy vehicles with a share car for 3 persons paying US\$99 per quarter, and for 2-persons costing US\$147 (University of California Los Angeles 2003). The University of Minnesota charges for car pool permits at a rate about half the daily rate for single occupant vehicles, to increase vehicle occupancy (University of Minnesota 2002).

Vanpooling

Vanpool schemes may be a good approach for rural/regional universities in Australia. They operate mainly in America and are available only to staff and students who live more than a minimum distance from the university – usually 10 or more miles. Vanpool schemes offer the same benefits to participants as car pool programs including reduced parking costs, guaranteed ride home and discounted occasional parking for single occupant vehicles. Car and vanpool participants must have a U Pass or integrated ticketing system at the university.

Some vanpool schemes offer cash incentives to new scheme participants and to recruit new 'riders'. At the universities offering cash incentives for vanpools, the incentives are not available in the car pool program. This may indicate van pool schemes are difficult to maintain due to the turn over of student drivers every 3-4 years, the need for a minimum of 5 passengers per van, and the higher apparent cost of these schemes compared to car pooling.

The vanpool scheme at University of California (Los Angeles) is co-ordinated by the University which partly subsidises its cost. The vans are owned, maintained and insured by the University. The program requires van occupancies of 6-14 passengers, the costs per person are US\$93-191/month (cost per person decreases as number of van occupants increase), which includes eligibility for the emergency ride-home scheme (ERH) and Ride Card. The ERH provides travel home in an emergency or if a van pool participant works late or misses the ride home. The Ride Card provides a US\$2 discount off daily parking charges, enabling participants occasionally to drive their own car (University of California Los Angeles 2003).

The University of Washington vanpool scheme is available for staff/students living 10+ miles from campus. A minimum of 5 persons is required to establish the vanpool. Vans use high-occupancy vehicle lanes near the University, conferring travel time advantages on participants. The vans can be fitted with bike racks so participants have a bike available for travel during the day. The University offers three financial incentive strategies to promote the vanpool scheme:

- US \$100 subsidy on scheme costs is offered to join the van pool program
- US \$200 worth of vouchers for drivers of van (students)
- US \$25 vouchers to riders for each new recruit to the vanpool. The vouchers can be used to pay vanpool fees, and there are six sponsoring businesses that accept the vouchers as payment for services (University of Washington 2003).

Students or staff members may be van drivers. Student drivers must have a 'clean' licence; pass a driving test set by the university and a medical/health check. Drivers keep the scheme van at their home and have some private use of the van as a further incentive. The University also subsidises employees US\$60/month to participate in a van pool (University of Washington 2003).

The University of Wisconsin participates in a state-run vanpool program established for state employees, including University staff and students, who may vanpool with others working in the vicinity of the University. The enlarged pool of potential riders improves the opportunity for securing a sufficient number of people to participate in the program.

A comprehensive manual on the policy and procedures is available on the State of Wisconsin's web site. The policy manual covers information for drivers and coordinators, rider information rules and regulations, terminations, emergencies, organisation and administration, vehicle maintenance (State of Wisconsin n.d.). The policy is a good source of information for universities without any experience of formal car or van pool programs.

Flexible work practices

Teleworking enables employees to work from home. It is suited to those employees who do not require everyday contact with students. The University of Washington uses teleworking as a tool to reduce employee absences and to help retain employees (University of Washington 2003).

Washington University also offers employees a 'compressed working week' which allows them to work additional hours on most days, accruing work time which can be 'cashed in' for one day off. Therefore an employee may work a nine day fortnight, having each tenth day off and avoiding travel on that day (University of Washington 2003).

Teleworking and compressed working weeks have a number of benefits to the university, to staff and the community. The benefits reported to the university and staff include increased productivity and worker morale, and reduced stress and absenteeism. Other personal benefits accrue to employees from reduced travelling time, vehicle mileage/costs and personal costs (food and beverages etc). Community benefits come mainly from reductions in road congestion, vehicle emissions, vehicle noise and accident exposure (Luk et al. 1998).

Land use and transport integration

The spatial layout of a university campus can contribute to supporting public transport, walking and cycling networks. Clustering buildings around a pedestrian core assists to create a compact, walkable campus. Buildings



should be in close proximity and orientated to public transport stations to provide safe and convenient access. Locating commercial businesses such as newsagents and delicatessens around the public transport station also enhances service to public transport users. Locating some student housing adjacent to the transport stop would provide an additional market for small businesses.

Car parking should be located on the periphery of the campus, preferably at a greater distance than public transport stops. However, inappropriate location of on-site car parks can be a deterrent to people walking to the campus, especially where parking is located between student housing areas and the university.

Well located student accommodation on or near the university will contribute to students walking or cycling to the campus. University of California at Berkeley has just over half of its students walking to the campus. This is largely attributed to 59% of students living within 1 mile of the University.

Influencing travel behaviour

Apart from implementing structures and processes to provide incentives for non-car travel, information and persuasion should also be used to influence individuals' travel choices. A TravelSmart marketing campaign has been used successfully to achieve travel behaviour change by individuals and households in South Perth, Western Australia.

To change travel decision processes and outcomes, it is first necessary to make individuals aware of new transport resources and options available for the contemplated journey. Every potential traveller has a 'modal pool' of transport resources perceived by them to be available and effective for each commonly experienced journey type or destination (Godfrey & Affleck 1977; Curtis & James 1998). Attitudes to mode use, and therefore the content of an individual's 'modal pool' are affected by habit and by recent experience, noted by Curtis and James (1998) as a key factor in making the transition from a contemplating user to actual mode user.

Segmenting the travel market

To alter attitudes and raise awareness of alternatives to single occupant car travel, information and marketing messages should be targeted to groups of potential users with common attitudes and needs. This requires segmentation of the travel market. The purpose of the segmentation is to identify groups with common characteristics that are likely to have common responses to promotional messages and information regarding their travel needs, their perceptions of available resources and the constraints perceived to affect them.

Segmentation of transport users should be based on a combination of shared behavioural experiences, motivations and values, as objective demographic and occupational characteristics are unlikely to provide an basis for useful attitudinal segmentation (Godfrey & Affleck 1977; James & John 1997; James & Brog 2001). Demographic variables must be combined with attitudinal variables to be powerful descriptors for segmentation.

Therefore markets for university travel may be segmented based on Income; Age; Gender; Household role (Hanson & Hanson 1981); Location of residence; Access to a car; Observed or self-reported behaviours; Attitudes to transport modes; Occupation (Administration staff – full time or part time; Teaching staff – Full time, part time or sessional; Post Graduate, Masters or PhD student; Undergraduate – full time, part time and international).

This information will come from the travel questionnaire administered to staff, faculty and students. Intersection of needs and attitudes for market segments can be derived in a two-way matrix, from which the appropriate promotional and information campaign can be developed to reach the market segments. Table 4 is an example of

how this might be done, but each campus and location will differ and planners should think about the unique segmentation of their 'markets'.

Table 4: Demographic and Attitudinal Response Variables

<i>Demographic Variables</i> →									
	Income	Age	Gender	Household Role	Location of Residence	Access to a Car	Observed or Self reported behaviours	Attitudes to Transport Modes	Occupation
<i>Attitudinal Variables</i> ↓									
Environment Concerns									
Health and Fitness Concerns									
Car-orientated Enthusiasts									
Financial Limitation Constraints									
Status Orientated Focus									
Safety Awareness Concerns									

Attitudes are derived from experiences with people and places (Robbins et al. 1994), are potentially unstable and therefore may be influenced through targeted advertising (Robbins et al. 1994). Some relevant attitudes will include:

- environmental concerns
- health and fitness concerns
- car-orientated enthusiasts
- financial limitation concerns
- status orientated focus
- safety awareness concerns (Transport 1999; Scheurer 2001).

The focus of a marketing campaign therefore needs to be information to inform transport users about how non-car transport modes can meet the needs and be consistent with attitudes shared by identified market segments.

Targeted messages to market segments

The aim of targeting messages to identified market segments is to provide user specific information that can contribute to encouraging behaviour that reduces less sustainable travel behaviour. Targeted messages provide a means of reinforcing or communicating specific educational information to certain market segments. The technique is effective because the information is designed to address the identified needs and attitudes of market groups.

For groups with safety concerns, emphasising the safety and security aspects of the university's public transport system including a shuttle bus to bus or train stations, emergency telephones, CCTV, well lit and staffed waiting

areas will be more appropriate to convince this group it is safe to travel without their car. The needs identified in promotional messages must of course be genuinely catered for, or novice users of alternative non-car transport modes will be 'switched off' and persuading them to re-try will be even more difficult. Don't over-sell!

Market segments with environmental concerns can be more responsive to information and advertising emphasising the environmental benefits of walking, cycling or travel by public transport.

In developing information messages to target the audience, start with information which explains the problem, then presenting practical advice about behaviour change, and lastly show how change can be a positive contribution to the users lifestyle or the problem (INPHORMM Project 1998a).

Stage 2: Implementation

Implementing the Travel Demand Management Plan

Successfully implementing the actions contained in a TDM plan requires:

- the appropriate systems in the university's administration
- prioritisation of actions within a timeline for completion
- leadership from senior staff within the university
- consultation with staff, students and relevant stakeholders to gain 'grass roots' support.

Organising for decisions and plan management

The Environmental Management System at your university should be expanded to address university transport, supported by sustainability objectives in the university's Environmental Plan (Manners 2001), and link to your university's Strategic Plan.

Transport Coordinators employed to implement and manage the TDM Plan are a key to successfully managing the daily requirements and problems in on-going implementation, and to plan and prioritise issues for consideration by the University Transport Committee.

The Transport Committee incorporates representatives from relevant departments including parking, security, grounds and landscape (Cameron 2003 pers. comm.). The Transport Committee assists in works approval and carrying out work within the campus grounds.

'Good practice' actions include having a member of staff unions and student guilds promoting sustainable transport within each organisation (Manners 2001). Keeping the representative bodies of staff and students informed of new initiatives and inviting comment on proposals can assist to overcome potential barriers of misinformation or misunderstanding (Department for Transport 2002a). Curtin University of Technology and the University of Western Australia have found that staff and student guilds can through simple misunderstanding considerably weaken or halt initiatives to discourage unsustainable travel patterns.

Partnerships with relevant public transport providers, local governments and the state government will be a critical element in achieving off-campus infrastructure changes that support the sustainable transport objectives of the

university (Manners 2001). The importance of these partnerships cannot be underestimated and a university should seek to establish strong relationships with stakeholders early in the TDM plan development. The partnerships between stakeholders and the university will be an invaluable source of information and expertise in addition to possible funding sources for joint initiatives.

Marketing, promotion and information

There are three aspects to selling a TDM plan and the services it aims to provide:

- strategic marketing,
- promotional events,
- information dissemination.

Strategic Marketing

Strategic marketing focuses on altering individual travel behaviour during moments when individuals are undergoing life changes.

Research indicates that changes in life circumstances opens individuals to new patterns of behaviour, new habits and attitudes, presenting opportunities to introduce modifications to travellers' 'modal pools' and consequent travel behaviour (The Warren Centre for Advanced Engineering n.d.). Information dissemination is a passive process in regard to plan implementation, requiring the 'market' (staff and students) to seek the necessary information. Promotional events are used to launch new initiatives and showcase ongoing initiatives in an entertaining and relaxed setting.

The need or desire for changes to lifestyle result from major life circumstances or from perceived threats to health. Moments of opportunity include change of address, change of car, change of job or job location, birth of a child, changes to schooling patterns, drivers licence acquired, drivers licence lost or suspended, persistent traffic or parking violations, violent attack while travelling, serious traffic accident, marriage/divorce, serious illness, death of friend or family member (The Warren Centre for Advanced Engineering n.d. citing Fergusson, Davis and Skinner 1999).

It is important to 'catch' people when they are in transition, for example when they first start travelling to the campus or at orientation before a travel resources are secured and a travel pattern and habits are established. At this point new transport system users should be offered methods of transport that are not currently in their 'modal pools'. This is an opportunity not to be missed.

In the university environment there are a number of identified opportunities for strategic marketing:

Orientation week

Orientation week is an opportunity to present transport 'solutions' to new students who are yet to establish travel patterns to the university campus. For students entering university straight from high school, a large number will just be reaching driving age. Car travel habits are yet to be entrenched and many will be without direct access to a car, either through lack of ownership or sharing a car with parents and household members.

Keeping these students on the public transport system or as 'active transport' users (walkers and cyclists), and not losing them to car travel is as more likely to be successful than persuading new students with unlimited access to a car to adopt sustainable travel patterns.

Orientation provides an opportunity to reinforce the benefits of sustainable travel, such as opportunities for exercise, sleeping, reading, socialising or cheap travel, whilst highlighting the restrictions in place to reduce car travel to campus. Given that beginning university can be a confusing and overwhelming process, providing journey planners for students and personalised information by suburb can remove some of the uncertainty associated with travel to the campus. With orientation packs, each new student should be provided with a public transport ticket granting one or two free return journeys as an incentive to utilise public transport, and to gain experience in this mode. Similar incentives or prizes should be made available to new students who walk or cycle to university within the first week.

At the University of Western Australia's orientation week, the Office of Facilities Management dedicates one day to transport issues. A marquee at the orientation day presents students with information on walking, cycling and public transport. The University adopts a slogan for the year, e.g. "Bus, Bike or Take a Hike", and utilised the slogan "Love Those Legs" to promote walking. The day presents the issues facing the University with regard to meeting car demand, describes the Access Plan and its purpose, and staff in the Office of Facilities Management advise new students on their transport options (University of Western Australia 2003).

New employees

New university staff can be introduced to the university's transport plan through induction programs.

The University of Bristol noted that a "key issue" for achieving successful implementation of their commuter plan was communication with staff (Department for Transport 2002b pg. 124). Induction sessions therefore provide an opportunity where staff who have not yet established workplace travel habits to receive information on efficient and cost-effective transport options.

Induction sessions can be used to describe the purpose of the transport plan and make available service information, walking and cycling maps in addition to information regarding salary packaging for purchasing bicycles or public transport tickets. Some organisations offer personal journey planners for new joiners (Department for Transport 2002a). All new staff applying for parking permits could be required to complete an information session with a personalised journey planner before a permit application will be processed. This will improve awareness of travel options and may avert staff from developing car dependent travel patterns to the workplace.

Staff health needs

Curtin University (Bentley) is developing a program to promote 'active transport' through the Health and Lifestyle Office, which promotes exercise in the workplace and healthy lifestyle to improve the health and wellbeing of staff. With the Curtin Envirolink (Environmental Management Office) it will develop a program to promote walking and cycling for travel to the University. This program should reduce the number of commuting car trips made by University employees and reduce sickness and stress-related illness (Bastow 2003b; Woolmer 2003). The University of Western Australia (Crawley) is also addressing transport and health issues in a collaboration between the School of Public Health and the Transport Coordinator (Cameron 2003).

Staff employed by the City of Fremantle Western Australia have trialled pedometers to measure daily activity. Log Books used in the trials also include ideas to increase daily step counts (Malcolm 2003), and advice on walking to work and walking to the bus for work travel (Malcolm 2003). The trial occurred before beginning a community 10,000-Steps program in Fremantle. Similar programs could be undertaken in universities to promote the active transport and healthy living message.

De-marketing the car

De-marketing the car includes strategies for negative marketing, demand restraint and indirect conservation. Negative marketing focuses on the marketing strategies for cars which "engage with the car users' self image"—

sexy, stylish, fun, exciting, sporty – and show this perspective to be an illusion (Wright & Egan 2000:291). The aim is also to highlight the negative attributes of cars – their high cost, fumes, noise, congestion and accidents. Indirect conservation “discourages demand for a product or service whose consumption threatens another resource where conservation is important but cannot be easily marketed itself” (Wright & Egan 2000:288). The key to campaigning is humour, but there may be challenges arising from cultural differences within your university’s population.

Marketing targets by residential location

The University of Western Australia has identified approximately 15 postcode areas located close to the University campus and adjacent to transport routes well serviced by public transport. Staff and students living in these postcodes are ineligible for parking permits on campus unless an exemption is obtained (University of Western Australia 2003).

In the absence of similar restrictions at other universities, or before the implementation of similar restrictions, university employees and students in such localities can be given information regarding public transport services to the university.

Personal journey planning assistance through TravelSmart should also be made available to encourage less car travel (Department for Transport 2002a). Incentives such as free bus/tram/train tickets could be included in the information package to encourage the use of public transport.

Promotion of the TDM Plan and related initiatives

Promotional functions aim to raise awareness with fun and entertainment. Promotional events can be used to motivate people to try alternatives to the car, to reward people who travel by methods other than the car, and to reach people that may not be receptive to marketing or who are not active information seekers. Promotions can be held to coincide with national or global events including ‘car free days’ and ‘walk to work days’, or other events specific to the needs of the university.

‘Bike to Breakfast’ events held annually in late summer are common in Australian universities. They are organised by university Bicycle User Groups, and in Western Australia the breakfasts are held in conjunction with ‘Bike Week’, an event organised by the State bicycle planning unit (University of Western Australia 2003).

‘In Town without My Car!’ is an international Car Free Day event promoting travel without a car for one day of the year. The event aims to raise awareness of car-related environmental issues and to encourage people to travel without cars. In 2000, an estimated 70 million people took part in the event in Japan, North and South America, and for the first time Australia (Curtis 2000:2). The success of the Australian event has been reviewed. There is an opportunity for Australian universities to participate in this event or undertake a similar Car Free Day event at your university.

‘Walk to Work Day’ is an annual event in Australia promoting walking as a mode of transport. The aim of the Walk to Work Day is:

- to promote walking as an important transport mode and healthy activity
- to reduce reliance on private motor vehicles
- to promote and improve the use of public transport
- to improve air quality by reducing unnecessary vehicle emissions” (The Pedestrian Council 2002 [online]).

Your university could become involved in this annual event to promote alternatives to car travel and walking to the university. The day also provides opportunities to establish ‘walking shuttles’, walking groups of university staff and students who live in the same area and can walk to work together.

The Buckinghamshire Council launched their transport plan with a 'Big Bang' approach. Such launch events use billboards, competitions, giveaways, senior staff or a 'personality' to speak at the event, aimed at generating interest for the purpose. Prizes for staff at the Buckinghamshire Council included "frisbees, mugs, mouse mats, stress balls, yo-yos" all promoting the green transport message (Department for Transport 2002a pg. 32). Universities could undertake such events inviting corporate sponsorship and donations from businesses, which would benefit from the exposure to a market of 1,000's of potential customers.

Events at some universities include the 'Smart T. Bucks' program which involves participants keeping track of every non-car trip to the campus on a special calendar (the calendar is handed in for 'smart bucks'); 'Special Earth Day' as a promotion for sustainable behaviour; and 'Don't Drive One In Five Week' with every day having a different non-car travel mode (Poinsatte & Toor 1999). These can then be spent at the sponsoring businesses. 'Staying Alive' is a program that promotes active transport. Participants keep track of walking and cycling trips and prizes are available for individuals and departments achieving the greatest number non-motorised trips. 'Get It Together' is an event promoting carpooling, vanpooling and bus travel (Poinsatte & Toor 1999). For more information on American and Canadian promotional events see 'Finding A New Way: Transportation for the Twenty-First Century'.

Passive Information Strategies

Information must be high quality, accessible and relevant. Information describing access to your university should be factual, provide details for each transport mode and the service provided by each transport route. The information must be provided at a variety of locations on the campus and in varied formats – as leaflets, maps and tables, posters and signs, information resource packs, by telephone, via the Internet and in person at information centres (INPHORMM Project 1998a).

Information for university staff can be distributed via the internal mail system. All staff can be sent a 'Travel News' newsletter either biannually or quarterly. Information regarding meetings and promotional messages can be issued with payslips. (Department for Transport 2002b).

The University of New South Wales distributes a transport brochure through Student Union shops, Library and other campus information points. It outlines public transport routes to the University, service frequency, ticket costs, parking restrictions and the health benefits of walking for transport. The University has also identified other possible media for information distribution via invitations to events and conferences, stationery, business cards and electronic text. A map is to be developed with energy expenditure calculations for certain walks including walking to the University from the bus stop, and walking up the University library steps (Black, Mason & Stanley 1999).

Other ideas for conveying information include promotion of university carpool schemes with a free bumper sticker for participating cars. The backs of toilet doors can be used to display promotional posters or the university access map showing non-car transport routes (Kaufman n.d.).

Some tips for the presentation of information are listed below in Table 5.



Table 5: Ideas for maps and information displays.

<p>Maps should include</p>	<ul style="list-style-type: none"> • all public transport routes • cycle routes (on-road and path) • public transport service times, frequencies, fares and disabled access • the closest bus stops, train stations and time taken to walk from them to your university • key visual landmarks and cross-streets for pedestrians • phone numbers and web addresses for public transport service providers; location of taxi ranks and phone numbers • on-campus bike facilities, lockers, showers, repair shops • put information in context “parking costs \$X but the bus only costs \$X...” (Roads and Traffic Authority n.d.)
<p>When presenting information</p>	<ul style="list-style-type: none"> • use icons for graphics • be specific e.g. ‘takes 10 min’ rather than ‘close to’ • be comprehensive • be helpful with phone numbers, web addresses, info on fare discounts • be encouraging “No parking fees! No parking hassles!” (Roads and Traffic Authority n.d.)
<p>Ways of presenting the access guide</p>	<ul style="list-style-type: none"> • on recruitment advertising • small map of access plans on business cards, stationary, invitations, with compliments slips and in advertising material • on website (make map easy to download i.e. pdf file) • a single page plan that can be faxed or mailed and easily referred to by staff • as part of a telephone ‘on-hold’ message, or with information line hours of opening messages (Roads and Traffic Authority n.d.)

Stage 3: Monitoring and Evaluation of the TDM Plan

After your Travel Demand Management Plan has been implemented it is important to evaluate whether the actions intended to change travel patterns are effective. Evaluation measures a plan’s progress toward set targets at a specified point in time, and assesses the benefits to your university and its community. Evaluation brings rigour into TDM Planning and can help decision-makers to maintain a plan that is adaptive and responsive to changes in travel demand, travel patterns and cultural expectations (Bridgeman & Davis 2000).

The process of evaluation is similar to the method for developing a TDM Plan:



Terms of Reference

The transport goals a plan has focused on are described. A mid-term evaluation may focus on one specific aspect of the TDM plan such as car trip rates and parking demand, while an annual evaluation should address all of the implemented transport initiatives.

Evaluation Strategy

The next step is to design an evaluation strategy (Bridgeman & Davis 2000:117), specifying what will be evaluated, how the evaluation is to occur and a completion date. Evaluations should re-survey staff and students to understand their travel patterns and attitudes to transport initiatives (University of British Columbia and Trans Link 2002; Department for Transport 2002a; University of Western Australia 2003; Roads and Traffic Authority n.d.).

It is not necessary to do a complete access survey for the evaluation, but it should include questions regarding 'holes' in the transport network. Parking supply and parking controls should be surveyed annually to ensure that any new or de facto off-site parking locations are not undermining restrictions on campus. Such surveys also provide the opportunity to alter parking charges and restrictions if necessary.

Key Performance Indicators

Data gathered from evaluative surveying can be compiled and presented as key performance indicators (KPI's) established at inception of the TDM plan. The KPIs must be compatible with targets for change established in the plan's development phase, and may include:

- number of vehicle trips generated by your university at a given time
- percentage reduction in vehicles parked on campus and surrounding streets
- acceptable take-up rate for carpooling
- increase in the proportion of staff, faculty and students using public transport
- an increase in number of bicycles parked on-site (Environmental Resources Awareness Group and Conservation Council of WA 1999).

For a successful and useful evaluation program, the KPI's must measure appropriate aspects of change, e.g. for a carpooling program, measure the number of cars arriving at your university daily rather than the number of people arriving daily by car (Department for Transport 2002a).

Targets for travel mode change can be drawn from transport targets established in plans at other universities and government programs. The University of British Columbia derived targets from TDM programmes at Canadian and American universities, workplaces, targets established in the Regional District Council's plans for the University and Greater Vancouver Region, from stakeholder input and professional judgement (University of British Columbia Transportation Planning 1999 pg. 7). The UK Department for Transport (2002a) state it is reasonable to expect a 15% reduction in car use within three years, while a minimum of 10% would be acceptable in this time.

Use of Results

Results of the evaluation can be used to promote the success of the plan and secure new infrastructure or financial support. Where benchmarks have not been met, the survey results can be used to justify further action to achieve change (Roads and Traffic Authority n.d.).



Case Studies

This Universities TravelSmart Kit has been developed from a wide range of literature and examples of good practice at universities in Australia and overseas. In addition to the references to universities in each of the three stages of the kit, the following case studies are included for their particular strengths:

University of British Columbia (Vancouver Canada) – involving others in TDM planning

University of New South Wales (Sydney Australia) – overcoming information and transport barriers

University of Western Australia (Perth Australia) – precinct planning

UNIVERSITY OF BRITISH COLUMBIA, VANCOUVER: a case study in involving others in TDM planning

Background

The **University of British Columbia** (UBC) is a 402-hectare campus located on the outer western edge of the metropolitan region of Vancouver. The campus is isolated from the urban area by the Pacific Spirit Park which lies between UBC and Vancouver city (for an aerial photo see page 3 of OCP at www.gvrd.bc.ca/growth/pdfs/ocp-ea-a.pdf).

The University campus is the second largest trip generator in the Vancouver region, only surpassed by the Central Area of Vancouver City. In the late 1990s over 100,000 daily vehicle trips were made to and from the UBC campus. An expected increase in vehicle trips prompted the Greater Vancouver Regional District (GVRD) to address transportation issues at the UBC campus (Mitchell 1999).

The overarching framework for development of the Greater Vancouver region is the *Liveable Region Strategic Plan*. In order to implement this plan within UBC, the *Official Community Plan* was developed by GVRD and adopted in 1997. The *Official Community Plan* requires that UBC “pursue a transportation demand management plan that will include...measures to reduce single occupant vehicle travel from 1996 levels by 20%” (Greater Vancouver Regional District Policy and Planning Department 2003:20).

In response to the *Official Community Plan* UBC began developing the *UBC Strategic Transportation Plan* to guide travel demand initiatives aimed at meeting the target of a 20% single occupant vehicle (SOV) reduction.

Consultation and Participation

The first steps at UBC included benchmarking traffic volumes in 1997 followed by the release to the University community of a 1998 ‘Issues and Options Paper’. In conjunction with the discussion paper release, a survey was emailed to 35,000 staff, faculty and students at the University. The email survey collected information on individual travel patterns and opinions regarding proposed transport initiatives. Input received from the initial process was combined with the results of a literature search to develop a discussion paper on the Issues and Priorities. Options for the proposed Strategic Plan were included and prioritised within the ‘Options and Priorities Discussion Paper’, released to the staff, faculty and students for comment in 1998 (Lovegrove 1998).

Four months after submissions closed on the 'Options and Priorities Discussion Paper', the UBC Transport Advisory Committee released a paper outlining the proposed stages for implementation of the *Strategic Transportation Plan*.

The Discussion Paper advocated a "pyramid of participation/consultation" as part of the critical steps to ensure success, in addition to identifying stakeholder groups and their areas of involvement in planning for transport changes (G-7 Subcommittee of the UBC Transportation Advisory Committee 1998). The STP would be developed in two stages – first a strategic section and then an action section, from which an implementation program would be developed (G-7 Subcommittee of the UBC Transportation Advisory Committee 1998). In November 1999 the *UBC Strategic Transportation Plan* (STP) was released.

Travel Management Success

In the four years since the release of the STP, there have been significant changes in the travel patterns of staff, faculty and students at the University. Most interesting has been the 56% increase in public transport trips, surpassing the GVRD 20% target (University of British Columbia and Trans Link 2002 p. i). This large change is attributed to changing class start times from 8.30 am to 8, 8.30 and 9 am thereby reducing the morning 'peak' (University of British Columbia and Trans Link 2002:2). Annual increases in bus service levels to UBC over the period of 1997 to 2002 also contributed to growth in ridership, with a total service expansion of 30%. The service improvements included routes with 'bikes on buses' and an express service between the University and Skytrain Station (University of British Columbia and Trans Link 2002:2).

Parking charges and supply reductions were also implemented in the four years, however, analysis of travel data indicate this has done little to reduce the proportion of travel by single occupant vehicles. 1,200 parking bays were removed and redeveloped for housing, in addition to daily parking price increases of \$1.50 for some car parking areas (University of British Columbia and Trans Link 2002 pg. 2). Although there has been a decline of 9.2% in SOV travel since 1997 (University of British Columbia and Trans Link 2002:6), this is considerably less than the required 20% as set by the GVRD in the *UBC Official Community Plan*. The overall number of journeys made to and from the campus has also declined, by 7.7% (University of British Columbia and Trans Link 2002 pg. 6), despite a UBC population increase of 7,700 over the same time period (University of British Columbia and Trans Link 2000:4).

Future action proposed to encourage more reduction in SOV travel includes introduction of a U-Pass program, predicted to further increase public transport ridership (University of British Columbia and Trans Link 2002). The *Transportation Report Card* indicates that the primary mechanism to reduce SOV trips is through future parking restriction and pricing increases (University of British Columbia and Trans Link 2002:22). However clear actions are not indicated, and it appears the UBC Parking Department mandate to remain profitable – it functions as an independent financial entity – conflicts with the objectives of reducing car travel to the campus. However, there are many more successes to the program at UBC including bike pools, bike shops, bike paths, multi-modal travel and GO Green Coordinators. Many of the transport initiatives are undertaken by organisations not affiliated with the University including the Jack Bell Foundation. For further detail see the **TREK** web site at www.trek.ubc.ca.

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UNIVERSITY OF NEW SOUTH WALES, SYDNEY: a case study in overcoming information and transport barriers

Background

The University of New South Wales Kensington campus is located some ten kilometres south of Sydney CBD in New South Wales (for a locational map see www.unsw.edu.au/maps/aust.pdf), and experiences peak hour congestion on the surrounding road network with poor pedestrian amenity and dangerous conditions for cyclists.

A transport information system was developed to better identify the transport needs of the University and the barriers inhibiting an effective transportation system. Barriers experienced at the University included overcrowding and long waiting times for travellers at the Central Railway Station interchange and a confusing disarray of ticketing and information for public transport users (Sharp & Lee 1998; Black, Mason & Stanley 1999).

Travel Management Success

Reducing passengers waiting times at the Central Station interchange was achieved using a simple queuing system that ensured passengers alighted buses efficiently and safely. The system's success was evident in reduced waiting times for patrons – from 39% of passengers waiting more than five minutes before implementation of the queuing system, to only 21% with queuing (Black, Mason & Stanley 1999 pg. 7). The queuing system required collaboration between UNSW and Sydney Buses, effecting an improvement in relations from the preceding two decades when UNSW had been ineffectual in achieving improvements for University travellers (Sharp & Lee 1998; Black, Mason & Stanley 1999).

Improving information availability to staff and students was the second hurdle, addressed with UNSW developing a brochure detailing “public transport routes, frequency of services, tickets, restricted parking and the value of walking for health” (Black, Mason & Stanley 1999 pg. 8). The brochure was made available at various locations commonly used by staff and students at the Kensington campus. Information for visitors attending conferences at the University is provided in pre-conference packs containing transport details and hotel ratings according to ease of access to the campus grounds (Black, Mason & Stanley 1999). Ongoing information strategies include the **UNSW transport web site** with a range up bus, bike and pedestrian information.

http://www.isf.uts.edu.au/publications/CM_JB_KS_1999.pdf contains information on UNSW Travel Demand Management.

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UNIVERSITY OF WESTERN AUSTRALIA, PERTH: a case study in precinct planning

Background

The University of Western Australia (UWA) is located adjacent to the Swan River five kilometres from the Perth Central Area (Johnstone 1999). Within one kilometre north of the University is the Queen Elizabeth II Medical Centre (QEII) general and teaching hospital. Development of a precinct access plan for sustainable travel demand management was motivated by an anticipated future growth of 75,000 mainly car trips per day to the total precinct and associated demand for parking (Johnstone 1999:660-661).

Travel Management Success

The Access Plan proposed a number of initiatives for improving existing bus services, and establishing new infrastructure for pedestrian and cyclists in addition to a new ferry service. Management of car travel was to be addressed with strategies focussing on the pricing and availability of car parking. The proposal incorporated actions for marketing and promoting the plan (Johnstone 1999).

Since 1998 UWA has successfully implemented parking permit and fee increases, student car pooling, a policy for end-of-trip facility provision, more bike racks, a Bicycle Users Group and a program to encourage staff to cycle, supported by annual promotional events. Information has been improved through surveys of staff and student travel patterns. Access maps showing public transport and cycle routes are produced and distributed annually (University of Western Australia 2003).

The outcome has been a significant proportional shift in student travel from cars to public transport and walking, decreasing car travel by 19.7%, and increasing public transport by 7.2%, and walking by 12.2% (Johnstone 1999; University of Western Australia 2003). These changes are in line with targets expressed in the *Metropolitan Transport Strategy 1995-2029* for the Perth Metropolitan Area. For an overview of the UWA-QEII Access Plan and proposed transport initiatives go to www.ofm.uwa.edu.au/about/transinits.htm

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