Reducing VKT, reducing emissions: a long road ahead

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1 Introduction - Heading in the right direction

The Intergovernmental Panel on Climate Change (2007) has concluded that global atmospheric concentrations of carbon dioxide and other greenhouse gases now far exceed any past concentration measured through ice core samples dating back thousands of years, and that it is "very likely" that these atmospheric changes are already having an impact on the world's weather and in particular on the frequency and severity of extreme weather events. Stern (2007) has shown that emissions must be reduced, despite the fact that some of the measures required to achieve a reduction may be costly and/or unpopular, because the impacts of climate change will be much more costly.

Land transport systems are one of the greatest contributors to greenhouse gases and one of the most difficult areas in which to achieve reductions. The Ministry for the Environment (2007) has shown that in New Zealand, 40% of CO_2 emissions come from transport - mostly private cars - and that transport CO_2 is one of the biggest growth areas of New Zealand's overall greenhouse gas emissions. Projects which reduce CO_2 emissions from land transport are thus urgently needed as part of the overall need to stabilise the levels of atmospheric greenhouse gases.

Auckland, like most other cities, has plans to improve public transport provision, to encourage walking and cycling, and to prepare Travel Plans for schools and workplaces. The Auckland Regional Council (2005a) has included these projects as part of an overall strategy to provide for the transport needs of a rapidly growing population.

Auckland's public transport and travel planning projects could be characterised as "heading in the right direction", because they aim to reduce private vehicle travel and hence greenhouse gas emissions. However in addressing the challenge of global warming, heading in the right direction is not enough; it is also necessary to know where we are going and whether, at this pace, we will ever get there.

It is therefore important to quantify the actual impact of transport projects on greenhouse gas emissions and to compare this impact with the targets adopted by New Zealand under the Kyoto Protocol, to reduce CO_2 emissions to 1990 levels by 2012. It is equally important that this quantification be based on real evidence from completed projects. Such evidence is rare; most environmental assessments of transport projects are prepared as part of the process of applying for funding and are not revisited once the project is complete.

This paper presents survey data of changes in travel behaviour in response to two Auckland land transport projects:

- The Northern Express bus service links Albany and Constellation bus stations, each of which has a park and ride facility, to the Auckland central business district
- The TravelWise Schools Programme works closely with school communities and local councils to develop School Travel Plans and to reverse the trend for more children to be driven to school

Survey data from both projects is used to calculate changes in vehicle kilometres travelled (vkt) and hence in CO_2 emissions. The results of this calculation are then presented in context, by calculating the cost per tonne for the CO_2 reductions achieved, and by comparing the scale of the reduction with the expected growth in transport CO_2 emissions for Auckland.

2 Methodology

Greenhouse gas emissions from road transport vary with vehicle type, fuel type, driving speed, driving style, vehicle loading and distance travelled. For small groups of people all of these factors will vary and calculations of CO_2 emissions will be complex and unreliable.

However for very large groups of people, simplifying assumptions can be made. Data for average Auckland private motor vehicles, 6.2% of which burn diesel, driven at the average vehicle speed for the region (37 km/h), using average driving styles and carrying an average load, has been compiled for the Auckland Air Emissions Inventory (Metcalfe et al, 2006). This data can be used to calculate a relatively accurate assessment of the CO_2 impacts of a transport project, if the impact of the project on mode share and on kilometres travelled is known.

The methodology used in this paper uses survey data to calculate kilometres travelled, by mode. The methodology works well for surveys which have the following features:

- A large number of respondents (ideally 1,000 or more)
- Accurate capture of home address and destination address
- Accurate capture of mode of travel before and after the project

Standard GIS route mapping features are then used to calculate the most likely travel route for each individual, based on home address and destination address. The ArcInfo GIS system used for the analysis in this paper has two methodologies for doing this, one for vehicles which travel only on the street network and one for walking which allows use of walkways, parks etc. Further refinements of this methodology, for example limiting the routes calculated for bus trips to known bus routes, could be included in future but were not done for this paper.

This methodology generates a distance travelled for each combination of home and destination address, and adds a “distance” column to the survey dataset. This distance data is then used to calculate aggregate distance travelled, by mode, before and after the project for all survey respondents.

Where vehicle travel has been reduced, the calculated reduction in vehicle kilometres travelled can be multiplied by the CO_2 emission factors established by Metcalfe et al (2006) in the Auckland Air Emissions Inventory to calculate the resulting CO_2 reduction.

In this paper, the above methodology is applied to two very different projects; the Northern Busway and the Auckland School Travel Plans programme. In principle, this methodology could be used to assess the impact of any transport project on kilometres travelled, requiring only that a survey meeting the three criteria above be completed by a sufficiently large group of people whose travel is, or could be, impacted by the project.

This methodology could also be adapted to assess other impacts besides CO_2. Vehicle emissions impacting on human health, including fine particulate and carbon monoxide, can also be calculated from vehicle kilometres travelled using published emissions factors. The impact of transport on natural waterways and on local air quality is also related to vehicle kilometres travelled. Land Transport NZ (2005) has also published factors for calculating the traffic congestion benefits of a project from the reduction in vehicle kilometres travelled, and the health benefits from the increase in kilometres walked and cycled.

The assessment of CO_2 for two Auckland transport projects which follows is therefore of interest as a potential methodology for wider transport project assessment.

3 The Northern Express bus service

The Northern Express bus service links Albany and Constellation bus stations, each of which has a park and ride facility, to the Auckland central business district. From July 2006 to June 2007, an average of 1,620 customers travelled in each direction on the Northern Express each weekday.

A survey of Northern Express customers was undertaken on 29 March 2007. The survey team distributed paper surveys to customers at Albany and Constellation bus stations and on Northern Express buses, and collected these using a return basket on the bus. 1387 survey responses were collected, representing an 86% response rate. The survey collected information about home address, destination address, travel purpose and former mode of travel (prior to the service commencing in November 2005). The survey found that 26% of the surveyed customers formerly made the same trip by car as driver, as shown in Figure 1.

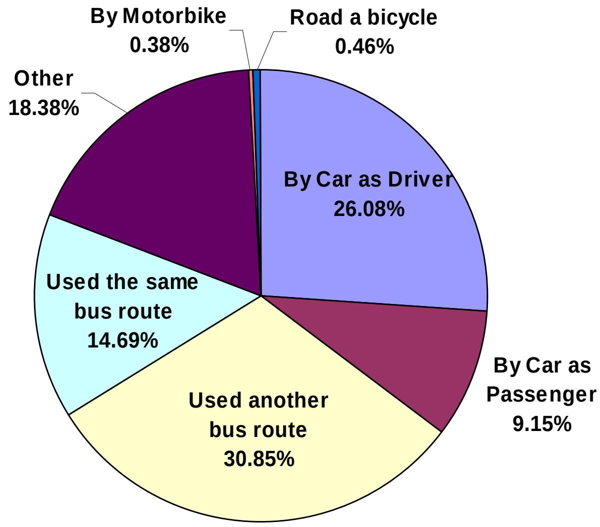

Figure 1 : Northern Express customers, previous mode of transport

The 18.4% of customers (255 people) who chose the option “other” were excluded from further analysis. There are two likely explanations for their choice:

- Some people would have used two or more modes of transport for their trip
- Others may not have made the same trip prior to the commencement of the Northern Express service in November 2005, hence the question about their previous mode of transport did not make sense to them.

Future surveys will be designed to provide for these choices and, it is hoped, give a lower proportion of respondents choosing “other”.

A further 162 people did not give a valid home and destination address, and were also excluded from the analysis. This left a sample size of 970 Northern Express customers.

For each of the 970 customers giving valid responses, the road network distance they previously travelled was calculated using the ArcInfo GIS. A map of this calculation is shown in Figure 2.

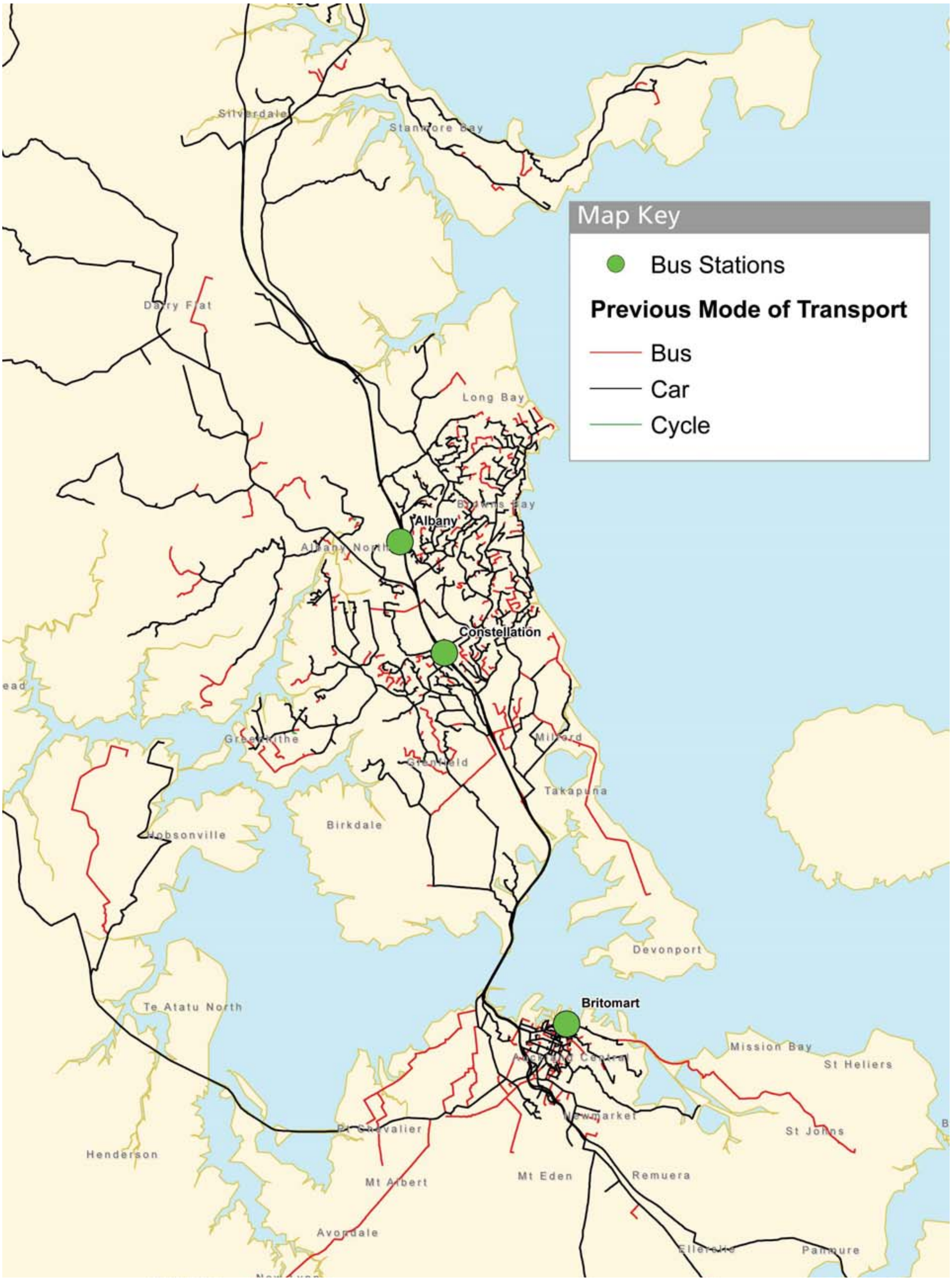

Figure 2: Previous travel of 970 Northern Express customers, before commencement of service

For the same customers' current trip on the Northern Express, the GIS was used to calculate the length of their trip to the busway station at which they boarded, of their bus trip, and of their trip from the busway station at which they alighted to their final destination. The resulting map is shown as Figure 3.

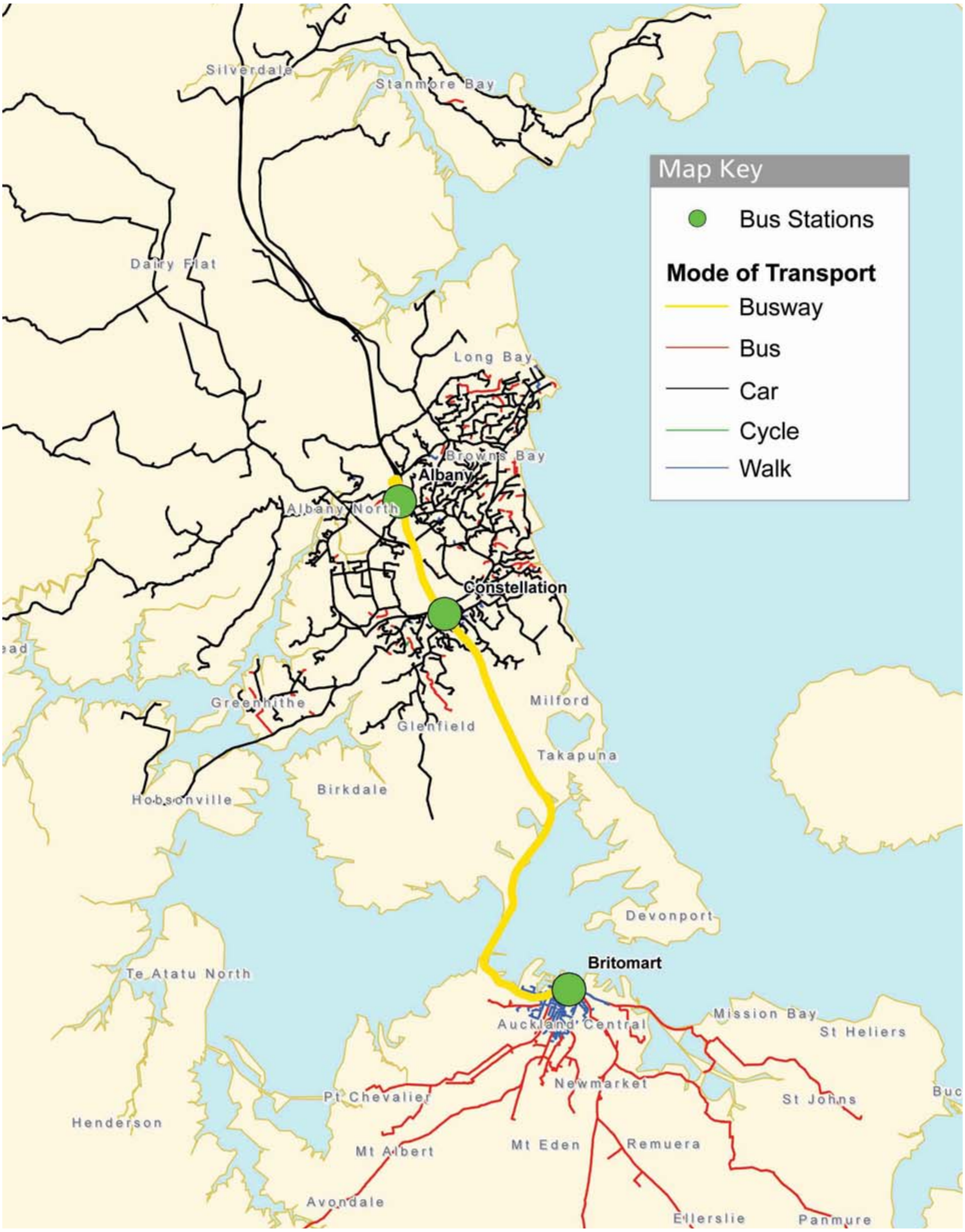

Figure 3: Current travel of 970 Northern Express customers

3.1 The impact of the Northern Busway on vehicle travel

Comparing Figure 2 with Figure 3, the impact of the busway has been to convert long car trips which cross Auckland's congested Harbour Bridge to shorter car trips to access busway stations. This is shown in the aggregate data in Figure 4 below:

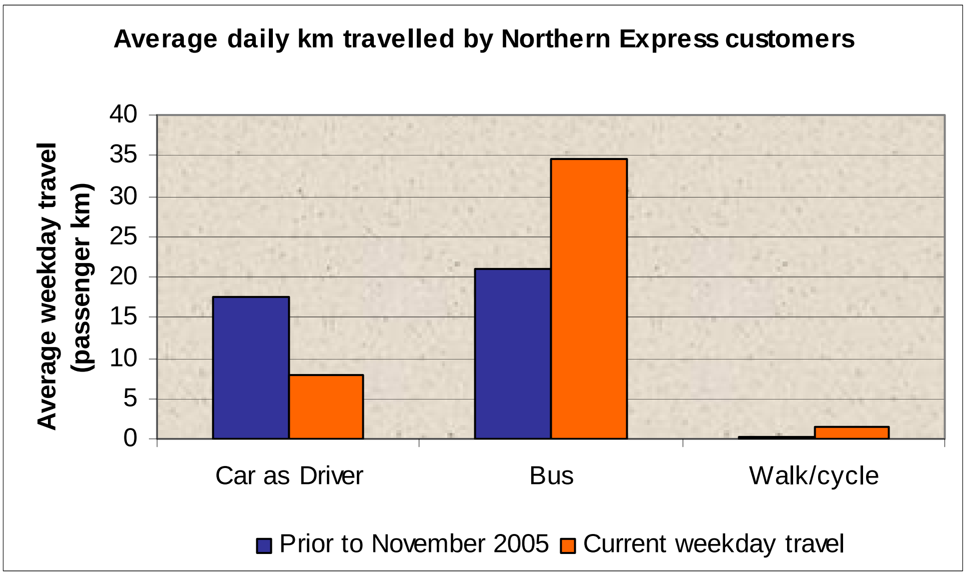

Figure 2 : Average daily km travelled, by mode, for Busway customers

Based on this data, the Northern Express service saved 3.9 million kilometres of private vehicle travel during 2006/07 (counting return trips and using a factor of 252 weekdays per year). The average customer drives 10 km less each weekday than they did prior to the commencement of the service.

This reduction in vehicle kilometres travelled is mainly due to the 26% of people (422 people) who formerly made the whole trip by car. Most of these customers now travel the shorter distance to the busway station by car (as driver or passenger). All 970 valid responses are included in this aggregate data, including the small number of people who used to catch a bus for their entire journey, and now drive to the busway station.

The full impact of the Northern Express service on travel by mode is shown in Table 1 below.

Table 1 : Annual (weekday) km travelled by mode for Northern Express customers

	Car	Standard Bus	Busway	Walk/cycle
Prior to Nov 2005	7,187,976	8,552,855		133,770
Current	3,248,643	1,263,855	12,872,883	620,724
Change	-3,939,333	-7,289,000	+12,872,883	+486,954

3.2 The impact of the Northern Express service on CO_2

To arrive at an estimate of the CO_2 impacts, emission factors for car travel were derived from The Auckland Air Emissions Inventory (Metcalfe et al 2006) and factors for bus emissions from the Auckland Regional Council (2006) Bus Emissions Model.

The Auckland Air Emissions Inventory gives a range of emissions factors for different driving situations. To model the car trips replaced by the Northern Express, an average was taken of "suburban interrupted" (355 g/km) and "motorway congested" (287 g/km) values. These values include emissions from buses and trucks, and a correction factor of 0.808 is applied to remove these, calculated from fleet data published in the document appendix. This gives a car emission factor of 260 g/km.

There is also a benefit from more efficient buses with higher passenger loadings. Vehicle emissions factors for buses are taken from the Auckland Bus Emissions Model for a bus speed of 37 km/h, with Northern Express buses as Euro 3 and other buses as Euro 2 (as a reasonable average standard). However bus vehicle km proved extremely complex to calculate in the context of Auckland's North Shore, where suburban bus services are in the process of being rationalised and aligned with the new busway. This benefit was therefore estimated using an emissions factor per passenger calculated from vehicle emissions factors in the Auckland Bus Emissions Model, and average loadings from patronage data.

The CO_2 emissions factors used are shown in Table 2:

Table 2 : Emission factors

CO_2 factor car (inc 4WD)	g/km	260	
CO_2 factor bus	g/pax km	41	avg loading = 15 passengers
CO_2 factor bus Euro 03	g/pax km	12	avg loading = 50 passengers

This enables the impact of the Northern Busway on CO_2 emissions to be calculated as 1,162 tonnes/year, as shown in Table 3.

Table 3 : Annual CO_2 calculation

	Car	**Bus**	**CO_2 in tonnes**
Prior to Nov 05	1,865	348	2,213
Current	843	208	1,051
Change	1,022	140	
		Annual CO_2 saving	**1,162**

Most (88%) of the calculated reduction in CO_2 emissions is the direct impact of reduced car travel by busway customers. There is also a benefit from more fuel efficient buses with higher average loadings. These are direct benefits and do not include any modelled effect on traffic congestion - in practice, State Highway 1 north of the Auckland Harbour Bridge is so far over capacity at peak that the spare capacity from 422 fewer car trips would be immediately filled, with no noticeable impact on congestion.

This change in travel and hence in CO_2 relates to Northern Express customers only. Because 970 survey respondents have said directly that their travel has changed due to the new service, this conclusion is robust as it applies to this small group. It is possible – indeed likely – that other people living on Auckland's North Shore have meanwhile changed their travel behaviour, increased their car use and cancelled out this benefit.

4 TravelWise Schools

Auckland's TravelWise Schools Programme works closely with school communities and local councils to prepare and implement School Travel Plans and to reverse the trend for more children to be driven to school. The programme was launched in April 2005 as a partnership between central, regional and local government and has established sustainable funding streams to enable every school in Auckland to prepare a voluntary Travel Plan by 2014. The number of schools involved in the programme is summarised in Table 4:

Table 4 : Auckland TravelWise Programme coverage

	School year		
	2005	**2006**	**2007**
TravelWise schools	51	92	138
Total students at TravelWise schools	31,941	57,199	75,000
Walking School Buses (not all of which are at TravelWise schools)	179 (Nov 05)	200 (Nov 06)	218 (July 07)

The 75,000 school students involved in the programme represent 30% of the Auckland school age population of 250,000.

4.1 TravelWise process and survey methodology

A School Travel Plan involves the school, the local council and the Auckland Regional Transport Authority working together to understand the reasons behind current travel patterns and to find ways to encourage safer and more sustainable choices for the journey to school. Each Travel Plan follows the standard process set out in Figure 3 to achieve lasting change in travel choices:

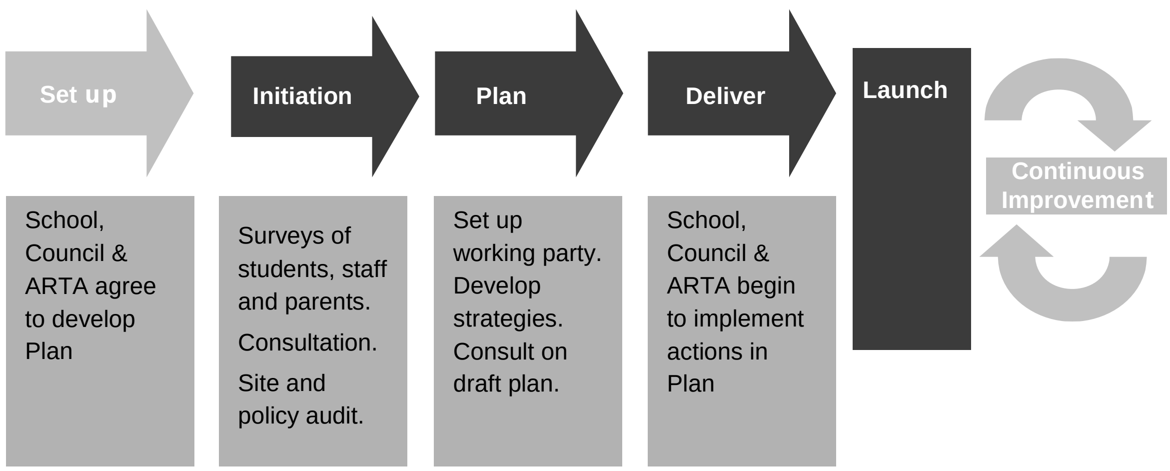

Figure 3: TravelWise process

Since its inception, the TravelWise Schools programme has had a strong emphasis on monitoring. A standard survey methodology has been applied, and progressively refined, since the inception of the programme. This gives a very rich dataset with large sample sizes to inform the evaluation of programme impacts.

Students, staff and parents complete a comprehensive survey form as part of the Research phase of the Travel Plan. This survey serves two purposes; to provide information which helps in developing the Travel Plan, and to provide a baseline for later monitoring of the effect of the Travel Plan. Thereafter, most schools simply undertake a “roll survey” twice a year, which requires teachers to record the travel mode of students to and from school on a prepared form, as part of the process of calling the roll. Roll survey forms include links to address data held by the school, and this address data is used to calculate distance travelled. A few schools have volunteered to be “case study” schools and to complete more comprehensive follow-up surveys, which are distributed to students, parents and staff.

4.2 TravelWise results

A set of “roll surveys” were undertaken in November 2006 covering 17,006 students at 42 schools. The analysis of these surveys was undertaken by ARTA and reviewed by Hinkson et al (2007). Data from each participating school in the 2006 survey was compared with baseline data collected at the same school prior to the development of their Travel Plan. The summary results of the analysis are shown in Table 5:

Table 5 : Auckland TravelWise Programme results, baseline to 2007

		Average (%) per mode weighted by school roll
Walk	Pre STP	30.38
	Post STP	33.43
	% modal change	3.05
WSB	Pre STP	1.16
	Post STP	2.01
	% modal change	0.85
Cycle	Pre STP	2.70
	Post STP	2.23
	% modal change	-0.47
PT	Pre STP	8.73
	Post STP	8.37
	% modal change	-0.37
Family car	Pre STP	53.60
	Post STP	50.60
	% modal change	-3.00
Friend car	Pre STP	1.51
	Post STP	2.61
	% modal change	1.10
Scooter	Pre STP	0.54
	Post STP	0.35
	% modal change	-0.19
Drive self	Pre STP	0.19
	Post STP	0.00
	% modal change	-0.19
Other	Pre STP	1.19
	Post STP	0.41
	% modal change	-0.78

TravelWise School Travel Plans have achieved a reduction of 3.2% in car trips to and from school, calculated as the sum of the change in travel to/from school in the family car and in students who drive themselves to and from school. This represents 544 fewer students being driven/driving themselves, out of the sample population of 17,006. This is a statistically significant change at $p_{(one\ tail)} = 0.01$.

Applying these results to all 42,625 students at schools with complete or near-complete Travel Plans as at November 2006 gives 1,364 fewer students travelling to and from school by car.

There has been a parallel increase in walking to TravelWise schools, with independent walking increasing by 3.05% and walking school bus by 0.85%. For simplicity, this calculation of CO_2 impacts assumes a shift of 3.2% from car to walking and ignores the much smaller changes in other modes of travel.

4.3 TravelWise results in context

The mode shift reported for TravelWise schools of 3.2% is lower than the mode shift reported for parallel programmes in the overseas literature, as summarised by Cairns et al (2004). Most school travel studies state the percentage decrease in car travel through Travel Plans, rather than the percentage of the total student population. Such percentages of course vary according to the proportion travelling by car prior to the Travel Plan and are difficult to use to compare different travel modes or to sum across organisations or over time. Expressed in as a percentage decrease in car travel, the mode shift achieved at TravelWise schools in Auckland is 5.6%.

The fact that car travel to TravelWise schools has decreased, and that this decrease is statistically significant, is not in itself a proof that the decrease is due to the TravelWise programme. Other factors, such as petrol prices, could be behind the decrease in car travel.

National data from the Household Travel Survey, published by the Ministry of Transport (2007), can be used to provide a "control" for the TravelWise data and to test the hypothesis that the TravelWise programme is the cause of the observed mode shift. The proportion of children driven to school nationally has increased by around 1% per year since 1989/90, matched by a decline in walking and cycling to school, as shown in Figure 4. This means we can be reasonably confident that the decline in car travel, and increase in walking, at TravelWise schools is as a result of the programme and not of some external factor. Analysing the Auckland subset of the Household Travel Survey data specifically will enable us to be more confident of this conclusion, and this analysis is underway.

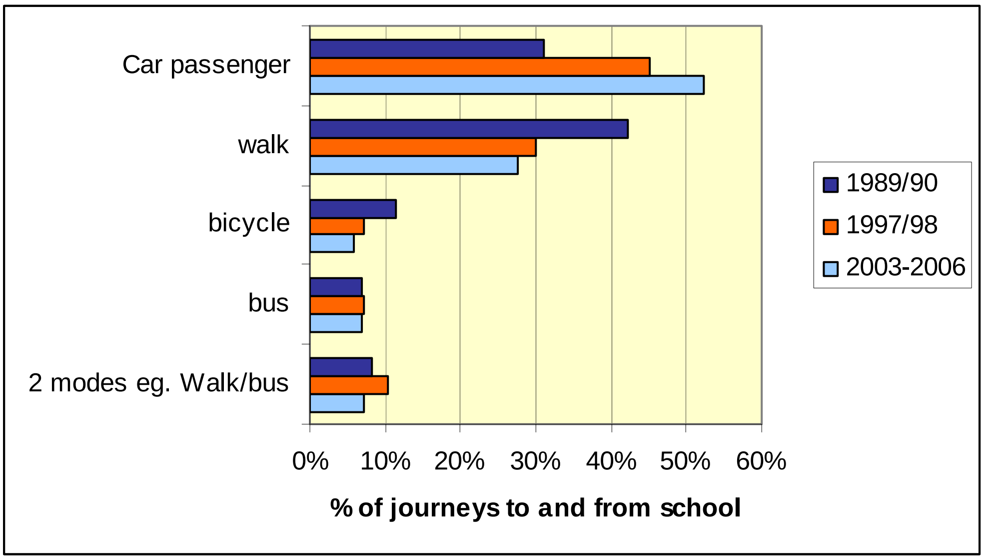

Figure 4: Mode of travel to school for NZ children aged 5-12 (Ministry of Transport 2007)

4.4 The impact of TravelWise on vehicle trips

Having established the change in mode share at TravelWise schools, four further factors are required to calculate the impact of the TravelWise programme on vehicle trips:

- The proportion of trips to school which are return trips (parents who drive a child to school, and then drive straight home, thus each child trip requires two vehicle trips). These trips are distinguished in the TravelWise baseline and case study surveys, and make up 42% of all trips to school in the family car. The remaining 58% of children are dropped off on the way to work or to another destination. A simplifying assumption is made that this adds the home-school distance to the driver's trip distance.
- The average number of children per vehicle on school trips. An unpublished study undertaken by Sinclair Knight Merz consulting for the Ministry of Education in 2007 established that there are 1.2 children in each vehicle arriving at an Auckland school. Data from TravelWise surveys is used to adjusted for the proportion of children who travel in "friend's car", giving average number of children per "family car" of 1.14.
- The car trips avoided through Walking School Buses at schools without School Travel Plans. 2832 students at non-TravelWise schools travel to school by Walking School Bus. Kearns and Collins (2007) have established that 63% of Walking School Bus children would otherwise travel by car.
- The number of school days per year, which is taken as 212 (232 school days adjusted for 20 wet days when fewer children walk)

These factors enable a conversion of student trips to car trips as shown in Table 6:

Table 6 : Auckland TravelWise results, baseline to November 2006

	Number of students	Vehicle trips saved each morning	Vehicle trips saved each year
Students at schools with complete or near-complete Travel Plans Nov 06	42,625	1,364	720,383
Students who walk to school on a Walking School Bus at schools without a Travel Plan	2,832	1,784	824,501
Total vehicle trips saved		3,148	1,544,884

4.5 The impact of TravelWise on vehicle kilometres travelled

The distance children travel to school can be calculated using GIS analysis of survey address data as described for the case of the Northern Busway above.

Distance travelled from home to school has been calculated for 41,000 students who provided valid address data on their TravelWise surveys. This data was used to calculate the average length of a walk trip to school, as shown in Table 7. For this paper, a simplifying assumption is made that all vehicle trips avoided are converted to walk trips. It is further assumed that the average length of a trip converted from car to walking is the same as the current average length of a walk trip.

Table 7 : Average walk distances to school calculated using GIS

	Average length of a walk trip to school
Secondary Students	1.8
Intermediate Students	1.7
Primary Students	1.0
Primary Students on WSB	1.2

This data can be used to calculate the impact of the TravelWise programme on vehicle kilometres travelled, as shown in Table 8:

Table 8 : Impact of TravelWise programme on vehicle km travelled

	Number of students	Number of vehicle trips shifted to walk each year	Length of walk trips	Km of vehicle travel saved each year
TravelWise Secondary Schools	14,492	244,922	1.8	450,103
TravelWise Intermediate Schools	11,246	190,063	1.7	319,633
TravelWise Primary Schools	16,887	285,399	1.0	283,516
Walking School Bus		824,501	1.2	989,401
				2,042,653

Thus the Auckland TravelWise programme reduces the distance travelled by private vehicle to school by 2 million kilometres each year.

4.6 The impact of TravelWise on CO_2 emissions

Trips to school in Auckland are short, and are made at peak times to congested destinations. As noted in 4.4 above, TravelWise survey data indicates that 42% of such trips are true "cold-start" trips, involving a trip of around 2km round distance from home to school and back home again. Side trips to school on the way to work or another destination are also likely to encounter delays and to involve stopping, reversing and travelling in very slow traffic.

As for the busway calculation, emissions factors for CO_2 were adapted from the Auckland Air Emissions Inventory (Metcalfe et al, 2006). To model the car trips removed by School Travel Plans, trips which involved dropping a child at school on the way to another destination (58% of trips) were taken as "suburban interrupted" (355 g/km) and return trips (42% of trips) were taken as "suburban cold start" (498 g/km) values. Again, a correction factor of 0.808 is applied to remove emissions from buses and trucks. This gives a car emission factor of 336 g/km.

The annual impact of TravelWise Schools on CO_2 emissions is therefore:

$$2{,}042{,}000 \text{ km/year} * .000336 \text{ tonnes/km} = \underline{685 \text{ tonnes } CO_2\text{/year}}$$

5 Cost per tonne of CO_2 for Northern Express and TravelWise Schools

The cost per tonne of CO_2 saved through the Northern Express and TravelWise Schools projects can be benchmarked against other emissions reduction strategies using a cost per tonne calculation.

This is not a fair comparison, as both projects contribute to an overall effective transport network, and have transport benefits which exceed the costs. CO_2 emission reductions are a secondary benefit of these projects, and the costs are not directly comparable with projects whose main or sole aim is to reduce or offest CO_2.

The comparison, however unfair, is nonetheless interesting: LandCare Research (2007) offers the opportunity to offset CO_2 emissions by sponsoring the retirement of grazing land to native forest in NZ at a cost per tonne of $30. The cost of reducing transport emissions through the projects analysed in this paper is over 100 times greater, as shown in Tables 9 and 10.

Table 9 : Cost per tonne calculation for Northern Express services

	2006/07
Net cost of bus contracts	$4,511,000
Operational costs, Albany & Constellation stations	$987,000
Depreciation costs for 2007/08 for A&C stations	$785,000
Annual operating costs for Northern Express	$6,283,000
Annual CO_2 savings	1,162
Cost per tonne of CO_2 savings, Northern Express	$5,407

Table 8 : Cost per tonne calculation for Travelwise Schools

	2006/07
Cost of preparing & monitoring School Travel Plans & supporting WSB	$1,890,000
Road safety activities (opex) in support of Travel Plans & WSB	$900,000
Annual CO_2 savings	685
Cost per tonne of CO_2 savings, TravelWise Schools	$4,073
Does not include the following:	
Road safety infrastructure (capex) in support of Travel Plans	$5,000,000

As noted above, these projects have other benefits which more than justify their costs. However if the CO_2 emissions impacts are valued at the current cost of offsetting CO_2 , these values will be small in relation to project cost.

6 Conclusion: Will we ever get there?

Busway customers, and children at TravelWise schools, have clearly reduced their car use and hence their personal contribution to CO_2 emissions and to global warming.

However these benefits are less impressive when placed in context with the overall trend towards increasing emissions from land transport. The Auckland Regional Council (2005b) has calculated that annual CO_2 emissions from the Auckland land transport system were 3.7 million tonnes in 2001, and that this is forecast to increase by 21 %, to 4.5 million tonnes annually, by 2016. This equates to an annual increase of around 50,000 tonnes of CO_2 between 2006 and 2007.

In combination, these two projects have offset that increase by 1,847 tonnes or 3.7%. This is a measurable step in the right direction, and is expected to continue and grow in future years as the Northern Express services travel on a dedicated Busway, and as School Travel Plans become active in more schools. Yet the activities analysed in this paper would need to be scaled up by a factor of around 30 to halt the increase in emissions from the Auckland land transport system; actually achieving a reduction in emissions would require more than this.

The stated goal of New Zealand's energy policy is not merely to offset the increase in emissions, but to reduce emissions in line with New Zealand's obligations under the Kyoto Protocol. It is recognised that land transport emissions present particular challenges, however the Ministry of Economic Development (2006) states in the draft NZ Energy Strategy that "the long term challenge is to reduce greenhouse gas emissions from the transport sector". The document goes on to explain that "ensuring that our transport system is resilient and less reliant on oil will require moderate changes at many levels." The analysis in this paper suggests that the level of change required goes well beyond "moderate".

In conclusion, it is possible to measure the impact of a transport project on CO_2 emissions through the GIS analysis of survey responses, and this calculation has been done for two very different transport projects. In both cases, the impacts of the project on CO_2 emissions is positive, but small in relation to the overall growth in emissions from land transport, and in relation to the project cost.

This is not in any sense a criticism of either project; both the Northern Express bus service and the TravelWise Schools programme are successful enhancements to the Auckland land transport system. Both projects contribute to economic and social goals in a cost-effective way while having an overall positive impact on the environment.

The direct customers of these two projects have reduced their car use and hence their CO_2 emissions. Because only two small subsets of Auckland residents are involved (Northern Express customers and students at TravelWise schools) it is not surprising that emissions reductions are also small in proportion to the total CO_2 emitted by the Auckland land transport system.

The conclusion of this paper is simply that neither project is a panacea. Climate change is a real and urgent issue that requires an informed policy response. To enable such a response, it is important not only to establish whether a project is having a positive impact, but to quantify that impact and compare it with the size of the overall challenge ahead. Simply heading in the right direction is not enough; hard targets are needed to ensure that we also reach our destination.

Each of the two projects analysed in this paper is a step in the right direction, but there is a long road ahead if transport systems are to become truly sustainable.

7 Acknowledgements

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North Shore City Council
Auckland City Council
Auckland Regional Transport Authority

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Auckland Sustainable Cities Programme
Ministry for the Environment
Auckland Regional Council
Auckland, North Shore, Waitakere, Manukau, Rodney, Papakura and Franklin Councils
Ministry of Health
Ministry of Education
Ministry of Transport
Land Transport NZ
Energy Efficiency and Conservation Authority
NZ Police
Transit NZ
SafeKids
SPARC

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