

Position Paper 1:

Voluntary travel behaviour change and its potential implications for climate change mitigation and adaptation.

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1 Introduction

Mounting scientific evidence identifies climate change as a serious global risk that requires immediate response from the global community (Stern 2006; Chapman 2007; IPCC 2007a, 2007b, 2007c; Garnaut 2008; Aitken 2009; Ball 2009). Climate change poses a threat to all fundamental human requirements including water, crop yields, health and the surrounding land and environment (Stern 2006; Ball 2009). The extended effects of climate change and the required actions will change the way individuals, communities and businesses function. The issue needs to be addressed using a combination of mitigation and adaptation measures along with technological advances. Rigorous mitigation of the changing climate.

primary source of the increased atmospheric concentration of carbon dioxide, the most consequential anthropogenic greenhouse gas, since the pre industrial period is the use of fossil fuels (IPCC 2007a). Transport represents 14% of greenhouse gas emissions by source (Stern 2006). Greenhouse gas emissions from the Australian transport sector have been found to be the fastest growing emissions source, having risen by 20.3% from 1990 levels with the potential to rise by 38% (AGO 1998; Taylor & Ampt 2003; Taylor 2007). The motor vehicle is the most widely used form of transport in Australia generating the second largest contribution to greenhouse gas emissions in the transport sector (Pramberg 2004; Chapman 2007). The number of motor vehicles in Australia is increasing at a rate higher than our population, indicating that although technological advances in fuel efficiency reduce per vehicle emissions, these improvements will be offset by increased ownership and use (WBCSD 2001; Pramberg 2004; WBCSD 2004; Chapman 2007; IPCC 2007c).

The 2006 Australian Census reported that approximately 60% of people travel to work as the driver of a car (ABS 2006). This demand on traffic infrastructure during peak periods results in traffic congestion in all major cities. With increasing car ownership and use it is logical to expect that congestion will continue to increase and that the period of congestion will tend to extend over more of the day (Stopher 2004). Urban congestion can double the fuel consumption and potential emissions of vehicles, and by 2020 the average avoidable social costs of congestion for Australian capital cities has been estimated at \$20.4 billion (BTE 2000; BTRE 2007). Previous studies have found that for 40% of

vehicle travel, and the use of education and information to instigate voluntary behaviour change (IPCC 2007c).

Voluntary behaviour change is defined as change that occurs when individuals make choices for personal reward without a top down mechanism, regulation of any sort, or a feeling of external compulsion (Ampt 2004; Ker 2004). This principle can be applied to achieve more sustainable urban transport systems in mitigating and adapting to climate change. Sustainable urban transport systems are defined by their ability to (Minken 1999; May & Taylor 2002; Taylor 2007):

- provide access to goods and services in an information

are the focus on voluntary behaviour change without coercion or enforcement, the concept of exchange in that the individual receives benefits from changing, and that the benefits will accrue to the individual and society, not the marketing body (Ampt 2003, 2004; Stead et al. 2007a; Powell & Thurston 2008).

Australia is a pioneer of VTBC programs, with efforts underway in all of the capital cities (James 1998; Ampt 1999; James et al. 1999; Marinelli & Roth 2002; Taylor & Ampt 2003; Ampt 2004; Pramberg 2004; Stopher 2004; AGO 2005; Tideman et al. 2006; Taylor 2007; Bonsall 2009; Brog et al. 2009; DTEI(SA) 2009). The advent of the National Travel Behaviour Change Program (NTBCP) in 2004 has also impacted the uptake of VTBC measures across the country. Funded by the federal government, the NTBCP is a nationally coordinated effort to address the growth of transport sector greenhouse gas emissions using individual travel behaviour decisions (Pramberg 2004). The target of the NTBCP was to engage 186,663 households nation wide, to deliver a sustained reduction of 3.9 million vehicle kilometres travelled (VKT), equivalent to a reduction of 1.2 million tonnes of carbon dioxide emissions by June 2013 (Pramberg 2004; Stopher 2004).

VTBC schemes in Australia are generally marketed under the banner of TravelSmart. TravelSmart initiatives in Australia typically include community wide household level initiatives, workplace and school travel plans (Ker 2004). TravelSmart programs are undertaken through the application of two general VTBC philosophies, travel blending and individualised marketing.

2.1 Travel Blending

Travel blending, initially developed as part of the Clean Air 2000 program, is an approach based around empowering individuals to reduce car use by focussing on I gar a T

then provided with a customised implementation plan based on their specific needs as determined during the interview.

3 VTBC Impacts

Generally the objectives of VTBC schemes are to reduce the amount of car travel or increase the use of more sustainable modes in order to reduce greenhouse gas emissions, however there are also a set of beneficial subsidiary effects that have been reported from the implementation of VTBC. As VTBC programs expand so too will the benefits. Taylor and Ampt (2003) provide a comprehensive summary of the benefits recorded from VTBC schemes and how they are observed, as summarised below:

Reduction of congestion

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- x
- x

Commonly travel diaries identifying changes in participant travel behaviour are used to provide quantitative feedback on how participants can improve, or reward them for their efforts. Travel diaries

should also represent all segments of the population in order to match the socio demographic profile of the community (Seethaler & Rose 2009). To establish the effect of the VTBC intervention ideally the surveys should obtain estimates of numbers of trips, numbers of activities, total distance travelled by mode, total time spent travelling by mode, and the modes of travel used (Stopher et al. 2004; Stopher et al. 2009). The reliance on individuals and households to accurately report on these factors can decrease the confidence of the evaluation through the introduction of errors. There are two methods to supplement the travel surveys in an attempt to quantitatively verify household travel surveys and reduce self reporting errors: odometer surveys, and GPS surveys.

Odometer surveys record the VKT by household vehicles. While odometer surveys do not indicate changes in behaviour such as mode selection or trip chaining, the method reduces error in trip reporting as missed trips can be inferred from the start/finish odometer readings, and respondents have limited opportunities to falsify information to provide the answer expected by the survey. Stopher and Stopher

behaviour. Travel behaviour has also been found to be seasonal; patterns change according to school holidays and also reflect change of seasons through the year (Stopher et al. 2009).

Temporal patterns and rhythms can also be detected at a smaller scale relating to travel behaviour. Axhausen et al. (2002) conducted a six week continuous travel diary of 139 German households in order to determine the reporting period required to enable detailed observation of the rhythms of daily travel. The survey collected the following data:

- socio demographic characteristics of the household and members
- commitments of participants to regular private, social and civic activities
- details of the vehicles and public transport tickets owned by the household
- six week continuous travel diary with geo coded destinations recorded
- attitude and values survey regarding different transport modes and general values
- the

past have not taken this relationship into account and undertaken intensive evaluation questions with sample sizes that produce insignificant results. The results from these evaluations are in turn inconsequential, and the resources would be better directed to developing

as individualised marketing results are measured against the whole target population, whereas travel blending results are reported with respect to

what the long term or residual effect the TravelSmart program has on the participants, the targeted community and indirectly on the general population.

The occurrence of a residual effect is proposed on the same psychological principles used as a basis for VTBC concept, that is, personal responsibility and an individual's lifestyle framework (Ampt 1999, 2004; Hughes & Di Pietro 2005; Nye & Burgess 2008). Nye and Burgess (2008) concluded that the durability of a particular behaviour was largely determined by how well it fit within the existing lifestyle framework. The personal and environmental gains achieved by changing travel behaviour are typically compatible with the individual's ethics and the concept of personal responsibility in making the ethical choice, providing sufficient motivation for the behaviour change to be sustained (Ampt 1999, 2004).

Seethaler and Rose (2009) addressed the idea of residual VTBC with a study that used a week long odometer panel survey to assess the effect of a one off, large scale community based TravelSmart intervention in Melbourne. The study found that the TravelSmart application did not induce a statistically significant effect on the average daily VKT twelve months after the intervention.

Contrary to these results, the bulk of evidence documented in voluntary behaviour change literature supports a residual effect in community and individual travel behaviour beyond the period of evaluation for the projects. In Australian applications there has been documented evidence for sustained behaviour change beyond a 2.5 year evaluation period (John 2001; Marinelli & Roth 2002). Marinelli and Roth (2002) discussed evidence from German VTBC applications where behaviour change was sustained beyond a 4 year period. Taylor and Ampt (2003) found that behaviour change is sustained and may intensify over the short to medium term. However, due to combination of the limited duration of evaluations over the long term and

6.1 Widespread Application of VTBC

Section 4.2.2 discusses the variability of travel behaviour with respect to time, geography, service and infrastructure availability, and individual characteristics. With this in mind, the application of TravelSmart to entire cities may be infeasible given the resources required and the likely 'hit and miss' nature of reaching the people most likely to take up the program. A targeted approach to the application of TravelSmart is recommended. This involves selecting areas where there are the least external barriers to people reducing private car use. This could be achieved by developing a screening process to determine geographic areas with a set of characteristics that may result in TravelSmart having a greater impact, for example, good public transport infrastructure, local conveniences, demographics, topographically suitable for walking or cycling, and distance to business centres. This could be achieved using a multi criteria analysis approach employing a GIS based application.

The diversity of the Australian community also requires VTBC interventions to consider how to include as many demographics as possible. Language and cultural barriers may isolate individuals that would otherwise participate in the scheme. Woodruff et al. (2005) undertook a study of TravelSmart tools to engage culturally and linguistically diverse ~~include the~~

- provide simple, motivating tools and techniques addressing the most significant barriers to behavioural change
- develop partnerships with key stakeholders
- independently evaluate results with statistical confidence
- be effective and efficient on a broad scale.

The application involved a combination of community development and individualised marketing approaches. 191 community groups were engaged in the project, helping to influence community opinions and offer support to individuals. 22,103 household were engaged at an individual level. Prior to the commencement of the project, a community perceptions survey on private car

A multiple wave approach was used for both evaluation methods, with the first wave conducted prior to the initiation of the project, and the final wave undertaken after the conclusion of the project in order to establish the behaviour changes at regular intervals. A panel survey approach was used with panels of participants and non participants (control group). The rolling wave panel survey approach was selected based on the perceived benefits including:

- average daily VKT could be calculated accounting for daily variations such as weather conditions, therefore allowing trends to be identified
- variation was minimised by using the same households in each survey wave
- if circumstances prevented a household participating in a single wave, the average daily VKT could be inferred from the data provided in the previous and subsequent waves
- changes in the household that may explain changes in household VKT were tracked over the length of the evaluation.

The following statistically robust findings were taken from the TravelSmart Households in the West evaluation (DTEI(SA) 2009; Stopher et al. 2009):

selected	VKT	control	trends
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6.3 Extending the VTBC Concept

The principles of voluntary behaviour change have been successfully applied to travel, as such it is useful to consider where similar principles have been employed in other disciplines and whether VTBC can be diversified to instigate general sustainable behaviour choices.

As discussed in Section 2, the practice of social marketing originally served as a public health intervention. Marketing campaigns were developed to improve awareness and accessibility to prompt voluntary behaviour change towards products and services such as contraceptives, hand soap and immunisation (Cairns

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flexible enough to take into account the local differences between each application. A coordinated approach provides the means to achieve a goal that would be near impossible to undertake as a single entity.

A possible model framework for this coordinated effort can be adapted from the Transport Management Associations (TMAs) operating in the United States, Canada and Europe. The first TMAs were established in the United States in the early 1980s and served to establish a public private coordinated body to implement transportation management strategies addressing traffic congestion, mobility and transport related environmental problems in specific geographic areas (Luten 2006). TMAs represent areas with common transport related characteristics, and are not formed according to political boundaries. TMAs vary with the composition of stakeholders, and

Evaluation methods

- gaps still exist in understanding the full impacts resulting from VTBC. Methods and case studies fully evaluating impacts of VTBC require development to build a more persuasive argument on the extent and breadth of impacts related to VTBC, and their value to society
- evaluation should also be further applied to determine instrument effectiveness in order to improve the VTBC toolkit
- long term monitoring is required to determine the presence and extent of a residual effect to VTBC, and the possible maintenance requirements of VTBC interventions to maintain effectiveness over time
- GPS surveys have proven to be useful in evaluation (Section 4.2.1), however they rely on supporting travel surveys to define the travel activities undertaken, or inferences based on the characteristics of the data such as speed, route, stop frequency and location. In order to develop GPS as a complete, independent evaluation method the reliability of the inferences made to describe mode and other trip characteristics need to be assessed.

Application of VTBC principles to

7 References

Abrahamse, W, Steg, L, Vlek, C & Rothengatter, T 2005, 'A review of intervention studies aimed at household energy conservation', *Journal of Environmental Psychology*, vol. 25, pp. 273 291.

ABS 2006, *Method of Travel to Work (full classification list) by Sex Australia*, viewed 11/02/2010, www.censusdata.abs.gov.au

AGO 1998, *The National Greenhouse Strategy: Strategic framework for advancing Australia's greenhouse response*, Australian Greenhouse Office, Commonwealth of Australia Canberra, Canberra.

AGO 2005, *Evaluation of Australian TravelSmart projects in the ACT, South Australia, Queensland, Victoria, and Western Australia 2001 2005*, Australian Greenhouse Office, Commonwealth of Australia, Canberra, Canberra.

Aitken, C 2009, 'Changing climate and changing behaviour: Perceptions of powerlessness and the commons dilemma', Master of Environmental Studies, School of Geography, Environment and Earth Sciences, Victoria University of Wellington.

Ampt, E 1999, *From travel blending to living neighbourhoods...A vision for the future*, Papers of the 23rd Australasian Transport Research Forum www.patrec.org/atrf.aspx, Perth, Western Australia.

Ampt, E 2001, 'The evaluation of travel behaviour change methods a significant challenge', *Transport Engineering in Australia*, vol. 7, no. 1/2, pp. 35 39.

Ampt, E 2003, *Understanding voluntary travel behaviour change*, Papers of the 26th Australasian Transport Research Forum www.patrec.org/atrf.aspx, Wellington, New Zealand.

Ampt, E 2004, 'Understanding voluntary travel behaviour change', *Transport Engineering in Australia*, vol. 9, no. 2, pp. 53 66.

Ampt, E & Richardson, A 1994, *The Validity of Self Completion Surveys for Collecting Travel Behaviour Data*, PTRC European Transport Forum, Warwick.

Ampt, E & Rooney, A 1998, *Reducing the impacts of the car a sustainable approach: TravelSmart Adelaide*, Papers of the 22nd Australasian Transport Research Forum www.patrec.org/atrf.aspx, Sydney, Australia.

Andreasen, A 1994, 'Social marketing: its definition and

Baudains, C, Styles, I & Dingle, P

Hughes, I & Di Pietro, G 2005, *Developing a school travel planning guide*, Papers of the 28th Australasian Transport Research Forum www.patrec.org/atrf.aspx, Sydney, Australia.

Ife, J

Marinelli, P & Roth, M 2002, *TravelSmart suburbs Brisbane a successful pilot study of a voluntary travel behaviour change technique*, Papers of the 25th Australasian Transport Research Forum www.patrec.org/atrf.aspx, Canberra, Australia.

May, T & Taylor, MAP 2002, *KonSULT – developing an international knowledgebase on urban transport policy instruments.*, Papers of the 25th Australasian Transport Research Forum www.patrec.org/atrf.aspx, Canberra, Australia.

McKenzie Mohr, D 2000a, 'Fostering sustainable behaviour through community based social marketing', *American Psychologist*, vol. 55, no. 5, pp. 531 537.

McKenzie Mohr, D 2000b, 'Promoting sustainable behaviour: An introduction to community based social marketing', *Journal of Social Issues*, vol. 56, no. 3, pp. 543 554.

McKenzie Mohr, D 2010, *Fostering sustainable behaviour:*

White, A, P, D, †, Q F E@DÀ7

Rose, G & Ampt, E 2001, 'Travel blending: an Australian travel awareness initiative', *Transportation Research Part D*, vol. 6, pp. 95 110.

Seethaler, R 2005, *Evaluating Community Based TravelSmart in Melbourne*, Institute of Transport Engineers Conference, Melbourne, Australia.

Seethaler, R & Rose, G 2003, *Application of psychological principles to promote travel behaviour change*, Papers of the 26th Australasian Transport Research Forum www.patrec.org/atrf.aspx, Wellington, New Zealand.

Seethaler, R & Rose, G 2004, 'Application of psychological principles to promote travel behaviour change', *Transport Engineering in Australia*, vol. 9, no. 2, pp. 67 84.

Seethaler, R & Rose, G 2005, *Using the six principles of persuasion to promote travel behaviour change preliminary findings of two TravelSmart field experiments*, Papers of the 28th Australasian Transport Research Forum www.patrec.org/atrf.aspx, Sydney, Australia.

Seethaler, R & Rose, G 2009, 'Using odometer readings to assess VKT changes associated with a voluntary behaviour change program', *Transport Policy*, vol. 16, no. 6, November 2009, pp.

Stopher, P & Swann, N 2007, *A 6 Wave odometer panel for the evaluation of voluntary travel behaviour change programs*, Papers of the 30th Australasian Transport Research Forum www.patrec.org/atrf.aspx, Melbourne, Australia.

Stopher, P, Wilmot, C, Stecher, C