

Investigation of Implementation Issues for Congestion Charging

Booz Allen Hamilton, Wellington

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Executive summary

Road user charging, be it in the form of tolled roads, HOT (high occupancy tolled) lanes or congestion pricing, is currently topical in New Zealand, largely as a consequence of the endemic traffic congestion in the Auckland region and the shortage of funds to provide new capacity, but also in terms of the potential of the tool for generating revenue and managing demand across the nation. However, under current arrangements and expectations, while diesel vehicles pay a road user charge (RUC), the extension of the pricing concept to cover petrol vehicles in primarily urban areas would represent a challenging task for policy makers and government bodies.

London's high profile Congestion-Charging Scheme has clearly raised congestion charging to the fore within the global transport debate. Yet a scheme suitable for London may not be suitable for other cities having different characteristics in terms of demographics, transport options and patterns of behaviour. It is crucial therefore that any city developing a scheme tailors it to the local environment while being mindful of lessons elsewhere. Yet these lessons are relatively few and far between in terms of congestion charging schemes. Fortunately, however, there are strong parallel lessons coming from the toll road sector and through high occupancy tolled lanes (from the United States).

The objective of this research project, carried out in 2003 and 2004, was to interview decision makers in cities where some form of road user charging has been introduced (and where it is being mooted or failed to come to fruition) to ascertain if there is any commonality in the factors which drove the successes and failures. This was undertaken through the development of a candidate set of success factors gleaned from issues within the literature, which were in turn presented to scheme developers around the world. Where a factor was repeatedly flagged as important it was classified as critical for success. The findings of the project developed in an iterative fashion - throughout the project, individual working papers were presented to the Steering Committee for sign off before progressing to the next phase.

There was a significant degree of consensus in terms of the critical success factors with the most important ones seen as being (in order of decreasing importance):

- a public perception of the need,
- an appropriately resourced promotional campaign,
- a single empowered agency,
- a strong political position,
- a robust business case.

Clearly there is a strong degree of interdependence between the above that points to the fact that a winning project will proceed in an iterative fashion. A draft business case first defines a skeleton scheme to be presented to the public with objections and modifications driving the eventual business case so as to gain maximum buy-in. Only then may the politicians have sufficient comfort to proceed and a political champion emerge.

The final stage of the project was completely New Zealand focused in that it took three candidate schemes and asked “are the critical success factors identified present to the extent in New Zealand that each scheme type could proceed?” Consultation with key stakeholders and agencies was the basis by which this question was explored. During this stage it became clear that there still an insufficiently detailed road user charging proposal to present to the public to allow them to support something concrete and this seems to be fuelling any apparent objections; people cannot always see what a scheme would mean in practice and what they would be getting for their money. This in turn has prevented a clear political position and an obvious political champion from emerging. Furthermore there still remain outstanding questions in relation to agency roles and responsibilities.

Feedback from the Steering Committee indicated that they were mindful of the issues raised looking forward. It is hoped that the upcoming project to examine the feasibility of road user charging in Auckland – the type of charge, roles and responsibilities and the channels for the revenue – will flag and probe these issues further and draw upon lessons from elsewhere. This will facilitate a stronger chance of success and the delivery of transport policy objectives.

Abstract

The success of the recently introduced congestion-charging scheme in London has raised urban congestion charging to the fore of the transport policy debate. Also, recent legislation in New Zealand has formalised the toll road financing option, and Auckland’s congestion is increasingly seen as a major issue.

This project, carried out in 2003 and 2004, sought to develop best practice guidelines for developing congestion charging schemes by interviewing those involved in such systems across the world to ascertain which issues were critical to their success or failure.

There was a significant degree of consensus as to what these critical success factors are:

- a public perception of the need,
- an appropriately resourced promotional campaign,
- a single empowered agency,
- a strong political position,
- a robust business case.

The project then looked at three suggested schemes in New Zealand and asked whether the critical success factors were present by consulting with key stakeholders and agencies. It became clear that objections are fuelled by the lack of sufficient detail for any of the schemes, which in turn prevents a clear political position. There are also questions in relation to agency roles and responsibilities.

1. Introduction

1.1 Terminology

Throughout this research report the term 'road user charging' (RUC) is used extensively. There are several global interpretations of the term 'road user charging', notwithstanding the current usage of the term in New Zealand – payment for diesel vehicles to use the road network, with the eRUC project exploring the potential for automating this charge. Within this report the term 'road user charging' can be taken to mean payment for the use of a road at the point of use.

1.2 Background

The recent roll-out of the Congestion Charging Scheme in London and the one already in place in Singapore has raised the issue of RUC to the fore across the world. Within New Zealand the topic is being actively discussed in the light of these events and the Land Transport Act, 2004, which authorises the financing of new road links through tolls at point of use.

Given the recent Act, an upcoming study to examine the feasibility of congestion charging in Auckland and the lobbying of Wellington Region for a high occupancy tolled (HOT) lane along SH2, clearly road user charging is an area in which the NZ Government is seeking to enlarge its already significant knowledge base.

One area generally documented in the literature, although not extensively, is the issue of what systems, institutions and design features need to be in place to enhance the potential for a scheme to progress (recognising that these will usually differ by scheme type). Given that the NZ government bodies will want any schemes to develop with as few problems as possible, the purpose of this research project is to document recurring critical success factors and assess whether or not they are present in New Zealand. This therefore gives this research report a more applied steer than is often seen in reports of its type as its aim is to develop a tool which can be readily used and applied by scheme proponents.

1.3 Relevance to Transfund New Zealand's outcomes and key topic areas

Transfund¹ outlined its mission as "achieving the greatest benefit for each dollar invested", through the efficiency goal of "a more efficient use of the existing network". This project is in keeping with that mission.

In particular, this project contributes to the following Transfund Outcome (Section 2.2 of Transfund's Research Strategy):

¹ Transfund became part of Land Transport New Zealand in 2004.

*Traffic Management – to more effectively manage the movement of vehicles by: -
Improving the efficient use of the existing transport infrastructure and system -
identifying and evaluating appropriate demand–management techniques.*

1.4 Key stakeholders

Anyone taking contingent liability (either legal or political) on the success of a road user charging scheme within New Zealand – politicians, government departments and regional councils – would have an interest in this work.

Letters of support for the project proposal were received from the following entities:

- Wellington Regional Council (WRC),
- Auckland Regional Council (ARC),
- Wellington City Council (WCC),
- New Zealand Automobile Association (AA).

Other stakeholders who provided feedback to the project include the Ministry of Transport, Transit NZ and Transfund. Their feedback has been incorporated into this report through commentary on each of the various working papers.

2. Project methodology

2.1 Description of methodology

The methodology employed to deliver the research project is shown in Figure 2.1.

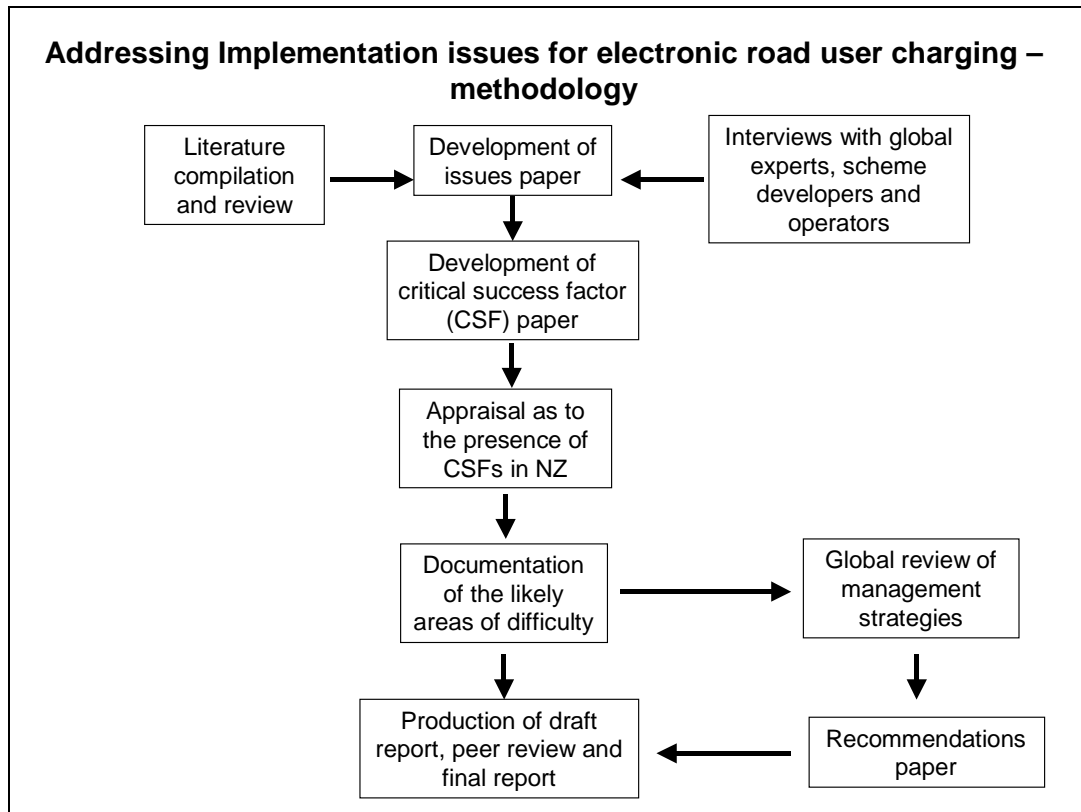


Figure 2.1 Project methodology.

Each of the tasks will be described in more detail below.

2.2 Literature compilation and review

The initial review was collated using Booz Allen Hamilton (BAH)'s library and by drawing on the company's network of contacts, to develop an up to date document library. This material was used as the basis for identifying key issues.

2.3 Development of issues paper

In parallel with the literature review BAH began to develop a critical issues paper that relayed the factors successful to the introduction of road user charging schemes. Specific attention was devoted to segregating the issues raised for three particular user-charging applications:

- congestion charging,
- tolled roads,
- HOT lanes.

This paper was circulated to the project Steering Committee and feedback was incorporated into a revised version.

2.4 Interviews with external third parties

Many cities have been at the forefront of RUC and therefore have an unrivalled understanding of how to ensure schemes progress as smoothly as possible. In the earlier stages of the project, standardised responses were elicited using a pro forma questionnaire for telephone and email interviews. During the later phases contacts were approached with tailored questions.

2.5 Development of a critical success factor (CSF) paper

The literature review, key issues working paper and interviews with relevant third parties led to the development of the second project milestone – the CSF working paper. This was also circulated to the project steering committee. In this paper BAH laid out the factors perceived as critical by the majority of stakeholders.

2.6 CSFs in New Zealand

The critical success factors paper offered success factors specific to scheme types. The next phase identified whether these factors were present in New Zealand both nationally and locally. Where a CSF was absent, it was flagged as a gap and an area of potential difficulty.

2.7 Global review of management strategies

Others will have faced, or be facing, the same or similar CSF gaps. This phase therefore used the network of contacts developed in earlier stages of the work to discover the strategies employed by each city to bridge CSF gaps which were perceived to be important to New Zealand. The findings of the assessment of CSFs in New Zealand and the global review of management strategies formed the basis of working papers 3 and 4. These working papers were circulated to the Steering Committee.

2.8 Recommendations

On the basis of the contents of the previous working papers and the feedback from the Steering Committee, BAH made recommendations as to potential next steps.

2.9 Production of draft report, peer review, final report

The final phase was to draw together all of the above steps into this draft final report which was critiqued by the peer reviewer (Professor Phil Goodwin, University College London), before being released to Land Transport New Zealand.

3. Identification of key issues

The first step in the project was to review the research material to identify key recurrent issues in order to enable the presentation of these issues (as potential success factors) to each of the experts and scheme implementers, to ascertain those they considered critical. An issue was deemed of being 'worthy' if it was flagged recurrently throughout the literature; issues are generally not unique to the scheme type although some will be more prevalent for certain types.

Readers should note the purpose of this chapter is to flag issues to be presented to stakeholders, not provide an all-encompassing review of all the available literature on each topic.

3.1 Political risk

The majority of references cite political risk as a reason for a scheme not developing past the discussion phase. Political risk is a relatively loose term but it can broadly be taken to mean anything that may have a strong detrimental effect upon an administration's position of power.

The cases of London and Singapore are noteworthy here. When area licensing, the forerunner of the current Electronic Toll Collection (ETC), was introduced in Singapore in the 1970s no democracy per se was in place so the position of the government was never vulnerable. Interestingly enough, despite this, selling the scheme intensively to the public was still needed. In London, Mayor Livingstone first canvassed the public to assess the most acceptable form of congestion charging before using the scheme as the centre of his successful 2000 election campaign. His more recent re-election shows that congestion charging has proven to be a vote winner not a vote loser.

Deloitte Consulting (2003) performed a global congestion charging survey and found that lack of political support was the major challenge to implementing congestion charging. Santos (2000) cited an official in Cambridge stating "all political parties knew they would lose the following election if road pricing were implemented". Goh (2002) cites that 'political nervousness' caused the stall of the Hong Kong road pricing schemes both in 1985 and more recently.

Within the United States the issue of political risk when implementing road user charges is also frequently flagged in the reference material. Sapkota (1997) raises the issue of the need for strong leadership and political support to drive forward a project, in this case the San Diego HOT scheme. TRB (1994) states:

...three issues appear paramount in determining political feasibility: the general acceptance by the public for paying for facilities at point of consumption rather than through taxation; the distribution of winners and losers (see 3.4 – equity); and the conditions affecting local coalition building in support of or in opposition to congestion pricing.

3.2 End use of revenue

The end use of any revenue raised is mentioned at length in the literature with people seeking a tangible benefit from a charge be it in the form of:

- time saved,
- provision of a facility that they would not otherwise have had,
- investment in other sectors of the economy.

Sapokta (1997) noted that the use of revenue topped the list of public concerns. This was borne out in Ison (2000) - cited by Santos (2000) – in which respondents were asked if they would support a select road pricing scenario. The majority (88.7%) were hostile to RUC in any form if no use of the money was specified. When specific policy options were outlined for the revenue then the support rose to 54.6%.

This figure bears out the rough orders of magnitude shown in work undertaken by the New Zealand Automobile Association (Research Solutions 2003) and by the National Economic Development Office (1991) which showed 70% support of road pricing for all respondents surveyed provided the revenues were invested in roads or public transport.

Odek & Bråthen (2002) cite the policy behind the use of the toll revenues as critical:

There is reason to believe that an upgrading of the public transport system together with the implementation of the road user charge would cause an initial improvement in public acceptability...In Norway large tollbooths in uncongested road systems have not been removed after the roads are paid for but have been used to finance roads elsewhere in the region...this can result in lack of public confidence.

In London, work in the early 1990s by May (1992) showed that road pricing was only acceptable to 43% of the population in a general sense but this rose to 62% of the population if the revenue would be used to improve London's public transport system. A separate UK-wide survey by Jones (1991) identified that road pricing (with no defined revenue usage) in cities was generally only supported by 30% of people who were of the opinion that "something needed to be done" whereas once the revenue was used to reduce accidents, improve conditions for pedestrians and cyclists and increase investment in public transport, the figure rose to 57%.

References coming from the United States broadly offer the same conclusions although support levels are of a lower order than those outlined by European commentators. Harrington et al. (2001) outline how a survey carried out by the South California Area Governments (SCAG) suggests that the public will respond favourably to congestion pricing proposals that address the issues of revenue redistribution and motorist's route choice. A promise to return a portion of the revenues (in benefits) increased support by around 7%. Plans to use the revenue to fund an extra high occupancy lane produced the greatest support.

3.3 Public entitlement

Many people simply feel that roads should be provided by the State and that use of them should be free. Roads seem to occupy a special place in this regard: while people seem comfortable paying usage charges for water, public transport, telecommunications and other public services, many are uncomfortable with the idea that they should pay for road usage.

This is illustrated by findings from work carried out by the NZAA (Research Solutions 2003), and Austroads (2000). Austroads cited examples from Australia and Europe of the strong social opposition to paying for road travel based upon the traditional view that governments finance all public works and infrastructure.

The recent NZAA research into Aucklanders' attitudes to transport funding highlighted that 19% of the population of Auckland simply felt that the user should not pay for roads at point of use, regardless of the mechanism (Figure 3.1).

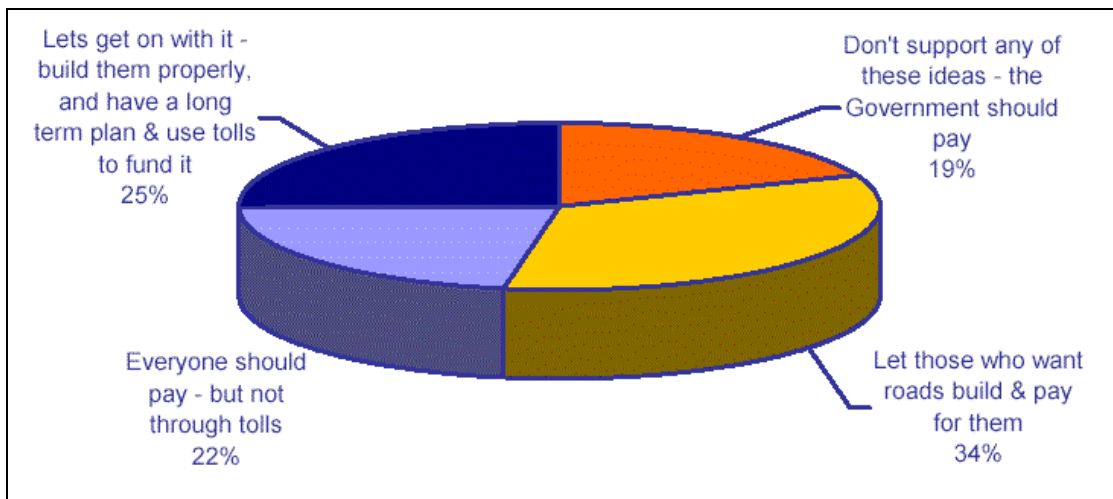


Figure 3.1 Aucklanders' attitudes to payment for roads using tolls (Research Solutions 2003).

An article from the *Adelaide Advertiser* in April 2003 summarises the viewpoint of those who believe the State should be responsible for infrastructure:

There was a time when it was a Government obligation to maintain and upgrade popular public facilities. In recent years, successive state governments of both colours have been abandoning this responsibility. The people who use traditionally free facilities have to pay. And if we accept the car park fees at Morialta, what comes next? The Government has spent more than \$45 million upgrading the State Library. Will the Government sanction charges for library services? The State Museum has undergone a remarkable transformation - but at a cost. Will the public soon have to pay an entrance fee to the museum and logically, the Art Gallery. Is it on the Government's wish list to apply tolls on the South Eastern Freeway, the Southern Expressway and Port Wakefield Rd? It is easy to grudgingly accept the implementation of a parking fee - effectively an entrance fee - to the Morialta Conservation Park. But where does it stop?

3.4 Equity

Equity is perhaps the most commonly cited issue around RUC. The imposition of a charge at point of use raises questions of fairness:

- “What about those who have no alternative route?”
- “What about low income groups?”
- “What about residents?”
- “What about those elsewhere who don’t pay?”
- “How will it affect other factors such as house prices?”

These are all clearly valid questions. Policy makers have several tools available to them to address some of these areas of concerns and make a scheme fairer and thus more sellable. These include:

- Provision of an alternative route - in Sydney, local roads are available for use instead of paying to use the tolled network.
- Exemptions for certain categories of users – low income groups, delivery vehicles and residents. The actual choice reflects the politics of a situation. In Singapore practically nobody is exempt. In London the scheme would have struggled to proceed without the support of residents living within the cordon, so they pay only 10% of the charge.

RUC equity can also have a dynamic component that can be used to encourage behavioural change - charging cars and using the money to improve buses has completely different equity impacts from charging cars to reduce fuel tax.

The literature provides many references that touch on these topics:

- May (1992) describes concerns that cordon pricing will affect those making short journeys and living close to cordons, as well as those who have no choice but to travel by car.
- Parsons Brinckerhoff (2001) demonstrate a correlation between HOT lane users’ income and usage.
- Wellington Regional Council present a very generalised view of the potential winners and losers in the case of tolling an existing road or bridge drawing upon the work of Gomez-Ibanez (1992).
- Borins (1988) cites that one of the most critical reasons for failure of the initial Hong Kong scheme was the distribution of winners and losers.
- The MVA Consultancy as cited in Austroads (2000) states “for some households...the introduction of congestion charging would be a significant and unavoidable increase in costs”.

3.5 Traffic effects

According to Goodwin (2004) a lot of international empirical evidence is now available on displaced traffic not only in relation to charging but also in relation to pedestrian zones, capacity reductions and disasters. The general conclusion is that forecasts of “chaos because the surrounding parts of the network can’t cope” are endemic, but usually

exaggerated, because of a persistent underestimation by traffic models and local media (for different reasons) of the degree of volatility and adaptability of travel choices, from day to day and year to year.

There is also evidence of traffic worsening on arterial routes close to tolled motorways – WRC (2001) use the example of Highway 407 in Toronto. May (1992) describes how the Norwegian toll roads reduced traffic into the centres of Bergen and Oslo; in the case of Bergen by 7%; Transport for London (2003) estimate that 67,000 fewer car trips per day are now made into London's charging zone of which some 17,000 were diverted around the zone. Luk & Chung (1997) describe how in Singapore, the 1975 area licensing system led to a 73% reduction in traffic entering the restricted area and Goh (2002) describes events following the introduction of the Electronic Road Pricing (ERP) system:

Traffic was better spread out during the day with the expressways and arterial roads carrying close to their design capacity while remaining less congested...travel speeds in the CBD were smoother whilst on the expressways themselves travel speeds improved from 45 to 65 km/hr.

3.6 Legal issues

Very often RUC schemes require the passing of complicated and time-consuming legislation. The legislation required may be to allow a state body to own a particular asset or to prosecute for certain traffic violations. It could also be to transfer responsibility for an asset from one government body to another. In addition a set of legal issues surrounds toll-funded specific infrastructure, e.g. toll roads, because of the risk-sharing game between public and private sectors.

The time-consuming nature of the legislation required can slow the development of schemes. Sapkota (1997) describes how this occurred in relation to the San Francisco Bay Bridge's proposed high peak period tolls. A legislative hurdle was also experienced in the Maine Turnpike proposal to increase peak hour tolls during its congestion pricing demonstration programme in that the Maine legislature disrupted the implementation of the original congestion pricing plan. Both the Maine legislature and businesses were strongly opposed to the toll increases fearing that they would drive tourists away.

TRB (1994) details how toll road authorities that collect tolls electronically need to migrate automatic photo-based enforcement yet often do not have legislation allowing such evidence to be used. In the United States, Illinois was the first state to convict a driver on the basis of photographic evidence; in Dallas (North Tollway) following the commissioning of the link it was found that photographic evidence of toll road infractions would be inadmissible in court.

Odeck and Bråthen (2002) describes how in London the ability to initiate the Congestion Charging Scheme was underpinned by the 2000 Transport Act. In New Zealand, the 2003 Land Transport Management Act does allow for tolls to be imposed on new roads to contribute to their funding, but not on existing roads.

3.7 Land use effects

Road user charging schemes will inevitably have impacts upon the geographical areas and economic sectors that they interface with. Opponents of schemes often raise objections such as "...it will drive down house prices", "kill the city centre" or "destroy local businesses".

The evidence that any of these things occur is patchy. Herve Commeignes (1991) describes how area pricing was not introduced in the US for fears it could affect retail trade, but then cites that the experience in Singapore would not bear this out – other factors drive the economy far more strongly than road pricing. So far in London the business community seems to largely support the scheme (49% in favour with only 16% openly against). Despite one high profile retailer claiming it has lost trade, evidence from London First (2003) suggests that 71% of businesses feel the congestion charge's effect upon their business has been neutral.

There is even contention amongst researchers as to what should be expected of road user charging in terms of the impacts upon land usage:

One line of reasoning holds that the traditional underpricing of highways encouraged urban sprawl and that correct pricing would encourage dense development around urban centres. An opposing line of reasoning holds that congestion pricing would facilitate continued decentralisation because it would reduce the attractiveness of an area affected by pricing especially if other competing areas are unpriced...(TRB 1994).

3.8 Funds integrity

The term 'funds integrity' loosely alludes to the public's concern that the technology works and that they do not lose money or value through technical flaws. BAH representatives in Holland have alluded to the fact that one of the major reasons for the recent abolition of the national Dutch motorway charging system was a concern over the unproven nature of the technology.

This problem is not new. Herve Commeignes (1991) describes how in 1989 a survey carried out in Sydney about the use of electronic tolling on the Harbour Bridge indicated that people had little trust in the technology and that 30% of the respondents perceived reliability and accuracy as their greatest concerns. This points towards a need to demonstrate that the technology of choice works consistently and without errors.

3.9 Costs and benefits

According to Goodwin (2004) there are two distinct ways of appraising the cost-benefit profile of an RUC scheme. Social cost-benefit analysis for congestion charging schemes assesses benefits in terms of congestion reduction and environmental improvements; commercial business case analysis purely deals with money income, often large:

- In London the cost of the concession contract is £230 M over five years.
- In Trondheim the concession contract is NOK 2.3 M over 15 years.
- In Singapore the capital cost of the ERP system is S\$197 M.
- In Hong Kong the 1985 trial cost £15 M.

Social and economic cost-benefit analysis comes together within the context of demand elasticities where (unlike traffic effects) there seems to be a persistent tendency to underestimate the elasticity. This is especially the case when distinguishing between short and long run effects, which is critical to the business case (i.e. it is necessary to know the year-by-year cash flows as market responses build up). The result can be to underestimate the effect on traffic, and overestimate the revenue.

Despite theoretical rigour the public is unlikely to accept a scheme that is sold purely on the basis of economic cost-benefit analysis if the benefit streams consist of externalities. Most people would wish to see any benefits presented in the form of revenue which can be used for something tangible.

In addition, as the systems are often large and sophisticated, unless risks are managed, there is a significant chance that the costs of the scheme can far outweigh the benefits causing, in some cases, political embarrassment. This was the case in Germany where in early 2004 the national electronic tolling project was abandoned after several years' development and investment of millions of Euros. It has also been an issue in London where just over half of the revenues forecast (£68 M as opposed to £130 M forecast) have been forthcoming because the enforcement system is too 'weak' to cope with all the violators. Finally in Oslo a \$27 M scheme eventually cost \$47 M (Herve Commeignes 1991).

Many of these problems can lie in the need for an initial business case to first justify funds for scheme development. It is not surprising that scheme proponents will be encouraging forecasters to minimise costs and maximise benefits. This process is well documented by Bruzelius et al. (2003) and by Austroads (2002) when debating problems with the Chilean Costanera toll road. The revenue forecasts for both the Channel Tunnel rail link and the Brisbane Airport link were far higher than the reality when the schemes went live.

In the absence of a robust risk-based business case it appears that a scheme has a higher chance of not proceeding or failing in the development process as in Germany. This is a real concern and should be highlighted as an issue.

3.10 Dual taxation

The issue of dual taxation ties in well with the issue of public entitlement. Some people perceive that they are already giving the state money for the construction and maintenance of new roads and that any extra charge is unfair and yet another 'tax' for which there will be no tangible benefit.

The most obvious ways to counteract this is through revenue hypothecation (targeting the funds) and revenue neutrality (not making a profit). Both are effective but incompatible. Toll roads are a very clear example of revenue hypothecation – without the tolled revenue streams the concession company which built the road could not afford to pay back the capital borrowed to construct the road nor cover their operating costs. Further, if a private company is to be involved, a profit margin would also be required over and above the recoup of costs.

The literature covers the topic reasonably comprehensively. Santos (2000) cites the need to restructure the charging scheme in an obvious way or to obviate the perception of dual taxation – moving more towards a variable charging mechanism with a small fixed component. DeCorla Souza (1993) offers the opinion that a section of the public will always see congestion pricing as yet another tax increase. Odeck and Bråthen (2002) describe how road user organisations in Oslo opposed the toll ring as yet another tax when road users were already contributing NOK 2.5 billion in taxes but only NOK 300 million of this was being spent on roads.

3.11 Privacy

User charging particularly with regard to violation enforcement and billing can involve issues of privacy. (The enforcement issues have been documented in Section 3.6 which deals with legal issues.) Essentially when an automated system can allow the tracking of a person's whereabouts at specific times of the day, privacy considerations are bound to arise. Parsons Brinckerhoff (2001) cite:

although electronic toll collection has proven very popular among drivers, some perceive the electronic tracking of vehicles as an invasion of privacy.

The major problem associated with privacy is when third parties have access to a person's mobility or usage information. Pre payment options obviate this problem to some degree. Privacy can also be protected by linking electronic toll collection (ETC) transponders with a generic internal account number that does not reveal a driver's identity and legally prevents other organisations from accessing information.

Privacy seems to be an issue for some but not others. According to Herve Commeignes (1991), Australians, despite valuing privacy highly, seemed to have few concerns over this issue when crossing the Harbour Bridge. When asked to cite possible disadvantages of electronic tolling only 4% of respondents mentioned privacy.

Privacy was a huge problem in the Hong Kong electronic road pricing experiment of 1985. Borins (1988, cited in Ison 1996) describes how a lack of anonymity ultimately led to the failure of the trial. Goh (2002) describes how the public in Hong Kong rejected the scheme for reasons of privacy. This was apparently also a major concern in trials in the late 1990s in the Netherlands (Phang and Toh 1997, cited in Goh 2002). May (1992) states that although the problems of privacy invasion raised in Hong Kong have now been overcome by removing the need for automatic vehicle identification, the privacy of those who choose not to pay a charge is bound to be affected.

3.12 Institutional

Another well documented issue is whether a city or state possesses the appropriate institutional and governance structure required for the development, procurement and operation of a complex RUC system. If the political decision-making structure or process and government bodies are fragmented, then obtaining consensus and allocating responsibility is a concern. It would seem that a single empowered entity is thus a potential critical success factor. For example, in London, Transport for London was specifically set up for this purpose and Singapore has a single layer of Government.

Furan (1999) stipulates that there are currently no technical impediments to the implementation of inter-operable RUC systems. Rather it is the administrative and legal matters that need to be typically overcome. DeCorla-Souza (1993) cites:

...inter-jurisdictional issues as a barrier to scheme progress and highlights one key problem, namely that many arterial roads are federally owned but the remaining roads are the responsibility of local government. To implement a region-wide pricing strategy it is necessary to tackle difficult issues such as the setting up of institutional mechanisms for implementation, getting agreement on toll rates for select location and sharing revenues amongst the various bodies involved.

4. Identification of critical success factors

4.1 Methodology

The previous chapter outlined key issues pertaining to road user charging (RUC) schemes. This chapter will translate these issues, and other issues referenced, into potential critical success factors (CSFs) through consultation with experts and scheme developers.

4.2 Comment on statistical rigour

BAH feels it is appropriate at this point to offer comment on the statistical rigour of our proposed process. It is not possible, because few schemes are operational in the field, to meet the criteria for statistical random sampling criteria to give a statistical level of confidence in our results.

However, by focusing upon those who have actually implemented or developed schemes BAH feels that there is knowledge which can be tapped. For this reason we believe that our survey methodology – the Delphi survey – provides meaningful insights into what the selected professionals believe makes an RUC scheme successful.

4.3 Candidate critical success factors

Candidate CSFs were drawn from Chapter 3 and from two other studies listed in the next section.

4.3.1 From other studies

Two major studies have been drawn upon here:

- the work carried out by the Swedish National Roads Administration in 2002,
- the ROCOL report (2000) undertaken as part of the development of the London congestion charging scheme.

The CSFs flagged by Swedish Roads study are:

- The charge/revenue must be needed.
- The public needs to know where it is going.
- There must be broad political agreement.
- The charges must be part of a strategy.
- Regional benefits must be obvious.
- Distrust of the motives of the politicians must be overcome.
- Charges must be sensibly designed.
- The public should be involved during the scheme development process.
- There needs to be one decision making authority.

The ROCOL CSFs are that schemes should be:

- achievable,
- sensible,
- predictable,
- adjustable,
- responsive,
- implementable.

As can be seen, the Swedish Roads report offers more elaborate caveats than the ROCOL report which flags generic and more practical advice.

4.3.2 Final candidate set

The key issues from the previous section were consolidated into a list of candidate critical success factors. These were compared with those flagged in the mentioned reports to assess overlap and the final candidate set was thus derived.

The candidate CSFs were:

- a revision of the charging basis – moving to less fixed and more variable,
- well-planned public relations campaigns,
- a credible public transport alternative,
- privacy is protected,
- a scheme is priced appropriately,
- the scheme is co-ordinated with other transport modes,
- a strong political position,
- the presence/ease of enabling legislation,
- a political champion,
- the public perceive the need,
- a ring fencing of revenues (hypothecation),
- a broadly equitable scheme,
- a well-planned investment in development,
- the scheme is co-ordinated with land use,
- the presence of a single empowered agency,
- a clear business case.

The actual interview guide presented to the market is shown in Appendix B.

4.4 Key respondents' views

This list of CSFs was then presented to each of the experts mentioned in Appendix B through the process of telephone interviews to ascertain those which they felt were the most important. For the interest of the reader, BAH has highlighted below the salient findings of those whose schemes became operational (the only exceptions being Hong

Kong which trialled the technology in 1985 and the Netherlands whose national RUC scheme was finally abandoned in 2003).

4.4.1 Singapore

Singapore's area licensing scheme was introduced in 1975 and the scheme was upgraded to full electronic road pricing in 1997. There is little doubt that the scheme has been successful – traffic levels are down, average speeds are up and public transport usage has increased dramatically. The Land Transport Authority see the critical success factors for their scheme as:

- revenue neutrality - government not generating a positive net return from a scheme,
- well-planned public relations campaigns from the beginning,
- a public perception that congestion was set to worsen and "something needed to be done",
- the use of proven technology,
- a strong political position (only one tier of government exists and strong political protest is not part of the culture in Singapore),
- the inclusion of the charging scheme as part of an overall transport improvement package (revenues were hypothecated).

4.4.2 London

London's scheme was implemented in February 2003. By 2004 congestion was down and there had been few system glitches. The scheme has however, generated far less money for public transport than originally forecast – the costs of administering the enforcement side have been far higher than envisaged. Transport for London (TfL) representatives interviewed believe that London's scheme is successful because:

- The broad political consensus was that "something had to be done".
- A range of exemptions from the charge ensured that the scheme was largely fair.
- Existing mature technology was used.
- A single entity with full legal powers was responsible for development and delivery.
- A credible public transport alternative was available and revenues were ring fenced for public transport improvements.

4.4.3 Durham

In 2002 the UK Cathedral city of Durham began charging £2 for vehicles to enter a small retail area around the University between 10 am and 4 pm. The scheme was necessary because 3,000 cars per day were adversely affecting the 19,000 pedestrians who accessed the area on a daily basis. There has been no real backlash against the scheme – it was apparently harder to put in parking controls from the perspective of the County Council. The project manager interviewed at Durham County Council cited the critical success factors as being:

- "Something had to be done": the public saw a clear need and they were consulted at every stage of the process.
- The solution was in line with promises made.

- Ring fencing of revenues collected to park and ride.

4.4.4 Melbourne

In January 2000 a new electronically tolled highway was opened in Melbourne. Named City Link, it has been judged by many to be a political, technical and social success (see Lay & Daly 2002). The Melbourne City Link Authority (MCLA) see the reason for this success being:

- strong public consultation,
- revenues being used to fund the new road itself,
- provision of a toll-free alternative route and free tags for users,
- the establishment of a single body with full powers (including compulsory land acquisition rights) to develop the link,
- a strong political administration and a dedicated cabinet sub-committee who could fast track legislation and decisions,
- a clear business case ascertained through many months of development work.

4.4.5 Norway

There are three toll road schemes in Norway, in Oslo, Trondheim and Bergen, each comprising a ring road circling the cities. Charging for the city ring roads was originally planned to occur only during the life of a significant investment plan for roads and public transport. The schemes began operation in the 1990s; all succeeded in reducing traffic levels although there was no increase in public transport usage.

Public attitudes towards the toll rings are mixed. The Bergen toll ring eventually became popular because it was cheap (NOK 5) and is financing much needed new infrastructure. Despite lengthy user campaigns in Trondheim only a slim majority were behind the scheme after opening and public opinion is still in the balance. Oslo's toll ring is relatively expensive at NOK 10 and for this reason the majority of people in the city are still opposed. All 3 cities are now discussing keeping the tolls as a demand management tool and this is causing sizeable public opposition.

Despite these problems, the schemes have met their objectives of securing investment capital for transportation. The cities see this as being a function of:

- the ring fencing of revenues for transportation,
- well-planned PR initiatives,
- a high quality public transport alternative (although little modal shift actually took place, at least the alternative was there),
- dedicated and empowered political agencies in place to develop the schemes.

4.4.6 Netherlands

In the Netherlands, plans to introduce a national RUC system on the motorways were discontinued because of public opposition and unproven technology. The scheme was in development for many years and was promoted by one government, discontinued by another and has now been finally dropped after a recent review. The reasons for the

failure (according to BAH staff in Amsterdam, who had significant involvement with the scheme) were:

- very strong public opposition,
- lack of political consensus,
- an underestimation of the need to communicate with the public,
- failure to convince people that it was fair – “why should we pay to sit in traffic jams”,
- the choice of expensive and unproven technology feeding an intense media backlash.

4.4.7 Hong Kong and other failures

The first attempt to introduce an automatic system with an electronic charge to control traffic in Hong Kong was made in the 1980s. Anxiety that the system would reveal a person’s identity led to a public backlash. In addition, the technology being trialled was immature and had doubtful functionality. Hong Kong recently undertook another trial comparing GPS- to beacon-based systems but continued public sensitivity means that a scheme is unlikely in the future.

The experiences of Cambridge, Stuttgart and Stockholm are also worthy of mention when discussing scheme failures. While the three cities cited several different reasons for not taking the trials of the 1990s further, the common denominators raised by those interviewed and the literature were:

- a lack of political consensus,
- very strong public opposition.

In Cambridge there was no high level buy-in and congestion was not considered by motorists to be sufficiently acute to warrant new charges. In Stuttgart almost all the critical success factors identified previously seemed to be missing. Technology was not mature, privacy was not guaranteed, the political groundwork had not been done and there were no plans to restructure road charges.

Stockholm’s “Dennis agreement” to increase investment in transport included road tolls both to finance part of the infrastructure and as a means of controlling traffic. This was eventually abandoned largely because of the politically explosive nature of road tolls - residents of some municipalities feared that they would be excluded from the road network, and there were concerns the tolls would strike low-income residents. That said, Stockholm has recently resurrected its plans to introduce congestion charging and is now fast tracking a scheme without public consultation. Time will tell whether or not this strategy will pay off.

4.4.8 Orange County, California

SR91 High Occupancy Tolloed (HOT) lane in Orange County, California, project sponsors understood that public acceptance was critical if their scheme was to succeed. This was particularly important in this case given that it would be the first privately owned and variably tolled high-occupancy vehicle facility. Continuous efforts to communicate with

and seek input from the public and its client base have been made from the initial planning stages through the operational phases of the project:

- Preliminary studies assessed travellers' likely reactions to variable pricing through comprehensive surveys of travellers and businesses, and a number of focus groups.
- The planning process involved broad representation from community, political, government and industry interests.

A further critical factor was the championing of the project by several local and state officials, and the involvement of public figures willing to support the project.

4.4.9 San Diego, California

A political champion was the key to the introduction of the I-15 San Diego HOT lanes. The mayor in the area bordering the I-15 highway was adamant that the HOT conversion project should go ahead.

The project was couched in a manner involving low political risk:

- It was a demonstration project: "if it doesn't work we can take it down".
- It started small (8 mile lane, monthly pass), then expanded (20 mile lane, variable pricing).
- It had minimal construction costs: lanes were already built.
- Extensive 'public outreach' was undertaken.
- The public were surveyed prior to the initial 'demonstration project' and again when the scheme expanded.
- Initial public reaction was positive.

Revenue hypothecation was also a feature – it was required by the State that surplus revenues be used to fund bus services or carpooling equipment.

4.4.10 Houston

A political champion also helped with the successful introduction of the Houston HOT lanes. The local mayor was very supportive and took the approach that "this is a good idea, just do it". Good public education and marketing was critical to the successful implementation; with HOT lanes it is possible to argue that there are 'no losers'.

Those interviewed in Houston were adamant that enough funding must be available to cover all aspects of scheme implementation, enforcement and monitoring. This ensures that the principle of 'doing it right the first time' is followed. Other factors which were thought to have helped the successful implementation were: simple pricing and a fair system (e.g. no cost travel options were available).

4.5 Chosen CSFs for all schemes

Table 4.1 demonstrates those success factors flagged by the experts consulted, not only for schemes which became operational, but for those that did not progress such as Stuttgart, Cambridge and Hong Kong.

Table 4.1 Rating of the candidate success factors by scheme type and location.

CSFs (or failure factors)	Cordon							Toll				HOT		
	Sing	Lond	Dur	Stutt	HK	Camb	Stock	Melb	Oslo	Trond	Neth	Hous	OC	SD
Revision of charging basis	Yes													
Public perceive need	Yes	Yes	Yes	Yes			Yes		Yes		Yes	Yes	Yes	Yes
Well planned PR campaigns	Yes	Yes						Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ring fencing of revenues		Yes	Yes					Yes	Yes	Yes				Yes
Credible PT alternative	Yes	Yes					Yes		Yes					
Proven technology	Yes	Yes		Yes	Yes					Yes	Yes			
Ensure privacy is protected				Yes	Yes		Yes				Yes			
Equity/fairness		Yes					Yes	Yes				Yes		
Price appropriately	Yes									Yes		Yes		
Invest in development	Yes	Yes	Yes	Yes				Yes	Yes			Yes		
Coordinated w/ other transport	Yes								Yes					
Coordinate with land use														
Strong political position	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes			
Single empowered agency	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes				
Presence/ease of legislation								Yes						
Clear business case	Yes	Yes		Yes				Yes	Yes			Yes	Yes	Yes
Political champion		Yes		Yes				Yes				Yes	Yes	Yes

The results are more clearly presented in Figure 4.1 which demonstrates on a percentage basis the critical success factor cited by all cities. (BAH has taken the median as being the borderline between universally critical and non-critical).

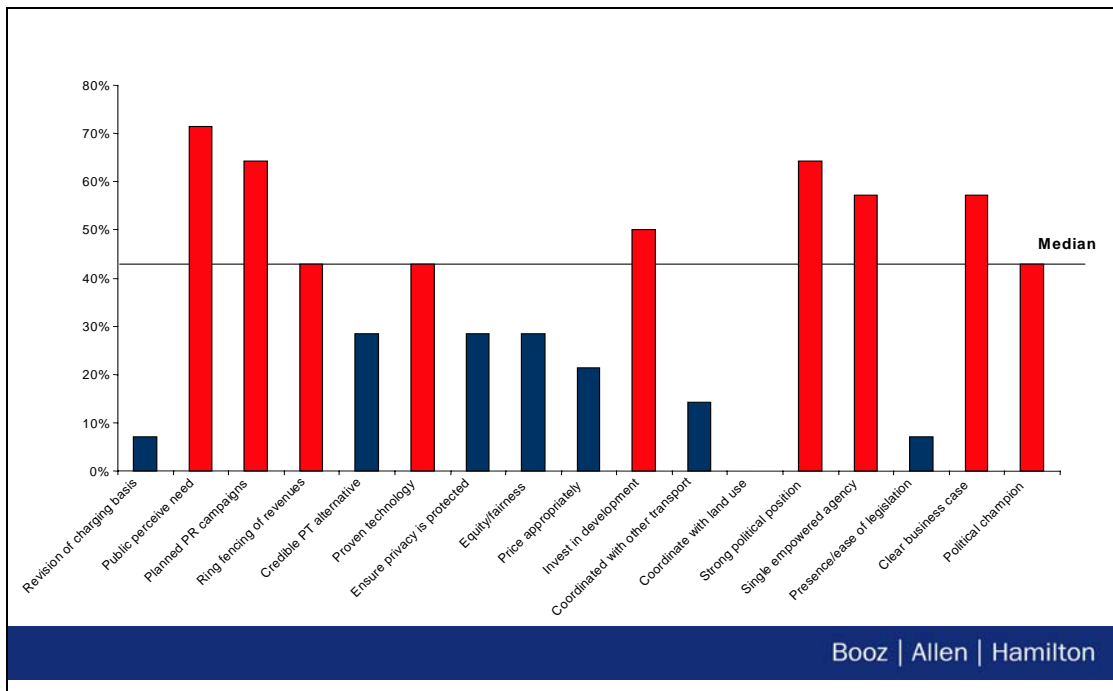


Figure 4.1 Universal critical success factors.

As can be seen, the highest ranking CSF is the public perceiving the need. Following this a strong political position ranks alongside well-planned PR campaigns. Others ranking over the median include: a single empowered agency; a ring fencing of revenues; use of proven technology; a lengthy investment in development; a clear business case and a political champion. These cited factors will therefore constitute the CSFs to be used throughout the remainder of this report.

4.6 Chosen CSFs by scheme type

It is interesting to note how CSFs differ between scheme types – congestion pricing, HOT lanes and tolled roads. Table 4.2 demonstrates critical success factors by scheme type.

- Toll roads use a fee for use to pay back a loan which provided the infrastructure.
- HOT lanes provide a dedicated or reversible third lane on a highway which can be accessed either by payment of a fee or by having a certain number of passengers in a car.
- Cordon charging schemes levy a fee for crossing a cordon point typically surrounding a congested central business district.

Drawing statistical inference from such a small sample size is risky. The most startling thing, however, is the commonality between tolled roads and cordon tolls whereas HOT lanes may have fewer CSFs.

This makes intuitive sense. HOT lanes are reasonably simple and offer a win-win situation in that those who can pay are rewarded with faster journey times as are those who car pool. But this then frees up more capacity for existing lanes for those who do not choose to pay. A full graphical representation for each scheme type is offered in Appendix C.

Table 4.2 Critical RUC success factors by scheme type.

	Cordon tolls	Tolled roads	HOT lanes
Strong political position	Yes	Yes	
Well-planned PR campaigns	Yes	Yes	Yes
Single empowered agency	Yes	Yes	
Public recognition of need	Yes	Yes	Yes
Ring fencing of revenues	Yes	Yes	
Proven technology	Yes	Yes	
Lengthy development	Yes	Yes	
Clear business case		Yes	Yes
Political champion			Yes

In this chapter the critical success factors have been identified and discussed. In Chapter 5, BAH uses its own judgement and correspondence with project stakeholders to make a judgement as to whether or not they are present in New Zealand.

5. CSFs in New Zealand

Having identified the factors that the experts consulted perceived as critical for each road user charging (RUC) scheme type, the next stage of the project was to assess whether these are present in New Zealand. This necessitated consultation with New Zealand stakeholders on the presence of CSFs at a national and local (scheme specific) level.

5.1 The CSFs

The critical success factors identified were:

- a strong political position,
- a political champion
- a public recognition of need
- a single empowered agency,
- the ring fencing of revenues,
- a well-planned development phase,
- a clear business case.
- well-planned public relations campaigns,
- the use of proven technology,

As stated, the focus of this exercise will be at a *national* and *local* level. Although the New Zealand Government recently announced that an increase in petrol tax will fund a large proportion of necessary highway infrastructure (and public transport, local roads and travel demand management measures) in New Zealand (35% in Auckland), some tolling and pricing schemes are being considered by various parties in the medium-to-long term. Schemes raised by the Steering Committee as potential longer-term options are shown in Table 5.1; they cover each of the scheme types raised earlier throughout New Zealand.

The schemes vary in complexity from a simple tolled link (ALPURT) through a regional HOT lane in a topographically complicated coastal region, to full pricing for existing facilities in Auckland. Difficulty will be linked with complexity but the CSF *analysis* is still the same for each.

Note that the eRUC project which could move towards a variable charging basis for non-petrol freight vehicles is not being considered here although it is understood that the functional specification does include provisions for expansion.

Table 5.1 Potential RUC schemes in New Zealand

Scheme	Description
ALPURT (Orewa to Puhoi) toll road, north of Auckland on SH1	A toll road from Orewa to Puhoi - in effect a by-pass in the Rodney District Council area. Modelling to date by Transit shows significant time savings. Private finance was mooted as an option for this link earlier but it has since been decided that the road will be State-financed.
Charging for existing roads in Auckland	A shortfall exists between the infrastructure required to tackle congestion and the available revenues from taxation. Pricing existing roads is a potential way of bridging this gap and a way of managing demand to get better use of the existing capacity. The exact scope of schemes is still unclear but options may include: <ul style="list-style-type: none"> • pricing to enter the isthmus, • pricing the strategic network – key motorways only • a network based system – car users charged on a per distance basis
A new HOT lane on SH2 between Petone and Ngauranga (Wellington)	Scheme being scoped by Greater Wellington in partnership with Transit and Land Transport NZ. Consists of the segregation of a third lane along SH2 between Petone and Ngauranga.

5.2 A strong political position and a political champion

These consist of stable governance with a broad coalition of support for an initiative from all stakeholders and a key figure either at a local or national level driving a project forward. Governments or individuals in a tenuous position are unlikely to ‘commit political suicide’ by pushing unpopular charges.

The subject of a strong political position is intrinsically linked with public support and, as further sections will demonstrate, this is far from universal. Stakeholders are thus proceeding cautiously:

The Government has ruled out toll roads unless there is a free alternative (NZ Herald December 19th, 2003)... (due to it being) ... “a blunt instrument” that would hit low-income workers the hardest, and allow the wealthy and those whose jobs were well served by public transport to avoid paying the charge.

Within New Zealand there seems to be broad support for road tolling as a way to fund new roads *across the political spectrum*. Of political parties only New Zealand First expressed opposition to tolling in the Commentary on the Land Transport Management Bill (LTMB). As yet, however, there is no legislation that allows for HOT lanes or charging for the use of existing facilities for the purposes of demand management.

Charging for use of existing facilities for reasons of demand management is likely to be very contentious. Any new legislation which devolves the right to implement these schemes to the Regional Councils (in many cases logical scheme proponents) would see the movement of some political risk from central government (as in the UK with the 2000

Transport Act). It would also result in territorial authorities no longer being road controlling authorities.

Proposals to charge road users for existing facilities are likely to raise public outcry in Auckland: it is a very car-dependent city (Figure 5.1). While road pricing developments globally have generated interest, the Auckland Regional Land Transport Strategy describes pricing as merely a “potential long-term measure”. Ministers are beginning the process of asking that the ‘feasibility’ of pricing be examined, and are awaiting results before proceeding.

No political champion has emerged for the pricing of existing facilities in Auckland. The Manukau mayor has indicated his belief that tolling motorists on the Oslo model is the best way to fund Auckland’s *new* transport infrastructure and services.

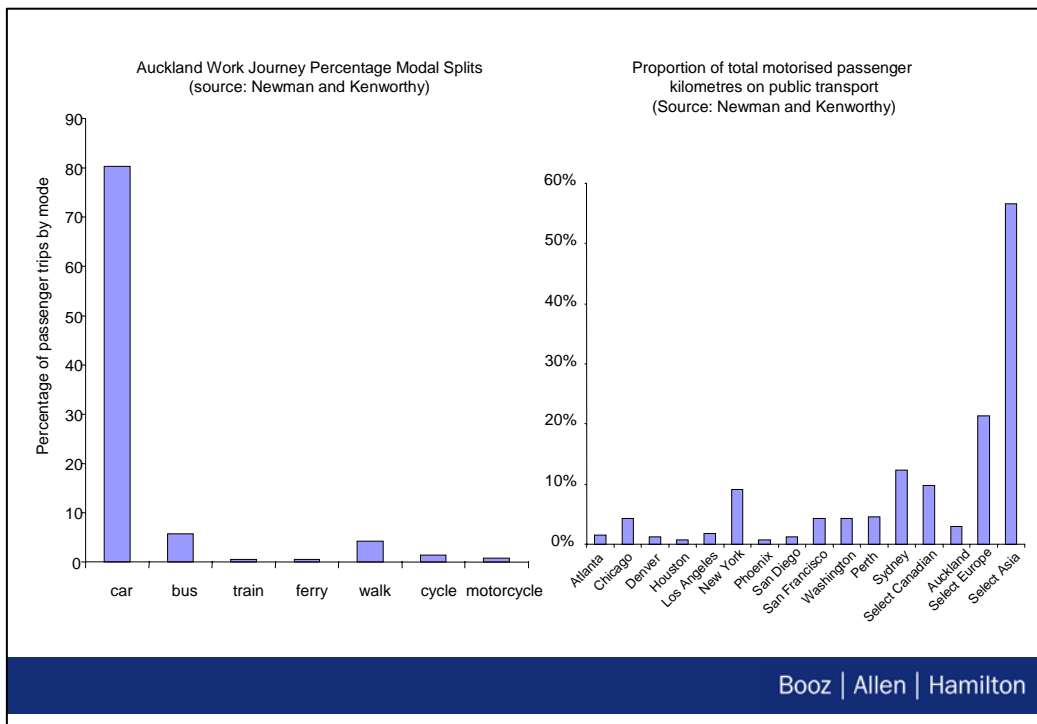


Figure 5.1 The predominance of the car in Auckland (Newman & Kenworthy 1999).

In Wellington (a much less car-dependent city) the Regional Council is actively looking at the SH2 HOT lane proposal, and has fast-tracked it as part of the Hutt Corridor improvement plan, but as yet, no enabling legislation and no obvious political champion is available. The scheme is also not yet on Transit’s approved list of schemes which means under current rules it cannot proceed. However, if the HOT lane shows the following characteristics:

- clear travel time savings,
- no reduction in road capacity available to existing users,
- technical feasibility given the geography,

then local political support is not out of the question. However, this must be accompanied by Central Government support to facilitate enabling legislation.

The ALPURT toll road is, however, on Transit's list of schemes and enabling legislation is already in place. The scheme is also supported by a local agency - Rodney District Council.

BAH would conclude that a clear political champion is not yet forthcoming for any form of petrol vehicle RUC in New Zealand. While supporters and advocates are emerging, they are as yet not pushing the concept sufficiently to be deemed champions.

There is also not a strong political position nor consensus on the need for charging for the use of existing facilities. This is not the case for new tolled roads for which enabling legislation was passed in 2003. HOT lanes are a concept only recently being contemplated and provided no existing road capacity is removed, and they are technically feasible, BAH cannot see a major problem in generating political momentum for their development as they offer a clear benefit for a clear and transparent cost.

5.3 A public recognition of need

The successful delivery of toll roads and HOT lanes involves public recognition that current infrastructure is not meeting its requirements owing to insufficient or reduced capacity (caused by congestion) which in turn leads to delays. Also needed is acceptance that insufficient public funds are available to procure any new infrastructure.

Pricing existing facilities is more complex as it necessitates the public being willing to pay for something that was previously free to either control demand and/or generate revenues (preferably for use in the transport sector). Evidence shows that new infrastructure funding mechanisms (HOT lanes and tolled roads), despite inevitable opposition, are easier for people to accept than pricing something which is already in place and which had been free.

The research to date carried out in New Zealand indicates that the public are far from completely behind paying for roads at point of use. There is a strong recognition of the need to 'fix' the traffic problem in Auckland and Wellington but only moderate support for road pricing as the appropriate solution.

In Auckland a pilot research programme on public attitudes to road pricing (Forsythe Research 2001) demonstrated that:

- Traffic congestion is perceived as a major problem in Auckland.
- Road pricing is not popular or well understood as a way of controlling congestion.
- Road pricing is perceived more as a revenue-generating measure.
- Road pricing is more acceptable if the revenue is spent on public transport and/or roading.
- Options which give the public a choice about paying were most popular (e.g. HOT lanes).

Research carried out by the Automobile Association in Auckland reinforced the Forsythe work:

Respondents were told that completion of the (strategic) network by 2010 would require at least an additional \$5 billion (probably more) than was available from traditional funding sources. Overall, just 14% of people clearly support the idea that the people in the region should contribute directly to the additional funds required – one third clearly reject this idea, with the rest having an intermediate view. This constitutes a significant level of resistance to paying, and this when such payment is contingent on the network being completed faster than the planned 2015 to 2020 (Research Solutions 2003).

The AA research also showed that those in households with income levels of more than \$70,000 per annum were significantly more willing to accept the idea that people in the region will need to contribute directly to the extra cost of completing the network by 2010 (as were public transport users and AA members).

As Figure 5.2 shows, tolling was the least contentious option but only to fund new infrastructure for a finite period:

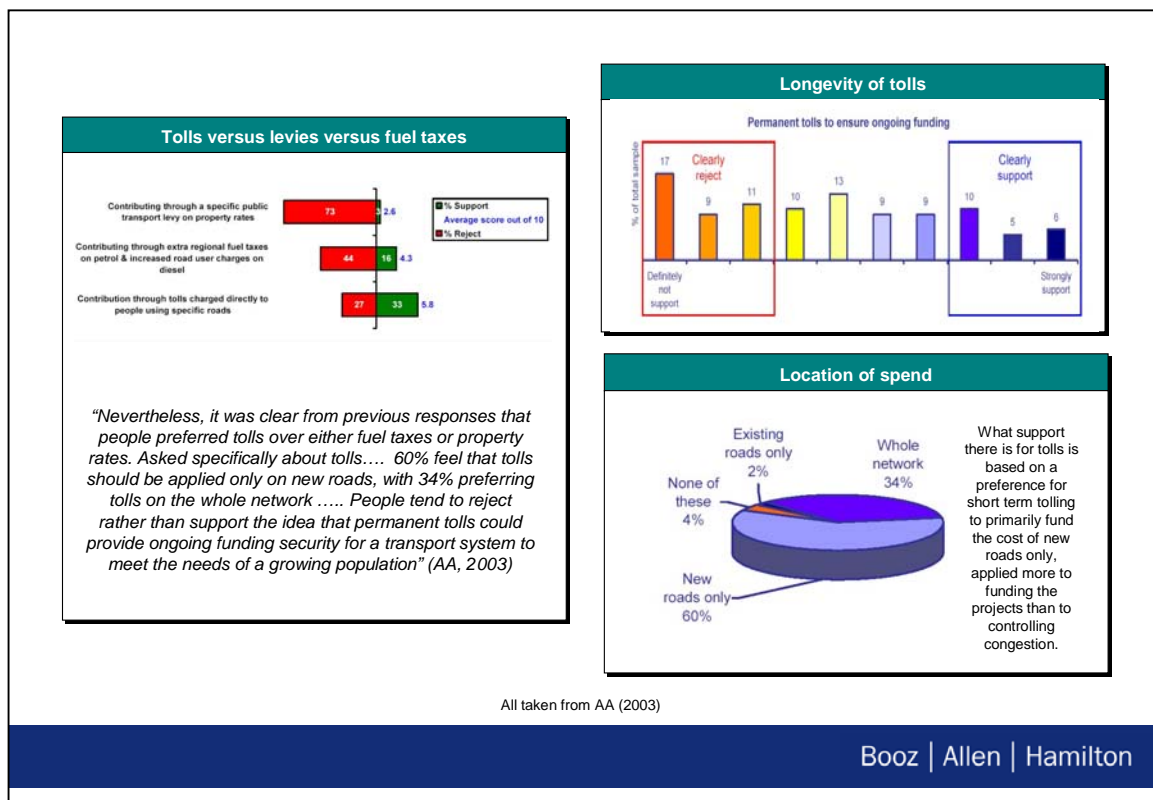


Figure 5.2 Tolling versus other options for financing Auckland road expansion (Research Solutions 2003).

In Wellington, the Forsythe research found broadly similar conclusions:

- Traffic congestion is less of an issue than in Auckland.
- 'Ownership' of congestion is at a higher level than in Auckland ("it's our problem; not the government's").
- Attitudes to road pricing were similar to those in Auckland.

Also in Wellington a survey of 1000 members of the public on road pricing showed (Gravitas Research 2003):

- 63% thought congestion was a problem now; 83% thought it would be in the future.
- 61% were open to road pricing in general; 39% rejected it outright.
- 26% saw road pricing as an effective way to reduce congestion.

The SH2 HOT lane has yet to be presented to the Wellington public as an option although work carried out by the Regional Council when assessing the business case for Transmission Gully showed a section of the public was amenable to paying for travel time savings.

The ALPURT scheme was supported by the public as a Transit project. At the time of the research no work had been done to assess broad support for it as a tolled road. As it relieves congestion in the town and an alternative route is available, overwhelming opposition seems unlikely.

In conclusion, technical feasibility aside, it seems clear that the area of public acceptance of RUC in New Zealand is critical both in its own right and as a determinant of political support. It would also seem that despite stated opposition a small core of people are sufficiently concerned about the delays and disruptions caused by congestion to pay a user charge to fund new roads. This is not the most popular mechanism and to date it has not been the chosen measure for Auckland. Increased petrol taxes combined with funding from the consolidated fund and existing RUC funds from diesel vehicles have been. However it is not being ruled out in the longer term.

Given enabling legislation, Transit's support, and public acceptance of the link, the greatest challenges to ALPURT would seem to be ensuring that the scheme can be funded through tolls and successfully re-defined as a tolled link.

Similarly (considerations of getting the project onto the approved Transit list aside) the Wellington public have indicated (through surveys carried out relating to Transmission Gully) that they could be persuaded to pay for travel time savings. Provided equity considerations are tackled, i.e. no existing capacity is removed and the scheme can physically be built, BAH does not expect selling the SH2 HOT lane to the public will be very difficult if scoping and marketing are done carefully.

Obtaining support for pricing existing facilities in Auckland (and to a lesser degree in Wellington) will be extremely difficult. Given the degree of contention it is unsurprising that no political figures have emerged to champion the concept. If pricing becomes a sought objective it would seem that the logical starting point would be to assess the exact nature of the opposition and whether or not it can be placated.

5.4 A single empowered agency

This would consist of a single body having both roading and public transport powers (if hypothecation to public transport was a feature), entitled to raise revenue, and to own assets. As yet there are no entities of this nature in New Zealand but progress is being made on several fronts.

The Government has recently (2005) established a single agency with enhanced powers to coordinate transport in Auckland – the Auckland Regional Transport Authority (ARTA). The need for ARTA arose in part from the Auckland Transport Strategy and Funding Project, and from a broad recognition of the problems of building consensus between the myriad of agencies involved in transportation in Auckland as things previously stood. Several local authorities supported the initiative, although there was some opposition to proposals to place this authority under the ARC. Auckland territorial authorities (TAs) retain local roading powers and Transit continues to control state highways funded by Land Transport New Zealand.

There are no plans to develop a similar body in Wellington at this stage although those consulted at Greater Wellington expressed interest in the concept.

Transit is a single empowered agency but they may not have an appetite for initiatives such as pricing existing facilities or HOT lanes at a purely local level. Their current remit purely relates to state highways; it is the TAs who are responsible for local roads. The Regional Councils are the most likely entities to push local schemes, because they are close to local concerns and also responsible for implementation of strategic transport plans, but they currently lack the powers (and to some degree the skill set).

The outlook for the different schemes in terms of proponent empowerment is therefore mixed. The progression of charging existing facilities in Auckland could therefore be handicapped by the absence of road powers from ARTA although ARTA could assume road-controlling powers as delegated by TAs after 1st July 2007. The HOT Lane in Wellington is being pushed by WRC who do not currently physically control the asset nor the revenue stream which it would generate (although Transit do and are single and empowered). The ALPUR scheme falls under the jurisdiction of Transit who do have full powers to ensure it goes forward.

5.5 The ring fencing of revenues

The ring fencing of revenues is the ability to ensure that all funds raised are targeted specifically for a particular initiative (or initiatives if there is multi-agency involvement), as well as having the accountability mechanisms in place to ensure this happens. The research undertaken for this report shows that ring fencing is critical in terms of placating public fears over dual taxation. In general, diverting funds raised to roads is much less contentious than channelling it into public transport.

Hypothecation mechanisms for transport do already exist in New Zealand in the form of the National Land Transport Fund. Heavy goods vehicles' user charges and around half of petrol excise (and all LPG and CNG excise) go to fund roads and other land transport.

The prognosis for targeting funds (to either Transit or Land Transport NZ) raised by new RUC initiatives to transport initiatives therefore seems promising. A recent petrol tax of 6c per litre has been accepted by the public to fund new roads. This is undoubtedly a form of variable pricing but it is crude as it is linked to usage but not location or time (in addition the long term sustainability of using this measure to fund new infrastructure is questionable given concerns over long-term pricing of fuel).

There is also some historical precedence. In 1992 regional petrol taxes were introduced under the 1992 Transit NZ Amendment Act. Regional councils in Auckland, Hamilton, Wellington, Christchurch, and Dunedin were able to tax petrol sold in their areas. The money raised through the tax was allowed to be used only for passenger transport. The tax was eventually ended in 1995 mainly because petrol companies appeared to fund the tax from sales throughout New Zealand and not just the five cities in question. This illustrates the need to 'do what you say' to get the public to accept hypothecation.

Outside transport, hypothecation has been used in New Zealand to justify user pays schemes in the garbage collection and landfill sectors.

Privately financed toll roads by definition use hypothecated revenues; HOT lanes can do so as well if the charge involves underwriting of the construction and operation of the lane. Provided these scheme types were both the responsibility of Transit, revenue hypothecation could be possible. If WRC sought to own and develop the HOT lane, not only would legislative change be required but also the transfer of the right to raise revenue from a facility from Transit. This is likely to be a contentious and time-consuming topic. The same would apply to the pricing of existing road space in Auckland were ARC looking to own and operate charging schemes.

If hypothecation to public transport is sought for the revenues raised by any schemes, and if Transit were to raise the revenues, they would need to pass it to the regional councils. TfL in London avoids this problem by being responsible for both road pricing and public transport. Again this could be difficult to implement effectively in New Zealand. Alternatively funds could flow to Land Transport NZ who would then fund Transit and the regions for roads and public transport.

5.6 A well-planned development phase

A well-planned development phase entails investing appropriate amounts of time and funds to successfully take a project from inception to fruition. The steps involved are typically:

- scoping,
- options definition,
- options evaluation,

- forecasting and sensitivity testing,
- redefinition,
- risk management plan,
- functional and technical specification,
- tendering,
- contracting,
- implementation.

Projects frequently fail seemingly because they truncate this process often due to political deadlines.

In recent years many public projects have become increasingly focused in the information-technology space. Within transportation this would comprise the field of 'intelligent transport systems' (ITSs) of which automated RUC is a subset. There are many examples of expensive public IT project failures all over the world. In New Zealand, a good example would be INCIS (Dale 2000). In fact the outcome of the failure of the INCIS project led the State Service Commission (SSC) to develop a set of guidelines for IT project development in the public sector (see State Services Commission 2001).

Assessing whether any potential RUC systems which planned to use automated systems are likely to follow best practice and guidelines will be difficult - as yet no RUC systems have been installed in New Zealand. Given this lack of precedence the gap analysis should be practical and address whether or not mooted schemes are likely to:

- adhere to clearly defined, mandatory steps to ensure an appropriate project development phase, and assess whether these steps are clearly defined,
- truncate the development phase caused by pressures imposed by political timelines,
- draw upon appropriate skills within the scheme developers to identify and manage risk – technological, contractual, fiscal and temporal.

The question of political deadlines is to some degree scheme-specific so will not be discussed further. The answers to the other questions, though, are clear. In terms of the skills needed within local government, many are inevitably absent, but could be contracted from outside. In terms of clear development phases under the SSC guidelines there is a lengthy and prescriptive section on project development (and the formation of a business case) that, if adhered to, would greatly help to manage risk. But these guidelines are *discretionary*. Even though it is estimated that there are 14 Government IT projects deemed 'risky' (SSC guidelines define this as a value of over \$15 m with more than \$7 m in a single year, affecting multiple departments, impacting the government's ability to function) by the SSC in progress, none of the projects have to adhere to the guidelines produced. Furthermore no clear diagnostic or accountability processes are in place should things go wrong.

BAH would therefore conclude that the current guidelines for developing new road schemes should ensure some form of project development phase. But these guidelines do not cover the extra stringency needed for the successful delivery of an IT project. If

complicated IT systems are to underpin the charging, adherence to the SSC guidelines (and other global best practice manuals) would be very desirable as would a formal risk management process. As yet though, adherence to the SSC guidelines is not mandatory, which raises some serious concerns.

5.7 A clear business case

The construction of a business case is an essential subset of the project development phase and as such, many of the issues raised in that section apply here. A business case is basically the estimation of scheme life-cycle costs and benefits. If the benefits exceed the costs by some margin, a project is deemed to be worthwhile. A commercial business case purely deals with the flow of costs and revenues, i.e. it assesses whether or not a scheme is likely to operate profitably. Where a shortfall is shown, and there are sufficient economic benefits such as time or lives saved, then a public subsidy or capital grant may be justified.

One critical aspect of a business case (and one dealt with in the 2001 State Service Commission Guidelines to Government IT Projects) is how project risk is handled. Risk assessment will demonstrate both the most favourable and unfavourable scenarios and what could cause each to manifest. It is then possible to instigate a risk management strategy to ensure negative outcomes can be managed if not entirely avoided.

There is a clear benefit to cost ratio process for proposed road schemes in New Zealand and the use of sensitivity testing allows for some risk management. Coupled with the fact that the SSC guidelines make clear the dimensions of a business case, BAH would conclude that the processes needed to deliver a robust business case to Ministers, bidders and financiers are in place. Once again however, the fact that they are not mandatory flags a slight gap between the situation and best practice.

The current work being carried out to assess the feasibility of ALPURT, the SH2 HOT Lane and pricing existing facilities in Auckland all demonstrate that business cases are being considered. However, BAH would strongly advise that risk analysis be incorporated into these, especially if the schemes are expected to be self-funding or are heavily IT based. In short, once again, following the SSC guidelines would be sensible.

5.8 Well-planned PR campaigns

In this instance 'lengthy PR campaigns' refers to a history of successful social marketing campaigns (preferably focused on travel behaviour) and the willingness to engage in public dialogue. Recognising that consultation should be separate from PR, all road schemes currently have to go through a public consultation exercise as part of the planning process but this represents something more – the apparatus to sell a novel or difficult concept to people through marketing media.

BAH would suggest that there is some experience in New Zealand that could be drawn upon. The LTSA's road safety campaign has been running since 1995. This includes extensive media advertising (including television, radio, billboard, buses) in conjunction

with enforcement and other measures. It is designed to change behaviour by engaging people's core fears. So far the campaign has been very successful - the number of drink drivers has dropped by 46% in 5 years.

Other national social marketing campaigns that have been run successfully include:

- the 'Breaking the Cycle' child abuse campaign,
- a campaign to reduce the stigma of mental health issues.

Local social marketing campaigns are also being trialled such as Auckland's Big Clean Up.

In terms of specific schemes, ALPURT has obtained approval from Transit to proceed and public consultation was part of this process. It is expected that the public in Wellington and Auckland will be consulted regarding specific RUC schemes in the future as part of the feasibility assessment process. Once candidate schemes have been designed they will be presented to the public and the schemes will then be optimised in the light of feedback.

BAH would therefore conclude that the PR process is already an inherent part of the feasibility study and development process that is underway for schemes being considered here. Most importantly, if any decisions to proceed are made, there does not appear to be a significant gap between the apparatus needed to successfully run a PR campaign for RUC and the scale of other social marketing campaigns that have gone successfully before.

5.9 The use of proven technology

The use of proven technology entails installing a system that will be able to deliver full and future functionality using methods tried and tested elsewhere. Standardisation of the equipment is desirable as is minimising the number of interfaces with other systems.

In the road pricing sector in New Zealand there is no experience with RUC technologies. A functional specification has been developed for eRUC but as yet there is nothing installed in the field (the functional specification produced does, however, include provision for extension to cover other vehicle types). So the gap analysis will need to pose the question "do systems exist elsewhere in the world that could readily be installed in New Zealand?" The answer is yes, depending upon the technology chosen.

In the field of road tolling, dedicated short range communication devices using radio frequency are well proven and standardised. Examples of the use of this 'tag' or 'transponder' technology abound, primarily in North America but also in Asia, Latin America and Australia. Yet the limitation of this technology is that it caters to closed systems where entry and exit points can be installed to read the tags. If monitoring of vehicles is sought continually, say for the development of network pricing (a per km charge) then placing infrastructure to read tags across an entire city is expensive and crude. In this case, newer GPS technologies come to the fore. These are less proven in a road pricing context but have been working well in the Swiss Heavy Vehicle Road User Charging scheme since 2001. Furthermore, trials in Hong Kong have demonstrated that GPS can work in inner city environments with a large concentration of high buildings.

Given that the focus of the New Zealand gap analysis work will concentrate on toll roads, HOT lanes and network pricing in Auckland, however, it can be assumed that there is no gap between the technology needed and that which can be supplied. If integration with eRUC is sought this would complicate things for a variety of reasons, including differing functional requirements and timetabling. These problems are not insurmountable though, if dealt with in a structured way.

6. Individual scheme recommendations

Based upon the CSFs and general gap analysis carried out in the previous chapter, this chapter will offer (on the basis of best practice identified and the experience of other cities interviewed) key development areas upon which to focus for the three schemes chosen. Of course the methodology applied can be used for any scheme. This is to enable the usage of the CSFs as a practical set of guidelines for scheme developers.

6.1 SH2 HOT lane

The Petone to Ngauranga HOT lane seems to demonstrate many of the critical success factors identified by others as necessary for success. The Regional Council is promoting the plan and it has been fast tracked as part of the Hutt Corridor plan. The development work is in the preliminary phases, but modelling work carried out shows a clear benefit to cost ratio under a variety of tolling scenarios. The public in the Wellington Region have not yet been approached regarding the HOT lane specifically, but feedback from the Transmission Gully project reflects a general willingness to pay for time savings.

All of the HOT lanes in the US proceeded relatively smoothly once the enabling legislation was in place. Interestingly, research showed lower numbers of CSFs for HOT lanes than other schemes. Provided there was clear value in the scheme and a political body chose to sell the scheme intensively to the public, then all went relatively smoothly. In the case of Houston the technology systems were already in place, as were HOV lanes – the system was simply trialled and was so successful that it was maintained. In fact, the HOT lane scheme was deliberately under-marketed to keep the HOT lanes from becoming too full in the peak.

In Orange County the road was already in place as a private toll concession and was bought back by the government. Following extensive modelling, which included the risk of extra capacity being added, the scheme proceeded with eTags being chosen as the technical medium because they were used elsewhere in the state. San Diego managed project risk by running the scheme as a trial for three years. Several charging scenarios were modelled and public feedback was extensive throughout the process. eTags were chosen for state legislative reasons.

In Wellington the major stumbling blocks to the HOT lane relate to legislation and empowerment with some concerns over technical feasibility. Under current rules, if a scheme is not on Land Transport NZ's approved list, it cannot proceed unless it is completely self-funding. WRC can promote the scheme but cannot implement it themselves. There is also no legislation in place to allow charging for HOT lanes. Furthermore Transit has raised major concerns over the technical feasibility of putting a third lane into a geographically constrained section of coast.

BAH recommends that WRC continue to scope the scheme intensively, soliciting feedback from the market. If this is positive and technical feasibility is proven, then WRC's focus should move to central government to lobby for the scheme to be placed upon Transit's

list and legislative change to allow for charging. A high profile political champion will also push the process along. If automated charging is a feature of the system then BAH would strongly recommend adherence to SSC guidelines on IT project development.

6.2 Charging for Auckland's existing roadspace

Charging for existing facilities in Auckland undoubtedly will be very difficult. Auckland differs greatly from London and Singapore in terms of urban geography, having more in common with the US where no city has yet been 'brave' enough to push the concept (see Figure 4.1). The most likely areas of difficulty lie in public support, a single empowered agency to cover the whole transport spectrum and political buy-in. Furthermore, schemes have not even been scoped sufficiently to present them to the public which is surely the first step. In terms of technical feasibility, much depends upon the type of pricing required – network or cordon (Auckland arguably lends itself to network; Wellington to cordon).

This assessment may sound overly pessimistic. It is not intended to be so, but merely realistic at this early 'exploratory' phase. Auckland lacks many of the CSFs identified by others as being critical; it also has some common features with those cities or nations where schemes failed to proceed. In London, the scheme went through a long consultation process, had a political champion and a single empowered entity and proceeded largely because residents paid a reduced charge and revenues were hypothecated for public transport. In Singapore the area licence scheme went forward, again, following a long consultation process and the hypothecation of revenues for transport. It is also difficult to compare the autocratic governance in Singapore to the consensus politics of New Zealand. Despite very lengthy consultation, plans for congestion charging schemes in Belfast, Genoa, Bristol and Leeds have stalled due to sheer public objection. Durham's scheme is small and offered clear benefits to most, even retailers. Interestingly enough Stockholm would appear to be breaking many of the lessons learned from elsewhere (the public already rejected road pricing once there in the 1990s as part of a package of measures under the Denis Agreement) and it will be fascinating to see if they can realistically make progress. Edinburgh on the other hand was scoping their project but followed CSF procedure by promising a full public referendum in which the scheme was rejected.

The Australian and American cities offer perhaps a more comparable situation to Auckland. In New York (a city with good public transport) pricing tunnels from Long Island would effectively price entrance to Manhattan by car and as yet no politician is willing to champion this. Melbourne and Sydney are tentatively 'exploring' pricing as an option and Brisbane is examining equity issues. Perth does not even have road pricing on the agenda at the moment as its congestion is simply not bad enough. The main point here is that outside Europe and Asia traffic congestion does not appear to be so damaging that the public accept demand restraint.

Auckland is proceeding as quickly as it possibly can. BAH recognises that the Government is in the early stage of scoping and feasibility assessment and Ministers will be equipped to make a decision when the public response to well defined scenarios is clear. Aside from

this, there are governance issues where debate could begin now. Legislation will be necessary to allow pricing. If hypothecation of revenues to public transport is desirable then ARC and Transit would need to develop a suitable contractual transfer mechanism. Given ARTA do not yet have the powers to price existing facilities but may be the best party to push the concept, the transfer of powers from Transit and territorial authorities may be eventually seen as desirable.

Auckland region and central government are proceeding cautiously. This is wise. The public will take time to convince – it is BAH’s suggestion that if schemes are to proceed, the process of convincing (even at a subtle level) should begin now. Furthermore, given the contentious nature of the topic it would not be sensible to complicate matters by opting for unproven technology. Such a decision has underpinned difficulties in Holland and Germany.

6.3 ALPURT

ALPURT seems the most likely of the schemes mooted to be implemented in the medium term particularly if manual toll collection is applied before the introduction of the eRUC project. A single empowered agency exists in the form of Transit and it has been chosen as the first scheme to proceed under new enabling legislation. Toll roads are seldom popular anywhere in the world but this is often because an alternative route is absent. Despite the fact that the schemes are hardly of a similar scale, the M6 toll route in the UK proceeded comfortably (the only protests being environmental) because there was a free alternative. The Norwegian toll roads offer no such parallel facility and are still unpopular even though nowhere near as much as before the roads opened (Figure 6.1).

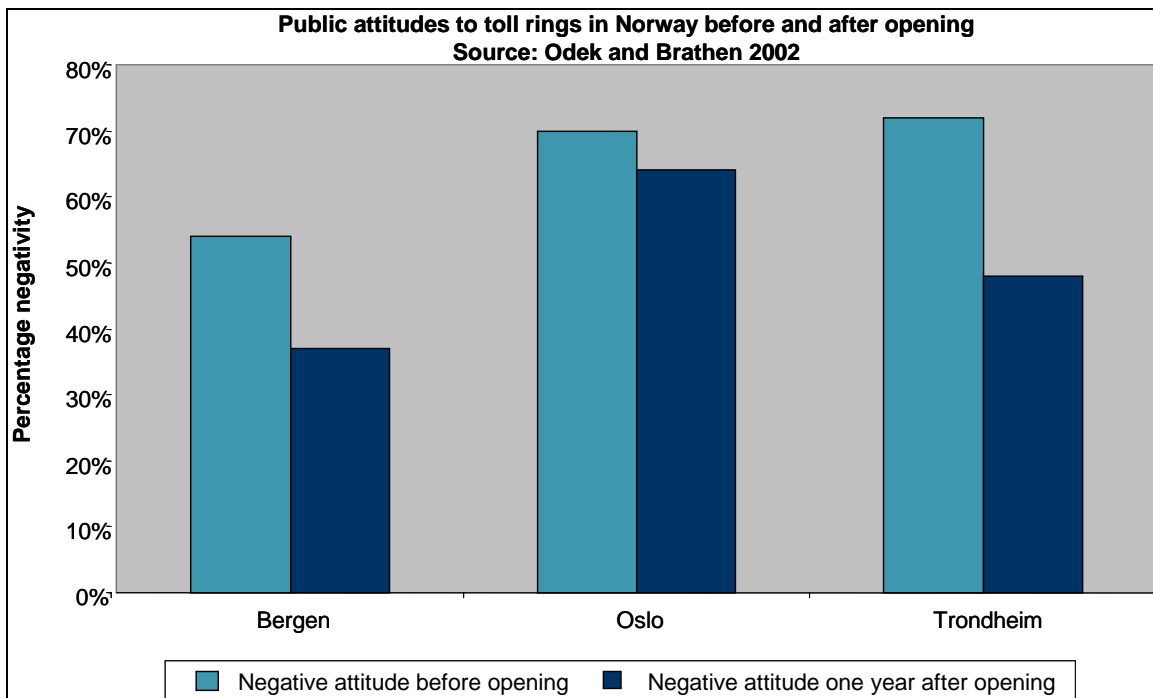


Figure 6.1 Norwegian toll roads.

One or two potential stumbling blocks remain. The public supported the by-pass as publicly funded, but as yet there is no feedback as to whether they would support it as a

tolled link. There is also the issue of detailed scheme design and further iterations once the results from consultation are clear. Technology should not be a problem provided proven off-the-shelf products are chosen but, for the flows of traffic involved, justifying the fixed costs of an automated system might be difficult.

BAH would therefore recommend that on the basis of global best practice, intensive scoping work be the first priority. Scheme scenarios should be presented to the public for feedback and an optimum design derived.

7. Conclusions

This report has demonstrated that despite the diversity of road user charging scheme types and the diversity of environments that they are employed in, there is strong commonality in terms of best practice lessons coming from cities where some form of charging has been implemented. This means that if a city is to have a successful scheme it would be well advised to try to ensure the right levers for success are in place. The absence of some levers should not derail a scheme completely. But it is suggested that the absence of the majority offers little hope for progress.

In terms of schemes mooted for New Zealand it would seem that should national or regional government seek to progress select tolled links or HOT lanes in the urban areas, many factors necessary for success are in place. These schemes are relatively straightforward in that the consumer of the road space is getting a clear benefit for the toll paid – a new road link or time savings. Congestion is forcing people to modify their travel behaviour and this is wearing down traditional objections to tolls provided something tangible can be seen for the charge.

The case of congestion charging for petrol vehicles in Auckland is more complicated, however, and there are still gaps in the critical success factor portfolio. This is not surprising as the idea is still in its relative infancy. Politicians cannot support a scheme which has yet to be defined and presented to the public. This situation is changing – a study is examining several options for road user charging in Auckland and will seek to package together attributes into the most feasible scheme going forward. It is hoped that the material within this report will complement the work of that study.

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Appendix A Organisations consulted

Transport for London

Land Transport Authority, Singapore

Durham City Council

Bristol City Council

Mobility, Parking and Transport Directorate, Comune di Genova

Agenzia per la mobilita del comune di Roma

Metro, Leeds

Northern Ireland Department for Regional Development

Transek, Sweden

Edinburgh City Council

Brisbane City Council

New South Wales Department of Natural Resources (DIPNR)

Western Australia Department of Planning and Infrastructure

Booz Allen Hamilton, Newark, NJ

Trondheim City Council

Bergen City Development Department

Statens Vegvesen (Norwegian Public Roads Administration)

UK Department of Transport

Department of Infrastructure, Victoria, Australia

Ontario Ministry of Transportation, Canada

Orange County Transportation Authority, California

Texas Transportation Institute, Austin, Texas

San Diego Association of Governments

Appendix B Interview guide to develop critical success factors

Potential critical success factors from initial research	Accompanying notes
Ability to revise the existing charging structure to remove perception of double taxation	Usually to reduce the fixed component and move to a more variable basis. Revenue neutrality a goal for some but not others
A large proportion of the public need to perceive the need	I.e. desperate for new road or congestion so bad that everyday activities affected - recognising many will oppose the charge as a gut reaction
Lengthy public information campaigns during the development phase	Show why the scheme is necessary, i.e. gridlock or shortfall in funds. Showing benefits and equity more likely to win hearts and minds than economic or environmental arguments?
Credible PT alternative	Presence of bus or rail option
Ring fencing of revenues	For roads or public transport? If benefits accrue to other user group then less likely to convince drivers
Simple and easily understood basis for charging	Sophistication requires a payoff
Utilise proven appropriate technology	Mature in the field, fit for purpose, suitable for environment
Ensure privacy is protected	Encryption and choices for payment
Make the scheme as fair as possible	Exemptions for certain citizens - residents, low-income etc. Ensure alternative routes. Price linked to congestion levels. Appropriate scheme choice - i.e. cordon over area?
Price appropriately to achieve desired outcome	Too high - massive opposition and potentially poor capacity utilisation; too low no traffic reduction
Invest in the development phase to manage risk and uncertainty	Modelling, refining and redesigning the scheme. Assess other impacts across the network, i.e. parking on periphery, dispersal of congestion. Resolve outstanding policy issues before scheme implementation
Coordinated transport planning framework to link scheme with other transport initiatives for optimal network outcome	Controlled parking zones, traffic calming, public transport upgrades
Link scheme with land use planning for optimal outcome	Linkage of transport and land use legislation. Investment and upgrade of city centre as coherent package. Looking to prevent decline in city vitality and dispersal of trade to out of town centres
Strong political position	Empowered to push potentially difficult legislation
Legally empowered single agency to own, develop and procure solution and receive revenues	Needs high level political buy in to set this up and overcome vested interests
Presence/ease of enabling legislation	Simple amendment to existing laws
A clear business case - scheme not pushed purely for political reasons	Robust revenue and cost estimates, risk assessment/ sensitivity testing, use of independent contractors for procurement and design, optimal enforcement rates
A powerful political champion	High level political momentum and speed of decision making

Appendix C Critical success factors by scheme type

