

○ BROADBAND TELECOMMUNICATIONS AND URBAN TRAVEL

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Energy consumption associated with transport is one of the major contributors to greenhouse gas emissions. As the information economy expands, the potential to use broadband to eliminate a percentage of daily trips grows. In particular, broadband can make it possible for a percentage of the workforce to work effectively and efficiently from home on at least one or two days a week.

This paper explores key economic and environmental benefits of a hypothetical 5% reduction in daily trips. Using a simulation model to assess the impact on traffic flows indicates that such a reduction would result in a 5.6% reduction in greenhouse emissions in Canberra, a low-congestion city, and 17% in Sydney. It would also result in savings of 5.54% in road maintenance, accidents, motorists' time and fuel costs or about \$145 million annually or \$1,000 per household by 2011. In Sydney these would be 10.5% or \$5 billion annually or \$3,300 per household.

INTRODUCTION

This paper enumerates some of the potential community advantages which may be available due to increased use of broadband telecommunication connections. It focuses on the potential to reduce daily commuting travel and the consequent savings in travel costs, greenhouse emissions and other harmful emissions.

WHO IS WORKING AT HOME?

The use of fast electronic connections is essential to small businesses many of which are operated from home. While broadband telecommunication offers other opportunities to reduce travel, daily commuting to work is one major area to investigate.

The Australian Bureau of Statistics Census 'Journey to Work' data provides information about those who "Worked at Home" on the day of the 2001 Census. This includes:

- Those who normally work at or from home – that is they are self-employed or carry out business from home, and
- Those whose normal workplace is elsewhere, but who worked at home on the day of the Census. This number would understate the total number of those who are able to take their work home because, presumably, they could not do this every day.

In the 2001 Census 4.28% of the total Canberra workforce worked at home and for 12.6% of these the normal workplace was elsewhere. Suburbs which offered only a small range of employment had more people working at home than those with larger job opportunities as illustrated in Figure 1 and in Table 1.

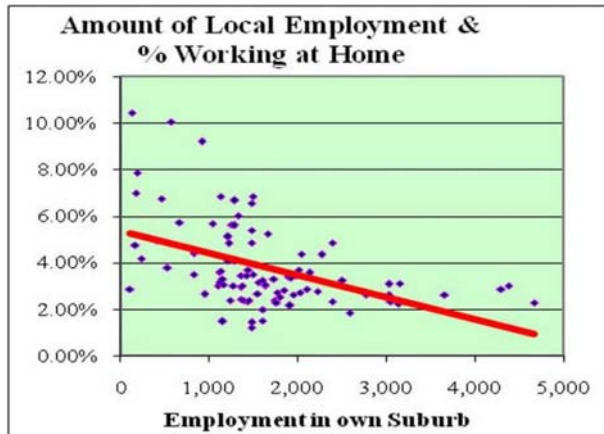


Figure 1 Employment offered in Suburb and % Working at Home
 Source: Derived from ABS Census Journey to Work data 2001

Employment in Suburb	% Working at Home
From 100 to 1,000	5.75%
1,001–2,000	3.54%
More than 2,000	3.02%

Table 1 Employment offered in Suburb and % Working at Home
 Source: Derived from ABS Census Journey to Work data 2001

It might be expected that more people would work at home if they faced high travel costs but Figure 2 shows that this is not the case.

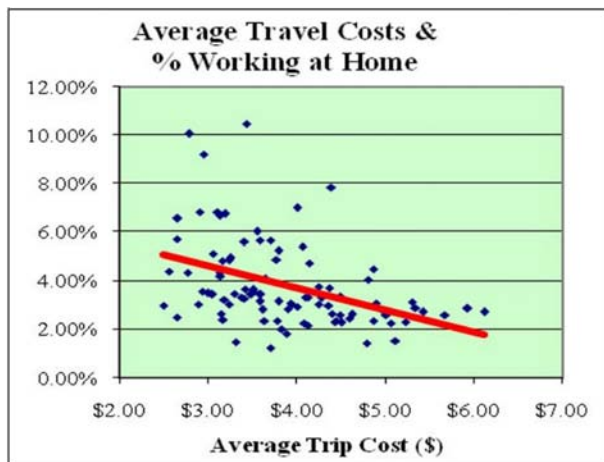


Figure 2 Average Travel Costs and % Working at Home in Canberra
 Source: Derived from ABS Census Journey to Work data 2001 & the Canberra Urban Travel Simulation Model

Suburbs in Canberra with higher average travel costs had a lower proportion of people working from home in 2001 than those with lower travel costs.

WHAT HAS BROADBAND GOT TO DO WITH IT?

Only a few suburbs in Gungahlin, one of Canberra’s Towns, would have had broadband connection at the time of the 2001 Census. However, most of Canberra was connected then and Table 2 shows that there is a higher proportion of people working at home in residential suburbs with broadband connection than without it.

Broadband	% Working at Home
Not connected	2.54%
Connected	3.93%

Table 2 Broadband Connection and % Working from Home¹
 Source: Derived from ABS Census Journey to Work data 2001

Offices are more likely to have broadband connections to individual workplaces than is the case of retail or commercial workplaces. This provides a greater opportunity for employees to work at home but still keep in constant contact with their office teams.

Table 3 shows that suburbs with mainly office employment have higher proportions of their staff working from home than those with retail or commercial employment.

Type of Workplace	% Working at Home
Commercial	1.21%
Office	5.83%

Table 3 Type of Workplace and % Working from Home in Canberra
 Source: Derived from ABS Census Journey to Work data 2001

IS WORKING AT HOME LIKELY TO GROW?

The pressure on finding skilled employees and the rapid increase in the number of persons over 65,² in Canberra as elsewhere in Australia, has meant that many people are retiring later or going back to work. Many seek part-time employment or the opportunity to work from home at least some days of the week.

Table 4 shows that there is a greater percent of people working at home in Canberra’s older suburbs than in new suburbs. The older suburbs have a higher proportion of retirees than the new suburbs.

Age of Suburb	% Working at Home
New	2.55%
Older	4.20%

Table 4 Age of Suburb and % Working at Home in Canberra
 Source: Derived from ABS Census Journey to Work data 2001

IS THERE ANY EVIDENCE OF A TREND?

The proportion of those who worked at home on the day of the Census, in one largely office area of Canberra, increased from 0.35% to 0.77%, when comparing the 2001 Census with the 2006 Census.³ While still a very small proportion of those who attended work those days, it grew by 120% in the five years between the two Census periods.

The same data showed that, in the same area, there were many changes in the way people journeyed to work as shown in Table 5.

Travel Mode	% in 2001	% in 2006	% Change
Bus	5.31%	6.34%	19.49%
Car	88.46%	83.77%	-5.30%
Motorcycle	0.75%	1.31%	74.17%
Walk & Bicycle	5.48%	8.58%	56.58%
Total	100.00%	100.00%	

Table 5 Changes in Mode of Travel to Work – 2001 to 2006 – in Canberra
Source: Derived from ABS Census Journey to Work data 2001 and part 2006

These changes are substantial and have been mainly brought about by restrictions on car parking in this area of Canberra.⁴ The same policies will influence the propensity to work from home.

However, rather than passively await the effects of parking policies there are other means available to encourage working at home or at least to remove impediments from those who would like to spend some days a week working from home.

ARE THERE ANY DEPARTMENTAL POLICIES FOR WORKING AT HOME?

At least one Federal Government Department has set out its formal policy on staff working from home. It is aimed at working mothers, the disabled and those who have difficulty travelling but it does apply to all employees who have reason to apply. It states the grounds on which an application to work from home would be considered and the conditions which would apply. It is very thorough and detailed. The conditions include such matters as an Occupational Health and Safety Inspection of the workplace at home.

WHAT IS A REASONABLE TARGET FOR REDUCTION IN TRAVEL?

At present about 4.3% of Canberra's employed people worked from home on the day of the 2001 Census. From the small sample of data available, it is clear that this proportion had increased by a large amount in the 2006 Census. Although it is unlikely to be quite that high, if all areas increased as much as this sample (120%) then this would mean that about 9.5% of Canberra's employed persons would have worked from home in 2006, an increase of 5.2%.

Broadband access provides a very wide range of opportunities for on line business. It provides e-mail facilities and the ability to transfer business files internationally very quickly. It provides

for virtual private networks and video conferencing for business on a local or international scale. All of these create the potential to reduce work travel.

However, the journey to or from work is only a part of travel in each day. Travel is undertaken for education, shopping and many forms of personal business and recreation as illustrated in Table 6.⁵

Trip purpose	All Day	AM Peak	PM Peak
Commuting	36.44%	55.33%	49.26%
Education	10.55%	23.06%	2.74%
Shopping	41.27%	17.43%	42.24%
Recreation	22.07%	5.12%	17.99%
Return Home	79.59%	94.96%	80.99%

Table 6 Travel Purposes in Canberra (1997)
 Source: Household Interview Survey of Canberra/Queanbeyan 1997 (W. P. Bown & Partners 1997)

Broadband telecommunication, however, provides more opportunities for reducing daily travel than just the incentive and opportunity to work at home. It provides an enhanced opportunity to shop on line and reduce shopping travel. You do not need to go to the bank but can receive and make payments on line much more cheaply and faster. It provides opportunities to watch sport or movies on line and avoid travel for entertainment purposes and it provides opportunities for talking with and viewing your friends on line and to send them family photographs or movies.

Although it is not possible to assess the extent to which all of these on line activities are growing and reducing travel, it is obvious that these applications are growing rapidly and all tend to reduce the need for travel.

It would not be unreasonable to set a hypothetical target to reduce daily travel by 5% by the next Census period in the year 2011 in order to illustrate the advantages that its achievement would endow on the people of Canberra.

WHAT POTENTIAL SAVINGS TO TRANSPORT COSTS ARE THERE?

A reduction in urban travel will reduce the cost to the community of road accidents and it will save road users some of their time, the cost of fuel and other vehicle operating costs. It will reduce the annual cost to Governments of energy-consumptive road maintenance activities as part of this cost in dependent on traffic volumes.

An estimate of the potential annual savings in these transport costs from a 5% reduction in travel is shown in Table 7. This represents an average annual saving of about \$1,000 per household in Canberra in 2011.

Annual Transport Costs	Now	With 5%	Saving	% Saving
Road User's Time (\$Millions)	\$1,124	\$1,038	\$87	7.70%
Road Accidents (\$Millions)	\$623	\$609	\$15	2.36%
Fuel (\$Millions @ \$1.20/Litre)	\$336	\$322	\$14	4.05%
Other Vehicle Operating Costs (\$Millions)	\$482	\$453	\$29	5.96%
Road Maintenance (\$Millions)	\$58	\$56	\$2	2.86%
Total Annual Cost (\$Millions)	\$2,623	\$2,478	\$145	5.54%

Table 7 Potential Savings in Annual Transport Costs in Canberra/Queanbeyan – 2011
Source: Derived from Results of Travel Simulation for Canberra/Queanbeyan

This estimate was prepared using a travel simulation model covering the whole of Canberra and Queanbeyan (Scott Wilson Nairn 2002), which is derived directly from demographic and other land-use data and allows for public transport and street congestion effects. It has been recently updated with the available 2006 Census data, allowing for household income and population ageing effects, and calibrated against the most recent Household Interview Surveys and Traffic Count data. It is a forecast for the year 2011 (Bob Nairn Consultant 2007).

The propensity for people to travel is influenced by parking availability, the price of fuel and delays caused by congestion.

While Canberra/Queanbeyan residents have had to absorb recent increases in the price of fuel, only a small proportion of the streets in Canberra have severe congestion and only a few areas have onerous parking restrictions. However, a much larger proportion of Sydney streets are heavily congested at peak times and parking prices and restrictions are more severe. This affects the travel behaviour of Sydney residents, who have a higher propensity to use public transport, have to pay tolls and higher parking charges. Therefore savings in travel in Sydney should illustrate greater savings.

Unfortunately, the ABS Census data is not available in the same form as that for Canberra at this time so 'Working at Home' statistics for Sydney cannot be used in this paper. However, if the same target for a reduction in travel is set (a reduction of 5% by 2011) then a similar estimate of the potential annual savings in transport costs for Sydney is shown in Table 8 (Bob Nairn Consultant 2004).

Annual Transport Costs	Now	With 5%	Saving	% Saving
Road User's Time (\$Millions)	\$34,155	\$30,093	\$4,062	11.89%
Road Accidents (\$Millions)	\$982	\$965	\$17	1.71%
Fuel (\$Millions @ \$1.20/Litre)	\$5,064	\$4,721	\$343	6.77%
Other Vehicle Operating Costs (\$Millions)	\$7,271	\$6,644	\$627	8.62%
Road Maintenance (\$Millions)	\$519	\$508	\$11	2.12%
Total Annual Cost (\$Millions)	\$47,990	\$42,931	\$5,059	10.54%

Table 8 Potential Savings in Annual Transport Costs in Sydney – 2011
Source: Derived from Results of Travel Simulation for Sydney

This represents an average annual saving of about \$3,300 per household in Sydney.

This estimate was prepared using a similar travel simulation model covering the whole of the Sydney Metropolitan Region for the year 2011.

WHAT POTENTIAL SAVINGS IN GASEOUS EMISSIONS FROM TRANSPORT SOURCES ARE THERE?

Urban travel is a major contributor to greenhouse emissions and this contributes to global warming. Urban travel also creates the potential for smog and for unhealthy concentrations of harmful gaseous emissions.

Building a healthy and sustainable future is of increasing importance and urgency and any means of reducing greenhouse and noxious gaseous emissions from urban travel sources has a high premium.

An estimate of the potential annual savings in greenhouse gas emissions available from a 5% reduction in travel by 2011 is shown in Table 9.

Annual Gaseous Emissions	Now	With 5%	Saving	% Saving
Hydro Carbons (kg)	4,665	4,398	267	5.73%
Carbon Monoxide (kg)	27,520	25,868	1,652	6.00%
Carbon Dioxide (Tonnes)	75,087	70,868	4,219	5.62%

Table 9 Potential Savings in Annual Greenhouse Emissions in Canberra/Queanbeyan

Source: Derived from Results of Travel Simulation for Canberra/Queanbeyan

It is estimated that the target 5% reduction in daily travel would result in over 5.6% reduction in greenhouse emissions in Canberra and Queanbeyan.

A similar estimate of the potential annual savings in harmful gas emissions available from a 5% reduction in travel by 2011 is shown in table 10.

Annual Gaseous Emissions	Now	With 5%	Saving	% Saving
Nitrogen Oxides (kg)	9,050	8,461	589	6.50%
Sulphur Dioxide (kg)	165	156	9.5	5.74%
Particulate Matter 10 (kg)	163	154	9.5	5.79%
Lead (g)	508	478	29.7	5.84%

Table 10 Potential Savings in Annual Noxious Emissions in Canberra/Queanbeyan

Source: Derived from Results of Travel Simulation for Canberra/Queanbeyan

It is further estimated that the 5% reduction in daily travel would result in over 5.7% reduction in all forms of potentially harmful gaseous emissions in Canberra and Queanbeyan.

This estimate was derived from the street traffic forecasts from the travel simulation model covering the whole of Canberra and Queanbeyan for the year 2011 and utilizing the most recently available emission information.

A similar estimate of the potential annual savings in greenhouse gas emissions available from a 5% reduction in travel in Sydney by 2011 is shown in Table 11.

Annual Gaseous Emissions	Now	With 5%	Saving	% Saving
Hydro Carbons (kg)	43,872	36,397	7,475	17.04%
Carbon Monoxide (kg)	322,484	267,950	54,533	16.91%
Carbon Dioxide (Tonnes)	417,355	343,416	73,938	17.72%

Table 11 Potential Savings in Annual Greenhouse Emissions in Sydney – 2011
Source: Derived from Results of Travel Simulation for Sydney

It is estimated that the target 5% reduction in daily travel would result in about 17% reduction in greenhouse emissions in Sydney. The estimate for noxious gas savings in Sydney is shown in Table 12.

Annual Gaseous Emissions	Now	With 5%	Saving	% Saving
Nitrogen Oxides (kg)	41,215	33,750	7,465	18.11%
Sulphur Dioxide (kg)	790	649	140.9	17.83%
Particulate Matter 10 (kg)	932	765	166.5	17.87%
Lead (g)	1,174	971	203.3	17.31%

Table 12 Potential Savings in Annual Noxious Emissions in Sydney – 2011
Source: Derived from Results of Travel Simulation for Sydney

It is estimated that the 5% reduction in daily travel would result in about 18% reduction in harmful gaseous emissions in Sydney. This estimate was derived from the street traffic forecasts from the travel simulation model for Sydney Metropolitan Area for the year 2011.

CONCLUSIONS

Broadband telecommunications access provides a wide range of opportunities for small businesses operating from home or for employees working at home and connecting to their base office elsewhere. It provides customers access to home pages and on-line purchases. It provides e-mail facilities and the ability to transfer business files very quickly. It provides for virtual private networks and video conferencing for business on a local or international scale.

This paper has shown that the spread of broadband telecommunication technology has been effective as one of the causes for the observed increase in working at home in Canberra.

While working from home is an important component in the bid to reduce urban travel, people travel for many other purposes than commuting. Broadband telecommunications also creates opportunities for carrying out a number of shopping, educational or recreational activities that otherwise involves urban travel. However, it has not been possible to firmly establish the extent to which this travel reduction has taken place for all of these travel purposes. Consequently a reasonable target of 5% reduction in travel by the year 2011 has been adopted in this paper to illustrate the potential advantages this creates.

A reduction in urban travel will reduce the cost to the community of road accidents and it will save road users some of their time, the cost of fuel and other vehicle operating costs. It will save energy-consuming road maintenance work.

In addition, urban travel is a major contributor to greenhouse emissions and this contributes to global warming. Urban travel also creates the potential for smog and for unhealthy concentrations of harmful gaseous emissions. Building a healthy and sustainable future is of increasing importance and urgency and saving greenhouse and noxious gaseous emissions has a high premium.

The substantial reductions in urban emissions and travel costs enumerated in this paper are unlikely to be achieved without the communication flexibility offered by broadband telecommunications.

ENDNOTES

- 1 Residential Suburbs only.
- 2 The average age of Canberra residents increased about 2 years during the 5-year inter-census period 2001 to 2006.
- 3 The 2006 ABS Census “Journey to Work” data for Canberra is not yet available but the author was able to get data covering some office areas employing about 8,000 persons.
- 4 The estimated shortfall in car parking provisions in this area of Canberra is about 900 spaces and this is growing rapidly as more development occurs.
- 5 The columns in table 6 do not add to 100% because travel takes place between workplaces and shopping or between school and recreation locations and these trips are then counted twice in the table.

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