NATIONAL ROAD TRANSPORT COMMISSION

EVALUATION OF A 50 KM/H DEFAULT URBAN SPEED LIMIT FOR AUSTRALIA

November 2001

Prepared by:
Monash University Accident Research Centre

National Road Transport Commission

Evaluation of a 50 km/h Default Urban Speed Limit for Australia, November 2001

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ISBN 0 642 54494 8

REPORT OUTLINE

Date:	November 2001
ISBN number:	0 642 54494 8
Title:	Evaluation of a 50 km/h Default Urban Speed Limit for Australia
Address:	National Road Transport Commission PO Box 13105 Law Courts, Victoria, 8010 Website: www.nrtc.gov.au E-mail: nrtc@nrtc.gov.au
Type of report:	Discussion Paper
Objectives:	Improving Road Safety
NRTC Programs:	Safety
Key Milestones:	Submission of final proposal to the Australian Transport Council expected in early 2002
Abstract:	Australia has applied a 60 km/h default urban speed limit since 1974. In 1999, the Australian Transport Council approved the Australian Road Rules with 60 km/h as the default speed limit for built-up areas. From the early 1990s, individual jurisdictions have introduced lower urban speed limits in various trials. This report: • evaluates available data from Australian trials; • reviews local and overseas research on the impact of lowering speed limits in urban areas; • analyses estimates of the costs and benefits of reducing the current national limit to 50 km/h. The report finds that a reduction in the national default urban speed limit to 50 km/h would result in fewer casualty crashes, property damage crashes and reduced air pollution.
Purpose:	For comment
Key words:	speed, speed limits, Australian Road Rules, travel times, pedestrians, cyclists, crash reductions.
Comments by:	31 December 2001

Comments to be addressed to:

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FOREWORD

Australia's population is heavily concentrated in capital cities and major provincial centres. As a consequence, some 60% of vehicle travel occurs in urban areas. Most crashes in Australia also occur in urban areas. Up to one third of fatalities and serious injuries take place on local streets.

The downward trend in the national road toll evident during the early 1990s - and even more so during the previous decade - has stalled in recent years. States and Territories have produced comprehensive road safety strategies and detailed action plans to achieve further reductions. The prevalence of speeding is seen by all jurisdictions as one of the main barriers to achieving a lower road toll. In these circumstances, the issue of urban speed limits takes on great significance.

An important study of urban speed management in Australia was undertaken during the mid-1990s (Austroads, 1996), to assist in the development of a nationally harmonious Urban Speed Management policy. A clear thread running through the specific conclusions of the report was the recognition of the potential to derive significant road safety benefits from lower urban speed limits in Australia. In addition, it concluded that "any changes in speed zoning practices should be incorporated in the Draft Australian Road Rules", which were then being drafted by the National Road Transport Commission.

While the Australian Road Rules approved by the Australian Transport Council in January 1999 had 60 km/h as the default speed limit for built-up areas (Rule 25), individual jurisdictions have implemented lower speed limits. In 1997 New South Wales initiated the trial application of 50 km/h limits in both urban and rural municipalities, now extensively applied. Queensland introduced this limit in the south-eastern area of the State from March 1999. Victoria implemented a statewide default limit of 50 km/h from January 2001. A two-year trial commenced in the Australian Capital Territory from March 2001 and implementation in Western Australia is under way with the aim of completion by the end of 2001. A general urban speed limit of 50 km/h will apply in Tasmania before the end of 2001.

Community opinion is increasingly in favour of action to control speeding. The Community Attitudes Survey Wave 12 (Australian Transport Safety Bureau, 1999) noted that:

"When it comes to nominating the one cause most often leading to crashes, speed dominates the Australian community's thinking…………All sections of the community maintain favourable attitudes towards speed regulation (87% agreeing that 'speed limits are generally set at reasonable levels' and 65% agreeing that speed limits should be lowered to 50 km/h in residential areas)".

This report draws on experience in Australia and overseas to assess the benefits and costs of adopting a national default urban speed limit of 50 km/h. Based on a conservative estimation, it finds that the major benefit would be fewer casualty crashes with minor benefits of fewer property damage only crashes and reduced air pollution. The major cost would be associated with increased travel time and minor costs would arise from increased vehicle operating costs. The net outcome depends on how meaningful it is to value very small increases in travel times. If these are valued, then a reduction in the default urban speed limit to 50 km/h is economically justified only for urban arterial roads currently zoned 60 km/h. If the small travel time increases are not valued, then a reduction in the default urban speed limit is clearly justified, in economic terms alone, for all classes of road considered (local streets, collector roads and urban arterial roads currently zoned 60 km/h).

SUMMARY

Purpose of the report

The purpose of the report is to evaluate the impacts of lowering the national default urban speed limit, to allow reconsideration of the adoption of a 50 km/h default urban speed limit in the Australian Road Rules.

Background

The subject of appropriate speed limits affects all road users, numerous road safety stakeholders, road safety and traffic authorities and law enforcement agencies. The issue was widely discussed in the development of national road rules for Australia. In 1996, the Australian Transport Council (ATC) decided that the draft Australian Road Rules be progressed with a 60 km/h general urban speed limit, but that jurisdictions be able to continue to alter local area speed limits, and that the issue could be revisited and the Australian Road Rules amended in the future if determined by Ministers. Thus, the Australian Road Rules were approved by ATC in January 1999 with 60 km/h as the default speed limit for built-up areas (Rule 25).

In October 2000 the ATC approved the development of a proposal to allow reconsideration of the adoption of a 50 km/h default limit. Part of this process was to include the preparation of an evaluation report in line with the requirements for the content of Regulatory Impact Statements. The results of the evaluation will be subject to comprehensive consultations with stakeholders throughout Australia to be undertaken by the National Road Transport Commission.

Main issues and implications

The main issue centres on the need to consider an appropriate default urban speed limit for inclusion in the Australian Road Rules in the interests of national uniformity of road laws. A 50 km/h speed limit now applies in practice to the majority of the Australian population when travelling on local streets - either by signing or as a default limit.

The evaluation includes estimates of road safety and other benefits from extending 50 km/h limits beyond local streets to those sections of urban arterial roads currently subject to 60 km/h limits. The results provide an objective basis for considering the application of the limit to roads that are not primarily intended to serve an access function.

Environmental and health considerations have provided impetus for the encouragement of walking and cycling as forms of transport. Given the key influence of speed on the severity of injuries sustained by pedestrians and cyclists, this has the potential to expose a greater number of vulnerable road users to risk. Managing the speed of vehicles by the use of appropriate speed limits goes hand-in-hand with the higher priority being given to non-motorised forms of travel.

It is not possible to conclude on the basis of existing information whether there is a specific preferred implementation model. There are both similarities and differences in the approaches taken to date. An evaluation of the Victorian approach - which unlike other jurisdictions relies predominantly on regulation without major expenditure on signing - is not yet available. Nevertheless, the experience so far points to a number of important, and in some cases fundamental, steps that should be considered as part of any future decision by a jurisdiction to adopt a 50 km/h limit.

Research methods/process

Three lines of approach have been used to undertake the evaluation:

- review of local and overseas research on the link between speed and crashes and the impact of lowering speed limits in urban areas

- consolidation of available information from Australian States and Territories on the implementation and trials of 50 km/h limits

- analysis of benefits and costs using a modification of a computer spreadsheet developed as part of the European project MASTER - MAnaging Speeds of Traffic on European Roads. This technique was previously used in a project to estimate the optimum speed on urban local streets conducted by the Monash University Accident Research Centre for the Australian Transport Safety Bureau (Cameron, 2000).

Consultations

Relevant agencies in each State and Territory were advised of the purpose and scope of the project, and assistance was sought for information to help meet its aims. However, broad-based consultations with a wide range of stakeholders did not form part of the evaluation phase of the project. Such consultations will be initiated during the second half of 2001. They are expected to provide valuable feedback on the form of assessment undertaken and on practical issues associated with any future implementation of 50 km/h limits.

As part of such consultations, consideration could be given to a meeting between State and Territory representatives - in a workshop format - at which the merits of different ways of implementing a 50 km/h limit could be explored in detail.

Conclusions

The major factor determining the effect of a reduction in the speed limit is the size of the actual reduction in travel speed. The values adopted to estimate the economic worth of both savings in crash costs and increases in travel times can have a crucial effect on the results of the evaluation and, hence, the conclusions that are reached. In the analyses, the base case was considered to be a reduction in cruise speed of 5 km/h measured according to BTE (2000) based crash cost values and adjusted values of travel time. The Austroads values of travel time (Thoresen, 2000) were adjusted to be comparable with the method of calculating crash costs. Other scenarios that were examined included a 10 km/h reduction in travel speed, higher and lower values of crash costs and unadjusted values of travel time.

The savings in casualty crash costs exceeded the savings in property damage only crash costs and modest benefits were identified from reductions in vehicle emissions. There were several factors that led the estimation of benefits to be conservative. First, the speed-related impacts of carbon dioxide and noise emissions were not measured. However, since these increase with speed, the impact of a lower speed limit in this area would be beneficial. Secondly, the possible benefit of improved speed compliance on collector and arterial roads resulting from lower limits on local streets was not able to be measured. Thirdly, the estimates of crash numbers were based on reported crashes only and therefore the benefits in reductions of non-reported crashes are not included.

The analysis is probably made more conservative by overestimation of costs. The travel time increases are likely to be overestimated because they do not take into account route substitution or destination substitution or trip suppression effects.

Implementing the lower urban speed limit on local streets, collectors and arterial roads currently zoned 60 km/h, is predicted to result in an average increase in travel time per head of population in Australia of about nine seconds per trip (assuming a 5 km/h reduction in cruise speed). If Australians were to accept travel time impacts of this order, it is estimated that about 2,900 casualty crashes would be prevented each year.

The estimated net outcome depends on the extent to which it is meaningful to value very small increases in travel times. If these are valued, then a reduction in the default urban speed limit to 50 km/h is economically justified only for urban arterial roads currently zoned 60 km/h. If the small travel time increases are not valued, then a reduction in the default urban speed limit is clearly justified, in economic terms alone, for all classes of road considered (local streets, collector roads and urban arterial roads currently zoned 60 km/h).

As noted above, substantial casualty crash savings will result if a 50 km/h default urban speed limit applies on urban local streets, collector roads or parts of the arterial road system. These crash savings, in the form of lives saved and long-term health losses prevented, will include significant benefits to pedestrians, motorcyclists, cyclists and other vulnerable road users, as well as vehicle occupants. The bulk of the casualty crash savings are predicted to result from implementation of 50 km/h speed limits on urban arterial roads currently zoned at 60 km/h. Once implemented, savings in life and health will continue to accrue over future decades.

The organisational costs of implementing a lower limit depend on the extent of signing undertaken, and the resources committed to community consultation and education, promotion of awareness of change, the intensity of enforcement and post-implementation monitoring and evaluation. Significant investment in these areas to ensure the maximum impact of a lower limit is justified on the basis of the expected benefits.

In general, the cost of signage for implementing a 50 km/h urban speed limit by the default approach is less than the cost of implementation by signage in speed limited areas. However, the real cost of implementation by the default approach would depend on whether those States and Territories that have already adopted an area-wide approach would change. There is no strong evidence of any additional road safety benefits of a uniform approach to implementation of 50 km/h urban speed limits (although attention to key aspects of planning, coordination and implementation can contribute to how effectively the change to a lower limit is introduced).

Recommendation

It is recommended that national consideration be given to the adoption of a 50 km/h default urban speed limit in the Australian Road Rules.

Next steps

Regulatory processes require the conduct of national stakeholder consultation in order to finalise the development of a proposal for consideration by ATC. These will be initiated by the National Road Transport Commission to enable reconsideration of the default urban speed limit in the Australian Road Rules.

ACKNOWLEDGMENTS

The development of this report was made possible with the financial assistance of the Commonwealth, through the Australian Transport Safety Bureau, who funded the consultancy.

The contribution of the following people who provided information and participated in discussions is gratefully acknowledged:

- Ms Lynne Habner, Project Manager-Operations, National Road Transport Commission
- Mr Chris Brooks, Australian Transport Safety Bureau
- Ms Fiona Calvert, National Road Transport Commission
- Professor Max Cameron, Monash University Accident Research Centre
- Professor Brian Fildes, Monash University Accident Research Centre
- Mr Stuart Newstead, Monash University Accident Research Centre
- Mr Daryl Poole, Senior Engineer Traffic, The Royal Automobile Club of Western Australia
- Dr Ken Ogden, Manager, Public Policy, The Royal Automobile Club of Victoria
- Ms Janet Brash, The Royal Automobile Club of Victoria
- Mr Eric Howard, General Manager, Road Safety, VicRoads
- Mr Sam Pirrotta, Road Safety Department, VicRoads
- Mr R J McKeachie, Acting Director, Road Use Management and Safety, Queensland Transport
- Mr Alex Rae, Manager, National Road Transport Reform, Department of Transport and Works, Northern Territory
- Mr Brian MacDonald, General Manager, Road Transport Section, ACT Department of Urban Services
- Mr William Lok, Acting Chief Traffic Engineer, Traffic Standards Branch, Land Transport Safety Division, Department of Infrastructure, Energy and Resources, Tasmania
- Ms Lynley Crackel, Office of Road Safety, Western Australia
- Mr Ray Brindle, Transport Research Group, Royal Melbourne Institute of Technology
- Mr Geoff Meers, Acting Director (Strategic), Queensland Transport
- Professor Michael Taylor, Director, Transport Systems Centre, University of South Australia
- Ms Rosemary Rouse, Manager, Road User Behaviour, Roads and Traffic Authority of New South Wales

CONTENTS

1. INTRODUCTION

1.1 Background

The Australian Road Rules were developed by the National Road Transport Commission in consultation with relevant agencies representing all jurisdictions, as well as motoring organisations, local government and other interested parties. Most rules were based on existing State and Territory laws, and were included as a result of either unanimous or majority decision by jurisdictions.

In 1996, the Australian Transport Council (ATC) decided that the draft Australian Road Rules be progressed with a 60 km/h general urban speed limit, but that jurisdictions be able to continue to alter local area speed limits, and that the issue could be revisited and the Australian Road Rules amended in the future if determined by Ministers. Thus, the Australian Road Rules were approved by ATC in January 1999 with 60 km/h as the default speed limit for built-up areas (Rule 25).

It was recognised, however, that the issue could be reviewed at an appropriate time in the future. In October 2000 ATC approved the development of a proposal to allow consideration of the adoption of a 50 km/h default urban speed limit, in accordance with the agreed process for consideration of amendments to the Rules.

Part of this process includes the development of an evaluation report covering all relevant issues, in line with the requirements for the content of Regulatory Impact Statements.

1.2 Objectives of the project

The key objective of the project is to develop a proposal to allow national consideration of a 50 km/h default urban speed limit in the Australian Road Rules. To this end, available data from each of the separate Australian jurisdictions where the limit is in place or trials are under way (or proposals to reduce the current limit are being considered) has been obtained.

The emphasis of the project is on the assessment of national impacts in terms of the benefits and costs of reducing the current default limit. The consideration of benefits and costs includes: impact on crashes and their costs; impact on vehicle emissions; effect on travel time and vehicle operating costs.

A further major objective is to document the issues involved in the implementation of a lower limit, with consideration of:

- a preferred approach;
- State/local government roles;
- enforcement;
- education and publicity.

The recommendations in the report will form part of wider public and stakeholder consultation to be undertaken by the National Road Transport Commission, prior to submission of a proposal for consideration by the Australian Transport Council.

1.3 Project approach

Three main sources of information have been used:

- information provided by States and Territories on the planning, implementation and evaluation of 50 km/h limits;
- outcomes of research conducted in Australia and overseas on the links between speed and crashes and the road safety impact of reducing speed limits;
- available data on the environmental impacts of vehicle speeds in urban settings, and the influence of changes in speeds on travel times and the costs of vehicle operation.

The information from States and Territories has provided a perspective on the different approaches adopted in various jurisdictions and important issues affecting the practical implementation of a lower limit.

2. PROBLEM AND OBJECTIVES

2.1 Problem

Urban roads account for over half of the vehicle kilometres travelled in Australia (1999) as shown below.

Table 1. Summary of vehicle travel and road length in Australia. (Source: Austroads, RoadFacts 2000)

	Length (km)	Percent of Total Length	Travel Million Vehicle Km	Percent of Total Travel
Urban Local	84,845	10.4%	31,194	18.3%
Urban Arterial	12,398	1.5%	67,534	39.6%

The significance of vehicle travel on urban roads is a direct consequence of Australia's population being heavily concentrated in capital cities and major provincial centres. In conjunction with a high level of motorisation, the result is a correspondingly high exposure to crash risk. Although the proportions vary between jurisdictions, up to a third of all fatalities and serious injuries occur on local streets (Radalj, Main Roads Western Australia, 1999 cited in Office of Road Safety 50 km/h webpage).

Figures published by the Roads and Traffic Authority of New South Wales show that 42% of those killed in crashes died as a result of a speeding driver (RTA NSW, 2001). Similarly, in Western Australia speed is recognised as a factor in 39% of fatal crashes (Road Safety Council WA, cited in Office of Road Safety 50 km/h webpage).

The concern of road safety agencies about speeding goes beyond the view that speed problems in urban streets can be attributed to the actions of a few irresponsible individuals, or the hazards that exist at a number of unsafe locations. There is now a greater emphasis on achieving safer speeds throughout the whole road system, and not simply focusing on minimum enforceable standards. Speed policy is seen as a major part of achieving desired safety objectives.

2.2 Objectives

The objective of the proposed change is to improve road safety through reduction in road trauma, which is consistent with the National Road Safety Strategy target of reducing fatalities per head by 40% by 2010. This project has investigated the extent to which a reduction in urban speed limits can contribute to this national objective.

2.3 Factors influencing the setting of speed limits in urban areas

2.3.1 Relationships between speed and crashes

Research undertaken by the National Health and Medical Research Council Road Accident Research Unit, University of Adelaide has clarified the relationship between speed and the risk of involvement in a casualty crash in 60 km/h speed zones (Kloeden, McLean, Moore and Ponte, 1997). A direct link had previously been generally accepted but its particular nature in the Australian context remained uncertain.

None of the drivers of case vehicles in the study had a measured blood alcohol reading so that the effects of alcohol on crash risk could be excluded. The results were also compared to previous findings on the effects of alcohol on crashes, enabling the relative risks of speeding and alcohol consumption to be directly compared.

The main findings were:

- the risk of involvement in a casualty crash approximately doubles with each 5 km/h increase in travel speed above 60 km/h;
- if none of the crashed vehicles in the study had been travelling above 60 km/h nearly 50% of the casualty crashes would have been avoided or reduced to non-casualty crashes;
- speeding in an urban area is as dangerous as driving with an illegal blood alcohol concentration (BAC); even travelling at 65 km/h increases the risk of crash involvement as much as driving with a BAC of .05;
- most of the crashes occurred on main roads with a relatively small proportion on local streets; this provided support for a lower speed limit throughout urban areas particularly on arterial roads.

Several factors were considered to be involved in the increase in crash risk with increasing speed:

- the greater distance that is travelled at higher speeds during the recognition and reaction time of the driver and the braking of the vehicle;
- the greater likelihood of losing control at higher speeds;
- misjudgement by drivers about the speed of another vehicle.

The link between speed and injury severity has previously been accepted as much more clear-cut. Even very small reductions in mean travel speed have a substantial impact on injuries and a greater effect on fatalities (Haworth, Symmons, 2001). A number of studies have confirmed that pedestrian crash risk is considerably lower when speeds are reduced. McLean, Anderson, Farmer, Lee and Brooks (1994) found that with a uniform reduction in travel speed of 5 km/h there would be a reduction in pedestrian fatalities of some 30%.

2.3.2 Vehicle speed and occupant protection

The ability of the modern motor car to protect occupants has advanced markedly over the years (Newstead, Cameron, Le, 2000). The mandatory standards of performance required by Australian Design Rules, and competition between manufacturers - as well as the market forces exerted by more informed and aware consumers - have combined to produce much safer cars. Both primary safety (crash avoidance features) and secondary safety (occupant protection) have been the focus of vehicle design improvements. However, most regulatory and consumer tests of vehicle crashworthiness are based on impact speeds of less than 60 km/h. With the combination of modern vehicles and our current road system, death and serious injury are regular and predictable consequences of crashes involving travel speeds of about 60 km/h.

2.3.3 Purpose and characteristics of local roads

Mobility and reduced travel times are valued objectives. Meeting these requires the provision of through-traffic routes with appropriate higher speed zones above the general limit. On the other hand, motorists also require safe access to residential areas where it is now generally recognised that high speeds are inappropriate. As shown by attitude surveys (Australian Transport Safety Bureau, 1999) motorists have become increasingly receptive to the idea of lower speed limits where the nature of land use activity and the built environment justify.

Despite some differences in the physical features of local streets (for example width, the presence of traffic management treatments, line markings), their essential purpose is to provide access to dwellings and local facilities whether by car or other means. Local streets are where children play, social contacts are made, students walk to school, pedestrians go to and from public transport facilities, teenagers ride bicycles and drivers and motorcycle riders access properties. They are unsuited by design or surrounding land use to function as through traffic routes or for travel at high speed.

Collector roads are designed to take on an increased vehicular traffic function within the local street system. Their access function, however, remains critical along with many of the other uses typical of access streets.

There can be noticeable differences in the characteristics of older and newer residential areas that impact on road use. In older areas through traffic is often heavy and the street network does not easily allow for the efficient control of traffic flows to the extent it does in newer and better planned environments. The streets are often used extensively for parking by non-residents, creating pedestrian hazards. Newer areas are more distinctly residential with the road network more differentiated according to traffic function and designed to discourage or eliminate through traffic. Most houses are located on access streets with low traffic volumes.

A range of measures are available to achieve safer local streets - whether by reducing the impacts of traffic in residential areas by initial planning, or the application of traffic calming techniques, as well as implementation of an appropriate speed limit structure.

2.3.4 Vulnerable road users

Pedestrians, cyclists and motorcyclists are much more vulnerable in the traffic system. Pedestrian crashes peak in areas such as strip shopping centres, near entertainment venues and around schools where walking activity is high and interaction with vehicles frequent. Victorian data indicates that pedestrians are 3.2 times more likely to be involved in a fatality and 1.7 times more likely to be involved in a serious injury than other road users (VicRoads, 2000).

Pedestrian crashes involve all age groups in the community. However, children, younger adults and older age groups are more significantly involved. Child and teenager pedestrian crashes most often occur in local streets with 60 km/h speed limits. In children the ability to judge the speed and distance of cars is not well developed. For older pedestrians factors such as reduced perceptual and cognitive functions come into play, along with reduced road use skills associated with age and less physical mobility. Older pedestrian crashes most often occur on arterial roads.

The apparently simple act of crossing a road can be intimidating for pedestrians, particularly the young and elderly. The higher the volume of traffic and the greater the speed, the more real the threat to safety becomes. Walking is an essential part of the way citizens move about, whatever the purpose of the journey - for work, school, shopping, or for recreation and social activity. How are pedestrian needs reflected in the design and development of the road transport system? In the *Austroads Guide to Traffic Engineering Practice: Part 13 - Pedestrians*, the position is described in the following terms:

"Despite the importance of pedestrians, traditional road network planning and design typically focuses on providing for the movement or access function of vehicles. Only more recently, due to increasing environmental, physical and financial constraints, is attention gradually turning to issues of traffic calming and demand management in order to encourage pedestrian, cycling and higher vehicle occupancy modes of transport. Consequently, attention is being drawn to the facilitation of these alternative modes of personal transport." (Austroads, 1995)

The integration of the needs of drivers for mobility and pedestrians for safety is an important issue in Australia's urban areas. Many arterial roads have adjoining developments that encourage pedestrian usage while catering also for motor vehicles travelling at relatively high speed, such as strip shopping centres, social and recreational facilities (playgrounds, entertainment centres, community halls, sporting venues) and dwellings.

Increased traffic has exacerbated two major problems on the main streets of rural towns and many sub-arterial roads. The traffic function is impeded by activities along the frontage, especially where there are heavy parking demands, turning movements and high pedestrian activity. The activities along the frontage suffer from the impact of traffic noise and pollution, difficulty in accessing sites and hazards for pedestrians who wish to cross (Roads and Traffic Authority NSW, 2000b).

Arterial roads with a high frequency of pedestrian crashes are typically undivided, wide and multi-lane with complex traffic conditions (Corben and Diamantopolou, 1996). The multi-function character of such arterial roads can be hazardous for pedestrians and motorists alike. There are a number of traffic engineering measures that can reduce the hazards on arterial roads including speed reduction treatments, reduction of road width, control of traffic volumes, pedestrian and traffic separation measures and road surface treatments. A reduction in the speed limit on arterial roads is addressed in greater detail later in the report.

Although vehicle and road engineering standards have improved, and funds allocated to black spot treatments have eliminated many hazardous locations, the protection of the more vulnerable road users can still be significantly advanced through appropriate speed control in both local and higher speed environments.

3. PROPOSAL AND ALTERNATIVES

The proposal is to reduce speeds in urban areas by reducing the default speed limit from 60 km/h to 50 km/h. The alternative approaches to achieving this objective include:

- signing of speed limited areas;
- enforcement;
- road network planning and traffic management;
- education and publicity.

This section compares the proposal and these alternatives.

3.1 Default speed limits

Speed limits in urban and rural areas are designated either by signs or a default speed on roads where a speed limit sign does not apply. Austroads has previously conducted a review of urban speed management to assist in the development of a national and harmonious approach (Austroads, 1996). It concentrated mainly on the local street network. A key conclusion was:

"Australia has a high urban speed limit compared to most other developed countries. It has been the experience of other countries that reduction of speeds, through lowered speed limits, has resulted in reductions in the severity of crashes."

The introduction of a 50 km/h limit was on balance considered appropriate with several options identified for implementation, namely:

- signing of individual streets at a lower limit while retaining a general limit of 60 km/h;
- a default limit of 50 km/h for all local streets with signing on those streets where higher or lower limits are appropriate;
- comprehensive signing involving installation of signs on all local streets, with the majority of streets having a 50 km/h limit;
- the definition of areas or precincts where higher or lower limits than the general limit would apply, with signing at the entrances to them.

Significant progress has subsequently been made in achieving the aims of the review, with Victoria adopting a whole of State default limit, Queensland adopting a default limit on a zonal basis and New South Wales using area signs supplemented by repeater signs and pavement markings. In Western Australia the limit will apply to local roads throughout the State by the end of 2001. A 50 km/h general urban speed limit is planned to be implemented in Tasmania before the end of 2001. In the Australian Capital Territory, the limit applies on local streets unless there is a sign specifying a higher limit.

A significant conclusion in the Regulatory Impact Statement in Victoria proposing a default speed limit of 50 km/h was its lower cost of implementation compared with the extensive installation of speed limit signs throughout the local street network to achieve the same objective (VicRoads, 2000).

3.2 Signing of speed limited areas

The implementation of a 50 km/h urban speed limit can be accomplished by the extensive installation of 50 km/h signs. Although this approach is an alternative to the application of a default limit, the costs of implementation are relatively high; consequently it has a lower benefit cost ratio than regulation (supported by signing as necessary).

VicRoads has estimated that the costs of extensive signing to achieve the equivalent outcome to that from a default limit would have been almost five times higher (VicRoads, 2000). In the case of Queensland where perimeter and reminder signs were used to support the implementation of the limit on a zonal basis, the costs are considered significant. *"Installation of the Perimeter and Reminder signs was a costly exercise, and was a distinct disadvantage of the zonal approach to the 50 km/h limit"* (Donaghey, Ram, 2000).

Table 2. Default speed limits - summary assessment.

Scope	Default limits have application across a wide area eg statewide
Relative Costs	Less expenditure on signing is required than other direct alternatives that achieve a wide application of lower limits Actual costs are dependent on the extent of signing required eg retention of 60 km/h on collector roads, public education programs undertaken
Effectiveness/Benefits	A Statewide default limit is introduced at one point in time, facilitating the effective coordination of implementation activities A change in the default limit provides a focal point for communicating the significance of speeding as a major factor in road crashes, and influencing community attitudes about speed issues Research shows that a reduction in the urban default limit results in fewer and less severe crashes with all road user groups being affected

Table 3. Signing of speed limited areas - summary assessment.

Scope	Can be applied throughout the local road network or within selected areas
Relative Costs	Costs of signing to achieve widespread application are relatively high
Effectiveness/Benefits	Effectiveness is similar to that achieved by the default approach

3.3 Enforcement

Significant changes in the techniques of speed limit enforcement have occurred since the early 1990s. These include increased use of crash data to guide strategies and target enforcement action, greater use of technology for detection, speedy processing of infringement notices, use of police resource scheduling strategies (such as Random Road Watch (Qld)) to enhance deterrence, more frequent alignment between enforcement action and intensive publicity support and the objective evaluation of programs to improve effectiveness. As a result more road users have been exposed to the possibility of detection. The potential of enforcement to influence driver behaviour in relation to speeding is now much greater.

The use of enforcement is an option to reduce speeds below prevailing levels. This would require more intensive effort and, realistically, greater resources than at present. A “one off” campaign based on current resources, however, is unlikely to have a sustained effect.

The question of enforcement tolerances which many drivers take into account in their driving behaviour must be considered in relation to enforcement as an alternative measure to reduce speeds. A reduction in the tolerance has potential to reduce travel speeds and the severity of crashes. Haworth, Tingvall, Vulcan and Cameron (1999) calculated that a reduction in tolerance to 5 km/h in Victoria would bring about a 7.3% decrease in fatalities and a 6.2% decrease in serious injuries. The saving in fatalities would be spread across speed zones but the serious injury saving would be greatest in lower speed zones (as relatively more serious injury than fatality crashes occur in lower speed zones). A reduction in enforcement tolerance from 10 km/h to 8 km/h would be expected to result in a 4.5% decrease in fatalities and a 3.4% decrease in serious injuries.

Table 4. Enforcement - summary assessment

Scope	Enforcement activity can be area wide or targeted to specific regions or selected locations
Relative Costs	Dependent on intensity and duration of enforcement effort/acquisition of new speed detection equipment
Effectiveness/Benefits	Intensive enforcement in conjunction with publicity has been shown to influence road user behaviour It is likely that campaigns would need to be undertaken periodically to maintain the desired behaviour

3.4 Road network planning and traffic management

One of the strategies to reduce local speeds and accidents is to create street networks that are inherently safer (Brindle, 1998). Layouts that induce lower speeds, avoid vehicle and pedestrian conflict, and reduce the proliferation of cross-intersections and junctions where significant numbers of crashes occur set the conditions for immediate and longer-term gains. Good design practice will ensure that crashes are both less frequent and severe.

In residential areas traffic volumes are typically low. Accidents are diffused throughout the local street network. In general, accident and speed reduction measures in residential areas need to be area wide, in contrast to individual treatments on heavily trafficked roads that can be effective in specific locations.

Local area traffic management comprises a number of specific techniques for reducing speeds. These include road closures, reduced pavement width, introduction of slow points, traffic islands, speed humps, road surface treatments, local precinct speed limits and other means. To achieve reduced speeds throughout the entire local road network in this way requires strong support for an integrated and coordinated approach between State agencies and local government. Significant expenditure on a wide range of traffic engineering treatments would also be required.

The advantage of many traffic engineering measures is that they are often self-enforcing. For example, a well designed roundabout or gateway treatment can be very effective in reducing speed without the need for policing.

Table 5. Road network planning and traffic management – summary assessment

Scope	Network planning and traffic management have potential to improve a significant proportion of the built environment over the longer term; applicable to both new developments and existing environments
Relative Costs	The costs of widespread application would be significant and extend over the long term
Effectiveness/Benefits	There is potential to achieve long lasting/permanent solutions by changing the nature of travel patterns and conflicts between road users, and creating an inherently safer infrastructure Many traffic management measures that reduce speed have the advantage of being self-enforcing

3.5 Education and publicity

Education and publicity in the context of road safety can have several broad objectives: to create awareness of particular issues, convey important information, shift public opinion, and influence road user behaviour. Research indicates that the impact of education and publicity in reducing crashes depends on whether it is associated with changes in legislation or enforcement effort, rather than delivered in isolation (Cameron, Haworth, Oxley, Newstead, Le, 1993).

There is no conclusive evidence that significant shifts in behaviour result from "stand alone" advertising campaigns focused on compliance with existing speed limits. However, education programs are seen as an integral part of initiating significant change such as the introduction of a lower speed limit. The 50 km/h speed limits in various States have generally been implemented as an integrated set of measures including appropriate signing and traffic management, enforcement support, and targeted publicity.

Public education as an alternative approach to reduce travel speeds was considered in Victoria and assessed as part of the Regulatory Impact Statement (VicRoads, 2000). Even with the use of all the major mass media (television, radio, print) and the conduct of campaigns up to three or four times a year, such a strategy was not supported on the grounds that it would not have a marked effect on driver speeds.

Table 6. Education and publicity - summary assessment

Scope	Coverage can be statewide or targeted to particular areas or regions
Relative Costs	Dependent on the selection of media, intended audience reach and duration of programs Would need to be undertaken periodically without certainty of achieving change in speed behaviour
Effectiveness/Benefits	Shown to be less effective than other strategies in achieving a change in road user behaviour

4. REVIEW OF 50 KM/H SPEED LIMITS IN AUSTRALIA AND OVERSEAS

As at July 2001, 50 km/h limits on local roads in built-up areas had been introduced extensively in New South Wales and Queensland and across Victoria. The lower limits have been introduced for a trial period in the Australian Capital Territory and the implementation process has commenced in Western Australia and Tasmania with the aim of completion across the whole of both States by the end of 2001. This section summarises the available information on these implementations and trials and their proven or likely effects.

4.1 Implementation and trials of 50 km/h limits in Australia

4.1.1 New South Wales

4.1.1.1 History of urban speed limits

Walsh (1999) provides a history of urban speed limits in NSW. The NSW general urban speed limit was 30 mph (48.3 km/h) until 1964. In May 1964 the speed limit was increased to 35 mph which brought NSW into line with the other States and Territories and the National Road Traffic Code. The rationale for the increase was that the roads in the 1960s were far superior to the roads of the 1930s when the 30 mph limit was introduced. As part of metrication, the general urban speed limit was increased from 35 mph (56.3 km/h) to 60 km/h in 1974.

A major review of speed zoning practice in the late 1980s resulted in the introduction of 70 km/h and 90 km/h speed zones on higher standard urban arterial routes in 1991. Lower 40 km/h speed zones have been introduced as part of Local Area Traffic Management (LATM) schemes since 1991.

4.1.1.2 The trial

In October 1997, New South Wales local councils and the NSW Roads and Traffic Authority (RTA) implemented a three-month trial of a 50 km/h urban speed limit. The aims of the trial included an assessment of the potential road safety benefits of a 50 km/h urban speed limit and to assess the extent of local government and community support for lowered limits (Walsh, 1999).

The trial included 26 local government areas (LGAs) and was conducted over the period October-December 1997. It included an analysis of the effect of the 50 km/h urban speed limit on accidents, vehicle speeds and community attitudes. The trial achieved reductions in average speeds of 1.5 to 2 km/h in some councils and a 7% reduction in the number of casualties and casualty crashes in the trial LGAs compared to the rest of the State (RTA 1998, cited in Walsh, 1999). Community support for the trial was mixed with a telephone survey showing 66% support, while a newspaper survey showed only 41% support.

4.1.1.3 Implementation process

On 3 June 1998, the Minister for Roads and Minister for Transport invited each New South Wales local council to implement the 50 km/h urban speed limit throughout its LGA. The Minister announced that all implementation costs, including signage and public education costs, would be funded by the RTA.

A Taskforce was established to oversee the implementation of the 50 km/h urban speed limit. It comprised representatives of key stakeholder agencies including NSW Police, Institute of Public Works Engineering Australia, Local Government and Shires Associations of NSW, and NRMA Limited.

The RTA states that:

" The 50 km/h urban speed limit has been implemented as a road safety partnership between councils, their communities and the RTA. This partnership ensures that there is a strong commitment to the new speed limit and therefore increases the likelihood of success". (RTA, 2000a, p.2).

In July 1998, the RTA distributed a *50 km/h Urban Speed Limit Information Kit* to all councils. The kit included a covering letter inviting all councils to participate in the project, a copy of the *50 km/h Urban Speed Limit Trial Evaluation Report*, information on funding and implementation of the community information programs and a copy of the *Draft Guidelines for Implementing the 50 km/h Urban Speed Limit*, which outlined key steps and issues in the development of road hierarchy plans and signage installation. These guidelines were later revised in consultation with councils.

In August 1998, the RTA conducted a one-day workshop for its own regional staff, council Road Safety Officers (RSOs), local government traffic engineers, and officers from the LGSA to develop strategies for the implementation of the 50 km/h urban speed limit, including a public education strategy for participating councils.

Selection of 50 km/h areas

The 50 km/h urban speed limit is designed for local streets in built-up metropolitan areas and in country towns. The number of speed limits that apply within an LGA is addressed within the process of implementing 50 km/h speed limits through the development of signage and hierarchy plans. These plans are developed jointly by the RTA and councils to ensure that streets are zoned consistently to minimise the number of speed zone changes.

As at March 2001, 127 councils (out of 173 LGAs in total) and two communities within the unincorporated area have implemented a 50 km/h urban speed limit. Of these, the vast majority have implemented the limit across the whole LGA and the remainder have implemented it in precincts. These councils house in excess of 90% of the population.

Signage

In partnership with councils, RTA has implemented several strategies to minimise the proliferation of signs. Networks of streets with limited access are posted with area signs, supplemented by repeater signs or pavement markings. Once signage has been installed in an LGA, the RTA conducts an audit.

Community information and education programs

Participating councils were invited to apply for up to $3,000 funding from the RTA for localised community education and consultation programs. This strategy aimed to ensure that councils could conduct community consultation activities in relation to the proposed new limit and build on the RTA's public education campaign by implementing specific local strategies.

The RTA implemented a number of public education strategies to supplement the localised community campaigns implemented by councils. Key elements were a newspaper advertisement for all councils implementing 50 km/h limits, published two weeks before the signs were installed and an information brochure distributed to all households in the affected area.

A number of strategies were introduced that targeted the community, stakeholders, councils, council RSOs, and other key stakeholders. These included:

- an information hotline to respond to enquiries from the community
- distribution of the information brochure through council chambers, motor registries etc.
- a 50 km/h poster distributed to motor registries in affected areas
- a media information kit for council RSOs
- information provided to key stakeholders for inclusion in their newsletters or magazines.

The RTA also implemented television and radio advertising campaigns.

4.1.1.4 Evaluation of the effects of the 50 km/h limit

The evaluation framework for the 50 km/h urban speed limit included:

- analysis of accidents and speeds on roads zoned 50 km/h and community attitude surveys by ARRB Transport Research
- analysis of claims data from 10 LGAs by NRMA Ltd
- telephone interviewing to measure the effectiveness of public education (before and after implementation and post-implementation)
- media monitoring

The evaluations distinguished two groups of LGAs:

- ‘Treatment’ LGAs – LGAs that had taken part in the trial and retained the 50 km/h signage afterwards. These LGAs offered the longest datasets for accident analysis
- ‘Control’ LGAs – LGAs that did not implement the new initiative and retained a 60 km/h urban limit. These controls were used to account for any changes that may have occurred as a result of other road safety initiatives. Efforts were made to match treatment LGAs with similar controls.

Effects on accidents

The analysis of accident changes had a complex design incorporating:

- a trend analysis using simple linear regression to establish a general understanding of the effect of 50 km/h urban speed limit on accidents of different types and involving each of the target groups: young drivers, older drivers, pedestrians, pedal cyclists and motorcyclists
- before and after analysis of actual and expected accidents in the trial and control LGAs

- log-linear regression analysis to measure the effect of the 50 km/h urban speed limit on reported accidents

Trend analysis. The percent accident reductions were greater for all accidents and all casualties in streets zoned 50 km/h than for similar streets which retained the 60 km/h limit (see Table 7). Greater accident reductions were found in the 50 km/h zones than in similar streets for young drivers, older drivers, pedestrians and motorcyclists. There was no difference in the amount of reduction for pedal cyclists, however.

Table 7. Percent accident reductions in 50 km/h zones compared to 60 km/h zones (from RTAa, 2000)

Accident type	Streets zoned 50 km/h	Similar streets which retained 60 km/h limit
All accidents	23	2
All casualties	19	-0.6
Young drivers	34	5
Older drivers	46	no change
Pedestrians	20	9
Pedal cyclists	33	33
Motorcyclists	33	no change

Before and after analysis of all accidents. The before and after analysis of all accidents showed that 21% fewer accidents occurred than would have been expected if the trend from before treatment had continued.

Log-linear analysis. The results were as expected from the models of the role of speed in crashes, with a greater reduction in fatal crashes than in all casualty crashes. That the reduction in all casualty crashes was not greater than that in non-injury crashes is somewhat surprising, however.

The RTA summary report (RTA, 2000a) points out that the reductions in the risks of fatal, pedal cyclist and motorcyclist crashes were not statistically significant, although they were in the expected direction.

Overall, the accident reductions were greater on urban local streets than on rural local streets and the reductions were somewhat less in the second year than in the first year of implementation (see Table 9).

In summary, the accident analysis showed that over the 21 month period there were approximately 262 fewer accidents on those streets speed-zoned at 50 km/h than otherwise expected. The cost saving to the community that has resulted from the accident savings on the 50 km/h streets in the 22 LGAs involved in the evaluation has been estimated to be $6.5 m for the 21-month period.

Table 8. Estimated reductions in risks of different types of accidents attributable to the introduction of the 50 km/h urban speed limit - Period April 1998 to December 1999 (from RTA, 2000a, Table 4).

Accident type	Two year average reduction (%)
Fatal	44.5
All casualty	22.3
Non-injury	26.5
All reported	25.3
Young driver	18.7
Older driver	49.5
Pedestrian	51.2
Pedal cyclist	32.5
Motorcyclist	33.0

Table 9. Estimated percentage reductions in reported accidents attributable to the 50 km/h limits in local streets in NSW (RTA, 2000a, Table 5)

Type of area	Year 1 reduction	Year 2 reduction	Two year average reduction
Urban	33.4	31.5	34.0
Rural	17.5	24.1	17.6

Analysis of insurance claims

NRMA Limited has stated that the implementation of 50 km/h speed limits in the Sydney Metropolitan Area had a positive influence on reducing accident claims on NRMA Insurance.

Effects on speeds

Pre-implementation speed surveys and two post-implementation surveys were conducted in 20 LGAs in the Greater Sydney Metropolitan Area and nine rural LGAs. These 29 LGAs were matched with 12 control LGAs.

Table 10 shows that:

- there was a reduction in both average mean speed and average 85th percentile speed from the before to the first after period
- there was a slight increase in both average mean speed and average 85th percentile speed from the first after period to the second after period

- all speed measurements were higher in rural areas than urban areas
- the reductions as a result of the lower speed limit were similar in rural and urban areas

Table 10. Average mean and average 85th percentile speeds before and after implementation of the 50 km/h urban speed limit

Treatment streets	Average speed			Average 85th percentile speed		
	Before	After Series 2	After Series 3	Before	After Series 2	After Series 3
Urban	57.1	56.2 (0.9)	56.6 (0.5)	65.6	64.5 (1.1)	64.8 (0.8)
Rural	57.5	56.5 (1.0)	56.8 (0.7)	66.5	65.4 (1.1)	65.6 (0.9)
Combined urban and rural average	57.2	56.3 (0.9)	56.7 (0.5)	65.8	64.7 (1.1)	65.0 (0.8)

Community attitudes

Attitudinal surveys were conducted before widespread implementation of the 50 km/h initiative (January 1999) and after (October 1999). Table 11 shows that community views of the 50 km/h urban speed limit were more positive after implementation than before.

The RTA concludes:

"While the reductions in the average mean and average 85th percentile speeds demonstrate a community willingness to reduce speed voluntarily there has not yet been sufficient understanding that 50 km/h is now the maximum legal limit in most urban areas. To ensure drivers travel at the 50 km/h speed limit in urban areas further public education campaigns will be implemented by the RTA. There is widespread community support for the enforcement of the 50 km/h urban speed limit with 77 per cent of NSW residents surveyed in October 1999 indicating that motorists should be booked for exceeding the 50 km/h urban speed limit.

While the responsibility for on-road enforcement of the 50 km/h urban speed limit rests with the NSW Police Service, achieving widespread community compliance will require a combination of stakeholder strategies. These strategies would seek to create a road environment which promotes voluntary compliance and include road calming treatments, improved signage and enhanced media activities". (RTA, 2000a, p.18)

Table 11. Survey responses before and after implementation of widespread 50 km/h urban speed limit. From RTA (2000a).

Response	Percent before implementation	Percent after implementation
Good or very good idea	68	75
Bad or very bad idea	22	17
Safety advantage	75	82
No drawbacks	38	42
Cause impatience	21	16
Be too slow	10	10
Increase travel time	10	9
Cause congestion	8	6
Result in people still driving at 60 km/h	5	3
Some drivers will be frustrated	44	43
All or nearly all drivers will be frustrated	25	21
Slight or no effect on travel time	66	similar to before
Unacceptable effect on travel time	5	NA
Should be booked for exceeding 50 km/h on signposted local streets	76	77

4.1.2 Queensland

4.1.2.1 History

Walsh and Smith (1999) discuss the history of urban speed limits in Queensland. Until the 1930s Queensland had a speed limit on "first class roads" (volumes over 2000 per day) of 30 mph (48 km/h). Since the early 1970s there have been trials of 50 km/h speed limit signs on particular roads.

The proposal for a lower speed limit on local streets within Queensland was first discussed in a Speed Management Issues Paper released in September 1993 (cited in Walsh, 1999). It was identified as a priority action in the Queensland Road Safety Strategy (1993) and the National Road Safety Strategy (1992). Several Queensland Parliamentary Travelsafe Committees identified a lower speed limit in urban areas as a priority action.

4.1.2.2 Implementation process

Consultation

Queensland Transport undertook significant consultation before implementation of the 50 km/h local street speed limit. A public consultation document was produced and 15,000 copies distributed. The document was advertised in newspapers and a freecall 1800 number was established. Responses to a questionnaire in the document found that 74% of respondents were in favour of a lower speed limit.

Presentations and workshops regarding the implementation of the 50 km/h speed limit were delivered to local governments, government, community and industry groups and key stakeholder groups.

To ensure that speed limits were credible and consistent in South East Queensland (SEQ), a speed limit review of the remaining road network was undertaken as part of the 50 km/h implementation. Local governments were required to carry out speed limit reviews of all roads that were to remain at 60 km/h or higher. The speed limit remained unchanged on most roads, but increased on a number of major arterial roads.

Selection of 50 km/h areas

As a result of the consultation process undertaken with local government and consideration of other issues, it was decided to implement the 50 km/h speed limit in a zonal manner across the SEQ area. The SEQ area is a continuous urban area which stretches from the New South Wales border to Noosa and contains approximately two million residents (about 60% of the State's population).

On 1 March 1999, the Queensland Government implemented a 50 km/h urban speed limit across the SEQ area. The speed limit applies to local streets, otherwise termed "non-collector roads" in built up areas.

"The lower speed limit of 50 km/h applies to 'non-connector' roads in built-up areas. The function of a local street is to provide direct property access only and/or limited neighbourhood movement. Trips on these streets generally start or end somewhere in the local area, as distinct from through trips." (Walsh and Smith, 1999)

A 50 km/h speed limit has also been applied in some situations other than on local streets. Examples include strip shopping centres, foreshores and where the physical environment supports the lowered speed limit. In these particular cases the 50 km/h limit is signposted.

Local governments have the legislative authority to determine speed limits on their roads. To prevent inconsistent speed zoning across local government jurisdictions, the 50 km/h speed limit is applied in accordance with the Queensland Manual of Uniform Traffic Control Devices (MUTCD). To achieve compliance with the MUTCD, Queensland Transport has worked closely with local government in determining and auditing the application of the 50 km/h speed limit.

A quality control process was developed to ensure that speed limits were credible, consistent and appropriate. Prior to the 50 km/h implementation, the general urban speed limit of 60 km/h applied to roads with a wide range of physical characteristics and traffic functions. There needed to be a way of identifying those roads for which 50 km/h was the appropriate limit. It was felt that if lower speed limits were placed on roads which carry significant traffic and are designed for a higher speed environment, then motorists would not see the changes as credible and speed limit compliance would be low. In order to achieve a system of consistent and credible speed limits local governments were requested to submit speed zonal plans to Queensland Transport for consideration before proceeding to implement speed limits.

The MUTCD lists the following characteristics of local streets:

- a carriageway width of 8-10 m or less;
- maximum 85^{th} percentile speed of 59 km/h;
- absence of centreline markings;
- located in built-up areas which typically have block sizes up to 2,000 m^2;
- a maximum AADT of 3,000 (i.e. service up to 300 dwellings).

Donaghey and Ram (2000) noted that these typical characteristics were provided for guidance only, not strict compliance. If the function of a street was purely for local access, then a 50 km/h speed limit was applied, even if the street did not comply with all of the typical characteristics. Some motorists complained that they incorrectly assumed that a street with a centreline was zoned 60 km/h. To counteract this problem, local government will allow centrelines on 50 km/h to fade out, unless required for safety purposes.

Signage

The 50 km/h speed limit is the default speed limit in SEQ, therefore only streets zoned 60 km/h or higher are signposted (Walsh, 1999). The signposting in 50 km/h areas is limited to perimeter signage and repeater signs.

All roads which have a speed limit of 60 km/h or greater are sign posted regularly with signs being installed approximately every one minute of travel time. Exceptions to this practice occur at the end of school zones or where a road has a significant change in function. In these situations, 50 km/h speed limits are installed on the road in question (Walsh and Smith, 1999).

Funding of implementation

Funding for implementation was shared between the Queensland Government and local government. The Queensland Government funded approximately half of the costs of zonal plans, speed limit reviews and the installation of signs. The Queensland Government fully funded the communication and education program and the enforcement component of the implementation, including the acquisition of speed detection equipment (LIDARs).

Enforcement

The enforcement of the 50 km/h local street limit is the responsibility of the Queensland Police. From 1 March 1999 to 1 June 1999 there was an amnesty period for enforcement. However, if Police detected motorists driving in a dangerous manner or travelling at excessive speed during this period, they were still booked. Enforcement of the 50 km/h limit commenced from 1 June 1999.

Police consider that hand held laser speed detection devices are the most effective enforcement tool for local streets, allowing Police to be highly mobile to deal with the low traffic volumes and large numbers of local streets.

Education and communication

A mass media campaign was undertaken and a brochure on the 50 km/h speed limit was mailed to households in SEQ. There were educational displays at shopping centres, community functions and marketing activities aimed at visitors from interstate and overseas.

4.1.2.3 Evaluation of effects

Crash and environmental benefits

Queensland Transport has advised that crash data evaluation results indicate that there has been an 18% reduction in fatal crashes on local streets in SEQ since the implementation of the 50 km/h local street speed limit when compared with the previous five-year average (personal communication, 2001). Additionally, there has been an 8% reduction in all crashes on local streets when compared with the previous five-year average. This has resulted in an estimated saving of over $26 m in social costs.

Meers and Roth (2001) estimated that the 50 km/h speed limit has saved 19 fatal crashes per year, a reduction of about 15%.

The 10% reduction in travel speeds on 50 km/h routes has been estimated to save 33,000 tonnes of CO2 equivalent each year (Meers and Roth, 2001). This is based on the speed reduction equating to a 5% reduction in CO2 equivalent emissions.

Speeds

Speed surveys have been undertaken by Queensland Transport and by various local governments. Table 12 summarises speed data from 14 sites in the Brisbane City Council area before implementation of the initiative, during the amnesty period and after the amnesty period. The streets were originally 60 km/h but became 50 km/h. The Table shows that a reduction in speed occurred at implementation and a further reduction at the end of the amnesty period.

Queensland Transport (personal communication, 2001) have stated that further in-depth evaluation, including further speed surveys, is currently being conducted.

Table 12. Average mean speed and 85th percentile speed results for sites in Brisbane (from Walsh and Smith, 1999).

Time period	Mean speed (km/h)	85th percentile speed (km/h)
Before implementation	49.3	57.8
During amnesty	45.0	54.8
After	43.1	52.1

Community attitudes

Surveys of community attitudes to road safety were undertaken in September 1998, April 1999, 1 June 1999 and November 1999. Strong support for the initiative was recorded during the amnesty period.

Donaghey and Ram (2000) state that the level of appeal of 50 km/h speed limits has increased from 61% to 78% in Brisbane and from 66% to 73% in the rest of SEQ. They state that it is believed that much of the increased appeal has resulted from the integrated and consultative approach taken during the implementation of this initiative.

The number of respondents stating that they would obey the 50 km/h speed limit has increased from 84% to 92%.

Enforcement

During the amnesty period, 484 tickets were issued for offences committed in the 50 km/h areas. After the amnesty, about 1,000 to 1,500 tickets per month were issued for infringements in 50 km/h areas (Walsh and Smith, 1999). A later paper (Donaghey and Ram, 2000) states that approximately 800 tickets per month have been issued.

Walsh and Smith (1999) conclude that *"the Queensland Police Service have been strongly supporting the introduction of a 50 km/h local street speed limit by undertaking a high level of enforcement"* (p.691).

Walsh and Smith (1999) conclude:

"The implementation of the 50 km/h local street speed limit in South East Queensland has involved the integration of engineering, education, enforcement and evaluation activities. Successful implementation of this initiative has also been reliant on the integration of knowledge from numerous stakeholder groups, government bodies and the community". (p.692)

4.1.3 Victoria

4.1.3.1 Implementation process

The default residential speed limit changed from 60 km/h to 50 km/h in Victoria on 22 January 2001. The prime objective of the change was to reduce the incidence and severity of road crashes on local streets by reducing speeds on those streets. A secondary objective was to maintain mobility on those local roads that perform a collector function.

The Road Safety (Road Rules) Regulations 1999 were amended to set the general urban speed limit at 50 km/h and to enable VicRoads to install speed limit signs on local roads in addition to its current powers on declared roads. Under the new regulations, local government retains its power to install speed signs on local roads with VicRoads consent but, in order to ensure the consistent application of signing across the State, VicRoads also has the power to install speed limit signs on roads other than declared roads.

Consultation

In May 2000 a telephone survey was conducted among people aged 18 years of age and over who held a current Victorian drivers licence that included questions about the proposal for a 50 km/h speed limit in residential areas (VicRoads, personal communication). A total of 701 interviews of rural and metropolitan drivers were analysed. In regards to the proposal, 65% said that they agreed. Rural residents were most likely to agree with the restriction (77%) and the high-risk group (males 18-39 years) was also in agreement with the restriction (59%).

Public comment was sought on the proposal to introduce the 50 km/h default speed limit in built-up areas and the proposal to give VicRoads power to install speed signs on non-declared (local) roads. Only one submission stated that the 50 km/h limit was too low. Comments on the speed signing proposal were mixed, with many local councils opposing the proposal.

The RACV conducted independent surveys of its members prior to the changes being implemented.

Selection of 50 km/h areas

In Victoria, 50 km/h has become the default speed limit for roads in built-up areas. Any street in a built up area without a sign automatically has a 50 km/h speed limit. A built-up area is defined in the Australian Road Rules as *"in relation to a length of road, means an area in which there are buildings on land next to the road, or there is street lighting at intervals not over 100 metres for a distance of at least 500 metres or, if the road is shorter than 500 metres, for the whole road"*.

Local roads which have the function of moving traffic to and from arterial roads (collector roads) retained their 60 km/h speed limit by signing. The Regulatory Impact Statement (RIS) states that it is envisaged that the majority of collector roads will retain the speed limit of 60 km/h.

Signage

Local governments are responsible for the installation of speed limit signs on local roads but require VicRoads consent for the installation of these signs.

Signs setting a 60 km/h limit are being erected on some collector roads in residential areas to ensure that through traffic is not delayed. The RIS estimated that there would be approximately 16,000 signs of this type, with an average of eight signs per collector road.

The RIS estimated that 100 advisory signs needed to be placed across the State to inform visitors and remind motorists of the 50 km/h speed limit. These were to be placed at strategic locations such as State borders, roads leading from airports and ports and roads leading to the major urban centres.

Enforcement

Exceeding the 50 km/h speed limit is an offence against Victorian Road Rule 20. The maximum fine on conviction in a court is $1,000 for large vehicles and $500 for other vehicles. Traffic Infringement Notice penalties can be issued ranging from $105 to $900 depending on the size of the vehicle and the amount by which the speed limit is exceeded.

The RIS states that Victoria Police has indicated that it will utilise resources where there is a demonstrated need. The Tactical Intelligence Unit will use the Collision and Complaint Information System to provide strategic guidance as to where resources are to be placed for enforcement and proactive activity.

Education and promotion

VicRoads had an educational campaign at the time of introduction of the 50 km/h limit, with the message "Think safe. Think 50". The campaign aimed to ensure that all motorists in Victoria were aware that the speed limit in a built-up area is 50 km/h unless otherwise sign posted. It concentrated on the radio and print media. The RIS estimated that the media campaign would cost about $200,000. There was extensive editorial coverage in the print and electronic media. Information was also placed on VicRoads' website. The Transport Accident Commission also mounted a media campaign with television advertising.

4.1.3.2 Likely benefits

There have yet been no completed after studies of the effects of the reduced speed limit in Victoria (VicRoads, personal communication).

The benefits which were considered in the RIS (VicRoads, 2000) were reductions in crashes and reductions in fuel consumption which consequently reduces vehicle operating costs and greenhouse gas emissions. The RIS also noted that there were unquantifiable benefits arising from consistent application of speed limits which are more closely aligned with road function and improvements in residential amenity.

Reductions in crashes

Based on the New South Wales results, the RIS chose a 7% reduction in casualty crashes and a 16% reduction in property-damage only (PDO) crashes as the lower limits of the possible crash reductions. Based on Kloeden's (1997) work and assumptions of less than complete compliance, a figure of 15% was chosen as the likely upper limit of the possible reduction in casualty crashes. The upper limit for PDO crashes remained at 16%, given no other data.

The RIS notes that there are 2,000 casualty crashes per year on local streets in Victoria with an average crash cost of $85,9000. Thus the total estimated cost of casualty crashes on local streets is $172 m per year. It was noted that this may be a conservative estimate given the over-representation of pedestrians and bicyclists in these crashes and their higher than average level of injury.

Assuming that PDO crashes are 80% of all crashes and assigning an average cost per crash of $17,505, the annual cost of PDO crashes in local streets is estimated to be $140 m.

The overall road safety benefits were estimated to range between $34.4 m and $48.2 m (see Table 13).

Table 13. Estimated road safety benefits by crash type (from VicRoads, 2000, Table 2).

Crash type	Lower estimate	Upper estimate
Casualty	$12.0 m (7% of $172 m)	$25.8 m (15% of $172 m)
Property damage only	$22.4 m (16% of $140 m)	$22.4 m (16% of $140 m)
Total	$34.4 m	$48.2 m

Reductions in fuel consumption

The RIS provides upper and lower estimates for reductions in fuel consumption and greenhouse gas savings resulting from the 50 km/h initiative.

The upper bound estimates are based on the figures in Austroads (1996) and in Roper and Thoresen (1996). This assumes that a reduction of 1 km/h in average speed will reduce fuel consumption by 0.3%, translating into annual fuel saving of 1.8 million litres. At a resource cost of 45 cents/litre, this means a cost saving of $812,000 per annum. If greenhouse gas reductions are valued at $82 per tonne, then the value of reduced emissions is $421,000 per year.

The lower bound estimates assume no reductions in fuel consumption or greenhouse gas emissions. These estimates are based on the NSW Environmental Protection Agency's submission to the NSW Staysafe Inquiry (Staysafe, 1996).

4.1.3.3 Likely costs

The likely costs which were considered in the RIS were costs of implementation, travel delays to passenger car drivers and delays to commercial vehicles and buses.

Costs of implementation

The costs of implementation were estimated in the RIS as:

- $200,000 for media campaign
- $500,000 for advisory signs
- $2.1 m for signing collectors at 60 km/h

Travel delays

The RIS notes that the overseas evidence shows that the average speed decrease is considerably less than the decrease in the speed limit. It cites the NSW results showing a decrease in average travel speed of about 1 km/h and a pre-implementation average speed of 57 km/h. This corresponds to a delay of about 1.1 seconds per kilometre. Multiplying this by the estimated amount of travel on local streets, the value of time and average occupancy of vehicles, the RIS estimates that the increased travel time as a result of the reduction in the speed limit to 50 km/h would have a cost of $20.3 m per year.

The RIS assumes that the effect on commercial vehicle travel or travel by buses would be negligible given that these vehicles are unlikely to use the residential street network on a regular basis. In addition, their large size and slow acceleration rates would mean that they would usually travel below the allowable maximum when they were on local streets.

4.1.3.4 Overall costs and benefits

Table 14 summarises the estimated benefits and costs of the 50 km/h initiative, discounted at 6% per annum over a ten year period. The largest items are the road safety benefits and the travel delays. The RIS notes that the travel delays per trip are relatively small and may not be perceived to be significant.

The net benefit is about $14 m per year over the life of the regulations, even in the worst case scenario. Under the best case scenario, the net benefit is about $34 m per year.

The RIS notes that the road safety benefits are based on crash cost savings which may be underestimated by up to about 75% compared with new BTE values (BTE, 2000). If the new figures were used, the net benefit would rise to $309 m in the worst case scenario.

Table 14. Costs and benefits of a 50 km/h speed limit on local streets, discounted at 6 per cent over 10 years ($ million). From VicRoads (2000).

Component	Lowest net benefit	Highest net benefit
Implementation costs	-2.8	-2.8
Road safety benefits	268.6	375.8
Travel delays	-158.6	-119.0
Vehicle operating cost savings	0.0	6.3
Greenhouse gas savings	0.0	3.3
Net Present Value	107.2	263.6

4.1.4 Australian Capital Territory

4.1.4.1 Implementation process

A two-year trial of 50 km/h speed limit on local suburban streets in the ACT commenced on 1 March 2001. The change in speed limit was implemented in accordance with *Australian Road Rule 22 – Speed limit in a speed limited area* (ACT Department of Urban Services, personal communication).

A trial was considered necessary to assess whether the 50 km/h limit would have similar road safety benefits when applied in the ACT's well-planned, good-standard road system as has been found elsewhere (from ACT Department of Urban Services website). An evaluation will be undertaken by ARRB Transport Research in which changes in the number and severity of crashes, speeding behaviour and community attitudes will be measured.

Consultation

A telephone survey of community attitudes was undertaken in January 2001 prior to the commencement of the survey (Taverner Research Company, 2001). The survey of 521 ACT residents aged 18 years and over showed that 63% of ACT residents approved of the concept and 27% disapproved. Females were more likely to approve of the concept than males. Approval was lowest among 18-24 year olds (particularly males) and highest among residents aged over 60.

Selection of 50 km/h areas

The 50 km/h speed limit applies to suburban streets that are used mainly to provide access to private homes and carry only neighbourhood traffic. These roads are those classified on the Territory Plan as local streets in suburbs, as recommended by the ACT Legislative Assembly's Standing Committee on Planning and Urban Services.

Major roads that pass through suburbs will continue to have a 60 km/h speed limit. Roads in the Parliamentary zone, commercial centres and industrial areas are unaffected.

Signage

Signs have been installed at the entry and exit of all 50 km/h areas. All streets in these areas have a 50 km/h limit, except for major roads which are signposted at 60 km/h and school zones which are signposted at 40 km/h. Advisory signs have also been installed on all entry roads to the ACT.

This approach to signing was undertaken as the lowest cost option with the lowest level of signage, and therefore the least impact on urban design. It is also consistent with arrangements in the adjoining State of New South Wales.

Public education

A comprehensive public education campaign was conducted to ensure that road users were aware of the change in speed limit. The campaign included TV, radio and press advertising, and the delivery of an information pamphlet to all ACT households.

Costs of implementation

The cost of implementing the trial has been estimated at $500,000 (ACT Department of Urban Services, personal communication). This comprises $300,000 for supply and installation of signage, $80,000 for a public education campaign, $30,000 for administration of the trial and $90,000 for evaluation.

Enforcement

The new speed limit will be enforced by the police in the same way as all other speed limits in the ACT.

4.1.4.2 Effects

Community attitudes

Approximately 250 calls were received on the 50 km/h telephone hotline by May 2001 (ACT Department of Urban Services, personal communication). Most calls were received at the start of the trial. Most callers supported the trial and letters and emails to the Minister and the Department of Urban Services have shown the same pattern. Many callers wanted the 50 km/h speed limit extended to other streets. The retention of a 60 km/h speed limit on some major roads in 50 km/h areas has been the source of some confusion. Those opposed to the trial mostly cited inconvenience and extra travel time as the reasons.

4.1.5 Western Australia

The Government of Western Australia has announced that a 50 km/h limit on local roads throughout the State will be introduced by the end of 2001. This approach differs from an earlier proposal that implementation would be area wide, meaning that the 50 km/h limit would apply on all local roads across a designated geographical area – for example, the whole metropolitan area, or on local roads in major regional centres or rural towns. Thus some of the material that follows may be subject to change.

4.1.5.1 Steps towards implementation

Introducing a 50 km/h speed limit on local streets is one method of achieving reduced travel speeds which is a key strategy in Western Australian Road Safety Strategy 2000-2005.

In 1999 the Speed Management Task Force commissioned a literature review of 50 km/h speed limits and presented a position paper on 50 km/h speed limits on local streets to the Road Safety Council in February 2000 along with the recommendations of the Task Force.

The Road Safety Council set up a special group with the role of developing an implementation strategy. This group is chaired by the Office of Road Safety and has representation from the Western Australian Municipal Association, Police, Royal Automobile Club, Office of Road Safety, Main Roads WA and Institute of Public Works Engineering Australia.

4.1.5.2 Community opinion

In November 1999, a survey involving 400 participants across metropolitan and regional areas of Western Australia found that approximately half of the participants were in favour of the proposed reduction in speed limits from 60 km/h to 50 km/h (NFO Donovan Research, 2000c). The major perceived benefit of a reduction in local street speed limits related to increased safety for pedestrians, particularly children.

In May 2000, five focus group discussions were held with people who opposed or had no opinion on the proposed introduction of 50 km/h speed limits on local area roads (NFO Donovan Research, 2000a). Most of the participants in the focus groups acknowledged that lower average vehicle speeds would reduce the severity of injuries in crashes. Of those who expressed ‘no opinion’, many switched to an ‘agree’ position when exposed to statistics and other educational information about speeding in local area roads and the benefits of a 50 km/h limit experienced in other jurisdictions.

A survey of 800 people from metropolitan and regional areas in WA (NFO Donovan Research, 2000b) found that about half of the people agreed that speed limits on local roads in residential areas should be reduced from 60 km/h to 50 km/h, while 5% of people were neutral.

A questionnaire was distributed to local governments canvassing elected members’ opinions on the introduction of a 50 km/h urban speed limit (Western Australian Municipal Association, 2000). Overall 75% of respondents were in favour of the lower speed limit, with about half in favour of statewide implementation. Support for statewide implementation was higher from metropolitan respondents (93%) and lowest among respondents in rural shires (56%).

4.1.5.3 Legislative aspects

Under the Road Code the Commissioner of Main Roads has the authority to erect, display and remove all traffic signs and currently all regulatory signs including speed limit signs are erected by Main Roads statewide (except parking signs which are erected by local councils). The WA Department of Transport advises that statewide introduction of 50 km/h limits on local streets would require legislation to be changed and an exemption from the Australian Raod Rules (by a vote of Australian Transport Ministers).

4.1.5.4 Selection of 50 km/h areas

In general terms, the lower speed limit will apply on local "built-up" roads in urban areas. Local roads are the smaller roads that carry neighbourhood traffic or give direct property access. Specifically, those roads that will not be reduced to 50 km/h include:

Primary Distributors

District Distributors (A)

District Distributors (B)

Dual Carriageways

Roads that have no direct access from properties

Roads that are not built-up or have no street lighting

Roads that are of a particular width (specifications to be determined)

The preferred method of implementation is state-wide. The WA Department of Transport has identified the following advantages of state-wide implementation:

- more lives saved and serious injuries prevented;
- less signage needed;
- less public confusion regarding which local council has 50 km/h and which has 60 km/h;
- greater public awareness as a simpler community education campaign can be delivered;
- a cost saving of approximately $3 million.

Kidd (2000) proposed slightly different approaches to be taken in the Perth metropolitan area and in rural areas. He states that in Perth there is an agreed functional road hierarchy and all Primary Roads and District Distributor A or B roads will be zoned to 60 km/h if not already speed zoned. By default all other local roads in built-up areas such as local access roads and local distributor roads within the Perth metropolitan area would generally be subject to the area wide speed limit of 50 km/h. In rural areas and major regional centres, Kidd states that similar principles would be used to determine which local built-up roads would be covered by the 50 km/h speed limits in consultation with local governments.

Signage

It is anticipated that individual roads not subject to 50 km/h will have speed limit signs for lower or higher speed limits, as appropriate.

Enforcement

The WA Police will enforce the lower speed limits as part of its core functions - forming part of enforcement of other speed limits. The application of a formal or informal "grace period" will be determined by the Police.

Community education

Kidd (2000) notes that the introduction of 50 km/h speed limits on local streets will be the subject of extensive publicity. A comprehensive community education campaign will be conducted prior to the lower limit being introduced. This will include brochures, advertising and on-road signing.

4.1.5.5 Expected costs and benefits

Up to a third of all fatalities and serious crashes in Western Australia occur on local streets (Radalj, 1999, cited in Office of Road Safety 50 km/h webpage). Crashes in cities and towns contribute 73% of the cost of road injuries in Western Australia. From 1995 to 1999, in the metropolitan area, an annual average of 25 people have been killed and another 543 seriously injured on local roads (access and local distributor roads) that would be zoned 50 km/h (Radalj, MRWA (1999)).

According to the Office of Road Safety 50 km/h web page, in the Perth metropolitan area it is expected that an initial investment of around $1 m, followed by ongoing expenditure of up to $100,000 per annum, will generate over $28 m in annual crash savings.

Kidd (2000) has calculated crash savings based on assumptions that crashes are reduced by 16% (from NSW interim report) and are not reduced to zero but reduced to the next lowest trauma level. This assumes that reduced speed does not prevent crashes from occurring, but only reduces crash severity which is a very conservative view.

Given these assumptions, Kidd estimates that the annual cost of casualty crashes that could be saved by the 50 km/h initiative would be $31.9 m (in 1998 dollars). In addition the expected saving from damage only crashes becoming near misses is expected to be about $13 m in the Perth metropolitan area.

The 50 km/h urban speed limit will be evaluated by the Office of Road Safety with a small independent research advisory group overseeing the research design and the process. The evaluation will involve the collection of baseline speed data at around 100 sites covered by the 50 km/h limit, and a further 50 sites to be speed zoned at 60 km/h in the metropolitan area. Follow up speed surveys and crash studies will occur at these sites at 6 months, 12 months and 2 years after implementation.

4.1.6 Tasmania

Over the past two years, Tasmania has implemented one 40 km/h area speed limit in the suburb of Battery Point and three 50 km/h speed limits in the suburbs of Lutana, Kings Meadows and Lenah Valley. The last two were installed in 2001 and covered a small portion of the total suburban area.

The Deputy Premier of Tasmania has announced that a 50 km/h general urban speed limit will be implemented in Tasmania before the end of 2001.

An earlier report (Langford, 1999) examined the role of speed in urban road crashes and estimated the likely implications of reduced urban speed limits for Tasmania. It showed that during 1989-98, 62% of minor injury, 48% of major injury and 30% of fatal injuries occurred in 60 km/h zones. It was not possible from the data to sub-categorise the 60 km/h speed zones into arterial and local streets. Based on the findings of Kloeden et al. (1997), it was estimated that implementing a 50 km/h limit on all urban roads (with present compliance levels) would lead to a 33% reduction in urban casualty crashes while lowering the limit on local streets only would lead to a 6% reduction in urban casualty crashes.

Langford notes that lowering the limit on local streets only, while contributing the smallest reduction, "*may serve as a publicly acceptable first step that will ultimately lead to an across-*

the-board reduction". He cautions that "*from a road safety viewpoint however, there are few benefits to restricting a reduced urban speed limit of 50 km/h to local streets. Indeed, the additional signage costs and likely motorist confusion associated with this selective development may well end up outweighing any savings from a reduced road toll*" (p.16).

He concludes that: "*Given the range of likely savings across the different scenarios discussed in the previous section, it is recommended that the reduced general urban speed limit of 50 km/h apply to all roads and streets in Tasmania where the current limit is 60 km/h*" (p.16).

4.1.7 Northern Territory

The Darwin City Council conducted a 50 km/h speed trial in the suburbs of Leanyer and Woodleigh Gardens in 1994. The trial involved erecting 50 km/h signs in most streets of these suburbs (Market Equity Pty Ltd, 1994). The Council found that speeds were essentially unchanged by the trial. This led Council to commission an assessment of community support for lower regulatory speed limits in the Leanyer area and to investigate residents' opinions and perceptions of what traffic control measures may have greater effect in changing driver behaviour.

A telephone survey of 255 Leanyer residents was conducted. Almost 80% of residents were in favour of the lower regulatory speed limit in their area. More than 75% of residents were in favour of greater traffic control measures. Police surveillance and physical road changes were perceived to be the most effective speed control option for both local minor and local distributor roads.

Darwin City Council has recently conducted further research into vehicle speeds on roads with reduced urban speed limits (a report will be forwarded to MUARC when available).

4.1.8 Other Jurisdictions

No information has been provided by Transport SA regarding any plans for future consideration of lower urban speed limits. The Transport SA website states that 60 km/h is the default speed limit in built-up areas in South Australia.

The City of Unley in Adelaide has had lower speed limits on local roads for many years (Dyson, Taylor, Woolley and Zito, 2001). It first implemented a trial 40 km/h zone on a north-south axis in 1991. The trial indicated that the 40 km/h initiative was feasible and it was made permanent following traffic monitoring and surveys of resident opinion. On 1 January 1999 the 40 km/h speed limit on local streets was extended to cover the entire municipality. There was an extensive marketing campaign and a three-month amnesty period. Speed camera enforcement has been undertaken on minor streets since the introduction of the lower speed limit.

An evaluation of the effects of the 40 km/h speed limit is summarised in Dyson et al (2001). Streets with the highest speeds before the reduced limit experienced the greatest speed reductions. The streets with the lowest speeds showed a small increase in mean speed. Reductions of traffic volumes on local streets were also measured, suggesting that traffic was diverted to more major routes. In 2000, 60% of residents surveyed thought that the local streets were safer and 58% approved of the 40 km/h limit. Community support had fallen since pre-implementation, possibly because 16% of survey respondents said they had been fined for speeding on a 40 km/h street. Dyson et al do not report crash data.

4.2 Comparison of implementation approaches in different States

The implementation approaches in the different States have varied according to:

- types of roads affected;
- geographical area;
- signage;
- funding responsibilities;
- extent/nature of advertising;
- enforcement approach;
- one-off or staged (trial).

One could speculate that the default approach (as exemplified by Victoria) might actually result in some drivers assuming that the speed limit is 50 km/h on some streets where it is actually 60 km/h. This would increase both crash savings and travel times. It is unclear what the net effect would be.

4.2.1 Comparison of results

Table 16 shows that Queensland achieved much greater travel speed reductions than NSW (Donaghey and Ram, 2000; RTA, 2000a). The question arises whether this difference is real or reflects differences in methods of measuring travel speeds. Further analysis would be required to determine any links between implementation methods and outcomes.

Table 16. Average mean speed and 85th percentile speed results before implementation, 3 to 6 months after implementation and about 6 months after implementation in urban NSW and Brisbane (from RTA, 2000a and Walsh and Smith, 1999).

Time period	Average speed		Average 85th percentile speed	
	NSW urban	Brisbane	NSW urban	Brisbane
Before implementation	57.1	49.3	65.6	57.8
Within 3 months after implementation	56.2	45.0	64.5	54.8
Initial reduction	0.9	4.3	1.1	3.0
3 to 6 months after implementation	56.6	43.1	64.8	52.1
Subsequent reduction	-0.4	1.9	-0.3	2.7
Total reduction	0.5	8.2	0.8	5.7

4.3 Community perceptions

During the 1990s there has been a significant degree of public support for lower speed limits in local streets. The Community Attitudes to Road Safety Surveys commissioned by the Australian Transport Safety Bureau (formerly the Federal Office of Road Safety) have included questions about lower speed limits in residential areas since 1995. Approval to the question "How would you feel about a decision to lower the speed limit in residential areas to 50 km/h?" reached 68% in 1999 (Mitchell-Taverner, 2000). Approval in earlier years had ranged from 55% to 65% (see Table 17).

Females are more likely to approve of lowering the speed limit in residential areas than males, although support among males increased from 56% in 1998 to 67% in 1999. Approval is lowest among 15-24 year olds and increases with age.

Approval is highest in Queensland (73%), followed by NSW (70%) and Victoria (70%).

Less than one-third of Australians approve of lowering the speed limit to 40 km/h in residential areas.

Table 17. Percent of respondents approving strongly or approving somewhat of lower speed limits in residential areas in Australia-wide Community Attitudes to Road Safety Surveys (CAS) (summarised in Mitchell-Taverner, 2000).

Proposed reduction	CAS 13 (2000)	CAS 12 (1999)	CAS 11 (1998)	CAS 10 (1997)	CAS 9 (1996)	CAS 8 (1995)
To 50 km/h in residential areas	68	65	62	55	61	62
To 40 km/h in residential areas	29	30	33	24	31	30

In addition to the series of Australia-wide surveys, a number of other surveys have been conducted in one or more States. The results of surveys of community perceptions are summarised in Table 18. The low level of support in the NSW newspaper survey (RTA, 1998, cited in Walsh, 1999) conflicts somewhat with other results and the survey may possibly have elicited more responses from those who were opposed to the measure than from those who favoured it.

Table 18. Summary of results of other surveys of community attitudes to lower residential speed limits.

Survey	Findings
RACV (in Williams, 1992, cited by Walsh, 1999)	46% thought speed limit on local streets should be 50 km/h, 24% believed 40 km/h and 30% believed should be 60 km/h
NRMA, 1993	49% of respondents agreed with the idea of introducing 50 km/h limit on urban roads with no centreline, 42% disagreed
RTA, 1993	54% felt 50 km/h general urban speed limit a good idea, 41% bad idea
South Australia, 1994 (in RTA, 1995, cited by Walsh, 1999)	48% supported a lowered speed limit on local streets in the Adelaide metropolitan area
NSW, Tasmanian and South Australian residents (Cairney and Swadling, 1997, cited in Walsh, 1999)	74% believed 50 km/h limit in local streets was a good idea
1997 post-trial telephone survey in 26 LGAs (RTA, 1998, cited in Walsh, 1999)	66% supported the lowered limit
Newspaper survey (RTA, 1998, cited in Walsh, 1999)	41% supported, 58% opposed
November 1999 survey in metropolitan and regional Western Australia (NFO Donovan Research, 2000c)	approximately half supported proposed reduction
2000 survey in metropolitan and regional Western Australia (NFO Donovan Research, 2000b)	approximately half supported proposed reduction, 5% were neutral
Victorian telephone survey May 2000 pre-implementation (VicRoads, personal communication)	65% agreed with proposal, rural residents more likely to agree (77%), males aged 18-39 59% agreed
ACT telephone survey January 2001 pre-implementation (Taverner Research Company, 2001)	63% approved, 27% disapproved, females more likely to approve, approval increased with age

4.4 50 km/h speed limits in other countries

The general urban speed limit is 50 km/h in most developed countries. This includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Greece, Hong Kong, Hungary, Ireland, Israel, Italy, Japan, Korea, Luxembourg, New Zealand, Norway, Portugal, Spain, Switzerland, the Netherlands and all States of the United States of America (Austroads, 1996). The Czech Republic has adopted a 50 km/h default urban speed limit since 1996.

Preston (1990) found that in countries in Europe and North America with an urban speed limit of 50 km/h or less, the average death rate of pedestrians aged 25-64 years was 30% lower than countries with an urban speed limit of 60 km/h.

After Norway reduced its urban speed limit from 60 km/h to 50 km/h, the average speed fell by 3.5-4 km/h and the number of fatal accidents was reduced by 45% (Norwegian Traffic Safety Handbook, cited in Jorgensen, 1994).

Denmark reduced the general urban speed limit from 60 km/h to 50 km/h in 1985. On major roads, the average speed of 50 km/h fell by 2-5 km/h, whereas on minor roads, which had lower speed limits initially (45 km/h), the reductions experienced were only up to 1 km/h (Engel and Thomsen, 1991).

When the speed limit in Zurich was reduced from 60 km/h to 50 km/h, pedestrian collisions fell by 20% and pedestrian deaths by 25% (Walz, Hoeflinger and Fehlmann, 1983).

The general urban speed limit in France was reduced from 60 km/h to 50 km/h in 1990. In its first two years of operation, the 50 km/h speed limit was estimated to have prevented 14,500 injury accidents and 580 fatalities, or 3% of the annual French road toll (Page, 1993).

5. BENEFITS AND COSTS OF THE CURRENT PROPOSAL

The MASTER framework (Kallberg and Toivanen, 1998) was used to assess the benefits and costs of the implementation of a default 50 km/h speed limit in urban areas. Estimates of the impacts of speed management policies on vehicle operating costs, travel time, crashes, air pollution and noise can be compared and integrated using this framework. The MASTER framework was developed as part of the European Union research program entitled "MAnaging Speeds of Traffic on European Roads". It was used by Cameron (2000) in his estimation of optimum travel speeds on urban local streets.

The MASTER framework requires input of the following data:

- Mean speeds;
- Length of link;
- Traffic volume (AADT);
- Crash numbers and costs;
- Travel time costs;
- Share of traffic by trip purpose;
- Vehicle operating costs;
- Air pollution values as a function of speed;
- Air pollution costs.

While the MASTER framework includes effects of speed management policies on carbon dioxide and noise emissions, these components were omitted from the analyses reported here, following the practice of Cameron (2000). Noise values were omitted because relevant Australian data were not available. The likely effect of these omissions would be to underestimate the net benefits of the reduction in the default urban speed limit.

The MASTER framework does not include benefits arising from reductions in non-injury crashes. In the Victorian RIS (VicRoads, 2000), it was assumed that casualty crashes are 20% of all crashes. In other words, there are four times as many non-injury crashes (property damage crashes) as injury crashes. In the calculation of the net benefits of the proposed changes in the current report, it is assumed that the percentage change in the number and cost of property damage crashes will be double the percentage change in average speed. This assumption is conservative when compared with the reported 16% reduction in casualty and property damage only crashes reported in the NSW evaluation (RTA, 2001). A 16% reduction in property damage only crashes was assumed in the Victorian RIS (VicRoads, 2000).

The MASTER framework does not include implementation costs such as signage and public education.

Another possible effect of changes in speed limits not included in the MASTER framework or reported here is the potential for changes in speed compliance on untreated roads. Austroads (1996) speculated that lower limits on local streets might lead to improved speed compliance on collector and arterial roads. The rationale was that a 60 km/h speed limit for the collector roads and arterial roads might be better accepted if the local streets were zoned 50 km/h. This was not measured.

5.1 Values chosen for input into the MASTER framework

5.1.1 Mean speeds

The MASTER framework requires input of estimates of average journey speeds and average cruise speeds before and after the change in speed management policy. Cruise speed generally represents the maximum speed at which the average driver traverses a section of road. It is unlikely that a reduction in the speed limit from 60 km/h to 50 km/h would result in a reduction of 10 km/h in average cruise speed. The reduction is likely to be much smaller. In the analyses presented in this report, the effects of 5 km/h and 10 km/h reductions in cruise speed are examined. The lower value represents an indicative estimate while the upper value represents a theoretical maximum effect (which is unlikely to be achieved).

Average journey speed represents the distance travelled by the average driver in a given time for that section of road. Average journey speed is equal to cruise speed if travel occurs at constant speed, but in traffic situations that is uncommon. Thus, average journey speed is lower than cruise speed and the difference can be quite large if there is congestion or other circumstances that result in lower speeds e.g. intersections, obstructions. During peak travel times, the difference between average cruise speed and average journey speed can be considerable. For these reasons, a reduction in the speed limit is likely to have a smaller effect on average journey speed than on average cruise speed.

Most existing speed data relate to cruise speeds (free speed measurements) although there are some data relating to average journey speeds. Average journey speeds in urban local streets where 50 km/h limits have been introduced were not available for this report.

Given the paucity of relevant speed data, cruise and journey speeds for urban local streets and urban arterial roads zoned 60 km/h were taken from SMEC (1998). This study reports measures of the peak and off-peak cruise speeds and average journey speeds on a small number of Melbourne local streets and arterial roads (see Table 19). It also presents estimates of the likely average speeds if cruise speed were reduced by 5 km/h or 10 km/h. The estimates were derived from measured speed profiles of instrumented vehicles travelling in Melbourne, with speed measurements at 0.5 second intervals. For a cruise speed reduction of 5 km/h, all observed speeds above the existing speed limit for a road section were reduced by 5 km/h. Speeds between 0 and 5 km/h below the old limit were reduced proportionately. Speeds more than 5 km/h below the old limit were left unchanged. The altered speed profile was then used to calculate a revised travel time and average speed for the vehicle.

SMEC also derived estimates of travel time effects from a transport model of Melbourne (TRANSTEP), which was able to predict effects of speed limit changes on route choice, destination substitution and trip suppression. The TRANSTEP model predicted smaller travel time changes than the “first order” effects based on the speed sample data. However, the TRANSTEP estimates were for network-wide effects, and could not be disaggregated by road type; hence only the first order effects could be used in the current analysis.

Mean speeds for urban collector roads were not reported in SMEC (1998). For this reason, the values provided for urban local streets zoned 60 km/h were input into the analyses for collector roads.

The degree of robustness of the SMEC speed estimates is unknown. The model estimates are based on a small data set. The prediction that the decrease in average journey speed for a 10 km/h reduction in cruise speed is more than twice that for a 5 km/h reduction in cruise speed (average peak/off-peak: 3.3 versus 1.3 km/h local streets, 4.9 versus 1.8 km/h arterial roads zoned 60 km/h) has significant implications for travel time costs associated with the 10 km/h reduction.

The SMEC data were collected in metropolitan Melbourne (Adelaide data were collected for off-peak only). Outside metropolitan areas there may be less of a peak effect and higher average speeds. In applying the SMEC data in urban areas Australia-wide, the current report may underestimate the differences in average speeds for given changes in cruise speeds and thus underestimate effects on travel times and crash numbers. However, there is insufficient data available to assess these possible effects.

Table 19. Cruise speeds and average speeds for Melbourne local streets and arterial roads zoned 60 km/h (from SMEC, 1998).

Road type	Mean cruise speed	Average speed - peak	Average speed – off-peak	Average of peak and off-peak
Residential street				
Current 60 km/h limit	57	32.8	39.8	36.3
5 km/h reduction in cruise speed	52	32.2	37.8	35.0
10 km/h reduction in cruise speed	47	30.7	35.0	33.0
Urban arterial				
Current 60 km/h limit	57	38.9	50.6	44.8
5 km/h reduction in cruise speed	52	37.5	48.4	43.0
10 km/h reduction in cruise speed	47	35.3	43.0	39.9

5.1.2 Estimation of distance travelled and link length

The estimates of annual distance travelled on various classes of urban roads are summarised in Table 20. These estimates were derived from published data and other assumptions as summarised below.

Urban areas are defined in Austroads (2000) as areas within cities of population greater than 40,000. Total annual distances travelled on urban local roads and urban arterial roads are available for each State and Territory (Austroads, 2000). Separate estimates of distance travelled on urban local streets and urban collectors (or distributors) are not available, however. The Victorian Regulatory Impact Statement (RIS) estimates that 56% of travel on urban local roads occurs on local streets and that 44% of travel on urban local roads occurs on collector roads (VicRoads, 2000). Applying this percentage to the distance travelled on urban local roads in all States of Australia, the values in Table 20 are obtained. Travel on local streets zoned 50 km/h is estimated as all of residential street travel in Victoria and the ACT and 90% of residential street travel in NSW and Queensland. Travel on 60 km/h urban arterial roads is estimated as 65% of urban arterial travel.

Table 20. Annual distance travelled in urban areas (million vehicle-kms). Estimates for urban local roads and urban arterial roads are from Austroads (2000). Travel on local streets and collector roads is estimated as 56% and 44%, respectively, of travel on urban local roads. Travel on local streets zoned 50 km/h is estimated as all of residential street travel in Victoria and the ACT and 90% of residential street travel in NSW and Queensland. Travel on 60 km/h urban arterial roads is estimated as 65% of urban arterial travel.

Road type	NSW	Vic	Qld	WA	SA	Tas	NT	ACT	Total
Urban local	11,800	5,510	3,445	5,963	1,359	2,101	1	1,015	31,194
Local streets	6,608	3,086	1,929	3,339	761	1,177	1	568	17,469
Local streets zoned 50 km/h	5,947	3,086	1,736	0	0	0	0	568	11,337
Local streets zoned 60 km/h	661	0	193	3,339	761	1,177	1	0	6,132
Collector roads	5,192	2,424	1,516	2,624	598	924	0	447	13,725
Urban arterial	18,880	23,000	10,300	5,532	5,390	2,536	521	1,375	67,534
60 km/h urban arterials	12,272	14,950	6,695	3,596	3,504	1,648	339	894	43,897

As noted earlier, total travel on urban arterial roads is not available by speed zone. For this reason, the percentage of crashes on urban arterial roads that occur in 60 km/h zones was used as an estimate of the proportion of urban arterial travel that occurs in 60 km/h zones. If the crash rate on 60 km/h arterial roads is generally higher than on other arterial roads (because of more vulnerable road users, less likely to be divided etc), then this estimate will also be somewhat high. However, Property-Damage Only crashes should provide the lowest degree of overestimation. If crash data are used as the basis of both the numerator and the denominator of the BCR, then any overestimation is likely to cancel itself out (although the absolute sizes of benefits and costs may still be overestimated).

The crash data from NSW in 1999 were chosen to estimate the proportions of travel on 60 km/h arterial roads because the data include non-casualty crashes and because the data set is relatively large. In addition, crashes on local streets can be assumed to have occurred in 50 km/h zones (this will be true for most crashes). The property damage crashes where the speed limit was 60 km/h were used as a measure of travel on all arterial roads. The data are summarised in Table 21.

Table 21. Crashes in metropolitan NSW in 1999 (from RTA, 2000c).

Speed limit (km/h)	Fatal crash	Injury crash	Casualty crashes	Non-casualty crash	Total crashes
60	112	9,956	10,068	17,092	27,160
70	33	1,164	1,197	2,388	3,585
80	26	650	676	1,078	1,754
90	4	219	223	412	635
100	8	132	140	265	405
110	6	125	131	305	436
Total>=60	189	12246	12435	21540	33975
% in 60 zone	59.3%	81.3%	81.0%	79.4%	79.9%

Table 21 shows that, in the metropolitan area, 79% of non-casualty crashes on roads zoned 60 km/h and over occurred on roads zoned 60 km/h. Some of the 60 km/h roads would have been collectors, rather than arterial roads. In addition, it is possible that the 60 km/h arterial roads had somewhat higher crash rates than other arterial roads and so using crashes to estimate volumes may lead to overestimation. For these reasons, it was decided to assume that 65% of travel on arterial roads in the metropolitan area occurs on sections zoned 60 km/h. The 65% proportion was applied to the urban arterial travel estimates in Austroads (2000) to estimate the amount of travel on 60 km/h arterial roads.

Link length

The length of each affected road type also needs to be estimated for input to the MASTER framework. The estimates of lengths of various classes of urban roads are summarised in Table 22. These estimates were derived from published data (Austroads, 2000) and other assumptions as summarised below.

For the purpose of this calculation, it was assumed that 80% of the length of urban local roads is composed of local streets and the remaining 20% comprise collector roads. The length of local streets zoned 50 km/h was estimated as the entire length of local streets in Victoria and the ACT and 90% of the length of local streets in NSW and Queensland. It was assumed that 60% of the length of urban arterial roads is zoned 60 km/h. Applying this percentage to the estimates of total length of arterial roads in Austroads (2000), produces the estimates summarised in Table 22.

Table 22. Estimated length of urban roads in Australia in 1999 (kms). Estimates for urban local roads and urban arterial roads are from Austroads (2000). It was assumed that 80% of the length of urban local roads is composed of local streets and the remaining 20% is urban collector roads. The length of local streets zoned 50 km/h is estimated as the entire length of local streets in Victoria and the ACT and 90% of the length of local streets in NSW and Queensland.

Road type	NSW	Vic	Qld	WA	SA	Tas	NT	ACT	Total
Urban local	21,103	26,400	14,814	10,469	7,431	2,728	59	1,830	84,834
Local streets	16,882	21,120	11,851	8,375	5,945	2,182	47	1,464	67,867
Local streets zoned 50 km/h	15,194	21,120	10,666	0	0	0	0	1,464	48,444
Local streets zoned 60 km/h	1,688	0	1,185	8,375	5,945	2,182	47	0	19,423
Collector	4,221	5,280	2,963	2,094	1,486	546	12	366	16,967
Urban arterial	4,181	3,180	1,524	1,588	929	369	160	510	12,441
Urban 60 arterial	2,509	1,908	914	953	557	221	96	306	7,465

Daily travel was calculated using the formula:

Estimated AADT = amount of travel / (length x 365)

The estimates of total travel, length and AADT on the different types of urban roads are summarised in Table 23. The estimated AADTs for urban local streets from the current analysis are similar to those in the Victorian RIS (VicRoads, 2000). The ratio of length of local streets to collector roads is much greater in the Victorian RIS, however. For the MASTER spreadsheet the crucial value is total travel, therefore the values of length and AADT are of less interest. In terms of total travel, the current estimates for urban local streets across Australia are about three times the estimates for Victoria. Given that the Victorian total travel estimate was taken from NRTC (1996) which is almost double that found in Austroads (2000), the estimate seems reasonable.

Table 23. Summary of estimated values related to amount of travel on urban roads.

Type of roads	Total travel (million vehicle kilometres)	Length (kilometres)	AADT (vehicles per day)
Urban residential throughout Australia	17,469	67,867	705
Urban residential zoned 50 km/h	11,337	48,444	644
Urban residential zoned 60 km/h	6,132	19,423	865
Urban collector roads	13,725	16,967	2,216
Urban 60 km/h arterial roads	43,897	7,465	16,110

5.1.3 Crash numbers

The MASTER spreadsheet requires Australia-wide numbers of injury crashes in urban areas disaggregated by road type (local streets, collectors and arterial roads) and by speed zone. This information was not available. Therefore, crash numbers were estimated by pro-rating available data. It should be noted that the available data were based on reported crashes. This provides a conservative estimate because there is significant under-reporting of non-fatal crashes (particularly non-hospitalisation casualty crashes and property damage only crashes).

The Victorian RIS (VicRoads, 2000) estimated that 2,000 casualty crashes occurred each year on urban local streets. Based on this value, it was estimated that approximately 7,000 casualty crashes occur each year on urban local streets throughout Australia. If the crash rates per vehicle kilometre travelled are similar on urban local streets and collector roads, then about 1,570 casualty crashes would have occurred on collector roads in Victoria (based on relative amount of travel on urban local streets and collectors). This would correspond to about 5,500 casualty crashes on urban collector roads in Australia each year.

The number of crashes on urban local streets zoned 60 km/h was estimated by pro-rating the amounts of travel. If there are 7,000 casualty crashes per year on all urban local streets throughout Australia and 35% of the travel on urban local streets is on those currently zoned 60 km/h (from travel data), then it is estimated that 2,450 (7,000 x 0.35) casualty crashes occur on urban local streets that are currently zoned 60 km/h.

In 1999 (after the introduction of the 50 km/h speed limit for local streets) there were 10,068 casualty crashes on 60 km/h roads in metropolitan areas of NSW (RTA, 2000c). It was assumed that most of these crashes occurred on 60 km/h arterial roads with a smaller number on collector roads. Based on this value, it was estimated that about 23,000 casualty crashes occur on urban arterial roads zoned 60 km/h each year throughout Australia.

5.1.4 Speed-crash relationship

The MASTER spreadsheet allows the form of the speed-crash relationship to be specified. In the analyses reported here, the Andersson and Nilsson (1997) relationship between changes in mean speed and number of crashes was used:

$$\mathbf{n_A = (v_A/v_B)^2 * n_B}$$

where $\mathbf{n_A}$ = number of injury crashes after speed change

$\mathbf{n_B}$ = number of injury crashes before speed change

$\mathbf{v_A}$ = mean speed after speed change

$\mathbf{v_B}$ = mean speed before speed change

This relationship was chosen in preference to the relationship developed by Kloeden et al (1997) because Cameron (2000) found that the risk estimates from Kloeden et al's relationship were not sufficiently stable for speeds below 60 km/h.

The Kallberg and Toivanen (1998) relationship between changes in mean speed and crash costs was also used:

$$\mathbf{C_A = [k*((v_A/v_B)^2-1)+1]*C_B}$$

Where $\mathbf{C_A}$ = crashes costs after speed change

$\mathbf{C_B}$ = crashes costs before speed change

$\mathbf{v_A}$ = mean speed after speed change

$\mathbf{v_B}$ = mean speed before speed change

k = a constant depending on the actual unit costs of fatal, serious and minor injuries and the average number of each in casualty crashes of various severities. A value of k=2 was used in the analyses since Kallberg and Toivanen found that this applied in most European countries

There is an apparent inconsistency between the changes in mean speed and crashes observed to result from the 50 km/h residential speed limit in NSW and those predicted by the Andersson and Nilsson relationship. In NSW, the measured reduction in mean speeds was of the order of about 1 km/h (see Section 4.1.1). From this speed reduction, the Andersson and Nilsson relationship would predict a reduction in crashes of the order of 3%. However, the before and after analysis showed that 21% fewer crashes occurred than would have been expected if the trend from before treatment had continued. This has led to concerns being expressed about the applicability of the Andersson and Nilsson relationship to urban speeds.

An alternative approach that could have been used in this report would have involved substituting the observed NSW crash and speed reductions from NSW into a modified version of the MASTER spreadsheet, rather than using the Andersson and Nilsson relationship. This approach was not taken for several reasons.

Firstly, the reported speed reductions in Queensland were considerably larger than reported in NSW. This suggested that the size of the speed reduction might depend on the method of implementation. It is possible that the greater emphasis on enforcement in Queensland compared to NSW (and possibly introduction Southeast Queensland-wide, rather than Local Government Area by Local Government Area) might have resulted in larger speed reductions.

Secondly, it was unclear what aspects of speed were actually measured in NSW. The MASTER framework requires cruise and average journey speeds as input. It is unclear whether the NSW measurements reflected cruise speeds, average journey speeds or something in between.

Thirdly, the NSW results were restricted to local residential streets. It was unclear whether the speed reductions reported in NSW would generalise to urban collector roads and urban arterial roads currently zoned 60 km/h.

The overall outcome of the approach used in this report is likely to be more conservative than the alternative approach. The observed casualty reductions in NSW lie between the outcomes predicted using the Andersson and Nilsson relationship for the 5 km/h and 10 km/h cruise speed reduction scenarios in this report. However, if the reported speed reductions in NSW actually represent cruise speed reductions, then the reductions in average journey speeds are likely to be smaller than in the 5 km/h and 10 km/h scenarios. Thus the costs associated with increases in travel time and vehicle operating costs would be smaller using the alternative approach.

5.1.5 Costs of travel time and crashes

Austroads provides estimates of cost of travel time for private and business travel by car and for other vehicle types (Thoresen, 2000). The values for business travel by car and for travel by other vehicle types are considerably higher than those for private travel by car.

The Bureau of Transport Economics has published estimates of the cost of crashes at varying levels of severity (BTE, 2000). Based on these figures, Cameron (2000) estimated that the cost of casualty crash was $152,270.

However, a fundamental problem exists in comparing these two forms of costs. The BTE crash costs are based on a Human Capital approach in which time lost as a result of crashes is only valued if it is paid work time or "productive" time devoted to unpaid community contributions (child care, housework, voluntary work etc). Leisure time lost through crashes is not valued in this approach.

In the Austroads figures, the estimated values of travel time for private use of cars (unpaid time) are lower than those for business use of cars (paid time). However, the unpaid time is assigned a value that is a high proportion of hourly average weekly earnings.

Thus, unpaid time is given a value in the travel time estimates, but not in the crash cost estimates. The outcome of this discrepancy is to value time lost as a result of lower travel speeds at a higher rate than time lost because of crashes. This discrepancy is not unique to the Australian estimates and has been discussed at length in the safety literature. Hauer (1994) pointed out that the discrepancy implies that it is better to be dead than stuck in traffic. Miller (1993) warned of the danger of making decisions based on conflicting travel time and crash cost values. He concluded that "by using monetary crash costs in resource allocation, highway engineers inadvertently created mobility by sacrificing lives" (p.605).

This report takes two approaches to addressing the discrepancy in the values of time generated by the travel time and crash cost estimates. The first approach attempts to deal with the discrepancy by reducing the estimates of travel times to remove the value of unpaid time (and comparing the adjusted estimates with published values of crash costs). The second approach uses published values for travel times but increases the value of crash costs to a level which attempts to include the value of unpaid time.

The values of a casualty crash used in the analyses were the BTE (2000) based value of $152,270, a lower estimate of $110,000 and a higher estimate of $250,000. The values of the cost of a non-injury crash used in the current analyses were a BTE (2000) based value of $6,000, a lower value of $4,500 and a higher value of $10,000.

5.1.6 Share of traffic by trip purpose

The MASTER framework requires that the percent of trips that are business, private business/commuting and leisure be entered. It also requires that the value of travel time associated with these three trip purposes be entered. The complicating issue in calculating the values to enter is that both of these measures are dependent on vehicle type and road type.

The Survey of Motor Vehicle Use 1999 (Table 8) provides information about the percent of travel by different vehicle types (for all types of roads) classified into business use, travel to and from work and "personal and other". The Mass Limits Review – Road and Bridge Statistical Tables (NRTC, 1996) provides information about the amount of travel on different road types by different vehicle types.

Table 24 combines these sources of information to estimate the proportion of trips on urban roads that are for different purposes. The calculations in the Table assume that the proportion of travel (for a given vehicle type) according to trip purpose is the same for all types of roads (e.g. if 20% of car trips are for business, then this is true for each road type). If the percentage of travel on urban local streets that is by private car is greater than for all roads as a whole, then the effect of the assumption would be to overestimate travel time costs.

Based on data in Table 8 of the Survey of Motor Vehicle Use 1999 (ABS, 2000), the calculations in Table 24 assume that:

- 25% of passenger car and motorcycle travel is for business;
- 50% of passenger car and motorcycle travel is for personal business and commuting;
- 25% of passenger car and motorcycle travel is for leisure;
- 70% of light commercial travel is for business and remaining travel is divided between personal business and leisure;
- all rigid and articulated trucks travel is for business.

The share of traffic by trip purpose and vehicle type on urban collector roads was assumed to be the same as on urban local streets.

Table 24. Travel by trip purpose on urban local streets and urban arterial roads. Based on data from Mass Limits Review – Road and Bridge Statistical Tables (NRTC, 1996) and Table 8 of the Survey of Motor Vehicle Use 1999 (ABS, 2000).

Type of travel	Urban local streets		Urban arterials zoned 60 km/h	
	Distance travelled (million vehicle-kms)	% of travel	Distance travelled (million vehicle-kms)	% of travel
Business trips	6,179	33.6	23,971	37.7
Personal business and commuting trips	8,012	43.6	25,962	40.9
Leisure trips	4,187	22.8	13,568	21.4

Travel time costs were estimated by applying the values in Thoresen (2000) (Table 9) to the percentages of travel by each vehicle type and purpose in Table 24. The value of travel time for each type of trip is summarised in Table 25. These values will be used in Approach 2. In Approach 1 the value of travel time for personal business/commuting and leisure trips will be set to zero (as explained earlier).

Table 25. Values of travel time used in Approach 1 and Approach 2.

Type of travel	Urban local streets		Urban arterials zoned 60 km/h	
	Approach 1	Approach 2	Approach 1	Approach 2
Business travel	$29.77	$29.77	$30.05	$30.05
Personal business and commuting travel	$0.00	$12.18	$0.00	$12.18
Leisure travel	$0.00	$12.18	$0.00	$12.18

5.1.7 Vehicle operating costs

Vehicle operating costs for each average speed were estimated by applying the values in Thoresen (2000) (Table 12) for the Urban Stop-Start model to the percentages of travel by each vehicle type and purpose in Table 24. The used car value was used for private travel by car. The resultant values are summarised in Table 26. Note that vehicle operating costs are greater at lower speed in the Urban Stop-Start model because speed is a component of the denominator of the function.

Table 26. Estimates of vehicle operating costs ($/km), based on vehicle mix and cruise speeds.

Cruise speed level	Urban local streets	Urban arterials zoned 60 km/h
57 km/h (60 km/h zone)	0.262	0.269
52 km/h (5 km/h reduction)	0.264	0.270
47 km/h (10 km/h reduction)	0.265	0.272

5.1.8 Air pollution values

Unit costs for air pollutants emitted by vehicles were taken from Cosgrove (1994). The relationship between amount of air pollutants and travel speed was taken from Ward, Roberston and Allsop (1998). These assumptions were used by Cameron (2000) in his estimation of optimum travel speeds on urban local streets.

5.1.9 Summary of Scenarios

The three values of the cost of a casualty crash used were the value used by Cameron (2000) based on BTE (2000), a lower value and a higher value. The three values were used to assess the extent to which the net outcomes were sensitive to the values selected to represent the cost of a casualty crash. The two values of the likely reduction in cruise speed used were 5 km/h and 10 km/h.

Eight Scenarios were examined in each analysis. The first six scenarios combine three values of the cost of a casualty crash and two values of the likely reduction in cruise speed associated with a reduction in the speed limit from 60 km/h to 50 km/h. In these six analyses, the value of travel time is adjusted to remove the effects of unpaid time. The final two scenarios use the published value of travel time and the higher value of crash costs for 5 km/h and 10 km/h reductions in cruise speed.

The base case is considered to be a reduction in cruise speed of 5 km/h assessed at the BTE (2000) based crash cost values and the adjusted values of travel time.

5.2 Urban local streets

5.2.1 Analyses in hypothetical and current situations

As described in the earlier section, some parts of Australia already have 50 km/h speed limits on urban local streets. Therefore, while the hypothetical assessment of the effects of changing from a 60 km/h limit in urban local streets throughout Australia to a 50 km/h limit may be of theoretical interest, it does not really measure the effects of the proposed change in the default urban speed limit. The more relevant analysis assesses the effect of changing to a 50 km/h limit in those areas where the current residential speed limit is 60 km/h.

Both sets of analyses are presented here.

Analysis 1 estimates the benefits and costs of implementing a default 50 km/h speed limit on urban local streets across Australia, compared to a baseline situation that all local streets are zoned 60 km/h.

Analysis 2 estimates the benefits and costs of implementing a default 50 km/h speed limit on urban local streets across Australia, compared to a baseline situation that represents the current situation. The current situation is represented here as 50 km/h on all local streets in Victoria and the ACT and 90% of all local streets in NSW and Queensland.

5.2.2 Analysis 1: Australia-Wide 60 Km/H Versus 50 Km/H

This analysis estimates the benefits and costs of implementing a default 50 km/h speed limit on urban local streets across Australia, compared to a baseline situation that all local streets are zoned 60 km/h.

Table 27 summarises the estimated outcomes of a default 50 km/h speed limit on urban local streets throughout Australia measured from 60 km/h national baseline. It assumes that the speed limit reduction would result in a **5 km/h reduction in cruise speed**. The savings in costs of casualty crashes are more than an order of magnitude greater than the savings in the costs of property damage crashes. The savings in terms of reduced air pollution are relatively modest. The vehicle operating costs are based on the mix of vehicle types on urban local streets.

Approach 1 attempts to deal with the discrepancy between published values for crash costs and travel times by reducing the estimates of travel times to remove the willingness-to-pay component. Approach 2 uses published values for travel times but uses the highest value of crash cost savings (which approaches willingness-to-pay estimates).

Approach 1 concludes that the outcome is a net benefit (negative value in the Table) if the higher value of crash costs is used. Approach 2 results in an estimate of travel time costs that is almost twice that in Approach 1 and concludes that the outcome is a net loss. If the effect of increased travel time is excluded, all estimates show a net benefit, ranging from $98 million per year to $247 million per year.

Table 27. Estimated outcomes of default 50 km/h speed limit on urban local streets throughout Australia (measured from 60 km/h national baseline) if the speed limit reduction results in a 5 km/h reduction in cruise speed**. Negative values represent a reduction in costs. All values in $000s per year.**

Component	**Approach 1 – Adjusted travel time costs**			**Approach 2 – Austroads travel time costs**
	BTE crash costs	**lower value of crash costs**	**higher value of crash costs**	**higher value of crash costs**
Casualty crash costs	-149,955	-108,328	-246,200	-246,200
Property damage crash costs	-11,760	-8,820	-19,600	-19,600
Air pollution costs	-948	-948	-948	-948
Vehicle operating costs	19,518	19,518	19,518	19,518
Net effect (excluding travel time costs)	**-143,146**	**-98,579**	**-247,230**	**-247,230**
Travel time costs	178,922	178,922	178,922	323,261
Net effect (including travel time costs)	**35,777**	**80,344**	**-68,308**	**76,031**

If implementation of a default 50 km/h speed limit on urban local streets throughout Australia (measured from 60 km/h national baseline) resulted in a **10 km/h reduction in cruise speed,** the savings associated with fewer casualty and property damage crashes would be more than double that associated with a 5 km/h reduction in cruise speed (see Table 28).

Approach 1 concludes that the outcome is a net benefit only if the highest value of crash costs is used. Approach 2 concludes that the outcome is a net loss. If the effect of increased travel time is excluded, all estimates show a net benefit, ranging from $239 million per year to $605 million per year.

The costs associated with increased travel times for a 10 km/h reduction in cruise speed are more than double the costs associated with a 5 km/h reduction in cruise speed. The travel time calculations are based on average speed, not cruise speed, and the reduction in average speed for a 10 km/h reduction in cruise speed is more than double that for a 5 km/h reduction in cruise speed.

Table 28. Estimated outcomes of default 50 km/h speed limit on urban local streets throughout Australia (measured from 60 km/h national baseline) if the speed limit reduction results in a 10 km/h reduction in cruise speed**. Negative values represent a reduction in costs. All values in $000s per year.**

Component	**Approach 1 – Adjusted travel time costs**			**Approach 2 – Austroads travel time costs**
	BTE crash costs	**lower value of crash costs**	**higher value of crash costs**	**higher value of crash costs**
Casualty crash costs	-369,978	-267,273	-607,438	-607,438
Property damage crash costs	-28,560	-21,420	-47,600	-47,600
Air pollution costs	-3,010	-3,010	-3,010	-3,010
Vehicle operating costs	52,547	52,547	52,547	52,547
Net effect (excluding travel time costs)	**-349,001**	**-239,156**	**-605,501**	**-605,501**
Travel time costs	481,229	481,229	481,229	870,319
Net effect (including travel time costs)	**132,228**	**242,073**	**-124,272**	**264,818**

While the monetary values associated with the increases in travel times appear very large, these values may be illusory. Travel time increased by 3.7% for a 5 km/h reduction in cruise speed and by 10.0% for a 10 km/h reduction in cruise speed. Expressed in absolute terms, the actual increase in travel times varied from 48,957 hours per day (5 km/h reduction in cruise speed) to 131,808 hours per day (10 km/h reduction). These travel time increases correspond to an average increase in travel time of between 8.8 seconds per day and 23.7 seconds per day for each member of the Australian population. If each person makes four trips per day (on average), then forfeiting 2.2 to 5.9 seconds per trip is required to prevent between 492 and 1,200 casualty crashes per year. The validity of aggregating small changes in travel time will be discussed in Section 5.5.1.

5.2.3 Analysis 2: Current Situation Versus Australia-Wide 50 Km/H

This analysis estimates the benefits and costs of implementing a default 50 km/h speed limit on urban local streets across Australia, compared to a baseline situation that represents the current situation. The current situation is represented here as 50 km/h on all local streets in Victoria and the ACT and 90% of all local streets in NSW and Queensland.

Table 29 summarises the estimated outcomes of a default 50 km/h speed limit on urban local streets throughout Australia measured from the current baseline. It assumes that the speed limit reduction would result in a **5 km/h reduction in cruise speed**.

The outcome is a net benefit only for Approach 1 with the highest value of crash costs. For all other Scenarios, the value of increased travel time costs exceeds the saving associated with casualty and property damage crash reductions.

Table 29. Estimated outcomes of default 50 km/h speed limit on urban local streets throughout Australia (measured from current baseline) if the speed limit reduction results in a 5 km/h reduction in cruise speed**. Negative values represent a reduction in costs. All values in $000s per year.**

Component	**Approach 1 – Adjusted travel time costs**			**Approach 2 – Austroads travel time costs**
	BTE crash costs	**lower value of crash costs**	**higher value of crash costs**	**higher value of crash costs**
Casualty crash costs	-52,484	-37,915	-86,170	-86,170
Property damage crash costs	-4,116	-3,087	-6,860	-6,860
Air pollution costs	-333	-333	-333	-333
Vehicle operating costs	6,853	6,853	6,853	6,853
Net effect (excluding travel time costs)	**-50,080**	**-34,482**	**-86,510**	**-86,510**
Travel time costs	62,764	62,764	62,764	113,511
Net effect (including travel time costs)	**12,684**	**28,282**	**-23,746**	**27,001**

Table 30 shows that if implementation of a default 50 km/h speed limit on urban local streets throughout Australia (measured from 60 km/h national baseline) resulted in a **10 km/h reduction in cruise speed,** the only Scenario that predicts a net benefit is Approach 1 with the highest value of crash costs. For the other Scenarios, the estimated cost of increased travel time exceeds the savings associated with fewer casualty and property damage crashes.

Travel time increased by 3.7% for a 5 km/h reduction in cruise speed and by 10.0% for a 10 km/h reduction in cruise speed. Expressed in absolute terms, the actual increase in travel times varied from 17,191 hours/day (5 km/h reduction in cruise speed) to 46,283 hours/per day (10 km/h reduction). These travel time increases correspond to an average increase in travel time of between 3.1 seconds per day and 8.3 seconds per day for each member of the Australian population. If each person makes four trips per day (on average), then forfeiting

0.8 to 2.1 seconds per trip is required to prevent between 172 and 425 casualty crashes per year. The validity of aggregating small changes in travel time will be discussed in Section 5.5.1.

Table 30. Estimated outcomes of default 50 km/h speed limit on urban local streets throughout Australia (measured from current baseline) if the speed limit reduction results in a *10 km/h reduction in cruise speed*. Negative values represent a reduction in costs. All values in $000s per year.

Component	Approach 1 – Adjusted travel time costs			Approach 2 – Austroads travel time costs
	BTE crash costs	lower value of crash costs	higher value of crash costs	higher value of crash costs
Casualty crash costs	-129,492	-93,545	-212,603	-212,603
Property damage crash costs	-9,996	-7,497	-16,660	-16,660
Air pollution costs	-1,057	-1,057	-1,057	-1,057
Vehicle operating costs	18,452	18,452	18,452	18,452
Net effect (excluding travel time costs)	**-122,094**	**-83,648**	**-211,869**	**-211,869**
Travel time costs	168,981	168,981	168,981	305,607
Net effect (including travel time costs)	**46,888**	**85,334**	**-42,887**	**93,739**

5.2.4 Summary of benefits and costs of implementing a default 50 km/h speed limit on urban local streets

The base case is assumed to be a 5 km/h reduction in cruise speed estimated using the BTE crash costs and the adjusted values of travel time costs. The analyses show that this would lead to a net disbenefit of about $36 million per year if implemented throughout Australia. This outcome is sensitive to the value of crash costs: the predicted disbenefit is larger if the lower value of crash costs is used and a net benefit of $68 million per year is predicted if the higher value of crash costs is used. The outcome is also sensitive to the size of the reduction in cruise speed. In the unlikely event that the 50 km/h default speed limit led to a 10 km/h reduction in cruise speed, the outcome would be a net disbenefit (unless the highest value of crash costs was used). Using unadjusted values of travel time (Approach 2) leads to a consistent pattern of net disbenefits.

The analyses show that the magnitudes of the outcomes were smaller when measured from the current baseline (i.e. 50 km/h already implemented in parts of NSW, Queensland and Victoria).

In all of the scenarios examined, the estimated costs associated with increases in travel time were substantial compared to the estimated savings from fewer casualty and property damage crashes. However, it may not be appropriate to include travel time costs when the individual time differences are so small (less than six seconds per trip). If the effect of increased travel time is excluded, all the Scenarios show a net benefit. The validity of aggregating small changes in travel time will be discussed in Section 5.5.1.

As noted earlier, the MASTER framework does not include implementation costs such as signage and public education. The values obtained from the MASTER framework can be interpreted as annual returns in a year that follows implementation. Clearly any implementation costs would need to be discounted across a period of years if these were to be included in the calculations.

5.3 Urban collector roads

Table 31 summarises the estimated outcomes of a default 50 km/h speed limit on urban residential collector roads throughout Australia. It assumes that the speed limit reduction would result in a **5 km/h reduction in cruise speed**. The outcome is a net benefit only for Approach 1 and the highest values of crash cost savings. For all other Scenarios, the cost associated with increased travel time exceeds the savings from fewer casualty and property damage crashes.

Table 31. Estimated outcomes of default 50 km/h speed limit on urban collector roads throughout Australia if the speed limit reduction results in a 5 km/h reduction in cruise speed**. Negative values represent a reduction in costs. All values in $000s per year.**

Component	**Approach 1 – Adjusted travel time costs**			**Approach 2 – Austroads travel time costs**
	BTE crash costs	**lower value of crash costs**	**higher value of crash costs**	**higher value of crash costs**
Casualty crash costs	-117,822	-85,115	-193,443	-193,443
Property damage crash costs	-2,322	-1,741	-3,870	-3,870
Air pollution costs	-745	-745	-745	-745
Vehicle operating costs	15,337	15,337	15,337	15,337
Net effect (excluding travel time costs)	**-105,552**	**-72,264**	**-182,721**	**-182,721**
Travel time costs	140,461	140,461	140,461	254,027
Net effect (including travel time costs)	**34,909**	**68,197**	**-42,260**	**71,306**

If implementation of a default 50 km/h speed limit on urban collector roads throughout Australia resulted in a **10 km/h reduction in cruise speed,** the outcome is a net benefit only for Approach 1 and the highest values of crash cost savings (see Table 32). For all other scenarios, the cost associated with increased travel time exceeds the savings from fewer casualty and property damage crashes.

Travel time increased by 3.7% for a 5 km/h reduction in cruise speed and by 10.0% for a 10 km/h reduction in cruise speed. Expressed in absolute terms, the actual increase in travel times varied from 38,472 hours/day (5 km/h reduction in cruise speed) to 103,578 hours/per day (10 km/h reduction). These travel time increases correspond to an average increase in travel time of between 6.9 seconds per day and 18.6 seconds per day for each member of the Australian population. If each person makes four trips per day (on average), then forfeiting 1.7 to 4.7 seconds per trip is required to prevent between 387 and 955 casualty crashes per year. The validity of aggregating small changes in travel time will be discussed in Section 5.5.1.

Table 32. Estimated outcomes of default 50 km/h speed limit on urban collector roads throughout Australia if the speed limit reduction results in *a 10 km/h reduction in cruise speed*. Negative values represent a reduction in costs. All values in $000s per year.

Component	Approach 1 – Adjusted travel time costs			Approach 2 – Austroads travel time costs
	BTE crash costs	**lower value of crash costs**	**higher value of crash costs**	**higher value of crash costs**
Casualty crash costs	-290,697	-210,000	-477,273	-477,273
Property damage crash costs	-5,730	-4,298	-9,550	-9,550
Air pollution costs	-2,366	-2,366	-2,366	-2,366
Vehicle operating costs	41,293	41,293	41,293	41,293
Net effect (excluding travel time costs)	**-257,500**	**-175,371**	**-447,896**	**-447,896**
Travel time costs	378,163	378,163	378,163	683,920
Net effect (including travel time costs)	**120,663**	**202,792**	**-69,733**	**236,024**

5.4 Urban arterial roads

The approach assumes that only arterial roads currently zoned 60 km/h would be subject to the default speed limit of 50 km/h.

Table 33 summarises the estimated outcomes of a default 50 km/h speed limit on urban arterial roads currently zoned 60 km/h throughout Australia. It assumes that the speed limit reduction would result in a **5 km/h reduction in cruise speed**. The outcome is a net benefit unless the lower value of crash costs is used. The size of the net benefit varies from $49 million to $410 million.

Table 33. Estimated outcomes of default 50 km/h speed limit on urban arterial roads currently zoned 60 km/h throughout Australia if the speed limit reduction results in a *5 km/h reduction in cruise speed.* Negative values represent a reduction in costs. All values in $000s per year.

Component	Approach 1 – Adjusted travel time costs			Approach 2 – Austroads travel time costs
	BTE crash costs	lower value of crash costs	higher value of crash costs	higher value of crash costs
Casualty crash costs	-551,548	-398,439	-905,542	-905,542
Property damage crash costs	-10,866	-8,150	-18,110	-18,110
Air pollution costs	-2,384	-2,384	-2,384	-2,384
Vehicle operating costs	50,774	50,774	50,774	50,774
Net effect (excluding travel time costs)	**-514,024**	**-358,199**	**-875,262**	**-875,262**
Travel time costs	464,654	464,654	464,654	775,883
Net effect (including travel time costs)	**-49,370**	**106,455**	**-410,608**	**-99,379**

Table 34 shows that if implementation of a default 50 km/h speed limit on urban arterial roads currently zoned 60 km/h throughout Australia resulted in a **10 km/h reduction in cruise speed,** the outcome would be a net benefit if the higher value of crash costs was used (regardless of whether published or adjusted values for travel time costs are used). For other Scenarios, the cost of increased travel time exceeds the savings from fewer casualty and property damage crashes.

Travel time increased by 4.2% for a 5 km/h reduction in cruise speed and by 12.3% for a 10 km/h reduction in cruise speed. Expressed in absolute terms, the actual increase in travel times varied from 112,370 hours/day (5 km/h reduction in cruise speed) to 329,663 hours/per day (10 km/h reduction). These travel time increases correspond to an average increase in travel time of between 20.2 seconds per day (5 km/h reduction) and 59.3 seconds per day for each member of the Australian population. If each person makes four trips per day (on average), then forfeiting 5.1 to 14.8 seconds per trip is required to prevent between 2,350 and

6,000 casualty crashes per year. The validity of aggregating small changes in travel time will be discussed in Section 5.5.1.

Table 34. Estimated outcomes of default 50 km/h speed limit on urban arterial roads currently zoned 60 km/h throughout Australia if the speed limit reduction results in a *10 km/h reduction in cruise speed.* Negative values represent a reduction in costs. All values in $000s per year.

Component	**Approach 1 – Adjusted travel time costs**			**Approach 2 – Austroads travel time costs**
	BTE crash costs	**lower value of crash costs**	**higher value of crash costs**	**higher value of crash costs**
Casualty crash costs	-1,448,424	-1,046,343	-2,378,052	-2,378,052
Property damage crash costs	-28,536	-21,402	-47,560	-47,560
Air pollution costs	-7,567	-7,567	-7,567	-7,567
Vehicle operating costs	148,954	148,954	148,954	148,954
Net effect (excluding travel time costs)	**-1,335,573**	**-926,358**	**-2,284,225**	**-2,284,225**
Travel time costs	1,363,167	1,363,167	1,363,167	2,276,226
Net effect (including travel time costs)	**27,594**	**436,809**	**-921,058**	**-7,999**

5.5 Overall summary of net effects

The base case is considered to be a 5 km/h reduction in cruise speed estimated using the BTE crash costs and the adjusted values of travel time costs. The first column of figures in Table 35 presents the results for the base case. It shows that the outcome would be a net benefit if implemented on urban arterial roads currently zoned 60 km/h. From the baseline condition of 60 km/h on local streets throughout Australia, implementation of a default 50 km/h urban speed limit on local streets, collector roads and arterial roads currently zoned 60 km/h, is predicted to result in a net disbenefit of about $21 million per year. Compared to the baseline of the current state of implementation of 50 km/h speed limits on urban local streets, the overall outcome would be a net benefit of about $1.7 million per year.

This outcome is sensitive to the value of crash costs selected: a net disbenefit of $203 million per year is predicted if the lower value of crash costs is used but a net benefit of $476 million per year is predicted if the higher value of crash costs is used. Using unadjusted values of travel time (Approach 2) leads to net disbenefits except for urban arterial roads currently zoned 60 km/h.

The outcome is also sensitive to the size of the reduction in cruise speed. In the unlikely event that the 50 km/h default speed limit led to a 10 km/h reduction in cruise speed (see Table 36), the outcome would be a net disbenefit unless the highest value of crash costs was used. Using the highest value of crash costs and adjusted travel time costs, the net benefit is estimated to exceed $1 billion per year. For the lower value of crash costs and the adjusted travel time costs, the disbenefit is estimated at over $700 million per year.

Table 35. Estimated net effects of 50 km/h default speed limit on urban roads (local streets, collectors and 60 km/h arterial roads) throughout Australia if the speed limit reduction results in a *5 km/h reduction in cruise speed.* Negative values are cost savings. (all values in $000s per year)

Affected roads	Approach 1 – Adjusted travel time costs			Approach 2 – Austroads travel time costs
	BTE crash costs	lower value of crash costs	higher value of crash costs	higher value of crash costs
Urban local streets – from 60 km/h national baseline	35,777	80,344	-68,308	76,031
Urban local streets – from current baseline	12,684	28,282	-23,746	27,001
Urban collector roads	34,909	68,197	-42,260	71,306
Urban arterials currently zoned 60 km/h	-49,370	106,455	-410,608	-99,379
Total (from 60 km/h national baseline)	**21,316**	**254,996**	**-521,176**	**47,958**
Total (from current baseline)	**-1,777**	**202,934**	**-476,614**	**-1,072**

Table 36. Estimated net effects of 50 km/h default speed limit on urban roads (local streets, collectors and 60 km/h arterial roads) throughout Australia if the speed limit reduction results in a *10 km/h reduction in cruise speed.* Negative values are cost savings. (all values in $000s per year)

Affected roads	Approach 1 – Adjusted travel time costs			Approach 2 – Austroads travel time costs
	BTE crash costs	lower value of crash costs	higher value of crash costs	higher value of crash costs
Urban local streets – from 60 km/h national baseline	132,228	242,073	-124,272	264,818
Urban local streets – from current baseline	46,888	85,334	-42,887	93,739
Urban collector roads	120,663	202,792	-69,733	236,024
Urban arterials currently zoned 60 km/h	27,594	436,809	-921,058	-7,999
Total (from 60 km/h national baseline)	**280,485**	**881,674**	**-1,115,063**	**492,843**
Total (from current baseline)	**195,145**	**724,935**	**-1,033,678**	**321,764**

In terms of the relative benefits on different classes of roads, Tables 35 and 36 also show that most of the benefit is derived through implementation on the urban arterial roads currently zoned 60 km/h.

5.5.1 The validity of aggregating small changes in travel time

In all of the Scenarios examined, the estimated costs associated with increases in travel time were substantial compared to the estimated savings from fewer casualty and property damage crashes. While the total costs of the travel time increases are very large, they correspond to very small increases in time for a very large number of trips. Table 37 shows that if implementing a 50 km/h default urban speed limit on local streets, collector roads and arterial roads currently zoned 60 km/h resulted in a 5 km/h reduction in cruise speed, the time increase per trip would be less than 10 seconds. This small increase in travel time would prevent about 3,000 casualty crashes per year.

Previous analyses of travel time effects of reduced speed limits have questioned the meaningfulness of valuing very small amounts of travel time across large numbers of vehicles (Austroads, 1996; Hauer, 1994; VicRoads, 2000). Hauer (1994) cites Strand (1993) as supporting the view that it is nonsense to sum the extra few seconds apiece that many vehicle occupants wait at a STOP sign (as compared to a GIVE WAY sign) and compare this value with estimates of crash cost savings.

Table 37. Summary of increases in travel time costs and travel time increases per trip compared to casualty crash reductions.

	5 km/h reduction in cruise speed				**10 km/h reduction in cruise speed**			
	Cost of time increase ($000)		Time increase per trip (sec)	Casualty crashes saved	Cost of time increase ($000)		Time increase per trip (sec)	Casualty crashes saved
	Adjusted	AUST-ROADS			Adjusted	AUST-ROADS		
Urban local streets – from 60 km/h national baseline	178,922	323,261	2.2	492	481,229	870,319	5.9	1,200
Urban local streets – from current baseline	62,764	113,511	0.8	172	168,981	305,607	2.1	425
Urban collector roads	140,461	254,027	1.7	387	378,163	683,920	4.7	955
Urban arterials currently zoned 60 km/h	464,654	775,883	5.1	2,350	1,363,167	2,276,226	14.8	6,000
Total (from 60 km/h national baseline)	**784,037**	**1,353,171**	**9.0**	**3,229**	**2,222,559**	**3,830,465**	**25.4**	**8,155**
Total (from current baseline)	**667,879**	**1,143,421**	**7.6**	**2,909**	**1,910,311**	**3,265,753**	**21.6**	**7,380**

The Austroads report on Urban Speed Management in Australia (Austroads, 1996) concludes that:

> *"Economic theory requires that travel time increases must adversely impact productive activity before it is appropriate to assign monetary values to them. As it is implausible that the small daily increases in travel time resulting from lower speeds on urban local streets have any measurable impact on productive activity, and as it is unlikely that any individuals will ever be faced with long delays as a result of the lower speeds, calculation of monetary costs of increased travel time would be inappropriate."* (Austroads, 1996, p.21)

Furthermore, because the average increase in travel time is of the order of 4-10%, such impacts fall within the normal range of variability of urban trips and, therefore, are unlikely to be noticed by vehicle occupants. The NSW preliminary evaluation found that 25% of persons interviewed did not perceive an increase in travel time and 41% considered it to be slight (ARRB Transport Research 1999, cited in VicRoads, 2000). Given this, vehicle occupants are unlikely to place a high value on travel time increases of this order.

5.5.2 Effects of methods of implementation

The outcomes summarised in Tables 35 and 36 are not predicated on whether the 50 km/h urban speed limit is implemented by default or by signing of speed limited areas. There is currently no clear evidence regarding the relative effectiveness of these two approaches to implementation. The summaries do not incorporate implementation costs which are likely to vary significantly according to the method and extent of implementation.

As noted earlier in the report, most States and Territories will have implemented a 50 km/h urban speed limit for local streets in some form or another by the end of 2001. Therefore, any estimate of implementation costs based on an assumption of a 60 km/h national baseline for local streets is largely hypothetical. However, it can be assumed that there has been no widespread implementation of 50 km/h speed limits on urban collector roads and arterial roads.

The real cost of implementation of a default 50 km/h urban speed limit in local streets would depend on whether those States and Territories that have already adopted an area-wide approach would change to the default approach. There is no strong evidence of any additional road safety benefits of a uniform approach to implementation of 50 km/h urban speed limits (although as discussed in Section 8 attention to key aspects of planning, coordination and implementation can contribute to how effectively the change to a lower limit is introduced).

The set of options for implementation includes:

Option 1: the hypothetical situation of implementation of a default limit assuming 60 km/h on local streets throughout Australia

Option 2: implementation of a default limit from current situation (assuming change to a default limit)

Option 3: implementation of a default limit from current situation (States and Territories with signing of speed limited areas remain the same)

Option 4: the hypothetical situation of implementation of signing of speed limited areas assuming 60 km/h on local streets throughout Australia

Option 5: implementation of signing of speed limited areas from current situation (assuming change to signing of speed limited areas)

Option 6: implementation of signing of speed limited areas from current situation (States and Territories with a default limit remain the same)

The costs of implementation of lower urban speed limits on local streets by changing default speed limits have been estimated as $2.8 million in Victoria and about $2 million in Western Australia. VicRoads (2000) estimated that the costs of extensive signing to achieve the equivalent outcome would have been almost five times higher. On the basis of these estimates, the hypothetical implementation assuming a 60 km/h baseline across Australia would cost in the order of $30 million for a default limit (Option 1) and in the order of $150 million for implementation by signing (Option 4).

If States and Territories that had already adopted 50 km/h residential speed limits did not change their method of implementation, then the total implementation costs would be less than the estimates for the hypothetical case. Thus Option 3 (implementation by default limit) would cost less than about $30 million and Option 6 (implementation by signing of speed limited areas) would cost less than about $150 million.

The implementation costs would be greater if States and Territories that had already adopted 50 km/h residential speed limits changed their method of implementation. It is more difficult to estimate the relative cost of the national uniformity options (Options 2 and 5).

6. CONSULTATION

6.1 Consultations undertaken

Relevant agencies in each State and Territory were advised of the purpose and scope of the project and assistance was sought for information to help meet its aims.

However, broad-based consultations with a wide range of stakeholders did not form part of the evaluation phase of the project. Such consultations will be initiated during the second half of 2001. They are expected to provide valuable feedback on the form of assessment undertaken and on practical issues associated with any future implementation of 50 km/h limits.

As part of such consultations, consideration should be given to a meeting between State and Territory representatives - in a workshop format - at which the merits of different ways of implementing a 50 km/h limit could be explored in detail.

7. REASONS FOR PREFERRING PROPOSED APPROACH

7.1 Decision criteria for a 50 km/h speed limit

The focus of the analysis in this report goes beyond the justification of a regulation *per se* (as a default limit of 60 km/h in built-up areas already exists in the Australian Road Rules) with the assessment, on the basis of available evidence, of whether a change in the current limit is desirable.

The primary consideration in any decision to reduce speed limits is whether a lower limit reduces speeds and to what degree. A range of international studies suggests that reductions in speed are modest but real (Leaf and Preusser, 1999). More importantly, even small reductions in prevailing vehicle speeds result in reduced crashes and injuries. In the urban context, this is particularly significant for vulnerable road users, especially pedestrians. The initial results of the introduction of 50 km/h limits in New South Wales and Queensland reviewed in this report support the conclusion that a reduction in the limit lowers speeds and crashes.

Associated considerations include the positive and negative impacts of lower speed limits on the community more broadly, in areas such as travel times, vehicle operating costs, vehicle emissions and the amenity of urban environments. This report finds that the major benefit would be fewer casualty crashes. Fewer property damage only crashes and reduced air pollution would be minor benefits. The major cost would be increased travel time and a minor cost would be increased vehicle operating costs. The net outcome depends on how meaningful it is to value very small increases in travel times. If these are valued, then a reduction in the default urban speed limit to 50 km/h is economically justified only for urban arterial roads currently zoned 60 km/h. If the small travel time increases are not valued, then a reduction in the default urban speed limit is economically justified for all classes of road considered (local streets, collector roads and urban arterial roads currently zoned 60 km/h).

The savings in casualty crash costs exceeded the savings in property damage only crash costs and modest benefits were identified from reductions in vehicle emissions. There were several factors that led the estimation of benefits to be conservative. First, the speed-related impacts of carbon dioxide and noise emissions were not measured. However, since these increase with speed, the impact of a lower speed limit in this area would be positive. Secondly, the possible benefit of improved speed compliance on collector and arterial roads resulting from lower limits on local streets was not able to be measured. Thirdly, the estimates of crash numbers were based on reported crashes only and therefore the benefits in reductions of non-reported crashes are not included.

The analysis is probably made more conservative by over-estimation of costs. The travel time increases are likely to be overestimated because they do not take into account route substitution, destination substitution, or trip suppression effects.

With regard to travel time impacts, the estimated average increase per head of population in Australia ranged from about nine seconds per trip up to approximately 25 seconds per trip. If Australians were to accept travel time impacts of this order, it is estimated that between 2,900 and 7,380 casualty crashes would be prevented in Australia each year.

Environmental and health considerations have provided impetus for the encouragement of walking and cycling as forms of transport. Given the key influence of speed on the severity of injuries sustained by pedestrians and cyclists, this has the potential to expose a greater number of vulnerable road users to risk. Managing the speed of vehicles by appropriate speed limits goes hand in hand with the higher priority being given to non-motorised forms of travel.

Other approaches can be seen as both alternative and complementary ways to reduce speeds in urban areas. The effectiveness of these alternatives varies from low (for example public education) to significant (for example traffic calming) with the latter being a higher cost alternative, and requiring application over the longer term to impact on a significant proportion of the urban environment.

A characteristic of the regulatory approach exemplified by a default limit is its capacity to have an immediate impact across a whole population, the effectiveness of which can be periodically reinforced by associated measures such as enforcement in combination with targeted public education programs.

7.2 Recommendation

It is recommended that national consideration be given to the adoption of a 50 km/h default urban speed limit in the Australian Road Rules.

7.3 National competition policy

The Competition Principles Agreement sets out the basic principle that must be applied to legislation, namely, that it should not restrict competition unless it can be demonstrated that:

- the benefits of the restriction to the community as a whole outweigh the costs
- the objectives of the regulation can only be achieved by restricting competition.

A reduction in the urban default speed limit does not directly provide for, nor have the effect of, a restriction on competition. There are no features of such a decision that impose barriers to entry or restrictions on competitive conduct. The direct effect is on how roads are used, not who can use them (VicRoads, 2000).

8. IMPLEMENTATION

8.1 Issues affecting the implementation of 50 km/h limits

The analysis in Section 5 of the benefits and costs of a 50 km/h default urban speed limit showed that the implementation is economically justified only for urban arterial roads currently zoned 60 km/h. If small increases in travel time are not valued, then a reduction in the default urban speed limit is economically justified for all classes of road considered (local streets, collector roads and urban arterial roads currently zoned 60 km/h).

On the other hand, jurisdictions have so far chosen to apply the lower limit essentially to local streets. Depending on the jurisdiction, this has been achieved by a default limit for the affected streets (Statewide or on a zonal basis) and the use of signing either to delineate the affected areas or to indicate where a higher speed limit applies (such as on collector roads). The lessons to be drawn from Australian experience in regard to the implementation of 50km/h limits therefore focus on the more limited context of local streets. Should a jurisdiction undertake implementation of a 50 km/h limit on a broader scale, encompassing segments of urban arterial roads, the challenge would be greater and different approaches may be required.

Experience to date suggests that the steps taken to plan, coordinate and implement a 50 km/h speed limit are likely to influence its effectiveness in reducing speeds and crashes. Key aspects of implementation discussed in this section include:

- the roles played by State and local governments;
- identification of affected roads;
- informing the public of change;
- achievement of compliance, and promotional support for enforcement.

8.1.1 Respective responsibilities of State and local governments for implementation

Generally, State and Territory Government agencies are fully responsible for the funding and management of State Highways, and are either fully responsible or share, with local government, funding and management responsibility for main roads (generally corresponding to the arterial category). Local governments are typically fully responsible for the funding and management of local roads (Austroads, 2000).

Experience indicates that *planning, coordination and integration* are essential features of effective implementation of new speed limits. Donaghey and Ram (2000) observed that:

"The success of the 50 km/h local street speed limit initiative in south-east Queensland has been due largely to the integrated implementation program that has been adopted. It was recognised that an effective implementation would require much more than simply erecting a few signs. The implementation program would need to be based on the 'Three Es' - Education, Engineering and Enforcement.

The implementation program required a working partnership between Queensland Transport, the Queensland Police Service, each of the local governments in south-east Queensland, and the Department of Main Roads."

In the case of New South Wales, Rouse (2000) observed that:

"The key factor contributing to the success of implementing the 50 km/h limit was the partnership between councils, their communities, the police and the RTA. This component is followed by clear, succinct technical guidelines, a well planned and executed public education campaign and an extensive evaluation of the lowered limit."

The principle of co-ordinated and integrated action had previously been re-affirmed by various inquiries/task forces that have addressed the introduction of lower limits in local streets:

- The New South Wales Parliamentary Joint Standing Committee on Road Safety (Staysafe) in the report of its inquiry (1996) recommended that the speed limit change as one action within an integrated package of measures which would include traffic management, traffic law, police enforcement, and publicity strategies;
- The Austroads report into Urban Speed Management in Australia (1996) concluded that a number of steps were needed to achieve lower speeds in local streets, including:
  - all required speed signs should be installed prior to any regulation changes;
  - particular attention should be paid to publicity, education and enforcement strategies in implementing change;
  - community and interest group input on the change should be encouraged via public discussion papers;
  - adequate monitoring and evaluation of the impacts of changes to urban speed management on vehicle speeds, accidents, travel times and amenity should be carried out.

The direct costs of implementing a 50 km/h limit are associated with the required signing, public education, enforcement of compliance, and monitoring and evaluation tasks. The arrangements for sharing these costs vary between jurisdictions but typically the greatest proportion has been met by the relevant central agencies.

Conclusion

The effective implementation of 50 km/h speed limits is facilitated by establishing procedures that ensure that an integrated and coordinated approach between responsible State, Territory and local governments is undertaken from an early stage.

8.1.2 Identification of affected roads

Central to the effective implementation of a lower limit in local streets is the identification of the streets to which the lower limit will apply. Jurisdictions have approached this in a number of ways.

In New South Wales the Roads and Traffic Authority provided councils with guidelines for implementing the 50 km/h speed limit that outlined key steps and issues in the development of road hierarchy plans and the installation of signs. The initial guidelines were later revised in consultation with councils. These plans were developed jointly by the authority and councils to ensure that streets are zoned consistently and minimise the number of speed zone changes.

In Queensland, the 50 km/h speed limit was applied to local streets in the south-eastern area in accordance with the Queensland Manual of Uniform Traffic Control Devices to prevent inconsistent speed zoning across local government areas. This involved working closely with local government to determine the application of the limit. The Manual listed typical characteristics of local streets for guidance. Consistency and credibility were re-enforced by requesting local government to submit speed zone plans before implementation. A 50 km/h limit was also applied in some situations other than on local streets. Examples include strip shopping centres, foreshores and where the physical environment supports the lowered limit. In these particular cases the 50 km/h limit is signposted.

In Victoria any street in a built-up area without a sign automatically has a 50 km/h limit. The issue in Victoria was the identification of those local streets where a 60 km/h limit was to be retained and signs needed to be erected. In conjunction with the adoption of the 50 km/h default limit, VicRoads was given authority to install speed signs on local roads in addition to its existing powers on declared roads. The main purpose of this additional power was to help ensure that collector roads are sign posted in a consistent manner across local government areas. The erection of these signs was arranged by VicRoads in consultation with local government.

In the Australian Capital Territory. the 50 km/h speed limit applies to suburban streets that are used to provide access to homes and carry only neighbourhood traffic. Major roads that pass through suburbs continue to have a 60 km/h limit. Roads in commercial centres, industrial areas and the Parliamentary zone also retain the previous limit.

Western Australia will implement the 50 km/h limit for local streets across the State, using criteria developed by Main Roads WA. The aim is to apply the limit on local roads that carry neighbourhood traffic (local distributors) or give direct access to properties. In Perth, where there is an agreed functional road hierarchy, all local roads not signed at 60 km/h (or other limits) will be 50 km/h by default. In rural areas and major regional centres, similar principles to those intended for Perth will be used to determine the local roads to which the limit will apply.

Conclusions

- **The selection of roads to which a 50 km/h limit should apply, along with the signing of those roads that need to retain a 60 km/h limit, should be undertaken jointly by the central road agency and local government;**
- **Sufficient time should be allowed for the effective completion of this process to enable a smooth transition to the new speed limit structure;**
- **Effective implementation processes help to achieve public acceptance of change and the retention of community support for speed management initiatives undertaken in the future.**

8.1.3 *Informing the public of change*

A change in the speed limit is a major one and not frequently undertaken. If insufficient effort is made to communicate the purpose and nature of the change, it represents an opportunity foregone to influence public perceptions and road user support.

All jurisdictions that have implemented the 50 km/h limit have identified community education as a key factor and undertaken activities relevant to their needs. For example:

- *New South Wales*: A public information campaign was developed with the following elements:
  - participating councils could apply for grants for community education and consultation programs so that more specific localised strategies could be conducted to enhance the Roads and Traffic Authority program;
  - conduct of a "generic" campaign in all councils implementing the new limit incorporating newspaper advertisements and a brochure to all households;
  - television and radio advertising campaigns targeted to specific regions of the State and also more broadly across the State;
  - a range of other initiatives such as an information hotline, posters, a media information kit, and material provided to key stakeholders such as the NRMA for use in its publications with wide circulation.
- *Queensland*: A public education campaign was needed to target south-east Queensland residents as well as visitors travelling to the region from other parts of the State, and interstate and overseas visitors; the campaign included:
  - a mass media campaign;
  - a brochure and map mailed directly to households in south-east Queensland;
  - promotions and educational displays;
  - marketing within local government areas by council officers;
  - marketing activities targeting visitors to the area.

  Aspects of communication were reviewed on the basis of community feedback and amended to ensure that any confusion about the application and impact of the lower limit was overcome.
- *Victoria*: An educational campaign was undertaken by VicRoads at the time of introduction of the default limit under the umbrella message of "Think safe. Think 50". It concentrated on radio and print media. Brochures were also distributed to households. There was extensive editorial coverage in the print and electronic media. The Transport Accident Commission provided support by mounting a campaign focused on television.

Queensland experience shows the importance of the careful choice of actual content of public communication in order to gain community support (Donaghey, Ram, 2000). The public was told that the speed limit would reduce to 50 km/h on around 90% of the streets in built-up areas. This had the opposite effect of that intended with many people assuming that they would be required to drive at 50 km/h for the majority of the time. Communication was adjusted to emphasise the fact that drivers would generally be travelling at 50 km/h for only one or two minutes at the start and end of each trip.

Conclusion

A range of media and public education activities should be planned and conducted as appropriate on a statewide and local basis, in specific regions and directed to relevant groups in the community to ensure community awareness of the intended change in speed limits.

8.1.4 Achievement of compliance

Speed limits, along with many other aspects of road law, suffer from the disadvantage of not being self-enforcing. On the other hand, public support for a 50 km/h speed limit in local streets is high, along with support for enforcement of limits seen to be reasonable and appropriate.

All jurisdictions that have implemented 50 km/h limits have accepted that enforcement is a necessary part of making lower limits effective. The attitude of responsible agencies has been that police will enforce the limit as part of their overall traffic safety role. Generally, enforcement resources will be utilised in accordance with each jurisdiction's policing strategies, for example, using crash data and information systems to guide enforcement tactics.

The position of jurisdictions can be summarised as follows - *"People who drive above the speed limit are likely to receive an infringement notice - just as they would if they drove above 60 km/h now"* (Kidd, 2000).

Conclusion

Enforcement is a necessary part of ensuring maximum compliance with a lower speed limit and should be undertaken with sufficient intensity to achieve the desired change in road user behaviour.

8.1.5 Promotional support for enforcement

In addition to making the community aware of the reasons for change in the speed limit and its specific application through a program of public education, promotional support for enforcement using appropriate mass media should be seen as an integral part of achieving compliance. This is strongly supported by evidence that the combination of legislative change, rigorous enforcement backed by promotional support can be instrumental in changing road user behaviour (Cameron, Haworth, Oxley, Newstead, Le, 1993).

Conclusion

Enforcement of a change in the speed limit should be supported by promotion using appropriate mass media to maximise its impact on road user behaviour.

8.2 Guidelines for implementation

It is not possible to conclude on the basis of existing information whether there is a specific preferred implementation model. There are both similarities and differences in the approaches taken to date. An evaluation of the Victorian approach - which unlike some other jurisdictions relies predominantly on regulation without major expenditure on signing - is not yet available. This precludes an objective comparison. Nevertheless, the experience so far points to a number of important, and in some cases fundamental, steps that should accompany any future decision by a jurisdiction to adopt a 50 km/h limit.

The successful implementation of a 50 km/h speed limit regime is reinforced by managing the process in a co-ordinated and integrated manner, with an emphasis on:

- ensuring that appropriate planning takes place among the responsible central agencies and local government from an early stage;
- collaboration between the central road agency and local government in the selection of roads to which a 50 km/h limit should apply, along with the signing of those roads that need to retain a 60 km/h limit; sufficient time should be allowed for the effective completion of this process to enable a smooth transition to the new speed limit structure;
- giving priority to a structured and managed approach to help achieve public acceptance of change and the retention of community support for any future speed management initiatives;
- planning and conducting a range of media and public education activities on a statewide and local basis, in specific regions and directed to relevant groups in the community to ensure community awareness of the intended change in speed limits;
- conducting enforcement as a necessary part of ensuring compliance with a lower speed limit, undertaken with sufficient intensity to achieve the desired change in road user behaviour;
- providing promotional support for enforcement using appropriate mass media to maximise its impact on road user behaviour.

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