

## Wellington Regional Road Pricing Study Stage Two Executive Summary

Road pricing in the greater Wellington region has the ability to reduce network congestion, and be economically and fiscally viable, while at the same time having marginal social and regional economic impacts. Moreover, reduce congestion in the greater Wellington region would improve accessibility and may well improve the regional economy by allowing greater mobility for traffic with a higher value of time (include commercial traffic).

### Background

Congestion and its associated social, economic and environmental problems are acknowledged as some of the largest issues facing the world's cities. More and more, road pricing is seen as an innovative and effective measure to reduce congestion and the greater Wellington region has been considering the implementation of road pricing to address congestion for some time.

Wellington has linear structure to its strategic highway network. This means that there are few alternative routes to avoid the consequences of incidents on the highway system. Further, the linear structure accentuates the effect of congestion induced travel time variability and again does not allow alternative routes to avoid these congestion related consequences. This can be frustrating for road users, particularly annoying for those who have absolute deadlines for arrival times such as airport bound travellers, and costly for trips with a high value of time such as commercial vehicles.

Over the last decade there has been a growing realisation that in the greater Wellington region that continuing major road capacity increases are unlikely to address Wellington's transportation needs. This is because major road construction, particularly in Wellington's constrained and difficult topography is very expensive and a comprehensive programme of construction is likely to be unaffordable.

Further, the linear structure of the strategic highway network and the adjacent passenger rail corridors means that road capacity increases, unless carefully managed, are likely to significantly reduce rail patronage and increase pressure downstream on the road network. This would require further expensive road construction to address the induced problems of road construction.

Another realisation over the last decade is that conventional measures, such as promoting public transport, walking and cycling and various non-pricing based Travel Demand Management can only have marginal if any impact on the choice to travel by car. Only road pricing appears to have the potential to significantly influence the choice between car use or an alternative means of travel. This balance between car use and alternative transport forms is important in the greater Wellington region where there is a linear strategic highway network with adjacent passenger rail.

Because carbon emissions from transport are a significant proportion of New Zealand's total carbon emissions there is growing interest in approaches that might reduce carbon emissions from transport. As carbon emission from transport are directly related to fuel consumption and therefore car use, the inability of conventional transport measures to influence transport base carbon emissions if high enough charges are imposed. This would however need to balance with the other adverse impacts of higher charging levels.

In this context, successive Wellington Regional Land Transport Strategies since 1993 have signalled the need to investigate Road Pricing as one measure within a wider package of measures. In response to a commission by Greater Wellington Regional Council, SKM produced a report

titled *Wellington Road Pricing Study – Stage 1 – Initial Road Pricing Viability Study* in 2005. This report showed that it was possible to develop a road pricing proposal for the greater Wellington region that is both economically and financially viable.

## **Road Pricing Objectives and Performance Measures**

The brief for this study state that the “...main purpose of road pricing in the Wellington region is network efficiency. However, revenue generation is considered a useful secondary benefit”, and that road pricing options should be evaluated against the objectives of the Draft Regional Land Transport Strategy (RLTS), which are as follows:

- Assist economic and regional development;
- Assist safety and personal security;
- Improve access mobility and network reliability;
- Protect and promote public health;
- Ensure environmental sustainability; and
- Consider economic efficiency and affordability.

Specific performance measures were developed to enable different pricing options to be evaluated against the objectives, and compared. A Planning Balance Sheet approach was used to undertake the evaluation.

## **Option Development and Definition**

A number of generic road pricing concepts are considered along with the cordon and screenline charging options developed as part of the Stage 1 work. These include:

- Toll Lanes / High Occupancy Toll (HOT) Lanes
- New Toll Roads
- Area Charges – where all trips into, out of, or within a particular area are charged
- Full Network Charges – where all trips on the strategic road network (e.g. State Highways and arterial roads) are charged
- Parking Charges – where additional charges (above those already charged commercially) are levied for parking in specific areas such as the CBD

A large number of tests were carried out to identify the potential the concepts had to provide an effective efficient road pricing option for the greater Wellington region. Through a screening process using key performance measures and assessments of the technology and cost implications, some of the options above were found to be deficient and were removed from further consideration. The remaining options were either retained as they were or refined to make them more useful.

## Option Testing

The following options were taken forward for detailed evaluation, with final option labels in brackets. The “Y” nomenclature refers to the resemblance the State Highway network has to the letter Y. Given that the prime objective of road pricing is to reduce congestion (which occurs predominately during peak periods) it was assumed that charges would be imposed in the periods between 7 to 9am and 4 to 6pm and in the peak travel direction (the exception to this are the YM and YMS options which have an element of counter peak charging on State Highway 2 near Petone).

For the purposes of this study all vehicles were charged on the same basis. Commercial and private vehicles were assumed to pay the same charge to simplify modelling.

The options tested included:

- CBD Cordon (CC) – Charges are paid on all trips that cross a cordon around the Wellington CBD. The cordon encompasses the central city, Thorndon, and Mt Victoria and is bounded in the south west by the Basin Reserve. Importantly, this option includes charges on the new Inner City Bypass (ICB) and the Mt Victoria Tunnel.
- Ngauranga Screenline (NS) – Charges are paid on all trips that cross a screenline immediately north of the Wellington central city. This screenline is located on SH1 immediately south of the SH1 / SH2 merge at Ngauranga.
- Y Screenlines – Inner Emphasis (YI) – Charges are paid on Ngauranga Screenline and at screenline across SH2 at Petone and across SH1 (and parallel local roads) immediately south of the Tawa Interchange.
- Y Screenline – Medium Emphasis (YM) – Charges are paid at the same locations as YI but also includes charges at screenlines at Pukerua Bay and between Hutt City and Upper Hutt. Additionally a counterpeak charge was imposed at Petone.
- CBD + Y Screenlines (CY) – Charges are paid at the same locations as YM but also includes charges on the CBD cordon.
- Y + South of CBD Screenline (YMS) – Charges are paid at the same locations as YM but includes charges on a southern screenline. This southern screenline is essentially the same as the southern part of the Wellington CBD cordon and runs from Oriental Bay imposing charges on the Mt Victoria Tunnel, Adelaide Road, Taranaki Street and Brooklyn Rd.

Each option was tested, using the Wellington Transport Strategy Model (WTSM) model. All the options performed well against the objectives of the RLTS using the performance measures developed for the planning balance sheet approach. The results are set out in Table 0-1 and discussed below.

Table 0-1: Planning Balance Sheet Scores (Equal Weights)

Summary – Equal Weights	No Pricing	CC	NS	YI	YM	YMS	CY
1 Economic Development	0	X	0	0	0	0	0
2 Safety & personal security	0	√+	0+	0+	0+	√+	√+
3 Access, mobility & network reliability	0	√	√	√	√	√+	√+
4 Public Health	0	0+	0+	0+	0+	0+	0+
5 Environmental sustainability	0	0+	0+	0+	0+	0+	0+
6 Efficiency & affordability	0	√√+	√+	√+	√+	√√	√+

***CBD Cordon*** – The Wellington CBD cordon option tested in Stage 1 performed poorly because it did not apply charges on the ICB, which resulted in rerouting through the Terrace Tunnel from the Quays routes to avoid the charge. Notably, this option charges trips from the south and east and achieves a reduction in congestion through the Mt Victoria Tunnel, but at the same time results in significant modal shift to public transport from this area.

A high charge is applied to all trips that cross the single cordon and so does not differentiate between short and long distance trips. This results in a high average cost of travel, high average charge and therefore performs poorly against the economic development objective. This option has a relatively large impact on travel, reducing person kilometres travelled by almost 8% which improves its safety performance.

***Ngauranga Screenline*** – This option applies a high charge to all charged trips and so does not differentiate between short and long distance trips. This option performs similarly to the other options under all objectives.

***Y – inner emphasis*** – This concept imposes higher charges on trips closer to Wellington City. This option performs well for all objectives, generally reducing congestion at all key bottlenecks except Mt Victoria Tunnel.

***Y – medium emphasis*** – This option imposes tolls at more regular intervals across the Y network, with modest tolls at several screenline points with counter-peak charges included on SH2 near Petone. This option performs similarly to the Y – inner option, but spreads the charges across the network more evenly.

***Y – medium + southern screenline*** – This option results in reduced congestion through the Mt Victoria Tunnel but at the same time induces a large modal shift towards public transport in that corridor. Overall this option performs the best for the access objective, having the greatest average reduction in volume to capacity (V/C) ratios at key bottlenecks and travel times on key routes, while having the greatest average speed increase. This option has a relatively high impact on travel by reducing the person-kilometres of travel and hence improves safety. The economic efficiency of this option is best of the options tested.

***CBD + Y screenline*** – This option performs similarly to the Y-medium emphasis option as charges are paid on the Y but also for trips from the south and east. The efficiency of this option is slightly worse than the Y-medium emphasis option.

The Y – medium + southern screenline (YMS) is one of the better performing options and charging levels and locations are shown diagrammatically in Figure 0-1. A summary of some key performance measures for that options is include din Table 0-2.

Figure 0-1 YMS Option Charging Locations

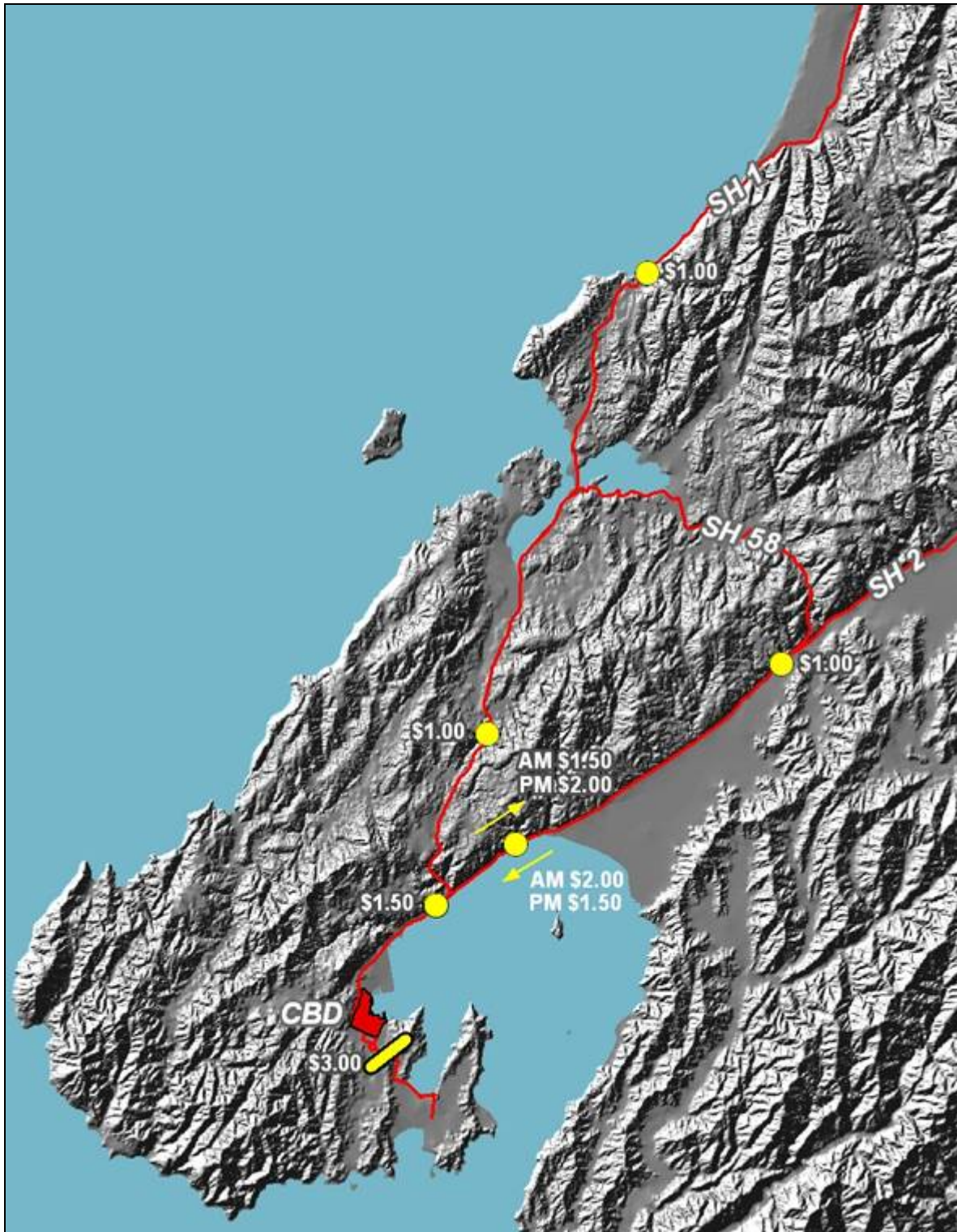


Table 0-2 Y – medium + southern screenline Key Performance Measures

Key Performance Measure	Compared to No Pricing
Congested VKT (VKT with V/C ratio >0.8) (AM peak)	-39%
Average vehicle speed on the network (AM peak)	+10%
Average travel time on key routes inbound Wellington CBD (AM peak)	-10%
Annual injury accidents	-6%
Average charge paid per trip (AM peak private vehicle)	\$0.32
Average generalised cost of travel per kilometre (AM peak private vehicle)	+2%
Person-kilometres of travel (AM peak)	-4%
User Benefits (25 year NPV)	\$119M
Scheme costs (25 year NPV)	\$57 - \$105M
User Charges (25 year NPV)	\$221M
Excess revenues (annual)	\$28 - \$38M

The primary purpose of road pricing in the greater Wellington region is to reduce congestion. Clearly, in reducing congestion, road pricing will assist in managing the balance between road use and other means of travel and will generate environmental and public health benefits as a consequence.

The best performing schemes tested could reduce congested motorised vehicle kilometres travelled (VKT) on links with a traffic V/C ratios of 0.8% or higher by up to 43%. This could increase average speeds on the whole road network by up to 10% during the AM peak period. This impact on links with a high V/C ratio will lead to significant improvement in congestion related travel time reliability. AM peak travel times on selected key routes into Wellington City could reduce on average 15% with up to a 36% reduction between Ngauranga and the CBD. At the same time annual injury crashes could reduce by up to 6% with average charges per trip in the AM peak as low as \$0.60 for all schemes.

The average generalised cost of travel per kilometre in the AM peak could increase by up to 15% for private vehicles which would imply negative economic impacts. The generalised cost is a measure of real costs paid plus the monetised value of the economic costs such as delays, crashes and others. Total person kilometres of travel could reduce by up to 4.5% in the AM peak, which indicates a reduction in personal mobility.

The YMS scheme is expected to have user benefits in the order of \$119M, scheme costs of \$57M with user charges in the order of \$221M (these are 25 year Net Present Values). Using the ratio of user benefits / scheme costs as a measure of economic performance, the benefits outweigh the costs by a factor of 2. Using the ratio of revenues / scheme costs as a measure of financial performance, the revenues outweigh the costs by a factor of almost 4.

This shows that a road pricing scheme could provide economic benefits while at the same time be financially viable. If the repayment of capital and financing costs is ignored, road pricing has the

potential to provide annual excess revenues in the order of \$17M to \$41M which could be re-invested into improving transport infrastructure and services.

## **Regional Economic and Land Use Impact**

The scheme based economic efficiency assessment above considers user benefits and shows that there will be clear economic benefits to the schemes evaluated from a national perspective. The charges paid will, however, impact on regional economic activity if they are additional to current taxes. A review of the possible wider economic impacts of the road pricing schemes developed was undertaken to identify any potential adverse impacts on the regional economy and land use from the imposition of charges.

The maximum estimated capital cost to implement a scheme is less than 0.24% of regional GDP, while the maximum annual operating cost is less than 0.1%. The maximum annual charge revenue is less than 0.27% of regional GDP.

This review concluded that the direct regional economic and land use effects of road pricing at the levels proposed here will be at most marginal. If the surplus revenues generated by road pricing are reinvested within the region, then any adverse impacts on the regional economy of road pricing would be negligible.

If the surplus revenues from a road pricing scheme are spent on efficient transport projects, the road pricing schemes plus the supplementary investments could generate a positive regional economic impact. These infrastructure and service improvements would generate additional user benefits and an increased regional economic benefit.

It was noted that a number of characteristics of the regional economy offer scope of complement road pricing in supporting further regional economic growth. The relatively high self-containment of much of the region's employment in the individual local authority areas means that employment is already located near to the contributing population centres. Road pricing would provide further incentive to build on this local employment reducing the need for travel across the region for employment.

The regional workforce is relatively highly qualified. A qualified professional workforce is more compatible with flexi-hours which avoid the work of peak period travel.

The greater Wellington regional economy is strong in some of the faster growing industry sectors such as business and other services, transport and communications. The transport sector will benefit directly from reduced congestion. While some parts of the business services sector will have a competitive advantage from location in the Wellington CBD, much of the services and the communications sectors will have more flexibility in terms of location decisions, again potentially reducing the need for peak travel to and from the Wellington CBD.

The proposed road pricing schemes are unlikely to have a significant impact on land use at the charging levels proposed. Nonetheless, there may be some limited opportunities for more intensive land use and development in specific areas of the region within charging cordons to reflect changes in road use related to road pricing charges.



## Social Impacts

Because of the modest charges proposed, social impacts are likely to fall on particular segments of the community who are more valuable because of their socio economic status and lack of flexibility in their trip making. Lower socioeconomic groups will be less able to afford a charge as it would make up a larger proportion of their household income. These groups may have to travel by car in the peak times because there is limited flexibility in their working hours e.g. sift workers or because no viable public transport is available.

Our investigations into the social impacts of road pricing has therefore focused on identifying socially deprived groups which would be unfairly impacted by road pricing and on investigating trips from these areas to key employment and community facilities.

The number of trips from socially deprived areas which would face a charge is in most cases small, with the exception of trips into Wellington CBD where employment is more likely to be in higher paying “white collar” jobs. Good public transport links are provided from most locations into central Wellington and therefore a viable alternative to the charges is provided.

Schemes which impose high charges near the Wellington CBD have the greatest potential to have adverse social impacts because of the high level of charge for a single cordon crossing. Even short local trips which cross the cordon would experience a relatively high charge but would not gain a large improvement in their journey times.

Road pricing schemes need to be designed to ensure that they have minimal adverse social impacts. Mitigation measures should be investigated to ensure minimal adverse social impacts, and could potentially include:

- Exempting people travelling from particular areas or to particular destinations from paying the toll-this would have to be by way of a form of concession card or tag. Exemptions can prove difficult to implement fairly
- Reimbursing socially deprived groups through reductions in rates (funded by road pricing revenues)
- Diverting excess revenues into improved public transport
- Improving opportunities for walking and cycling especially from areas close to the Wellington CBD. This could target those living close to the CBD or those who could drive to a point and then walk or cycle
- Obtaining community ‘buy in’ and acceptance of the scheme and its rationale – involve the community in discussing how the revenue raised should be spent. Work to ensure the political acceptability of the proposal and towards overcoming public scepticism about the outcomes.

If road pricing is to be considered further in the greater Wellington region, detailed investigations into the social impacts of particular road pricing schemes would need to be undertaken and involve detailed public consultation. This study has concluded that road pricing would have an adverse social impact on relatively small numbers of individuals. Through more detailed design and development of mitigation measures, it should be possible to reduce these impacts.

## Passenger Transport Impacts

There are unlikely to be any fundamental constraints to introducing a road pricing scheme due to additional demand for passenger transport.

Increases in rail patronage are generally small in the AM peak (in the order of 7%). As the current rail services can be near capacity at present these small increases could exacerbate the problem. The improvements that are required to upgrade current services to cater for future demand are substantially planned for in the GWRC Rail Business Case and the Western Corridor Plan. It is unlikely that the additional demand (maximum 700 trips in 2 hour peak) forecast as a result of introducing road pricing, would trigger the need for significant further investment in the rail network by itself but could lend further weight to the need for these improvements to take place.

The schemes which involve charges to the south of the CBD would result in significant increases in bus patronage from the south and east of the CBD. Because the majority of bus services use the existing roading infrastructure, the provision of additional capacity could be catered for through the procurement of additional bus services using more or larger capacity buses. These improvements could be funded from the surplus revenues generated by a pricing scheme. As road pricing is intended to reduce congestion, buses would experience reduced travel times after implementation, improving service performance. As part of a package of complementary measures, bus priority improvements such as bus lanes and signal pre-emption could be provided to improve services.

## Technology and Costs

The technologies identified as appropriate for cordon or screenline road pricing schemes in Wellington are:

- Vehicle mounted electronic tags (majority of users)
- Offline payment schemes available via Short Message Service (SMS), internet, call centre, on-street meters and retail shops (for infrequent users etc.)
- Enforcement using Automatic Number Plate Reader (ANPR) and colour context cameras.

These technologies have been chosen for a number of reasons. They have been used extensively in tolling systems around the world and are therefore proven. They have reduced costs in processing transactions because they are handled electronically and do not require costly manual interaction with staff. Importantly, the technologies are consistent with the technologies proposed in the Transit NZ Toll Systems Project and the Auckland Road Pricing Evaluation Study.

This means that there is potential for the same onboard units to be utilised nationally and significant cost savings to be made by combining the systems set up and operations. A stand alone 'back office' management system which stores and process the information collected has been assumed for this evaluation, but could potentially be combined with these other schemes.

The capital costs could range from \$37M for the Ngauranga Screenline scheme through to \$42M for the CBD + Y scheme. Annual operating costs could range from \$3M to \$18M. This large range is due to variations between the schemes in the number of transactions processed and uncertainty over the scalability of costs with additional transactions.

## Legislative and Privacy Issues

There is currently no legislative mandate that would allow for road pricing of existing infrastructure. New or modified legislation would be required before any road pricing scheme could be implemented. Legislation would be required that provides the ability to implement a charge and the ability to enforce the charge.

Assuming that the legislative framework would be similar to that set out for road tolling in the Land Transport Management Act (LTMA), even with legislative provisions in place, direct approval for a road pricing scheme would still be required from the Minister of Transport. It is likely that each road pricing scheme would need to be established by the Governor-General by Order in Council (OIC), on recommendation by the Minister.

The 'back office' management system would need to be secure, and meet the requirements of the Privacy Act. Any use of the data collected must be in compliance with the Act, which would require the drafting a well considered privacy policy. Processes, similar to those required under the LTMZ for road tolling, would be required to enable people to use the system without personal data being collected. Provision of anonymous prepaid accounts would allow people to make payments without having personal data recorded.

## Risks

A qualitative risk assessment has been undertaken which considered the risks to implementing a road pricing scheme in the greater Wellington region. The following broad categories of risk were identified:

- Legislative – There are risks associated with obtaining Government support the scheme and getting legislation through the House of Parliament in an effective and workable form
- Technological – There are risks associated with cost of the technology, ensuring it meets its functional requirements, the technology becoming outdated and the creation of a single supplier monopoly on future upgrades
- Implementation and Enforcement – There are risks associated with obtaining infrastructure consents
- Financing, Funding and Revenues – There are risks associated with finding a source of initial capital investment, Land Transport New Zealand reducing the regional funding contributions because of the revenues of the scheme, interest rate or currency fluctuations and how Government will treat the revenues
- Forecasting – There are risks associated with forecasting traffic growth and revenues collected, and differences between assumed and revealed elasticities to price
- Public and Political Acceptability – There are risks associated with how easily people will accept being charged to drive in Wellington, especially if no alternative road is provided (compared to the case for tolling proposals).

The majority of the high and extreme risks identified related to public and political uncertainties particularly legislative issues and political and public acceptability. This indicates that one of the key tasks in the future will be to develop an action plan to address public and political acceptance.

## **Acceptability**

Where road pricing has been implemented, a key factor in the successful introduction of road pricing is the level of public acceptability.

Local and international studies have consistently concluded that the following factors are a major influence on the level of public acceptability of road pricing schemes:

- Alternatives to the car and their perceived effectiveness
- Use of the revenues generated
- Scale of the congestion problem
- Understanding the purpose of road pricing
- Form, technology, complexity and privacy
- Political leadership and public trust

A number of recent studies and strategies have investigated the issue of road pricing in New Zealand. These include the GWRC Regional Travel Demand Management Strategy and the Auckland Road Pricing Evaluation Study.

Any form of road pricing is unlikely to gain widespread public support in Wellington initially. A clear strategy would need to be developed to build public and political support for a road pricing scheme before, during and after implementation. This would need to address the factors listed above and could include:

- Well-articulated vision and strategy which sets out the purpose of road pricing, and identifies the congestion problems it is intended to address
- Strong political leadership which will build public trust in the scheme
- Re-investment of revenues to publicly and politically supported transport infrastructure projects and services, clearly identifying where the revenues would be used
- Transparency of the operation, costs and revenues, and clear identification of accountabilities for managing the scheme in order to build public trust
- The scheme developed should clearly be seen as fair and equitable
- An education and information campaign which would advise people of the above.

## Conclusion

The analysis shows that road pricing in the greater Wellington context is economically and fiscally viable. Excess revenues, in the order of \$20 to \$40M per annum, would provide a funding stream for investment in transport infrastructure and services.

Further, road pricing at the relatively low charging levels proposed is likely to generate useful travel benefits through reducing congestion and travel time. These travel benefits are likely to lead to improved regional economic performance through enhanced accessibility, particularly for vehicles which have a high value of time such as commercial vehicles. This evaluation concludes that the social impacts of road pricing are likely to be able to be managed so that they are small.

While the Y-medium emphasis + southern screenline (YMS) scheme appears to provide the best overall performance, all the schemes tested perform similarly under the objectives of the RLTS. This indicates that a simple road pricing system could be implemented in greater Wellington which would attract a large proportion of the benefits that a more comprehensive scheme would generate and could be expanded in the future, as acceptability and available technology improved. The schemes do however perform differently under some specific measures and a decision on a preferred scheme would be dependent on which particular issues were considered the most important by decision makers.

It is important to see road pricing as one component of the overall regional transport strategy, rather than a stand-alone initiative. The next stage of developing a road pricing scheme for the greater Wellington region will need to involve consideration of road pricing as part of the mix of future transport investment projects in the RLTS. In parallel a detailed strategy for developing public and political acceptability would need to be produced.