

Review of Progress Achievements of the Greenhouse Gas Abatement Programme National Travel Behaviour Change Project

Public Release Report

Department of the Environment, Water, Heritage and the Arts

28 November 2008

Review of Progress Achievements of the Greenhouse Gas Abatement Programme National Travel Behaviour Change Project

Prepared for

Department of the Environment, Water, Heritage and the Arts

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Acronyms and Abbreviations

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
BAU	Business As Usual
CO ₂	Carbon Dioxide
CO ₂ -e	Carbon Dioxide Equivalent
DEWHA	Department of the Environment, Water, Heritage and the Arts
GGAP	Greenhouse Gas Abatement Program
GHG	Greenhouse Gas
GPS	Global Positioning System
HH	Household
NGS	National Greenhouse Strategy
NTBCP	National Travel Behaviour Change Project
QLD	Queensland
SA	South Australia
TDM	Travel Demand Management
VIC	Victoria
VKT	Vehicle Kilometres Travelled

Executive Summary

The National Travel Behaviour Change Project (NTBCP), funded partly under the Greenhouse Gas Abatement Programme (GGAP), is a coordinated bid between the Australian Government, the Australian Capital Territory, and the States of Queensland, South Australia, and Victoria (jurisdictions) to reduce Greenhouse Gas (GHG) emissions nationwide. The project, using the TravelSmart branding, aims to reduce the impacts of passenger car use by facilitating a voluntary change in behaviour towards more sustainable and less energy intensive transport modes (e.g. walking, cycling, public transport, smarter car use, and travel substitution).

The Department of the Environment, Water, Heritage and the Arts (DEWHA) commissioned Maunsell AECOM to analyse the data from the NTBCP in the respective jurisdictions and derive consistent and standardised GHG abatement results. The objective of this study was to produce results that can be represented collectively to evaluate the overall success of the NTBCP in achieving the national GHG abatement goals. A total of 38 TravelSmart projects were funded (across Australian Capital Territory, Queensland, South Australia and Victoria), representing a total of 212,290 target households.

The application of the methodology to calculate GHG abatement (as specified in the Deed) involves the calculation of Vehicle Kilometres Travelled (VKT) undertaken by the target households in each jurisdiction for each year in the analysis (from 2000 to 2020). This gives consideration to the average annual distance travelled by each household (in each jurisdiction) as well as other national and state greenhouse strategy measures that can impact on reducing VKT. The estimated reduction in GHG emissions from each project is calculated as the product of the estimated reduction in VKT (based on the percentage reduction in VKT achieved from each project) and a GHG emissions factor for each year in the analysis. The GHG emissions factors used in the analysis were kept consistent with those presented in the Deed, which take into account changes in the vehicle fleet composition and fuel efficiency and emissions profiles resulting from the implementation of advanced vehicle technologies over time.

The application of the agreed abatement methodology is subject to a number of assumptions, which has led to issues such as (but not limited to):

- Inconsistencies in the years for which some of the input data has been sourced;
- Inconsistencies relating to emissions factors adopted across jurisdictions;
- No decay in the impact of project results into the future being assumed; and
- No growth in VKT per household (due to increased income, etc) into the future being assumed.

Whilst it was found that some of the assumptions were limited, it was beyond the scope of the study to update all assumptions based on current knowledge and recalculate the results. Despite this, a number of sensitivity tests were undertaken to assess the impact of varying some of the key assumptions. The estimated reductions in VKT and GHG emissions should therefore be viewed in the light of limited assumptions and should only be used to provide general guidance.

Figure 1 shows the estimated reduction in VKT and associated GHG abatement over the project implementation period (2003-07) and the Kyoto reporting period (2008-12). During the project implementation period, a total reduction of around 1,900 million km was estimated to be achieved (with an associated abatement of 614,000 tonnes CO_{2-e}), whereas during the Kyoto reporting period, a total reduction of around 3,800 million km is estimated to be achieved (with an associated abatement of 1,204,000 tonnes CO_{2-e}).

Figure 1: Reduction in VKT and associated GHG Abatement. Actual measures are recorded for the project implementation period (2003-07), estimated measures are indicated for the Kyoto reporting period (2008-12).

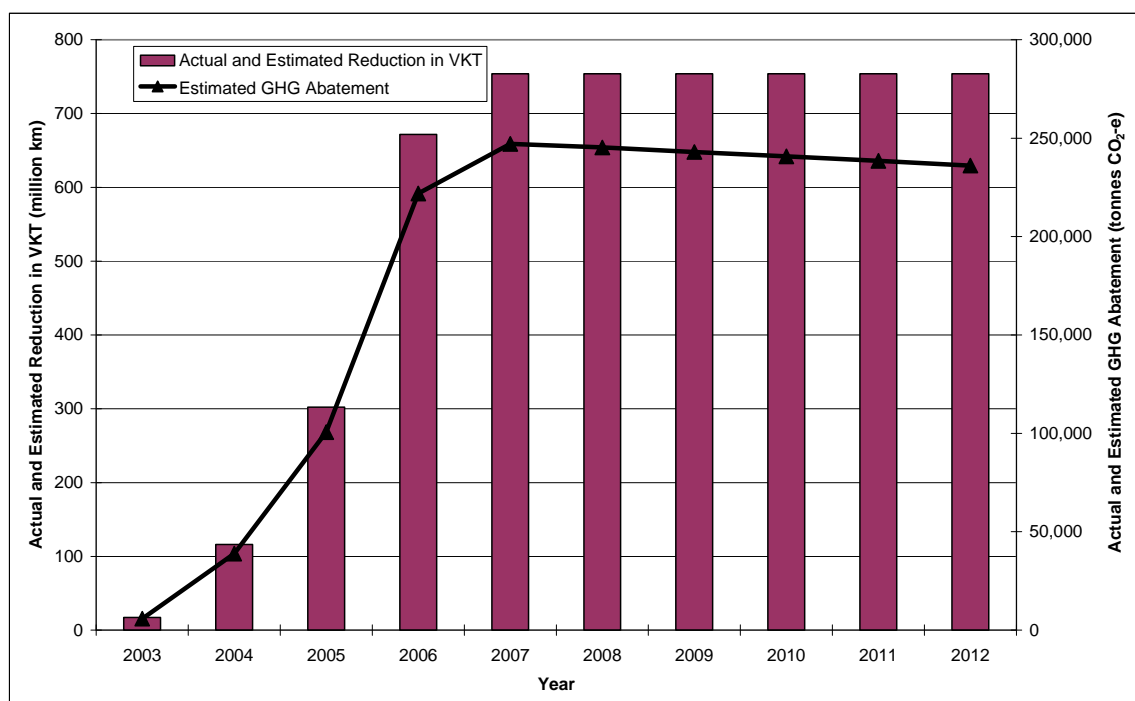


Table 1 provides a summary of key outcome measures for the project implementation period (2003-07) and the Kyoto reporting period (2008-12). For the Kyoto reporting period, the percentage (%) of the project GHG abatement goal estimated to be achieved is also provided, in addition to information relating to cost performance goals.

Table 1: Key Outcome Measures from the NTBCP (2003-07 and 2008-12)

Outcome	Results
Project Implementation Period (2003-07)	
Weighted average reduction in VKT (%) – all projects	11.8%
Estimated reduction in VKT (million km)	1,861
Estimated GHG abatement (tonnes CO _{2-e})	614,375
Kyoto Reporting Period (2008-12)	
Estimated reduction in VKT (million km)	3,770
Estimated GHG abatement (tonnes CO _{2-e})	1,203,554
GHG abatement goal (tonnes CO _{2-e})	1,232,600
% GHG abatement goal estimated to be achieved	98%
Total cost/tonne CO _{2-e} (goal)	\$17.35
Total cost/tonne CO _{2-e} (estimated to be achieved)	\$17.77
GGAP cost/tonne CO _{2-e} (goal)	\$5.26
GGAP cost/tonne CO _{2-e} (estimated to be achieved)	\$5.39

At the national level, the NTBCP is estimated to deliver an abatement of around 1.20 million tonnes CO_{2-e} over the Kyoto reporting period (2008-12), corresponding to 98 percent of the GHG abatement goal (1.23 million tonnes CO_{2-e}). For the purposes of this study, no decay in project results was assumed to occur, due to a lack of evidence to suggest otherwise. However, for illustrative purposes only, a sensitivity test was undertaken using a decay rate of 2 percent per year. Under this scenario, the percentage of the GHG abatement goal estimated to be achieved at the national level would be reduced from 98 percent to 89 percent.

The Deed also specifies GHG abatement cost performance goals. Overall, the estimated cost per tonne of CO_{2-e} achieved is approximately \$0.42 higher than the initial goal (of \$17.35). With respect to

GGAP funding, the additional cost per tonne of CO_{2-e} estimated to be achieved is approximately \$0.13 higher than the initial goal (of \$5.26). This additional cost reflects the fact that the overall estimated GHG abatement was not fully met. However, it is expected that the future implementation of TravelSmart projects will become more cost effective as their evaluation component costs are reduced.

Long-term monitoring of the impacts of the NTBCP will be undertaken until the end of 2012, using GPS technology on a small number of households in each of the jurisdictions. This monitoring will assist DEWHA and the participating jurisdictions to ascertain whether the reductions in VKT (and associated GHG abatement) are maintained over time, and if not, what level of decay in results is apparent. These findings can then be used to more accurately estimate reductions in VKT (and associated GHG abatement) from the implementation of the NTBCP.

Local transport in general is a State issue. While the Commonwealth can provide funding and assist in project co-ordination and information sharing, TravelSmart is a local behaviour change issue and States will continue to work on TravelSmart projects as they have in the past, irrespective of the completion of the NTBC project.

Maunsell AECOM recommends that the abbreviated methodology and analytical tool developed be used by DEWHA and the jurisdictions in future evaluations of the NTBCP. This will allow DEWHA to produce results that can be represented collectively to evaluate the overall success of the NTBCP in achieving the national GHG abatement goals.

1.0 Introduction

Australia's Federal, State, and local governments have agreed on the desirability of acting decisively to reduce Greenhouse Gas (GHG) emissions and contribute to the avoidance or lessening of climate change impacts. As a result, all levels of Government in Australia are currently developing appropriate policies, programs, and initiatives to address climate change and reduce GHG emissions. The Australian Government implemented the Greenhouse Gas Abatement Programme (GGAP) to reduce Australia's net GHG emissions by providing funding for activities that are likely to result in substantial emission reductions or for activities to offset GHG emissions, particularly in the first commitment period under the Kyoto Protocol (2008-12). GGAP supports activities that result in cost-effective, large-scale and quantifiable abatement that would not likely occur without GGAP funding. According to the most recent emissions projections, GGAP is estimated to deliver an abatement of 3.8 million tonnes (Mt) of carbon dioxide (CO₂) equivalent (CO_{2-e})¹ per annum by 2010. GGAP leverages private sector investment in activities or technologies through projects in a wide range of areas, including energy efficiency, Travel Demand Management (TDM), alternative fuels, power generation, and mining.

The National Travel Behaviour Change Project (NTBCP), funded partly under GGAP, is a coordinated bid between the Australian Government, the Australian Capital Territory, and the States of Queensland, South Australia, and Victoria to reduce GHG emissions nationwide. The project, using the TravelSmart branding, aims to reduce the impacts of passenger car use through a variety of measures to facilitate a voluntary change in behaviour towards more sustainable and less energy intensive modes of transport (e.g. walking, cycling, public transport, smarter car use, and travel substitution). Additional objectives of the GGAP Project include:

- Achieving set GHG emissions reduction goals in 2008-2012 by facilitating travel behaviour change in households, schools, workplaces, and communities;
- Demonstrating voluntary travel behaviour change methodologies on a large scale in the respective jurisdictions, with special emphasis on demonstrating their contribution to sustainability policy goals, reduction of transport's GHG impact, improving the viability of public transport systems, and public health policy goals through increase in the use of active transport modes such as cycling and walking;
- Promoting synergies between jurisdictions, stakeholders, and the community; and
- Improving cross-jurisdictional cooperation and coordination to maximise project benefits.

The NTBCP activities focus primarily on metropolitan regions and regional centres, with particular emphasis given to workplaces, communities and households, schools, and major destinations such as hospitals and shopping centres. The NTBCP is estimated to deliver an abatement of 1.23 million tonnes of carbon dioxide equivalent (CO_{2-e}) over the Kyoto reporting period (2008-12). Through the jurisdictions' participation in the NTBC, there are three components involved:

1. Jurisdiction Plan – description of the activities and their respective methodologies to be undertaken by the NTBC Grantees to deliver travel behaviour change that will promote GHG abatement during the 2008-2012 target period.
2. Long Term Monitoring Methodology – cost-effective and statistically valid model for long term monitoring of travel behaviour change projects and associated abatement needs. The Grantees will apply this methodology in the NTBC Project Jurisdictions until 31 December 2012 and the results, together with GHG abatement estimates, will be reported to the Commonwealth.
3. Abatement Methodology – method for calculating abatement resulting from activities undertaken by the NTBC Grantees in accordance with their respective Jurisdiction Plans.

¹ DEWHA uses CO_{2-e} as the basis for determining the warming effect of a GHG as compared to CO₂ and is calculated by multiplying the mass of a GHG by its global warming potential (GWP). GWP is defined as the relative warming effect of a unit mass of a GHG when compared with the same mass of CO₂ over a specific period.

The NTBCP has reached practical completion, with final reports for each jurisdiction already being submitted. The projects have been successful at implementing the jurisdiction plans and delivering travel behaviour change programs in the respective jurisdictions; the projects have also implemented long term monitoring plans. However, issues have arisen in applying the GHG abatement methodology (as outlined in the Deed of Agreement [Deed]) to estimate the results of the activities undertaken by the respective jurisdictions. The requirements of the final project reports have highlighted this issue, with each jurisdiction submitting abatement estimates using variations of the methodology.

The key objective of this study is to assist DEWHA in deriving consistent GHG abatement results so they can be represented collectively. This will assist in evaluating the overall success of the NTBCP in achieving the GHG abatement goal set at the national level. The approach adopted was agreed to by each of the jurisdictions through the facilitation of a full-day workshop.

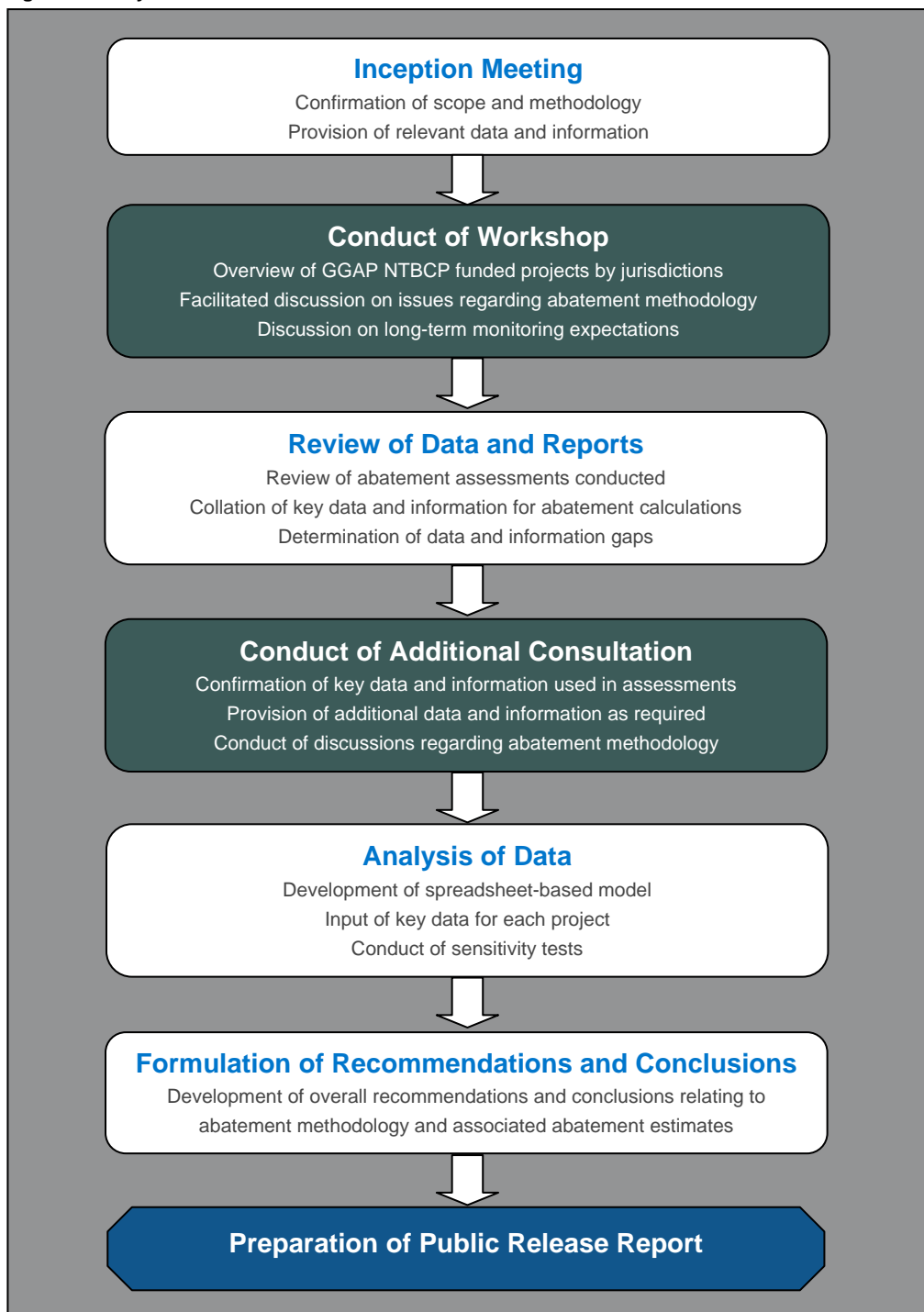
This report is structured as follows:

- **Section 2** describes the process undertaken to deliver the study;
- **Section 3** provides an overview of the current abatement methodology;
- **Section 4** presents the key findings of the data analysis undertaken; and
- **Section 5** provides overall recommendations and conclusions relating to the study.

2.0 Study Process

Figure 2 shows the process that was undertaken to deliver the study. A full-day workshop was first held with the participating jurisdictions in order to discuss experiences with using the current abatement methodology. A review of data and reports from each jurisdiction was then undertaken, followed by additional consultation with each of the jurisdictions to confirm and/or request data and information for abatement calculation purposes. The data was then analysed with a number of recommendations and conclusions being made. This report represents the final step in the study process which is the preparation and submission of the public release report.

Figure 2: Study Process



3.0 Abatement Methodology

The methodology used to calculate GHG abatement from TravelSmart programs, as presented in the Deed, is presented below:

Step 1. Define Program Elements - workplaces, communities, schools, etc

Step 2. Calculate Business as Usual (BAU) Vehicle Kilometres Travelled (VKT) and Emissions for the base year

Determine the number of people and households to be targeted by program element.

Estimate the current VKT by the target population, based on average distance per car, and average cars per households = BAU VKT.

Estimate the current Emissions by the target population, by applying a GHG emissions factor for transport (kg CO_{2-e} /vehicle km) = BAU Emissions.

Step 3. Calculate 'BAU + Measures' VKT from the base year to 2020

Determine Impact of State/Federal initiatives on vehicle kilometres over time.

The average vehicle km per car per year is expected to change over time due to National Greenhouse Strategy measures (NGS) and State/Territory Greenhouse Strategy measures.

Apply the VKT reduction path to the BAU VKT from the base year to 2020.

Step 4. Calculate Changes to the Average Transport Emissions Factor for passenger cars from the base year to 2020

Determine Impact of State/Federal initiatives on emissions over time.

The emissions factor (kg CO_{2-e} per km VKT) is expected to change over time due to:

- Change in the makeup of the vehicle fleet;
- Change in vehicle fuel efficiency and exhaust technology; and
- Change in fuel emissions makeup.

A base value for an Average Transport Emission Factor of CO_{2-e} (full fuel cycle) per annum has been sourced from Appelbaum which takes into account technological improvement.

A reduction path of the average emissions factor over time, based on NGS measures is estimated based on the expected impacts of the State/Territory Greenhouse Strategies over time.

The Average Transport Emission Factor of CO₂ equivalents (full fuel cycle) is the base value X the reduction path per annum.

Step 5. Calculate 'BAU + Measures' Emissions from the base year to 2020

Apply the average transport emission factor per annum from Step 4 to the 'BAU + measures' VKT from Step 3.

Step 6. Calculate 'BAU + Measures + Project' VKT from the base year to 2020

Based on existing Travel Behaviour Change projects in Australia, an average of 14% reduction in VKT is most likely. An assumption has been made that this % is applicable to all program elements.

Apply the % reduction to the 'BAU + Measures' VKT determined in Step 3.

Step 7. Calculate 'BAU + Measures + Project' Emissions as a result of the Travel Behaviour Change Program

Apply the average transport emission factor per annum from Step 3 to the 'BAU + Measures + Project' VKT from Step 6.

Step 8. Calculate the 'Project' VKT reduction from the base year to 2020

For each year, from the base year to 2020 take the 'BAU + Measures' VKT from Step 3, from the 'BAU + Measures + Project' VKT from Step 6.

Step 9. Calculate the 'Project' Emissions Abatement from the base year to 2020

For each year, from the base year to 2020 take the 'BAU + Measures' emissions from Step 5, from the 'BAU + Measures + Project' emissions from Step 7.

In reference to Step 3, no figure for the VKT reduction path is provided in the Deed. A VKT reduction path of 10 percent (over a 15-year period from the year 2000 to 2015) was initially contemplated by DEWHA but was not incorporated, to take into account the impact of other (non-NTBCP based) national and state greenhouse strategy initiatives. For this reason, this report outlines the results of an illustrative sensitivity test of using a VKT reduction path of 10 percent (see Section 4.3 for further details).

In reference to Step 4, no figure for the reduction path for the average emissions factor is provided in the Deed (for which the base year corresponds to 2000). However, the Deed does provide emissions factors for the years 2008 to 2012 as presented in Table 2, which were initially sourced from Apelbaum Consulting Group (1997). The emissions factors for Victoria are slightly higher than those for the other jurisdictions, yet no reason for this could be sourced at the time of preparing this report.

Table 2: Emissions Factors (kg CO_{2-e} / VKT)

Year	VIC	ACT / QLD / SA
2008	0.327	0.325
2009	0.324	0.322
2010	0.321	0.319
2011	0.318	0.316
2012	0.314	0.313

Source: Deed

Table 3 shows other input data that is provided in the Deed, along with expected abatement estimates for each jurisdiction. It should be noted that there are inconsistencies in the years for which some of the input data has been sourced. For example, the average number of persons per household is sourced from the 1996 ABS Census, whereas the average number of vehicles per household is sourced from a 2001 estimate. It is also noted that whilst 2006 Census data is now available, the Deed continues to utilise data from previous Census years.

Table 3: Input Data and Expected Abatement Results over the Kyoto Reporting Period (2008-12)

	VIC	ACT	QLD	SA	Total
Input Data					
Average persons per household in the urban area (1996 ABS Census)	2.69	2.7	2.62	2.47	
Average vehicles per household in the urban area (2001 estimate)	1.65	1.53	1.76	1.40	
Average Vehicle Kilometres Travelled per car per annum (Appelbaum)	16,380	19,700	18,800	15,500	
Minimum number of target households	54,735	10,997	97,345	22,101	185,178
Expected Abatement Results over the Kyoto Reporting Period (2008-12)					
Estimated reduction in VKT (million km)	1,035.0	232.1	2,254.7	336.0	3,857.7
Abatement estimate (tonnes CO _{2-e})	332,194	74,016	719,289	107,101	1,232,600

Source: Deed

The information contained in Table 3 shows that across all jurisdictions, the total minimum number of target households is 185,178, with a total estimated reduction in VKT of approximately 3.86 billion km and associated abatement of 1.23 million tonnes CO_{2-e} (from 2008-12).

The presentation of the abatement methodology in the Deed can be subject to misinterpretation due to the large number of steps involved. To address this, the methodology was summarised more simply as follows:

Step 1. Calculate Business As Usual (BAU) VKT for each project for the base year

BAU VKT = Target households x Average vehicles per household* x average VKT per car per year*

* Values provided in the Deed

Step 2. Calculate 'BAU+Measures' VKT for each project for the base year to 2020

'BAU+Measures' VKT = BAU VKT x (1 – VKT reduction % path*) for each year

* 10% reduction in VKT due to other national/state greenhouse strategy measures (initially contemplated, but not included in initial abatement estimates – incorporated as a sensitivity test only)

Step 3. Calculate 'BAU+Measures+Project' VKT for each project for the base year to 2020

'BAU+Measures+Project' VKT = 'BAU+Measures' VKT x (1 – VKT reduction % from project*) for each year

* Overall % reduction in VKT from the TravelSmart project

Step 4. Calculate the 'Project' VKT reduction for each project from the base year to 2020

'Project' VKT reduction = 'BAU+Measures' VKT – 'BAU+Measures+Project' VKT for each year

Step 5. Calculate the 'Project' Emissions Abatement for each project from the base year to 2020

'Project' Emissions Abatement = 'Project' VKT reduction x Emissions Factor* for each year

* Values provided by DEWHA – incorporated due to greater fuel efficiency and other technological advancements in the vehicle fleet.

At this stage, it is useful to provide a clear definition of a “target household”, since this term is used continuously throughout this report. A definition is provided as follows:

“A target household is one which was invited (and thereby contacted) to participate in the TravelSmart program, regardless of whether they actually participated in the program or not”.

In a workplace or school setting, the following rules are applied (as specified in the Deed) to determine the equivalent number of target households:

- 1 employee = 1 household; and
- 750 students = 500 households (or 1 student = 0.67 households).

A TravelSmart Workplaces program will generally target all employees at a particular worksite (or several worksites) whereas a TravelSmart Schools program may in some instances only target students only from particular year levels (i.e. grade 3-6).

4.0 Data Analysis and Results

This section of the report summarises the analysis of data and presentation of results, and presents a discussion of the data inputs and assumptions; summary of results; sensitivity testing; and long-term monitoring issues.

4.1 Data inputs and Assumptions

A number of inputs and assumptions were required in order to conduct a meaningful analysis of GHG abatement for the NTBCP. Where appropriate, these inputs and assumptions were agreed upon with DEWHA.

A total of 38 TravelSmart projects were funded under NTBCP, representing a total of 212,290 target households. For each of these projects, information relating to the number of target households, year of implementation, and estimated percentage reduction in VKT was sourced from each of the jurisdictions. Table 4 provides key information on the projects undertaken by each jurisdiction.

Table 4: Summary of Projects Funded under the NTBCP

	VIC	ACT	QLD	SA	Total
Years of implementation	2003-05	2006-07	2003-07	2005-06	2003-07
Number of projects	3	1	33	1	38
Total number of target households	75,553	10,978	104,286	22,103	212,290
Average weighted % reduction in VKT – all projects	5.9%	12.7%	14.6%	18.0%	11.8%

The GHG emissions factors used in the analysis were kept consistent with that presented in the Deed (see Table 2 of Section 3.0 of this report), which take into account changes in the makeup of the vehicle fleet, fuel efficiency, and fuel emissions profiles, among other factors. However, it was also necessary to derive emissions factors for the years prior to 2008 and beyond 2012 to ensure the analysis would consider the full period between 2000 and 2020. Table 5 shows the emissions factors that were adopted. As agreed with DEWHA, these were simply based on a linear extrapolation of emissions factors prior to 2008 and beyond 2012. It is noted that the presence of larger vehicles in the fleet has somewhat offset improvements to GHG emissions – the emissions factors adopted should therefore be viewed in this light.

As stated in Section 3.0 of this report, no VKT reduction path was incorporated into the abatement estimates provided in the Deed (to take into account the impact of other national and State greenhouse strategy initiatives). For this reason, the analysis also excluded a VKT reduction path. However, a sensitivity test was undertaken (see Section 4.3) **for illustrative purposes only** to assess the outcome of a VKT reduction path of 10 percent over a 15-year period (from the year 2000 to 2015).

Table 5: Emissions Factors (kg CO_{2-e}/VKT) Adopted

Year	GHG Emissions Factor (kg CO _{2-e} /VKT)	
	VIC	ACT/QLD/SA
2000	0.348	0.344
2001	0.345	0.342
2002	0.343	0.339
2003	0.340	0.337
2004	0.337	0.335
2005	0.335	0.332
2006	0.332	0.330
2007	0.330	0.327
2008	0.327	0.325
2009	0.324	0.322
2010	0.321	0.319
2011	0.318	0.316
2012	0.314	0.313
2013	0.311	0.311
2014	0.309	0.308
2015	0.306	0.306
2016	0.304	0.303
2017	0.301	0.301
2018	0.298	0.299
2019	0.296	0.296
2020	0.293	0.294

A number of other issues were also highlighted at the workshop, which are not taken into account by the abatement methodology specified in the Deed. These include:

- Decay in the impact of project results being expected to occur over time – since there is limited evidence to suggest this occurs (and also limited evidence to suggest decay in results does not occur), the effect of a decay of 2 percent per year has been assessed **for illustrative purposes only** as a sensitivity test (see Section 4.3);
- BAU VKT is assumed to not grow over time (e.g. growth in VKT per household due to increased income, etc) – BAU VKT may in fact grow over time, so this is recognised as a limitation of the analysis undertaken;
- It is assumed that all vehicles in a household travel the same average yearly distance – this is recognised as a limitation of the analysis undertaken;
- Different survey techniques (i.e. GPS, odometer, travel diary) can give different evaluation results for the same project – this finding would be difficult to take into account without undertaking detailed research on this topic and will therefore not be dealt with by the analysis; and
- Timeframes over which evaluations were conducted can impact on results – this is acknowledged but will not be incorporated into the abatement methodology.

Another potential issue relates to the same abatement methodology being applied across all types of TravelSmart projects (Communities, Workplaces, Destinations, and Schools). For example, the BAU VKT associated with a TravelSmart Workplaces project should technically be based only on VKT associated with trips to, from and for work, and not based on all trips (as is currently the case). Since the VKT reduction estimates are not limited to trips associated with work, the impacts of the Workplaces project are likely to be overestimated. Whilst this issue is considered to be outside the scope of this study, it is highlighted as a potential area for future improvement.

In addition, it should be recognised that evaluation methods for non-Communities projects (while outside the scope of this study) can be subject to response bias since workplace and school travel surveys tend to receive responses from a disproportionate number of participants (i.e. those with a interest in the survey that may have changed their travel behaviour).

4.2 Summary of Results

The analysis that was undertaken using the inputs and assumptions outlined in Section 4.1 resulted in two main outcome measures for each jurisdiction, as follows:

- Estimated reduction in VKT (generally expressed in million km); and
- Estimated GHG abatement (generally expressed in thousand tonnes CO_{2-e}).

Figure 3 shows that the estimated reduction in VKT from the NTBCP increases between 2003 and 2007 as projects were being implemented. Beyond 2007, when all projects had been implemented, an overall reduction in VKT of around 750 million km per year is estimated to be achieved.

Figure 4 shows a similar pattern for GHG abatement over time, which is expected given the direct correlation between GHG emissions and fuel consumed per distance travelled. Over time, estimated GHG abatement decreases (due to changes in the vehicle fleet composition and fuel efficiency and emissions profiles), which is reflected by the emissions factors provided in Table 5. Overall, GHG abatement estimated to be achieved is around 250,000 tonnes CO_{2-e} in the year 2007, which then declines to around 220,000 tonnes CO_{2-e} by the year 2020.

Figure 3: Estimated Reduction in VKT from NTBCP

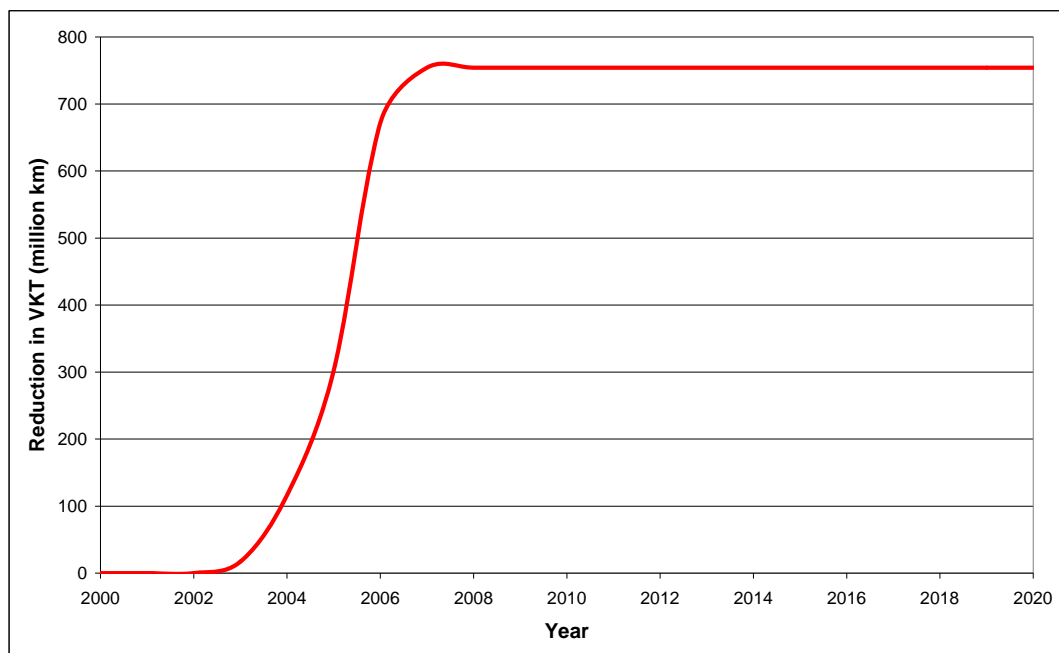


Figure 4: Estimated GHG Abatement from NTBCP

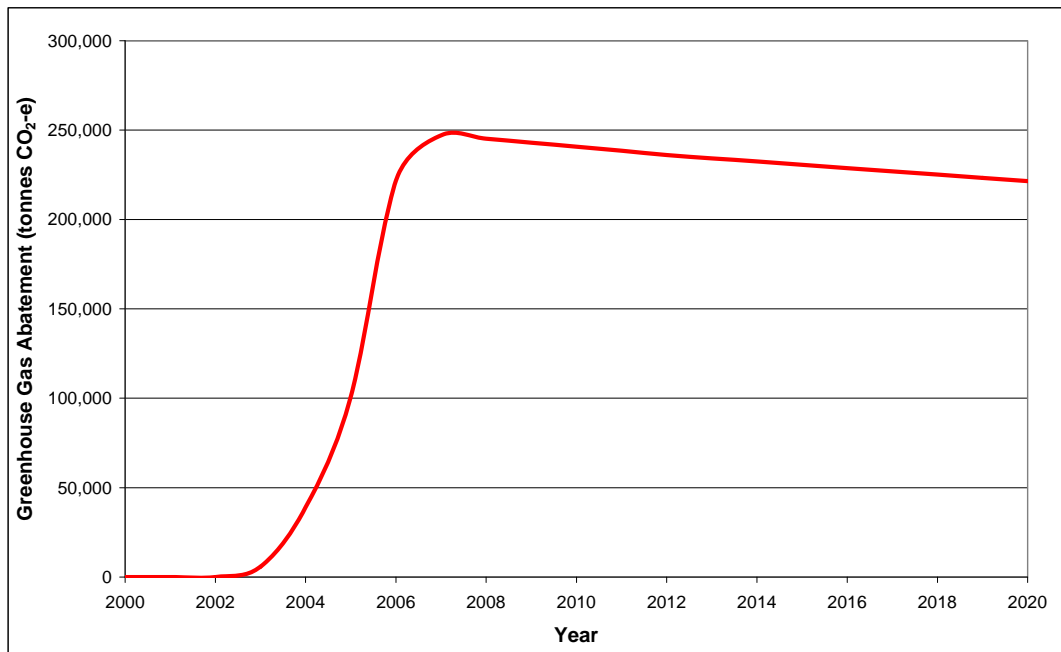


Figure 5 shows estimated VKT trend results from the NTBCP over time. The Business as Usual (BAU) VKT and Adjusted VKT are the same since no VKT reduction path has been incorporated into the analysis (although this is dealt with separately as a sensitivity test in Section 4.3). The estimated TravelSmart VKT decreases substantially over the period from 2003 to 2007 (from around 6,300 to around 5,600 million km), when the projects were implemented. The estimated TravelSmart VKT is then assumed to remain constant into the future (i.e. no decay in project results), although decay in results is dealt with separately as a sensitivity test in Section 4.3.

Figure 5: Estimated VKT Trends from NTBCP

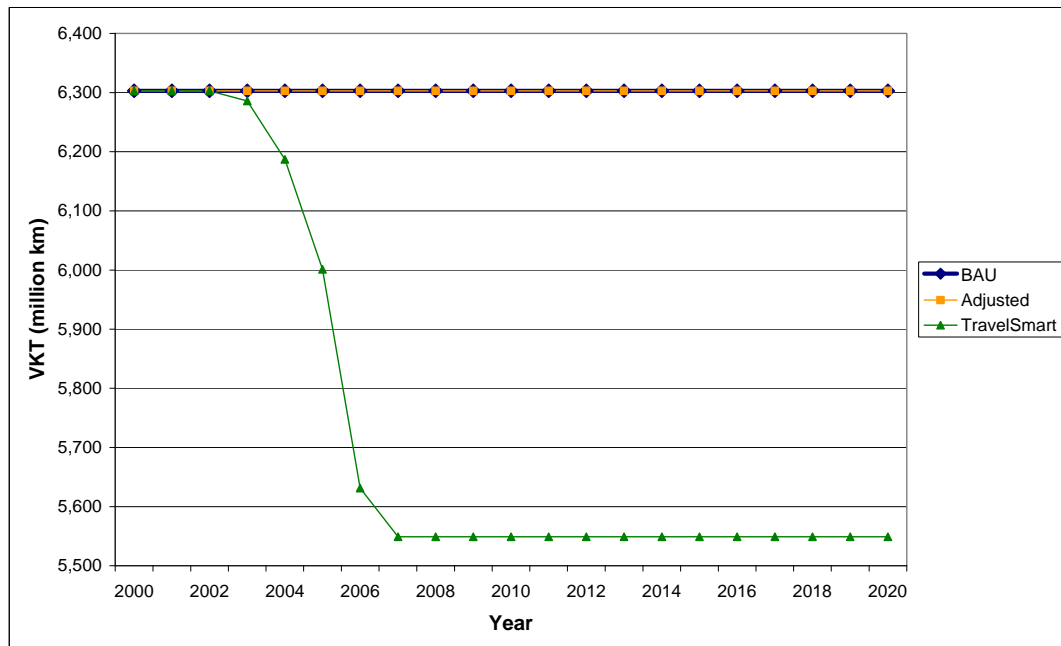


Figure 6 shows estimated GHG trend results from the NTBCP over time. As can be seen, the BAU and Adjusted GHG levels decline over time due to the incorporation of emissions factors that take into account changes in the makeup of the vehicle fleet, fuel efficiency, and emissions profiles. The

estimated TravelSmart GHG levels decrease from around 2,200 thousand tonnes CO_{2-e} in the year 2000 to around 1,600 thousand tonnes CO_{2-e} by 2020.

Figure 6: Estimated GHG Trends from NTBCP

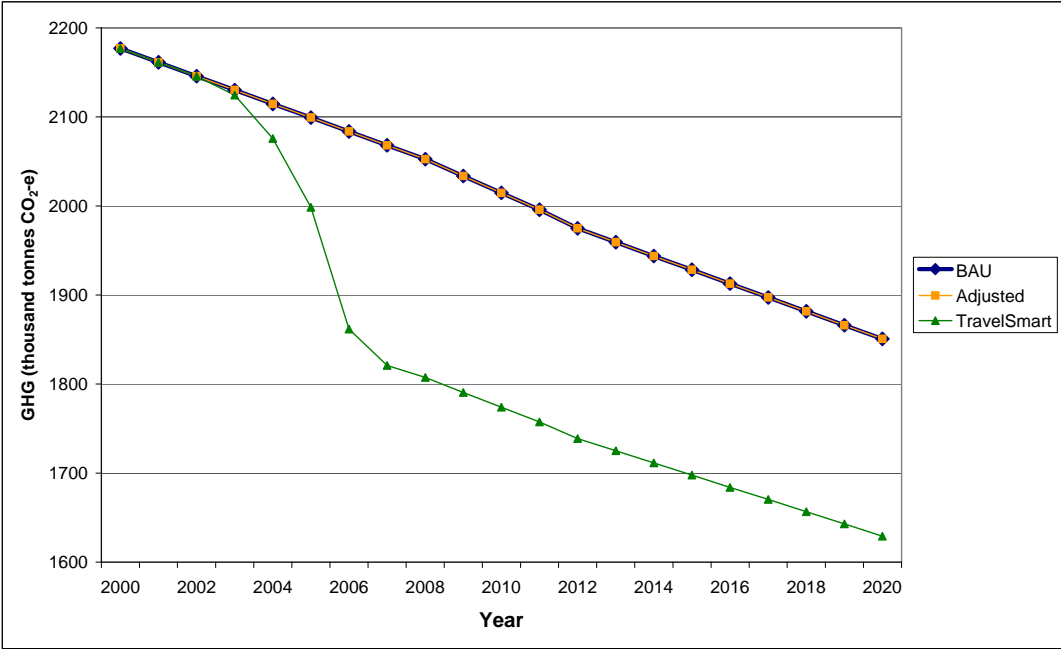


Table 6 shows the yearly estimated reduction in VKT and associated GHG abatement over the project implementation period (2003-07) and the Kyoto reporting period (2008-12). During the project implementation period, a total reduction of around 1,900 million km was estimated to be achieved (with an associated abatement of 614,000 tonnes CO_{2-e}), whereas during the Kyoto reporting period, a total reduction of around 3,800 million km is estimated to be achieved (with an associated abatement of 1,204,000 tonnes CO_{2-e}).

Table 6: Estimated Yearly VKT Trends, Reductions in VKT and GHG Abatement for the Project Implementation Period (2003-07) and the Kyoto Reporting Period (2008-12)

Year	Estimated VKT (million km)	Estimated reduction in VKT (million km)	Estimated GHG Abatement (tonnes CO _{2-e})
2002	6,303	0	0
2003	6,286	17	5,812
2004	6,187	116	38,954
2005	6,001	302	100,675
2006	5,631	672	221,843
2007	5,549	754	247,092
2008	5,549	754	245,259
2009	5,549	754	242,997
2010	5,549	754	240,735
2011	5,549	754	238,473
2012	5,549	754	236,091
Total during Implementation Period (2003-07)	29,655	1,861	614,375
Total during Kyoto Reporting Period (2008-12)	27,746	3,770	1,203,554

Figure 7 shows this same information graphically which illustrates the estimated reduction in VKT of around 750 million km per year from 2007 onwards.

Figure 7: Actual and Estimated Reduction in VKT and associated GHG Abatement for the Project Implementation Period (2003-07) and the Kyoto Reporting Period (2008-12) (Actual measures are recorded for the project implementation period (2003-07), estimated measures are indicated for the Kyoto reporting period (2008-12).)

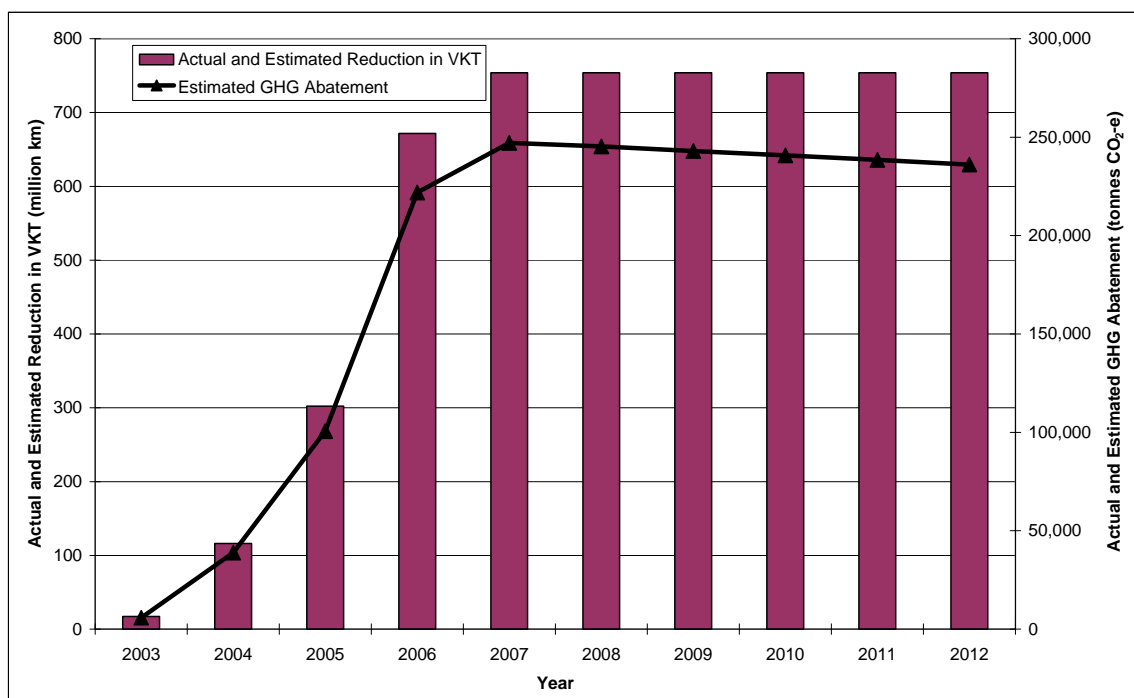


Table 7 provides a summary of key outcome measures for the project implementation period (2003-07) and the Kyoto reporting period (2008-12). For the Kyoto reporting period, the percentage (%) of the project GHG abatement goal estimated to be achieved is also provided, at 98 percent. The GHG abatement goal was set under the Deed and was based upon achieving a 14 percent reduction in VKT overall across the minimum number of target households for each jurisdiction (specified earlier in this report in Table 3).

Table 7: Key Outcome Measures from the NTBCP (2003-07 and 2008-12)

Outcome	Results
Project Implementation Period (2003-07)	
Weighted average reduction in VKT (%) – all projects	11.8%
Estimated reduction in VKT (million km)	1,861
Estimated GHG abatement (tonnes CO _{2-e})	614,375
Kyoto Reporting Period (2008-12)	
Estimated reduction in VKT (million km)	3,770
Estimated GHG abatement (tonnes CO _{2-e})	1,203,554
GHG abatement goal (tonnes CO _{2-e})	1,232,600
% GHG abatement goal estimated to be achieved	98%

The Deed also makes reference to GHG abatement cost performance goals. Table 8 shows that overall, the cost performance estimated to be achieved falls slightly short of the goals, both in terms of total funding and GGAP funding.

Table 8: Key Cost Outcome Measures from the NTBCP (2008-12)

Outcome	Result
Total Cost	\$21,383,387*
GGAP Cost	\$6,487,000*
Total cost/tonne GHG (goal)	\$17.35
Total cost/tonne GHG (estimated to be achieved)	\$17.77
GGAP cost/tonne GHG (goal)	\$5.26
GGAP cost/tonne GHG (estimated to be achieved)	\$5.39

* Includes costs associated with National Coordination Activity

4.3 Sensitivity Testing For Illustrative Purposes Only

A number of illustrative sensitivity tests were performed in order to assess the impact of modifying key assumptions on the level of GHG abatement estimated to be achieved. The sensitivity tests included:

- Application of a VKT reduction path of 10 percent (from year 2000 to 2015);
- Decay in the impact of project results of 2 percent per year; and
- Application of a VKT reduction path of 10 percent (from year 2000 to 2015) *and* decay in the impact of project results of 2 percent per year.

It is important to recognise that decay in the impact of projects results may differ depending on the setting in which a particular project is implemented. For example, a large-scale TravelSmart Communities project is likely to involve a one-off intervention, whereas TravelSmart Workplaces or Schools projects may involve a more consistent level of intervention and/or maintenance over a number of years through travel plans. For this reason, the results of the sensitivity tests are provided for **illustrative purposes only** and are not intended to necessarily demonstrate what may occur in reality. Since there are no accepted rates of decay for travel behaviour change projects (based on measured decay from other equivalent projects), the 2 percent decay rate chosen for the sensitivity test should not be taken as a true estimation of actual decay. A number of other sensitivity tests were also undertaken which involved variations to the level of decay in project results (as well as the VKT reduction path). Key outcome measures from these sensitivity tests are provided in Appendix A. Long-term monitoring of the impacts of the NTBCP that is currently being undertaken (discussed further in Section 4.4) will better inform the understanding of levels of decay that actually occur.

Figure 8 shows the impact of incorporating a VKT reduction path of 10 percent to the VKT trend results. As can be seen, the adjusted VKT now decreases in a linear fashion (from around 6,300 million km in the year 2000 to around 5,500 million km in 2020) with the estimated TravelSmart VKT also decreasing (from around 6,300 million km to around 4,800 million km by 2020).

Figure 8: Estimated VKT Trends from the NTBCP with a VKT Reduction Path of 10% (illustrative purposes only)

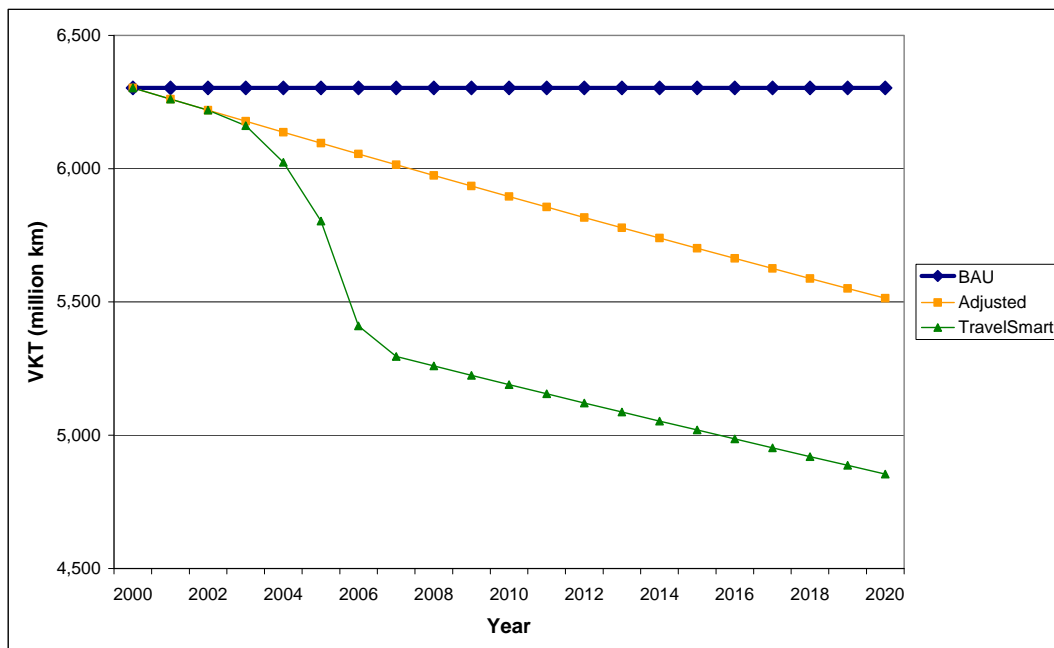


Figure 9 shows how a VKT reduction path of 10 percent impacts on estimated GHG trend results. As can be seen, the adjusted GHG levels decrease at a faster rate than the business as usual levels (from around 2,200 thousand tonnes CO_{2-e} in the year 2000 to around 1,600 thousand tonnes CO_{2-e} by

2020). The estimated TravelSmart GHG levels also experience a sharp decrease from around 2,200 thousand tonnes CO_{2-e} in the year 2000 to around 1,400 thousand tonnes CO_{2-e} by 2020.

Figure 9: Estimated GHG Trends from the NTBCP with a VKT Reduction Path of 10% (illustrative purposes only)

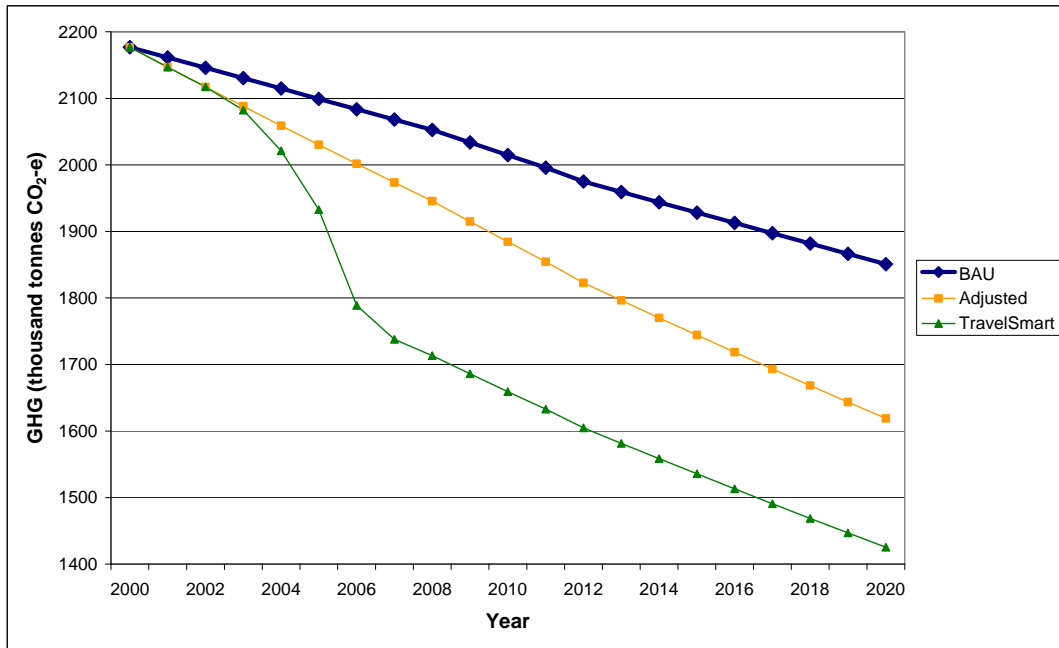


Figure 10 shows the impact of decay in project results of 2 percent per year to the estimated VKT trend results. As can be seen, the estimated TravelSmart VKT reaches its lowest point (around 5,600 million km) by 2007 (when all projects have been implemented) but then increases gradually up to around 5,700 million km by 2020.

Figure 10: Estimated VKT Trends from the NTBCP with Decay in Project Results of 2% per year (illustrative purposes only)

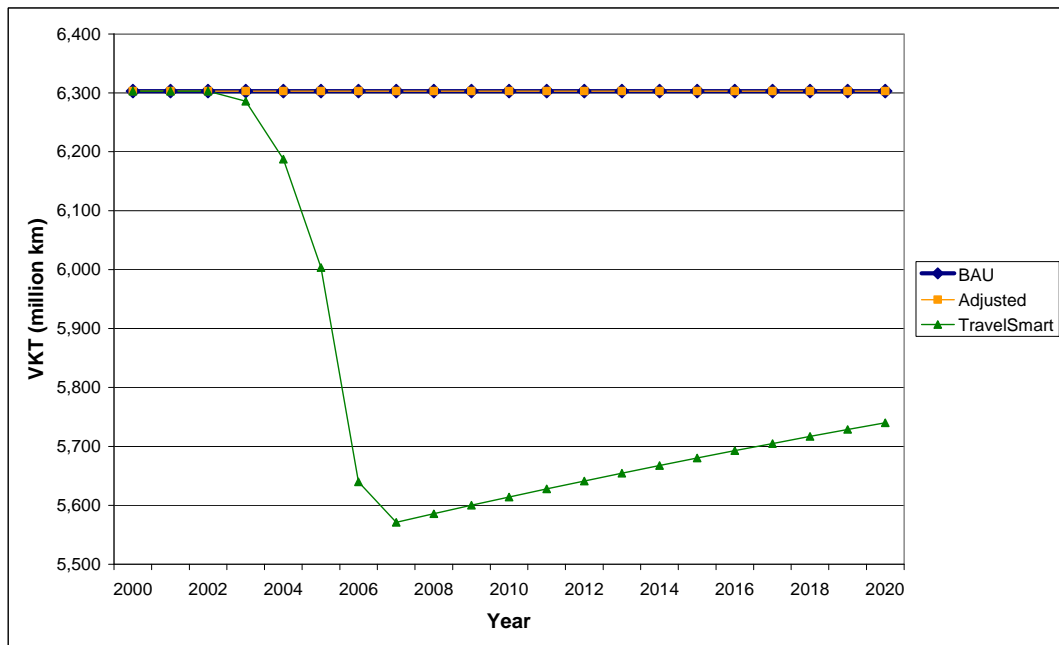


Figure 11 shows the impact of decay in project results of 2 percent per year to the estimated GHG trend results. As can be seen, the estimated TravelSmart GHG levels continue to decrease but become closer to the BAU/Adjusted GHG levels over time.

Figure 11: Estimated GHG Trends from the NTBCP with Decay in Project Results of 2% per year (illustrative purposes only)

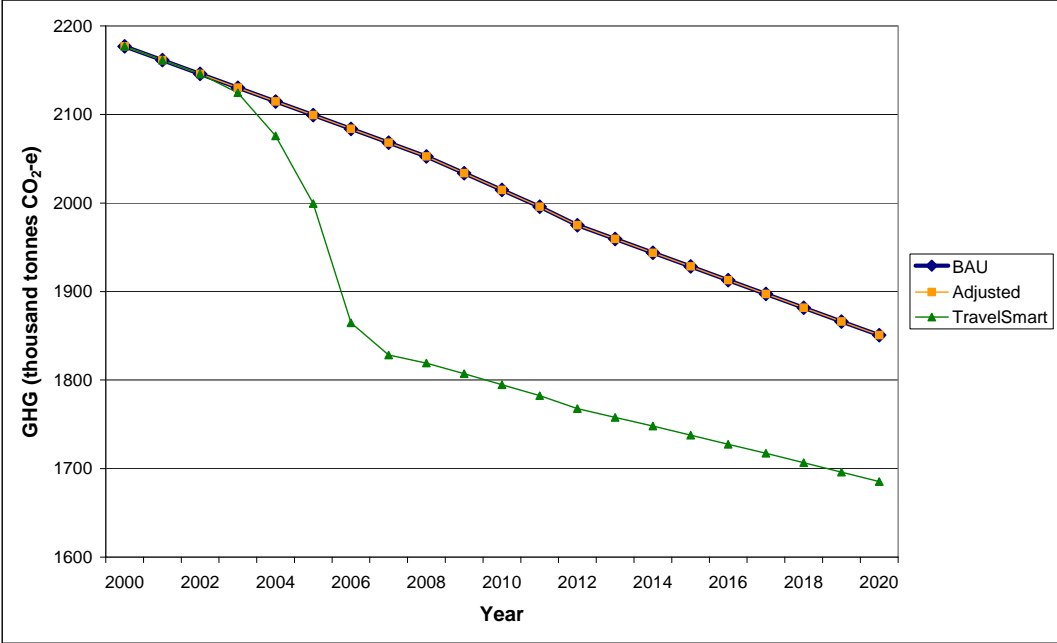


Figure 12 shows the impact on estimated VKT trend results from a VKT reduction path of 10 percent (from the year 2000 to 2015) and decay in project results of 2 percent per year. As can be seen, the adjusted VKT decreases linearly (from around 6,300 million km in the year 2000 to around 5,500 million km by 2020) as does the estimated TravelSmart VKT (from around 6,300 million km in the year 2000 to around 5,000 million km by 2020). However, due to the decay of project results, the estimated TravelSmart VKT approaches the adjusted VKT over time (albeit at a slow rate).

Figure 12: Estimated VKT Trends from the NTBCP with a VKT Reduction Path of 10% and Decay in Project Results of 2% per year (illustrative purposes only)

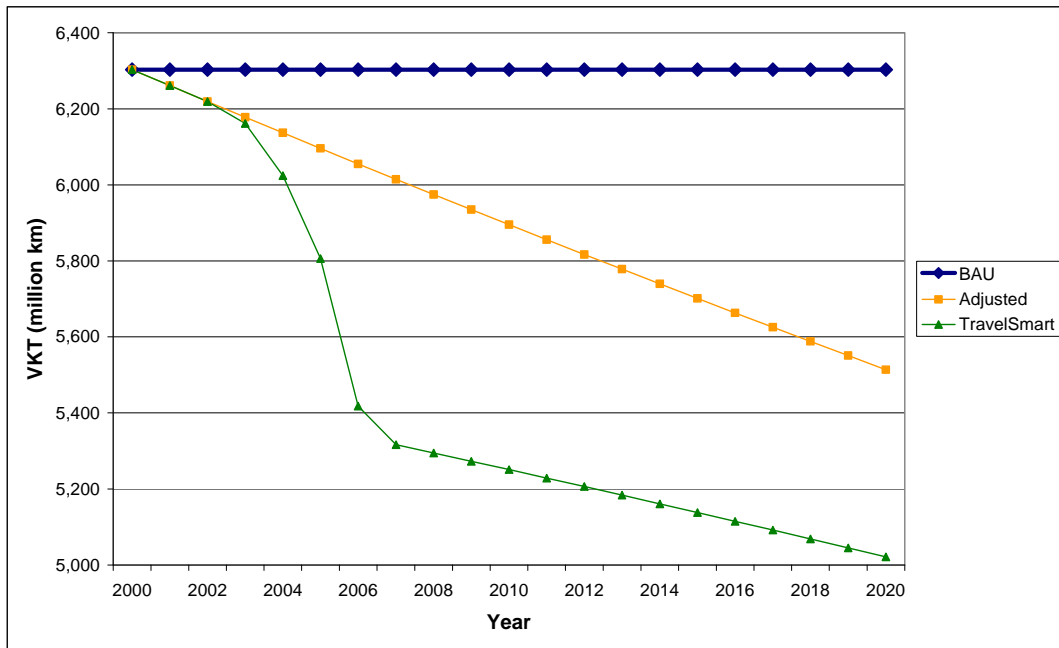


Figure 13 shows the impacts on estimated GHG trend results from a VKT reduction path of 10 percent and decay in project results of 2 percent per year. As can be seen, the estimated TravelSmart GHG levels continue to decrease but become closer to the adjusted GHG levels over time (due to decay in TravelSmart results).

Figure 13: Estimated GHG Trends from the NTBCP with a VKT Reduction Path of 10% and Decay in Project Results of 2% per year (illustrative purposes only)

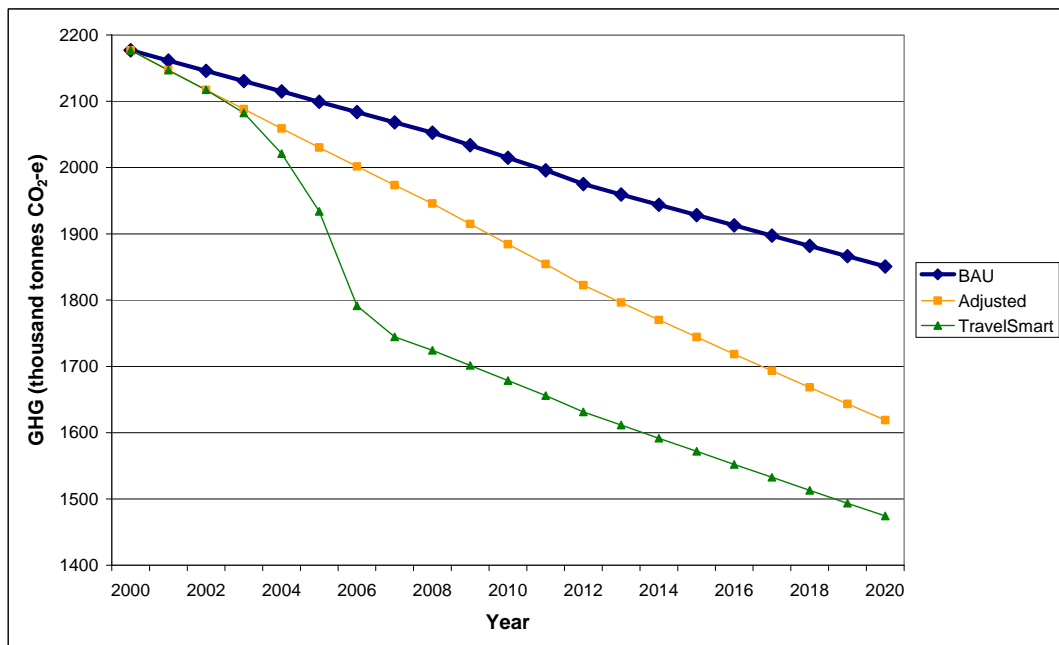


Figure 14 compares the estimated GHG trends (assuming implementation of the projects for all jurisdictions) under the different sensitivity scenarios considered: (1) VKT reduction path of 10 percent; (2) decay in project results of 2 percent per year; and combination of (1) and (2). The baseline GHG

trends represent the estimated GHG emissions with TravelSmart under the baseline conditions (no VKT reduction path and no decay in TravelSmart results over time).

As expected, the introduction of a VKT reduction path (to factor the effect of other programs) reduces GHG emissions, while the introduction of a project decay factor increases GHG emissions relative to the baseline. It is important to highlight that the BAU GHG emissions under the two scenarios that include a reduction path in VKT are different than the BAU GHG emissions under the baseline and project decay scenarios. As a result, the estimated GHG emissions presented in the figure should not be compared directly. However, they serve to illustrate the effect of the sensitivity tests applied in the analysis.

Figure 14: Comparison of Estimated TravelSmart GHG Trends from all Projects under the Sensitivity Scenarios (illustrative purposes only)

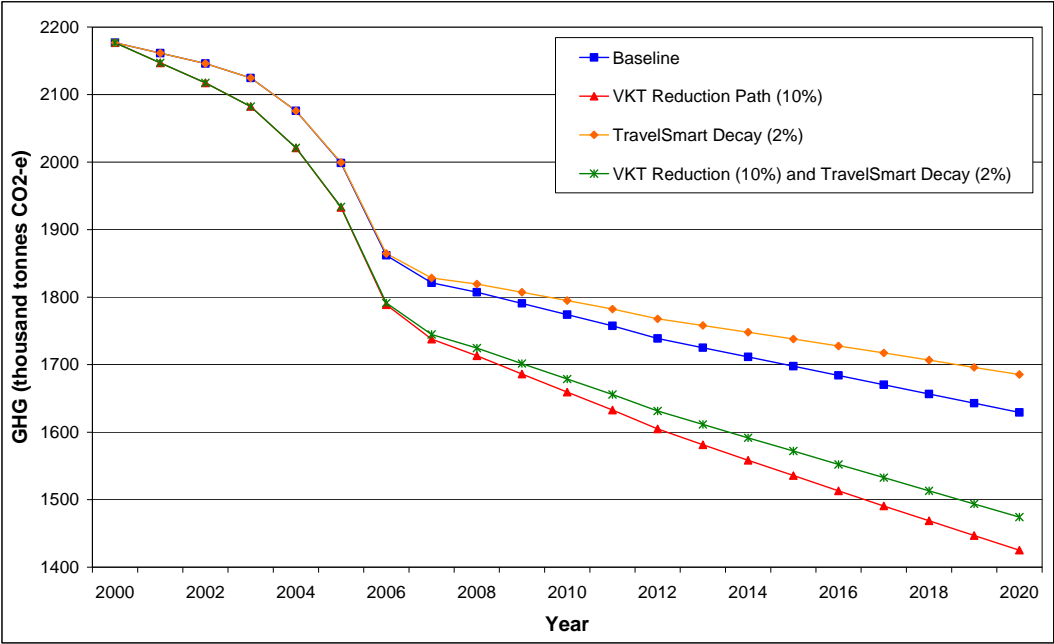


Table 9 provides a summary of GHG abatement goals estimated to be achieved under each of the sensitivity tests previously discussed. As can be seen, by incorporating a VKT reduction path of 10 percent or by incorporating decay in project results of 2 percent per year, similar results can be achieved (around 90 percent of the GHG abatement goal estimated to be met). However, when these two scenarios are combined (VKT reduction path of 10 percent and decay in project results of 2 percent per year), only 84 percent of the GHG abatement goal is estimated to be achieved. Results from additional sensitivity tests undertaken (that involved altering the VKT reduction path and level of decay) are provided in Appendix A.

Table 9: Percentage of GHG Abatement Goals Estimated to be Achieved under Sensitivity Tests (illustrative purposes only)

Scenario	% GHG abatement goal achieved
Base findings (as detailed in Section 4.2)	98%
VKT reduction path of 10% (from 2000 to 2015)	91%
Decay in project results of 2% each year	89%
VKT reduction path of 10% (from 2000 to 2015) AND decay in project results of 2% each year	84%

4.4 Long-Term Monitoring Issues

Long-term monitoring of the impacts of the NTBCP commenced in October 2007 and will be undertaken until the end of 2012. The monitoring involves the use of GPS technology on a small number of households in each of the jurisdictions as follows:

- Victoria: 9 TravelSmart households and 5 non-TravelSmart households;
- ACT: 15 TravelSmart households and 10 non-TravelSmart households;
- Queensland: 21 TravelSmart households and 7 non-TravelSmart households; and
- South Australia: Data from the continuing *Households in the West* project.

The long-term monitoring will assist DEWHA and the participating jurisdictions to ascertain whether the reductions in VKT (and associated GHG abatement) are maintained over time, and if not, what level of decay in results is apparent. These findings can then be used to more accurately estimate reductions in VKT (and associated GHG abatement) from the implementation of the NTBCP.

5.0 Conclusions and Recommendations

The study carried out by Maunsell AECOM for DEWHA focused on the analysis of the data from the NTBCP in the respective jurisdictions. The main objective was to derive consistent and standardised GHG abatement results. The application of the abatement methodology (as specified in the Deed) is subject to a number of assumptions, some of which are out-dated and/or inconsistent. Therefore, the estimated reductions in VKT and GHG emissions should be viewed in this light and should only be used to provide general guidance.

The analysis showed that the TravelSmart GHG annual levels are estimated to decrease from around 2,200 thousand tonnes CO_{2-e} in the year 2000 to around 1,600 thousand tonnes CO_{2-e} in 2020. The percentage of the GHG abatement goal (set under the Deed) estimated to be achieved at the national level provides a good measure of the success of the program. The analysis estimated an abatement from the NTBCP of 1.20 Mt CO_{2-e} over the Kyoto reporting period (2008-12), equivalent to approximately 98 percent of the national GHG abatement goal (1.23 Mt CO_{2-e}) for this project.

The Deed also specifies GHG abatement cost performance goals. At the national level the estimated cost per tonne of CO_{2-e} achieved is approximately \$0.42 higher than the initial goal (of \$17.35). With respect to GGAP funding, the additional cost per tonne of CO_{2-e} estimated to be achieved is approximately \$0.13 higher than the initial goal (of \$5.26). This additional cost reflects the fact that the overall GHG abatement was not fully met. However, it is expected that the implementation of projects into the future will become more cost effective as their evaluation component costs are reduced.

The illustrative sensitivity analysis showed that, as expected, the introduction of a VKT reduction path (to factor the effect of other programs) reduces GHG emissions, while the introduction of a project decay factor increases GHG emissions relative to the baseline.

Long-term monitoring of the impacts of the NTBCP will be undertaken until the end of 2012. This monitoring will assist DEWHA and the participating jurisdictions to ascertain whether the reductions in VKT (and associated GHG abatement) are maintained over time, and if not, what level of decay in results is apparent. These findings can then be used to more accurately estimate reductions in VKT (and associated GHG abatement) from the implementation of the NTBCP.

Maunsell AECOM recommends that the abbreviated methodology and analytical tool developed be used by DEWHA and the jurisdictions in future evaluations of the NTBCP. This will allow DEWHA to produce results that can be represented collectively to evaluate the overall success of the NTBCP in achieving the national GHG abatement goals.

Local transport in general is a State issue. While the Commonwealth can provide funding and assist in project co-ordination and information sharing, TravelSmart is a local behaviour change issue and States will continue to work on TravelSmart projects as they have in the past, irrespective of the completion of the NTBC project.

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Appendix A

Results of Additional Illustrative Sensitivity Tests

Table 10: Impacts on Key Outcome Measures (2008-12) from Additional Sensitivity Tests (illustrative purposes only)

Outcome	Total
<i>GHG abatement goal (CO_{2-e})</i>	<i>1,232,600</i>
Decay of 1% per year	
Estimated reduction in VKT (million-km)	3,605
Estimated GHG abatement (CO _{2-e})	1,151,075
% GHG abatement goal estimated to be achieved	93%
Decay of 5% per year	
Estimated reduction in VKT (million-km)	3,009
Estimated GHG abatement (CO _{2-e})	961,523
% GHG abatement goal estimated to be achieved	78%
VKT reduction path of 5%	
Estimated reduction in VKT (million-km)	3,646
Estimated GHG abatement (CO _{2-e})	1,164,119
% GHG abatement goal estimated to be achieved	94%
VKT reduction path of 15%	
Estimated reduction in VKT (million-km)	3,409
Estimated GHG abatement (CO _{2-e})	1,088,791
% GHG abatement goal estimated to be achieved	88%