



Behavioural responses to peak oil and carbon pricing: Save 70 cents a litre by driving less

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Abstract

TravelSmart is well established as a travel demand management tool that is complementary to investments in infrastructure for walking, cycling and public transport. The challenges of peak oil and carbon pricing have provided a new emphasis on behavioural measures as a tool to tackle the income distribution effect of Emissions Trading and to garner community acceptance of such structural adjustment.

Building on the success of the TravelSmart program, the Premier's Action Statement on Climate Change has initiated a demonstration of a behaviour change intervention for household consumption of energy, water, waste and travel. The Living Smart program has engaged 15,000 households resulting in 73% of these showing positive interest in making behaviour changes. Households have reported immediate and substantial energy efficiency actions. These changes are being monitored through gas, electric and water meter readings of both intervention and control groups. Travel changes are being tracked through random sample diary surveys.

This paper presents the key performance indicators of the Living Smart program and reports on progress towards carbon abatement at a government cost of less than \$20 per tonne.

1 Policy Context

There is now strong international opinion supporting individual behaviour change as a key response to climate change and an essential complementary measure to an Emissions Trading Scheme.

The Stern Review recognises that one of the three main policy responses to climate change involves removing barriers. This includes "...informing, educating and persuading individuals about what they can do to respond to climate change Dangerous climate change cannot be avoided solely through international agreements; it will take behavioural change by individuals and communities, particularly in relation to their housing, transport and food consumption decisions".

The Green Paper on the Carbon Pollution Reduction Scheme identifies a Government commitment to "provide additional support through the introduction of energy efficiency measures and consumer information to help households take practical action to reduce energy use and save on energy bills so that all can make a contribution" (Australian Government 2008 - Summary page 25).

The Garnaut Review Draft Report also acknowledges Western Australia as a leader in community education by including a case study on the success of TravelSmart (page 449).

The current price inelasticity of demand for petrol is, at least in part, a result of an information failure whereby consumers are either unable to properly compare the change in the relative cost between modes, or are unaware of the available alternatives for any given

trip. This price inelasticity suggests that the extra 5 cents per litre that will be added to petrol as a consequence of a \$20 per tonne cost of carbon will do little to reduce the carbon footprint of transport. By contrast, credible projections for the consequences of peak oil suggest that petrol could be priced at up to \$8 per litre within ten years (CSIRO 2008). Under this peak oil scenario the costs of private car transport are likely to force low income and location disadvantaged households to make major changes in household expenditure patterns, including their use of petrol. The need for information and education on the alternatives to car travel are likely to be a social and political imperative in an \$8 per litre economy.

2 Potential for behaviour change

The collective actions of individual consumers in Australia drive consumption of energy in the home (including the use of cars), which account for 14 tonnes of CO₂-e emissions per household per annum. The upstream effects (on the farm, embodied in manufacture and in freight transport) of the consumption of goods add another 16 tonnes per household. Household consumption accounts for around 25 per cent of national greenhouse emissions (SMEC 2008).

In-depth interviewing of 820 residents in Perth, Western Australia, reveals that accessible and time competitive alternatives exist for around half of all car trips currently made (Socialdata Australia 2000). Of this 'potential for change' a lack of information and awareness (eg. 'which bus?') prevents residents from taking up these available alternatives for 17 per cent of trips. Figure 1 illustrates that misperceptions (eg. 'the bus is really slow') prevent another 7 per cent of trips from being changed. This information failure theoretically prevents 24 per cent of all trips from being switched from the car. When the TravelSmart intervention is applied community-wide, these theoretical potentials for change translate into a rapid reduction of around six per cent in car-as-driver trips as a proportion of all trips (a relative reduction of around ten per cent of car trips).

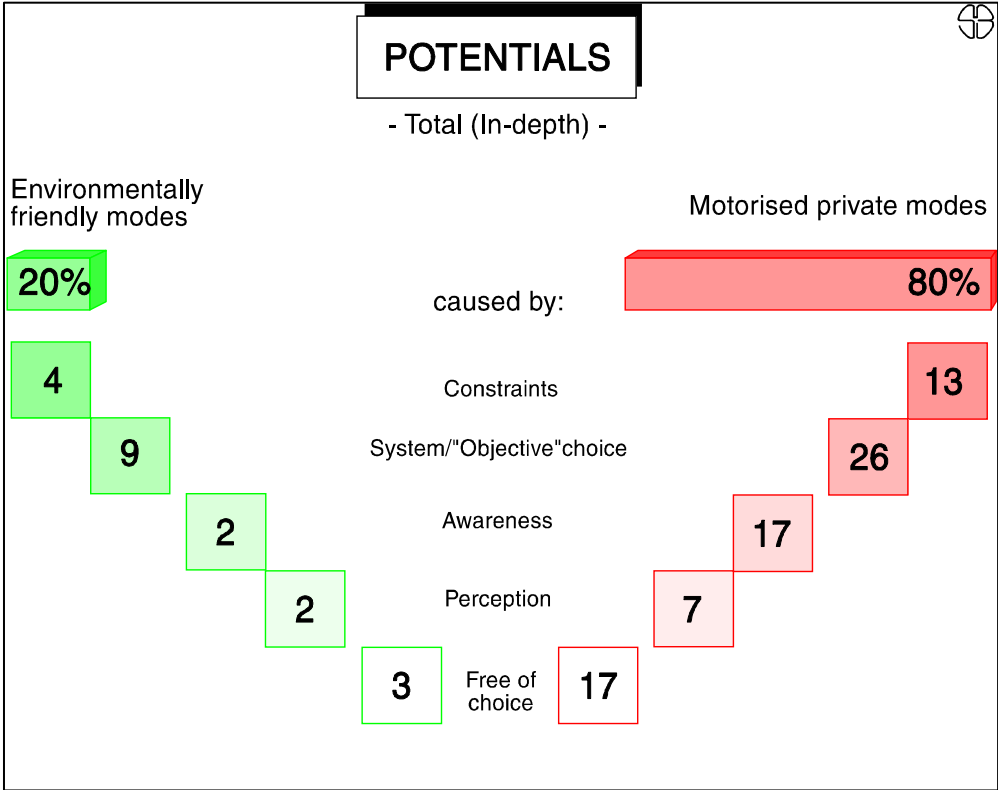


Figure 1: Potentials for change in mode choice

Attitudinal research is often designed to seek the reasons why an individual carries out (or not) particular behaviours. The in-depth approach seeks to discover the individual level of knowledge about, and perceptions of, behaviours. The powerful discovery from this research is that a lack of knowledge or experience in trialing a behaviour is a fundamental barrier to behaviour change. This barrier can often be obscured when survey respondents construct polite reasons for behaviour patterns, conveying them as a choice when they are really a habitual response.

The in-depth approach reveals this knowledge gap only when the survey respondent's trip-making is checked against other travel modes, thereby measuring the difference between what an individual perceives as the alternative modes of transport available and what is actually available (eg. was a bus service or other option available for each car trip?).

Similar research has been conducted to scope the barriers and opportunities to improving energy efficiency in the home. While hard measures of 'potential for change' have yet to be developed it is clear (Figure 2) that simple energy efficiency behaviours (eg switching to compact fluorescent globes, appropriate heating/ cooling settings etc) are not practiced by the vast majority of households (Socialdata Australia 2008).

What do you currently do (on Climate Change)?			
Q7a-d			
Energy:		Water:	
Switch off lights	25%	Grey-water/ collect it	16%
Turn off standby	19%	Short Showers	15%
Use CF globes	17%	Waterwise Garden	12%
Solar hot water	10%	Water saving appliances	13%
Green Power	2%	Rain water tanks	2%
Waste:		Transport:	
Recycling	52%	Walk	29%
Composting	9%	Trip chain/ car pool	26%
Choose less packaging	9%	Public Transport	11%
No plastic bags	3%	Cycle	6%

Figure 2 - current environmental behaviours of households

This formative research (completed with 100 households in Mandurah and Canning) has explored perceptions of environmental issues and the barriers to taking individual action on climate change.

A technical report has been completed, measuring the potential savings in greenhouse gas and household bills for typical households taking specific behavioural and technology based actions (SMEC 2008).

The spread of daily electricity consumption between similar sized households can range from five kilowatt hours per day to more than 50 kwh. It is likely that information failure plays a large part in the decisions of households consuming large amounts of energy. The Perth research shows that the majority of households have understood the contribution of their

energy use to climate change and are open to advice on how to become more efficient. We may be at a 'tipping point', where the application of proven behaviour change techniques is likely to be well received and, if applied on a large scale, provide a significant greenhouse gas emissions reduction.

These potentials for voluntary behaviour change represent in the order of 5% of national emissions that are simply wasted by households because they are unclear on the lower cost and lower emission alternatives available to them.

The TravelSmart and Living Smart programs provide an opportunity for the government to quickly achieve a two to three per cent greenhouse gas abatement by informing, motivating and supporting households to reduce their consumption of energy and water, minimise their waste and adopt environmentally friendly travel choices that reduce vehicle emissions.

3 Program (intervention) design

TravelSmart is an example of a successful government program that, by working with individuals at a household level, helps the local community to correct information failure. It also supports cross-sectoral leadership by helping the business community, institutions (such as universities and hospitals), schools and local governments reduce the car dependence of their staff and customers by overcoming infrastructure and information barriers.

By working directly with individuals at a household level and with stakeholders that can influence travel behaviour in the community, TravelSmart contributes to the establishment of new social norms and a more robust community that is better able to use the travel alternatives to the car. The social and political value of assisting the community to access alternatives to the car is relevant to the emerging market forces associated with the decline from peak oil and the necessary policy responses (carbon pricing) being developed to tackle climate change.

TravelSmart establishes a dialogue with households in the suburbs in which it is delivered. Depending on the response to an initial contact, households are taken through a process that informs and motivates them to replace car trips with walking, cycling and public transport trips. The participation rate (ie. ordering information materials or services) generally varies between 40 per cent and 60 per cent of the population contacted (the 'target' households).

The process is delivered over a two month period and works by:

- addressing information barriers by localising and simplifying information to make it relevant to people's needs;
- providing motivation through dialogue and personalised communication; and
- assisting with system experience particularly for new users of public transport.

TravelSmart empowers people by providing advice and encouragement relevant to their unique situation and then leaves the choices up to them. It does not tell people to get rid of their car or to reduce their mobility. It encourages people to consider the travel choices available to them, and to try an alternative to the car for one or two trips a week.

The dialogue technique has been extended in the Perth WaterSmart program to include an ongoing communication with households, constructed around providing feedback on water meter readings. In some projects this 'interactive' phase has been provided to households for a 12-month period.

The Living Smart demonstration project commenced in Perth in early 2008. The project design involves dialogue with households over a 12-month period, with meter reading services and home consultations being deployed as required. The interaction with households will take place over three separate motivation and information delivery phases.

Two communications packages are being tested in the demonstration project to compare household engagement in a one 'topic' at a time method (i.e. energy, water, travel or waste) with engagement in a progressive 'package' of actions across all topics. The 'package' design introduces simple behavioural and low cost technologies first, moving on over the course of the program to offer advice on more difficult behaviours and home improvement investments.

The program aims to reduce household greenhouse gas emissions by a minimum of 15,000 tonnes per annum. It is anticipated that these greenhouse gas abatement targets will be met by the adoption of behaviour changes and technology installation by just some of the 15,000 target households.

Formative research has been deployed to identify approximately 50 potential actions as being achievable steps to improve energy, water, waste and travel efficiency in and around homes. These actions have been captured in concise 'How to' guides which address the barriers to and benefits of each behaviour change.

Josh Byrne (popular gardening personality) and Tanya Ha (author of Greeniology and the Eco Coach on SBS Eco House) have been recruited as Living Smart Ambassadors. Both provided valuable input to the development of the Living Smart information resources.

A website has been established to provide broad access to the Living Smart information and to host a personal carbon calculator, together with links to Act Now, 10,000 steps and the community course version of Living Smart. All information guides can be downloaded from www.dpi.wa.gov.au/livingsmart.

The Living Smart service offers the following components available over a 12 month period:

- Household contact (by letter and telephone);
- Household segmentation (by 'topic' of interest or 'level' of current behaviours);
- Information selection by the households (from a 'Service sheet');
- Information delivery to the household;
- Follow up call to seek agreement to 'Home Assessments';
- Collection of meter reading data (monthly on six occasions);
- Booking of 'Home Visits' (including an 'Install' of light globes, 'Consultation' with the household or 'Star Rating' of the whole home);
- Telephone coaching and feedback on meter readings;
- Offers of involvement in community workshops and online challenges;
- Offer of additional information (next 'topic' or next 'level');
- Delivery of additional information;
- Further telephone coaching;
- Offer of additional information (final 'topic' or top 'level');
- Delivery of additional information; and
- Final feedback on reductions achieved.

All of this information, service and evaluation activity is being delivered within a budget of less than \$200 per target household.

4 Evaluation frameworks

The primary measure of the impact of TravelSmart is a change in mobility and mode choice as captured by random sample travel diaries. The sample frame is usually identical to the target group of households to be offered the TravelSmart intervention including an appropriate mix of households with and without access to a publicly listed telephone number. As a consequence of the random sampling, the survey respondents include a representative proportion of households that declined to take part in TravelSmart as well as participants in the program. The evaluation design allows the program impact to be reported for the entire target population (rather than just participants). Corroborative data, primarily in the form of bus boardings, is collected from the public transport provider (Transperth) through its electronic ticketing system pre and post implementation.

An intensive survey process is utilised to secure response rates of around 70%. A mix of cross sectional and panel sample techniques have been deployed, and 'speed of response' analysis has been utilised to compare results to those reported by surveys conducted at a lower intensity (Brog and Ker 2008). Care should be taken when making policy interpretations of the results of apparently similar TravelSmart programs from different jurisdictions. It is not uncommon for evaluations to utilise self selected respondents (one consequence of low response rates) or to survey only active participants in the program. The participant based sample will report relative changes in vehicle kilometers traveled approximately two times that reported for a similar success with a target population based sample. Both measures are valid, just not directly comparable.

The Living Smart program is targeting a range of consumption changes. The evaluation arrangements include:

- Analysis of meter reading data from participating households;
- Collection of amalgamated data (on a suburb basis) for gas, electricity and water consumption;
- Collection of waste and recycling tonnage by local area;
- Collection of travel diary data from a sample of target households and a control group; and
- Collation of household responses to the service.

Control groups are tracked (by diary surveys and meter readings) for both TravelSmart and Living Smart evaluations.

In evaluating the conduct of both TravelSmart and Living Smart interventions, it is useful to make note of the process indicators as well as the outcome measures. The level of interest in changing travel behaviours is generally between 40 and 50% with an additional 10 to 20% of the population already choosing alternative modes on a regular basis. The level of interest in changing water, energy, travel or waste behaviours is above 70% for the Living Smart program. Further process evaluation measures include the number of information requests and the responses to the program reported by participants.

5 Program delivery

Following from a successful large-scale TravelSmart demonstration project in the City of South Perth in 2000, the TravelSmart methodology (dialogue marketing) has been widely used to address the demand for travel in developed cities around the world, including Europe, England and North America. Projects have been delivered to more than two million people, and several specialist dialogue marketing contractors have emerged. Elsewhere in Australia, projects have been delivered in Queensland, South Australia, Victoria and the ACT (AGO 2006).

In 2006 and 2007 the TravelSmart Household program in Perth was co-funded by the Australian Government under the Greenhouse Gas Abatement Program. The target population was 218,500 persons in 98,430 households across several geographical areas of Perth. The process evaluation reveals that 93% of the target population were successfully contacted and 49% of these were interested in changing modes from the car to an alternative. The spread of interest was as low as 38% in the inner city (partly reflective of a high proportion of regular users of alternative modes) and as high as 68% in the City of Rockingham (a likely flow on effect from the then impending opening of the new rail line).

To date, TravelSmart projects have been completed across a range of inner, middle and outer suburbs in Perth with a total of 418,500 target participants. These intervention suburbs stretch from Clarkson in the north, to Rockingham in the south and include a range of urban typologies and socio-demographics.

The success of the WA TravelSmart Household program has led to its expansion beyond transport to incorporate other consumer behaviours through a Living Smart demonstration program scheduled to be delivered to 15,000 households during 2008. The Living Smart program is part of the Premier's Action Statement on Climate Change (Government of Western Australia 2007) in Western Australia.

Launch events for Living Smart were hosted by the WA Premier in Joondalup and by the Minister for the Environment; Climate Change in Mandurah. Launch coverage was featured on Channel 10 News and in the West Australian, Sunday Times and community papers.

Telephone contact with households commenced on 17 March 2008 with 1,000 households in Edgewater, and by mail with 250 household not on the telephone list. A similar pattern of contact has been delivered on a weekly basis to Woodvale, Padbury, Hillarys and to all suburbs in the City of Mandurah.

Full contact phase data shows that 96 per cent of the telephone target households (11,568 were successfully engaged). Seventy-three per cent (9,287) of the telephone target households expressed a positive interest in taking action on climate change and were subsequently sent a menu of information and services. To date 6,490 individualised information packs have been delivered to Joondalup and Mandurah households and more orders will be fulfilled in the coming months.

The initial quota has been achieved to recruit 4,000 households into an agreement to receive regular meter readings. An additional capacity to read meters for 3,000 homes has been reserved for households choosing to start with the travel or waste topics (where meter readings are not relevant).

The initial quota of 600 Home Visits has been filled and it is apparent that substantial demand for this service exists. A total of 3,600 Home Visits are available for the duration of the program in Mandurah and Joondalup.

The first Great Gardens Workshop was held in Joondalup on 12 May 2008 and was fully subscribed by 140 residents from the Living Smart project and the wider Joondalup community. The Workshop covered gardening for sustainability, and included advice on garden designs to minimise mechanical heating and cooling of the home.

A Living Smart community course ran in Joondalup for seven weeks from 21 May 2008, covering in depth advice on household sustainability and broad personal and community sustainability actions. This course was oversubscribed by 40 Living Smart participants and a second course has been planned. A similar course will commence in Mandurah in August and is oversubscribed.

The personalised Home Assessment phase of the project has commenced, with more than 600 households subscribing to this service immediately. The program will continue to offer information, home assessments and feedback to households until 30 June 2009. The cost of the service is less than \$200 per household and the outcomes are tracking well against the projected Greenhouse Gas abatement of 15,000 tonnes in the first year.

6 Results

The TravelSmart Household Program in Perth has been delivered to a target population of 418,500 residents over 26 local areas (groups of suburbs) over the last seven years. A common dataset exists for eight of these projects (representing 143,000 residents), including travel data for 6,000 households, 14,000 persons and 48,000 trips.

The combined dataset (of projects conducted between 2000 and 2003) shows the WA TravelSmart program has achieved on average a 10 per cent reduction in car trips and 13 per cent reduction in car kilometers across the suburbs in which it has been delivered. This is an average of 72 less car trips per person per year, with reductions in car trips transferred to more walking, bicycle and public transport trips. Table 1 illustrates that changes from car trips to alternatives are combined with changes of destination (trip distance) and trip chaining (a reduction in the total number of trips for the same level of activities).

A weighted average of 5 projects (across 11 groups of suburbs) conducted in 2006 and 2007 shows an outcome of an 11% reduction in car driver trips and an 11% reduction in vehicle kilometers. The proportionate change in trips and kilometers varies from 9% and 5% respectively (illustrating mode shift for shorter trips) to 12% and 16% respectively (illustrating changes to longer trips and/or destination changes for car trips).

Individual project results have ranged from a 4 per cent to a 14 per cent reduction in car trips and a 7 to 17 per cent reduction in car kilometres. TravelSmart results show that it is most effective in suburbs where there are good quality public transport, walking and cycling facilities and many local destinations (ie. mixed land uses).

Tracking of travel behaviours in South Perth (the first large scale demonstration project) have confirmed that the vast majority of the reduction in car use has been sustained for more than four years. Similar tracking of public transport ticketing data has shown no loss of the patronage increases achieved in Cambridge (the second large scale project in Perth) over a period of more than four years (see Figure 3). The system wide trend in bus ticket sales relative to service kilometres in Perth for the same period (2001 to 2005) showed no change in 2001 and 2002 (0.7 ticket sales per service kilometre), but an increase of 9% by 2005 (0.76 sales per km). Relative to this control, the long term increase in ticket sales in Cambridge is approximately 13% (there being no increase in service kilometres over this period).

Results from WaterSmart projects also validate the individual marketing methodology, with hard meter reading data showing reductions of 7 to 12 per cent in water consumption (adjusted for control groups) in four demonstration projects.

Table 1: Changes in main mode by trip distance

Total		Trips per person per year	Trip distance									
			Up to 1 km		1.1 to 3.0 km		3.1 to 5.0 km		5.1 to 10.0 km		10.1 km +	
without IM	with IM		without IM	with IM	without IM	with IM	without IM	with IM	without IM	with IM	without IM	with IM
131	165	Walking	91	117	35	42	4	5	1	1	-	1
23	35	Bicycle	6	7	8	14	4	6	3	5	2	3
4	4	Motorbike	0	0	0	1	1	1	2	1	1	1
706	637	Car as driver	72	63	153	140	127	112	169	153	185	169
273	276	Car as passenger	34	29	65	67	55	57	67	65	53	58
59	68	Public transport	3	2	7	10	11	14	15	20	23	22
1196	1185	Total	205	218	268	274	202	195	257	244	264	254
213	268	EFM^{*)}	100	126	50	66	19	25	19	26	25	26

^{*)} walking, bicycle, public transport (Environment Friendly Modes)

IM = Individualised Marketing (TravelSmart)

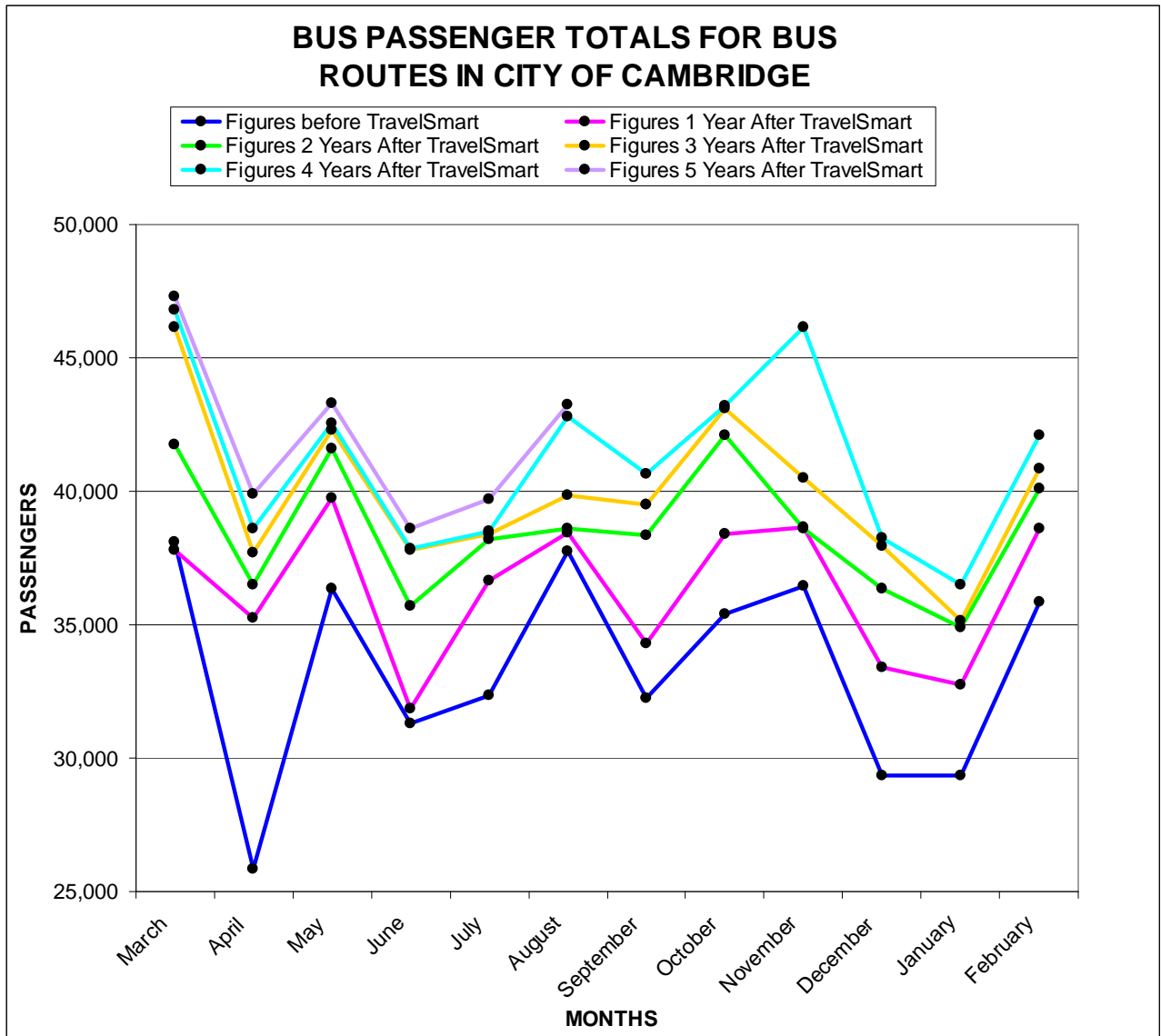


Figure 3 - Durability of bus patronage after TravelSmart Cambridge

The Living Smart Program was launched by the WA Premier in March 2008. Initial contact has been completed with 15,000 households in Joondalup and Mandurah. The key process indicators for Living Smart are:

- 96% successful contact rate with households on the telephone;
- 73% of households contacted by phone interested in Acting on Climate Change;
- 6,490 households (43%) ordered tailored information on specific actions to improve water and energy efficiency (including actions on transport and waste);
- The first round of meter readings (a household commitment to review and reduce consumption on a regular basis) was fully subscribed by 4,000 households; and
- During the initial feedback phase, households reported immediate actions such as switching off standby power, changing to efficient lighting and the installation of waterwise products.

The roll out of information and services for Joondalup and Mandurah households will continue until June 2009. Initial indicators of gas, electric and water savings are expected to emerge in September 2008. Full evaluation data will start to be processed from March 2009 onwards.

Resident responses to the Living Smart service has begun to be captured by the 'Eco Coach' staff as they conduct telephone follow-ups. Typical responses are very action oriented and include:

- "The material is really, really good and gave some great ideas! We started a compost set up as a result."
- "My showers are now less than 4 minutes."
- "My wife sent me out to buy 2 water saving showerheads. Now she wants me to dig up the lawn!"
- "The information is great. I want to install photo-voltaic cells and would love a home visit from one of your experts."
- "My family love it. We are using the stuff already, stickers going to school, timer in bathroom, and the bag for shopping."
- "We are building a new house and thanks to your information we will be putting in PV power and a smart meter."
- "Really good stuff! I've read it all now and am trying to get my husband to read it. We are already doing most of the things, but it reactivated us with good ideas to add on the rest."

Anecdotal feedback from attendees of Living Smart workshops include households reporting that they have taken immediate action to change costly halogen down lights to more efficient alternatives, signed up to GreenPower and sorted the information into piles labelled as 'do this week', 'do this month', 'plan to do later in the year'.

7 Policy outcomes

Many of the benefits of the TravelSmart program result from the reduction in car kilometres. Community benefits (based upon the combined results of eight projects reported to date) are projected, for the full program of 418,000 residents, to be an annual reduction of 30 million car trips, 290 million car kilometres and abating 88,000 tonnes of greenhouse gases. Other community benefits include increased public transport fare revenues, reduced local pollution, increased physical activity (from more walking and cycling), improved social well-being (people on the streets) and increased security (eyes on the street).

The large changes in travel behaviour (reduced car use and increases in cycling, walking and public transport) have proven to be durable for more than four years, yet provide financial and socio-economic returns sufficient to justify the program on the basis of travel behaviour changes sustained for as little as two years.

The individualised design of Living Smart, as demonstrated by TravelSmart and WaterSmart, aims to achieve significant behaviour change through the targeted deployment of information and services to households.

Initial reports from Living Smart households indicate that significant behavioural changes are already being achieved early in the intervention. The project is tracking well against performance indicators and is projected to reach the 15,000 tonne greenhouse gas abatement target for 2009 and to reduce electricity loads by 22.5 Megawatt hours per day.

There is potential for strong positive policy outcomes from combining the delivery of TravelSmart and WaterSmart and achieving similar results for energy and waste. The

potential policy outcomes from a Living Smart program for 100,000 households is set out in Table 2, together with the individual changes that drive the collective policy outcome. It is interesting to note that modest individual changes, such as changing light globes and standby power settings, do add up to major community savings when delivered at sufficient scale.

Table 2: Policy outcomes from a 10% change in household behaviour

Policy area	Individual (person)	Collective (100,000 households)
Physical Activity	2.5 mins per day (increase)	3% of population move to activity levels 'sufficient' to maintain health
Water demand	55 litres per day (decrease)	5 Gigalitres per annum (10% of a desalination plant)
Energy demand	1 kwh per day (decrease)	91,000 Megawatt hours per annum (equivalent to a 100Mwh coal-fired power station operating for 5 weeks)
Greenhouse Gas	1.6 kg per day (decrease)	150,000 tonnes per annum
Household costs (petrol)	36 cents per day (saving)	\$33 million per annum
Household costs (energy)	15 cents per day (saving)	\$13 million per annum
Oil vulnerability	0.25 litres of petrol per day (decrease)	9 million litres per annum (120,000 barrels of oil)

The savings per person per day represent the lower end of an individual households benefit from participation in Living Smart because they are calculated on the average saving including households who choose not to participate. For example a participating household may save 20% on petrol and achieve an annual saving of 480 litres and \$720. A 20% reduction in petrol consumption is the equivalent to 30 cents per litre reduction in the mid 2008 petrol price. A very transport efficient household will be saving the equivalent in kilometres of more than 70 cents per litre compared to neighbours with average car use.

Similarly, the increase of just 2.5 minutes per day of physical activity translates into a 3% point increase in the target population who are sufficiently active. Such an increase represents more than half of the Physical Activity Task Force target (Government of Western Australia 2001) and would realise more than \$20 million per annum in health care costs if provided to the whole population of Western Australia.

A policy measure of the cost effectiveness of behavioural programs is that the cost per kilolitre of water saved is around 25 cents (over a ten year life of the project) as compared to \$2.00 to produce a kilolitre of desalinated water.

8 Discussion

TravelSmart has been highly successful in Perth because the urban form is characterised by low-density suburban living that is highly car dependent (as measured by 80 per cent of personal trips being made by car as driver or passenger and only 20 per cent by walking, bicycle or public transport). This high level of car dependence leads to a strong habitual response to car use and a low level of awareness of realistic alternatives for many trips. The public transport system, and opportunities for walking and cycling, are better than they are perceived by that the vast majority of the population.

The reductions in carbon intensity of passenger transport that are achieved by TravelSmart (6 mode share points reduction in car driver trips) is similar to the disparity between transit

orientated development and poorly serviced suburban developments in Perth (Marangaroo has 8 mode share points more car use than Fremantle) (Ashton-Graham et al 2005). The difference is that TravelSmart can demonstrate the mode share reduction but urban development may not be able to service Marangaroo to the level provided by Fremantle at least in the short to medium term and at an affordable cost. TravelSmart changes are immediate and are a fraction of the cost of land use and public transport improvements.

For every 28,000 people the TravelSmart program is delivered to, the State invests \$1 million. When the full range of community benefits are taken into account (including car operating costs, traffic congestion and road maintenance, pollution and health benefits), it returns more than \$30 (over 10 years) for every \$1 invested (Ker I 2002).

From a greenhouse gas abatement perspective the TravelSmart Household program in Perth delivers a reduction of 750 kilometers per target person per annum. This approximates to 225 kg of CO₂-e (full fuel cycle) of abatement per target person. Each \$1 million project investment (with 28,000 target persons) delivers 6,300,000 kg of greenhouse gas abatement per annum. The first year cost being \$159 per tonne of abatement. Calculating on the evidence of 80 per cent durability of behaviour changes over five years, and no behavioural maintenance costs, the abatement cost falls to \$40 per tonne over five years. The 10-year cost (not yet tested by ongoing evaluations) is projected to be around \$20 to \$30 per tonne. Factoring in the fuel cost savings to the community or the public transport fare revenue take for the government and public transport provider would produce a negligible community cost per tonne of abatement.

Similarly, in Perth and most probably across the developed world, we have adopted a dependence on energy intensive appliances for our home comfort and entertainment. The environment (cooling breezes and warming sunshine) is much more comfortable than our perception of it from inside our homes.

The inclusion of energy, water, waste and travel in a behavioural package (Living Smart) increases the costs of the intervention by 100 per cent, but it also increases the abatement potential by around 300 per cent. The projected abatement costs for Living Smart are less than \$20 per tonne over a 10-year evaluation of the benefits (based upon a service cost of \$200 per household and an abatement of 1,500 kg per annum accumulating, with some behavioural decay, to 10,000 kg over 10 years). If a two tonne per household per annum reduction is achieved, and the mix of technologies and behaviours results in a minimal decay in abatement, a cost to government of \$10 per tonne is achievable.

Taking a whole of community view of the energy and water efficiency that is delivered by Living Smart we find that the savings to households exceed the cost to the Government of program delivery. The first year cost to the community is a net negative (ie. a saving) of around \$200 per tonne of greenhouse gas abatement. This saving rises in a five or ten year evaluation because the cost savings continue to flow but the program delivery is a first year only cost.

There are multiple other socio-economic benefits to Living Smart including: health outcomes (from physical activity); equitable access; reduced household financial stress; reduced congestion; reduced demand for peak load electricity; reduced stress on water supplies; improved air quality and efficient public transport loadings.

Research demonstrates that knowledge and experience (which in turn can be triggered by motivation) are far more powerful than attitude. Dialogue based marketing approaches work because they overcome simple information barriers to unlock some of the large potential for behaviour change. Currently dialogue based marketing is delivering around a 10% reduction in key elements of household resource consumption. Further investment and innovation is

required to move closer to the 50% reduction that is theoretically possible if all household inefficiencies could be corrected.

Dialogue marketing techniques are deliverable by State and Local Governments, at reasonable cost (around \$200 per household) to communities upwards of 10,000 households. The realistic reach, constrained by making reasonable efforts to contact households, is around 80 per cent of urban and regional centre populations. A full roll out of Living Smart to 50 per cent of the 7.6 million households in Australia could be achieved in operational terms for a cost of around \$760 million. With the benefits of a large-scale program 'normalising' the behaviour change, household reductions of two tonnes per annum are readily achievable. Such a national effort could achieve a seven million tonne per annum CO₂-e reduction (one per cent of national emissions). Increasing the investment (on a per household basis) to improve both reach and impact, could extend the abatement to 2.5 per cent of national emissions.

The TravelSmart and Living Smart programs are a legitimate and cost effective part of the solution to climate change. Engaging the community at a household level in taking personal action with respect to climate change provides the opportunity to quickly achieve up to 2.5 per cent of Australia's greenhouse gas abatement at reasonable cost (of less than \$20 per tonne).

At a more pragmatic level the household savings that are delivered by Living Smart may represent an important contribution to community acceptance of an Emissions Trading Scheme.

9 References

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