Regulatory Impact Statement: Time of use charging

Coversheet

Purpose of Document	
Decision sought:	To inform Cabinet decisions on the policy design of the Land Transport Management (Time of Use Charging) Amendment Bill
Advising agencies:	*Ministry of Transport*
Proposing Ministers:	*Hon Simeon Brown, Minister of Transport*
Date finalised:	*30 May 2024*

Problem Definition

Road taxes based on fleet averages and current traffic management practices are resulting in increasingly sub-optimal traffic-flows on the road network - increasing travel times, impacting on productivity and reducing liveability.

Executive Summary

Current practice (Status Quo) has not been effective in maintaining network services levels in our major urban areas over the last 25 years. TomTom traffic data reports that Auckland, Christchurch and Wellington are all under performing in terms of travel time compared to similarly sized Australian cities - Perth, Canberra and Hobart.

Three responses have been identified capable of delivering a systematic improvement in traffic-flow:

1. Improve traffic management practices (network optimisation)
2. Variable road charging on parts of the road network (time of use charging)
3. Variable charging of all vehicle trips anywhere on the network (national network charging)

The Ministry of Transport's assessment of these options finds that all three options need to be advanced in series or in parallel if service levels are to be restored and maintained.

The cost-benefit at the end of the analysis in this statement focusses on the potential impacts of time of use charging as that is the option currently being enabled in the Land Transport Management (Time of Use Charging) Amendment Bill. It identifies moderate net benefits.

To gain public acceptance time of use charging schemes need to set and refine charges that will deliver a clearly stated and measurable improvement in service levels. Charging schemes will also need to be designed in a way that minimise cost transfers to other road uses due to traffic diversion and retiming. Charges will need to be regularly varied and collection costs kept in check if net welfare gains are to be achieved and sustained. Revenues will need to be reinvested in the region in a way that those who pay see as adding local value.

Limitations and Constraints on Analysis

Time of use charging features in the coalition agreement between the NZ National Party and ACT New Zealand, which makes a commitment to *"work with Auckland Council to implement time of use road charging to reduce congestion and improve travel time reliability".*

As part of implementing that commitment the draft Government Policy Statement on land transport 2024 states that the Government will "*allow for time of use charging on the most congested parts of New Zealand's road network, helping to reduce congestion and maximise use of existing assets"* and *"improve travel times and network performance, reducing overall costs for freight businesses and their customers"*.

These commitments to reduce congestion and maximise use of existing assets are examined in this assessment.

There are known limitations on the analysis we have been able to undertake.

There is limited local information on traffic management tools that improve traffic-flow as many of them haven't been used systematically for some time

- Only limited local information is available about the net benefits of the type of traffic-flow investments identified in this assessment. Many of them have not featured in local work programmes for some time.
- Data on the efficiency and effectiveness of interventions, like clearways and traffic light rephasing, was available before 2008, when there was a specialised transport funding agency and works of this nature were more common. However, that data is now dated.
- Australian data is available under the Austroads umbrella as traffic-flow improvements are still in common use in Australia. Australian values of time and construction costs differ so the Australian material only gives an indication of the magnitude of net benefits.
- These indicative net benefits are consistent with the more limited recent local data.
- This gives confidence that the recent local data on traffic-flow improvements is indicative of the magnitude of gains that may be possible.

There is considerable technical work on local variable charges but limited public input

- Considerable technical work on congestion charging has been undertaken since 2018 in Auckland under The Congestion Question banner, including one reference group engagement.
- In 2021, there was a Select Committee Inquiry into Congestion Charging that provided an opportunity for stakeholders and the public to share their views with elected representatives.
- Cross-party discussions occurred following the select committee process centred on the Congestion Charging Bill developed by the government of the day. The legislative design has been held tightly as part of the political negotiations and officials have not undertaken any public consultation or stakeholder engagement beyond that undertaken by the Select Committee.
- Experience with road tolling provides an example of possible public responses to road charges among those unwilling to pay the charge. Road toll reporting indicates:
  - the main responses have been to reroute and retime. Shortening trips, changing modes, or not making the trip only account for a small proportion of the responses.
  - a relatively large response (i.e. typically 30% diversion) occurs at relatively modest charges (e.g. $2.50).

- the actual effect of road charges will not be revealed until a scheme starts operatiing.

Work hasn't been done on national network wide variable charging since the 1990s

- Enabling national variable charges has not been investigated systematically since the Ministry of Transport's Road Pricing work in the late 1990s.
- Much of the problem analysis and options analysis undertaken at that time is still relevant as network conditions and provision have not changed materially.

There is limited international experience with variable charging that is relevant

- There is limited relevant international experience with charging schemes.
  - Only Singapore operates a system that is comparable, but Singapore has a much larger population living at much higher density than any New Zealand city.
  - City centre congestion management schemes in London, Stockholm, Gothenburg, Milan, Oslo and Bergen do not address network wide congestion.

Timeframes have limited the amount of consultation on the time of use proposals

- The time available for developing this assessment has been compressed to enable the legislation to get to Parliament this year.
- Consultation with anyone other than Departments has been limited to Ministerial engagement with Auckland Council in advance of the policy design being determined by Cabinet.

Responsible Manager(s)

Matt Skinner
Manager - Revenue
Ministry of Transport
30 May 2024

Quality Assurance

Reviewing Agency:	Ministry of Transport
Panel Assessment & Comment:	This Regulatory Impact Statement (RIS) has been reviewed by a panel of representatives from the Ministry of Transport. It has been given a 'partially meets' rating against the quality assurance criteria for the purpose of informing Cabinet decisions. The RIS is relatively clear and concise but lacks depth of analysis for addressing the problem identified beyond the preferred time of use option. The panel considers that this RIS provides a sufficient basis for informed decisions on the preferred proposal, but not the alternative options. Legislative timeframes have limited the amount of research and consultation able to be undertaken and the RIS lacks analysis of Treaty of Waitangi implications.

Section 1: Diagnosing the policy problem

What is the context behind the policy problem and how is the status quo expected to develop?

Definitions and current context

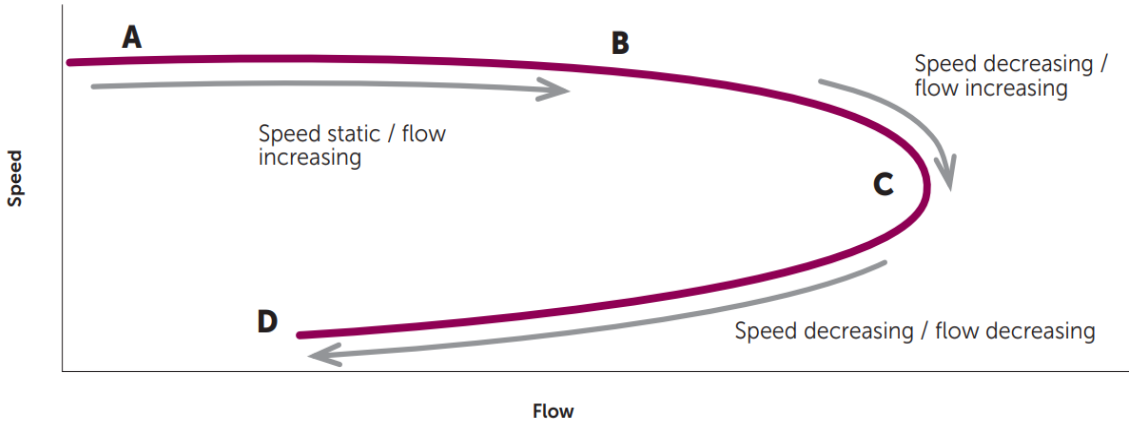
1. There are key components of the problem that need to be understood to enable realistic interventions to be identified. These include:

   a. traffic-flow and peak periods
   b. travel time budgets and travel distance
   c. average and variable charges
   d. taxes, charges and fees

Traffic flow

2. Road capacity varies with vehicle speed and numbers. A representative speed-flow relationship is shown in the following figure.[1]

Figure 1: Speed-flow relationship



3. Roads operating between A and B (free-flow) will be operating at close to the posted speed limit but supporting modest traffic volumes. A road operating between B and C (optimal capacity) will have slightly lower speeds but higher traffic volumes. Road operating between C and D (flow-breakdown) will have lower speeds and lower volumes.

4. A motorway lane operating optimally at peak times will support over 2,500 vehicle trips an hour with traffic speed of about 60 to 70 kilometres an hour.[2] At off-peak times they are likely to operate at close to their posted speed limits. This capacity can be reduced by a range of factors, particularly the frequency of onramps. It can be maintained by measures like ramp metering[3]. Capacity will be reduced by more than 15 percent where large vehicles make up more than 10 percent of traffic.

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[1] *The Congestion Question, Technical Report,* Ministry of Transport, 2020

[2] *Guide to Traffic Management, Traffic Studies and Analysis Methods*, Austroads, 2020.

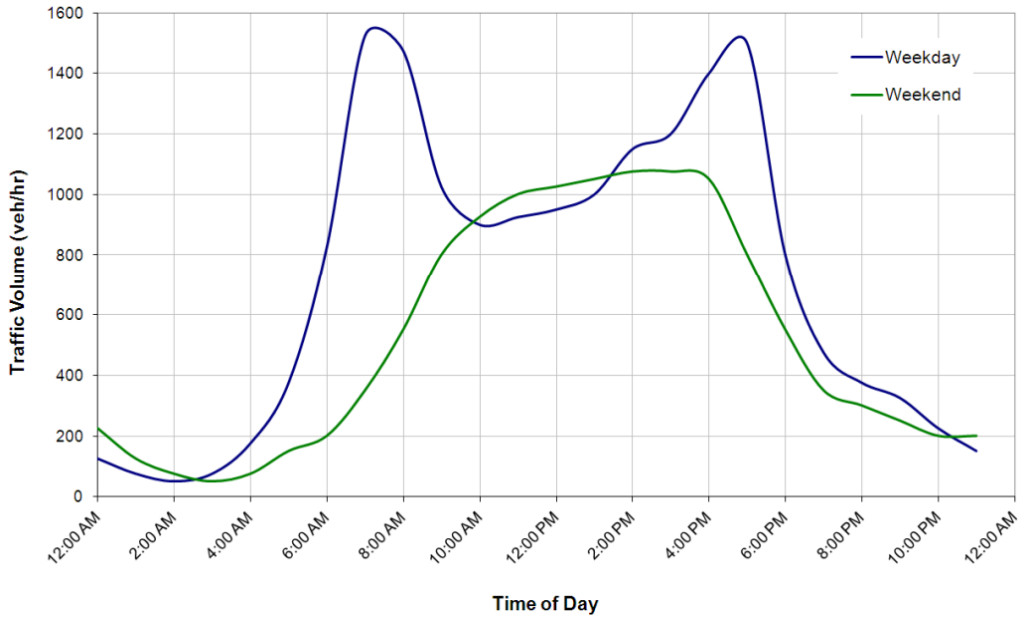
[3] Ramp metering is a signal-based system that *regulates traffic flow according to current traffic conditions.*

5. An optimised arterial road lane at peak times will support up to 1,500 vehicles an hour at speeds of about 30 to 40 kilometres an hour. At off-peak times they are also likely to operate at close to their posted speed limits. This capacity can also be reduced by a range of factors, like the frequency of unsignalized intersections, the length of the green phases on signalised intersections, and the number of usable approach lanes at roundabouts. Occasional parked vehicles will reduce capacity by a third.

Peak periods

6. People travel most during the weekday morning and afternoon commutes, and on weekend mornings. The following figure uses a Christchurch example to illustrates the concentration of weekday trips into morning and evening peaks and absence of peaks at weekends.

Figure 2: Typical daily traffic volumes (Source - NZTA)



7. Our networks are under most pressure during the weekday morning and evening commutes to and from work and education. People respond by avoiding peak periods, making trips earlier or later than their optimal time. This is called peak-spreading. Peak-spreading into the inter-peak can result in congestion spreading over longer periods into the business day.

8. Often these capacity constraints are in one direction in the morning, with flows reversing in the evening, but there are examples of corridors that are approaching capacity in both directions throughout the weekday, a trend evident to any regular users of the Auckland southern motorway.[4]

Travel time budgets

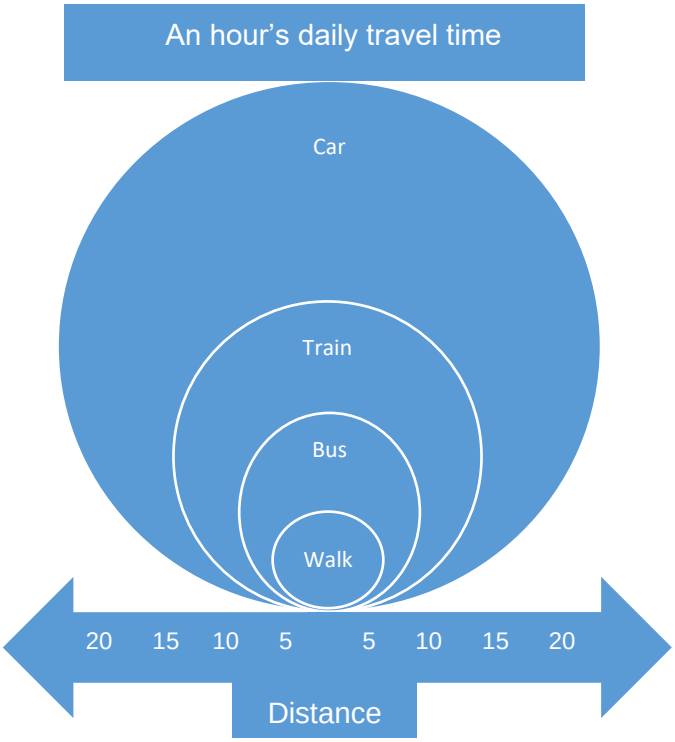
9. Increasing travel times due to congestion matters to people because they tend to have a fixed 1-hour travel time budget a day. This 1-hour budget is evident in most

[4] *Auckland Transport Alignment Project, Technical Reports,* Ministry of Transport, 2016.

developed countries and is known as the Marchetti constant.[5] As developments in vehicle technology and network design have enabled us to travel faster, we have tended to travel further, maintaining about on hour's daily travel time.

10. Marchetti's constant applies in New Zealand across all modes.[6] The following figure sets out the average return journeys able to be undertaken within 1 hour a day using our different modes.

Figure 3: Marchetti's constant (Source - Household Travel Survey)



11. The Household Travel Survey reveals that people have moved to faster modes to access more jobs, services, and friends within their 1-hour travel budget. Firms can access more customers, labour, and resources. Any reduction in travel time will increase access, while any increase will reduce access.

12. Roughly a third of the daily travel hour is allocated to work and education trips. Another third goes on supermarket and retail shopping. The final third goes on social visits, personal services, sports and transporting others.

Travel distance

13. The distance people cover varies with economic conditions, but has been tending to increase, with associated increases in safety risks and emissions. The increase has been particularly marked in Auckland, as illustrated in the following figure.

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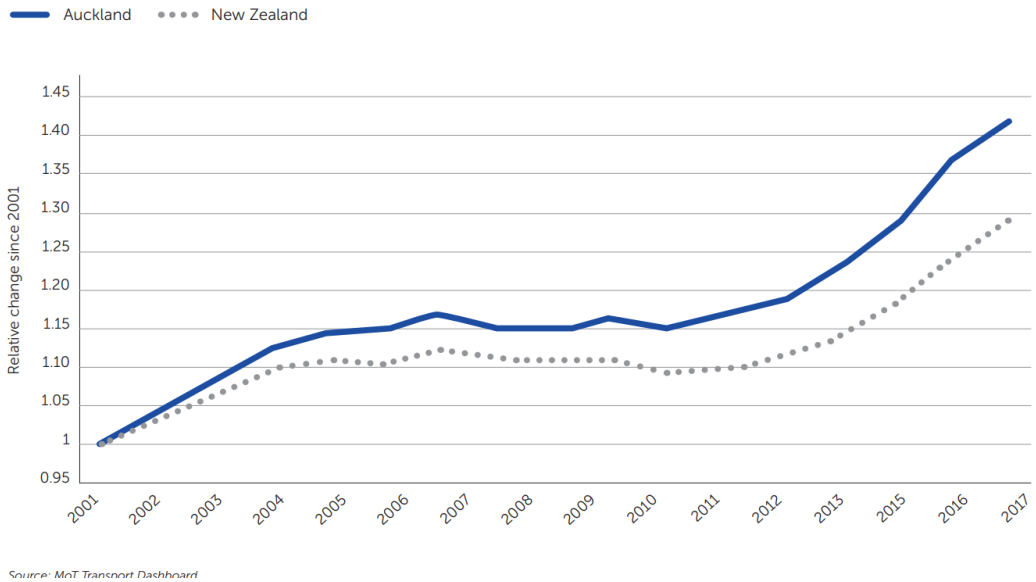
[5] *Anthropological invariants in travel behaviour,* C Marchetti, 1994

[6] *The Household Travel Survey – 1989 to 2021*, Ministry of Transport, 2023

Figure 4: Increase in travel – Auckland compared to the rest of New Zealand



Source: MoT Transport Dashboard

14. While the average distance Aucklander's cover is less than the national average it has been growing faster than in the rest of the country. Dwelling consents and job location data shows that households have been spreading into less expensive outer areas and firms have been concentration close to the motorways.[7]

15. Travel distances per person have increased from 25 to 29 kilometres a day per person since 1990. Over that period the population has increased from 870,000 to 1,700,000. This suggests the total distance travelled has increased from 22 million kilometres a day to almost 50 million kilometres a day. Over 95 percent of this distance is covered using private transport, although public transport has a larger role at peak times.

Averaging charges compared to variable charges

16. Our current way of funding land transport improvements and operation using average charges. Most transport funding comes from fuel excise duty and road use charges that are the same irrespective of where and when a vehicle is on the network.

17. Trips on parts of the network approaching capacity delay other trips being made at the same time and place. Added together these small delays add up to a substantial increase in total individual and collective travel time (congestion). Average charges mean that users enjoy the greater benefits of travelling at peak times and locations, with the cost reflected in congestion rather than in higher charges.

18. Network providers also only receive average revenues, even though increasing capacity is typically more expensive at locations of peak demand than elsewhere on the network. This can suppress the supply response at points on the network experiencing high levels of ongoing demand.

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[7] *Auckland household travel over 30 years*, Ministry of Transport, 2021

The difference between taxes, charges and fees within the funding system

19. The land transport funding system is how money is raised and spent (Revenue and Expenditure). Funding is sourced as taxes, charges and fees. Treasury guidance draws a distinction between taxes, charges and fees as follows:

    a. Taxes make transfers between groups
    b. Charges make transfers within groups
    c. Fees reflect costs incurred by individuals.

20. The current land transport funding system includes transfers between road users and public transport users and property owners and land transport users. Revenues are raised like charges and spent like taxes.

21. This assessment explores options that would introduce new forms of charge that are more like fees than taxes. Charges that reflect the time and location of travel, not just the distance covered or the weight of the vehicle making the trip.

Status quo response to congestion

22. The status quo transport response to rising demand has been to:

    a. add more road lanes and more public transport lines
    b. increase the frequency of public transport services
    c. reallocate road capacity to encourage uptake of public transport, walking and cycling
    d. aim for mixed use development where people will live work and play (quality containment).

23. The returns from large road and public transport projects are typically marginal (less than $2 per $1 spent).[8] Increased public transport services have not increased public transport's share of travel distance per capita.[9] Reallocation of road space has not reduced vehicle kilometres travelled or associated congestion.[10] Employers have concentrated their operations rather than disperse into suburbs.[11]

24. Under the status quo approach, network service levels are forecast to decline. Modelling suggests average speeds in already congested areas will decrease further and additional parts of the network will move into congested conditions.[12]

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[8] State highway Investment in New Zealand, Michael Pickford, 2013

[9] Household Travel Survey, Ministry of Transport, 2023

[10] Evidence review of road space re-allocation, NZTA, 2024

[11] Auckland employment over the next 30 years, NZIER, 2016

[12] Congestion Question, Technical Report, 2020

What is the policy problem or opportunity?

The problems

25. There are three primary problems:

    a. Congestion is worse than in comparable Australian cities
    b. The productivity dividend we get from our main cities is declining
    c. Residents are leaving cities like Auckland and Wellington

Congestion is worse than in comparable Australian cities

26. Our three largest cities are 10 percent to more than 30 percent more congested than comparable Australian cities with similar population sizes and densities, as set out in the following figure.[13]

Table 1: Comparison of annual commuter times between similar-sized New Zealand and Australian cities (Source - TomTom Traffic Index)

City	*Time commuting a year (20k a day)*	*Time Difference*	*Difference*
Auckland	*80 hours*	*20 hours*	*30% longer*
Perth	*60 hours*		
Christchurch	*69 hours*	*18 hours*	*35% longer*
Newcastle	*51 hours*		
Wellington	*58 hours*	*6 hours*	*11% longer*
Hobart	*52 hours*		

27. Differences in how we plan and manage our networks is likely to be a significant factor. Commuting mode shares by car are similar so this doesn't explain the differences.[14] Other significant factors include topography and the ratio of roads to houses.

The productivity dividend we get from our main cities is declining

28. Clustering of people and resources in our cities makes them more productive.[15] In urban economics these are known as agglomeration effect. Cities like Auckland and Wellington generate more GDP per capita compared to the national average. In both cases this premium has been declining as shown in the following figure.

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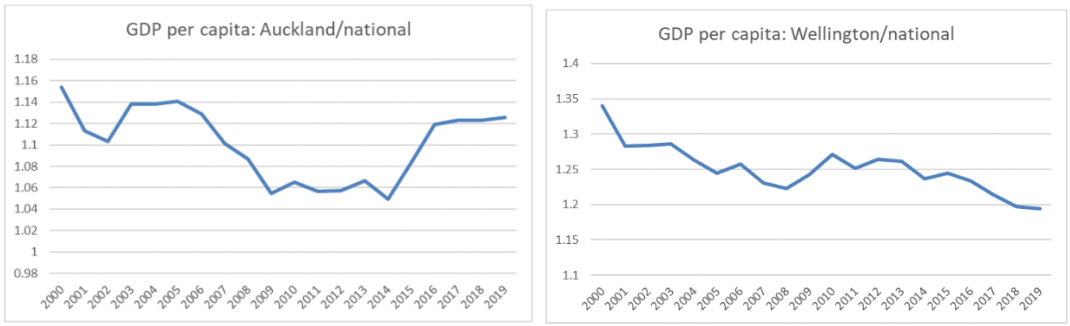
[13] *TomTom Traffic Index, Average travel time per 10km*, TomTom, 2024

[14] Australian and New Zealand Census data, 2018

[15] Economics of Transportation: Existing evidence and future directions, DJ Graham and S Gibbons, 2019.

Figure 5: Urban productivity dividend is declining (Source – Statistics NZ)



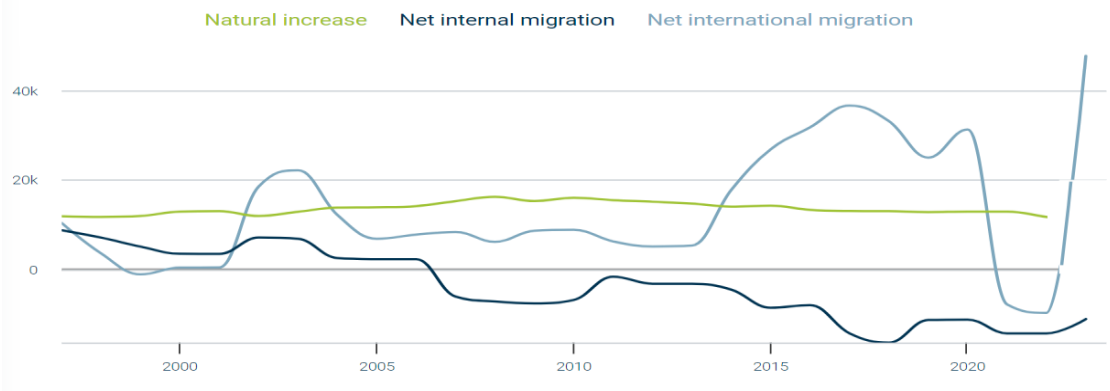
29. The level of congestion is likely to be one factor contributing to this decline in urban productivity. Agglomeration effects arise because clustering makes it easier for people to do business. Agglomeration benefits are eroded when it gets harder for people to make connections. Increasing housing density only improves access if transport costs, like travel time and emissions, fall.

30. Congestion costs are a material contributor to the cost of doing business. The cost of flow-breakdown at current service levels in Auckland has been assessed as ranging between $250 million [16] and $927million[17] a year. When comparing current service levels with free-flow conditions the studies identified annual costs ranging between $1,250 million and $1,392 million respectively.

Residents are leaving cities like Auckland and Wellington

31. Existing residents have been leaving cities like Auckland and Wellington in increasing numbers. In the case of Auckland this trend has been evident for the last 30 years. Outflows now match the national increase, with net international migration determining future population growth, as shown in the following figure.

Figure 6: Source of Auckland population growth (Source - Infometrics regional profile 2024)



32. Working age families are leaving Auckland in unprecedented numbers.[18] This is on top of the long-standing trend for older Aucklanders to leave. Auckland still has more people of working age than other parts of the country, but this is being eroded by the

[16] *Cost of congestion reappraised*, Wallis and Lupton, 2013

[17] *Benefits from Auckland Road Decongestion*, NZIER, 2017

[18] 2018 Census analysis, Statistics NZ, 2020

outflows. The cost of housing and difficulties of moving around the city are likely to be significant contributors to this outflow.

The opportunities

33. Three main opportunities have been identified to improve traffic flow and therefore improve access.

    a. We could adopt more effective traffic management practices
    b. We could apply higher charges at congested times and places
    c. We could vary all charges up and down with service levels

We could adopt more effective traffic management practices

34. Local area traffic management to optimise traffic-flows has not been systematically implemented in New Zealand's main cities and Austroad guidance is only applied selectively.

35. Neighbourhood precincts have not been systematically created by restricting connections to district distributor roads and installing slow-points on local distributor roads within neighbourhoods to make slower-speeds self-explaining to drivers. As a result, rat running has not been addressed and residential amenity continues to be compromised.

36. Capacity on district distributor roads has been limited due to factors like poor traffic light co-ordination, inefficient lane markings at traffic lights and roundabouts, the number of side-streets into neighbourhoods and the proliferation of property driveways along main roads due to housing intensification. In addition to these factors the capacity on primary distributors has been limited by the lack of peak-period clearways, limited use of contra-flows, and re-allocation of road space to lower capacity modes.

37. In contrast our motorways have benefitted from significant initiatives to improve their operation, most notably ramp metering on the Auckland network, variable speed signs on parts of the Auckland and Wellington networks, and moveable contra-flow barriers on the Auckland harbour bridge.

We could apply higher charges at congested times and places

38. Legislation does not currently allow for congestion (and its associated costs) to be addressed using a charge. Demand exceeds network capacity at times of peak demand in our major cities. Constrained revenues and construction capacity, ongoing demand growth, and investment in alternative forms of transport means it is unlikely to be feasible to solely address congestion on the supply side through improving existing infrastructure and investing in new projects (status quo).

39. There are likely to be two forms of benefit if charges reduced congestion in Auckland and elsewhere. Economic benefits, including increased productivity for businesses and individuals, increased per capita GDP and reductions in vehicle operating costs. Social benefits, including shorter commuting times, improved access to work, education and leisure opportunities, and environmental benefits (reduced emissions).

40. Overseas jurisdictions (for example, London and Stockholm and Guttenberg) have had some success in reducing inner-city congestion by introducing an additional charge to

fund additional public transport (London) and roading (Stockholm and Guttenberg). These schemes while initially opposed by many residents have been accepted once the amenity gains in the city centres became apparent.

41. Singapore has had considerable success in improving traffic-flow on the strategic network through an additional charge that varies by time of day. Charging people to access congested parts of the network at certain times encourages people to rethink the route, timing, destination and mode of their journey, and potentially whether the journey needs to occur at all.

42. Work in Auckland estimated that rolling out congestion charging across the Auckland strategic network (State highways and major arterial roads) would produce a sustained eight to 12 percent reduction in congestion, like what happens during school holidays in Auckland.

We could vary all charges up and down with service levels

43. A charging system that reduces charges as well as increasing them consistently across the entire network would avoid some of the distortions inherent in apply higher charges in some locations in addition to average charges.

44. Our national land transport revenue system relies heavily on averaged charges, through fuel excise duty, road user charges, property rates and increasingly general taxation.

45. Replacing average charges with variable charges would provide stronger signals to users about the actual cost of trips, reducing over and under use of parts of the network. Variable charges would also provide stronger signals to network providers about user willingness to pay and better align their supply decisions with demand.

46. A closer link between use and provision also suggests a reduction in the transfers currently make between different groups of network users, and an ongoing reliance on general taxation to fund merit goods like public transport and cycling.

47. Moving to variable charges that more closely reflect network use would also be an opportunity to move to delivery arrangements that more closely aligns with how our networks are used.

What engagement with the public and stakeholders has been undertaken on the problems and solutions?

48. The Select Committee inquiry into congestion charging in 2021 accepted written submissions and held public hearings in Auckland, Wellington and via Zoom videoconference. Submitters raised some common themes:

- concerns about equity of access to areas that might have congestion charges
- the potential for exemptions from congestion charges
- the capacity and reliability of public transport options in Auckland
- how revenue from congestion pricing should be used
- the potential for congestion pricing to lead to a reduction in transport emissions

- concerns that “rat running” could lead to increased congestion on roads not included in a congestion pricing scheme
- agreement that congestion in Auckland is a significant problem.

The inquiry concluded that equity should be considered in implementing congestions charging schemes, that equity concerns needed to be balanced against the fact that a high number of exemptions would increase operating costs and could reduce scheme effectiveness. The inquiry went on to note that consideration should be given to compensation for congestion charging through schemes for supporting low-income people, such as the Community Services Card.[19]

[19] *Inquiry into congestion pricing in Auckland,* Report of the Transport and Infrastructure Committee, 2021

Section 2: Deciding upon an option to address the policy problem

What objectives are sought in relation to the policy problem?

50. To improve traffic-flow in our main urban areas currently experiencing congestion, to improve access, productivity, emissions and liveability.

What criteria will be used to compare options to the status quo?

51. The options will be evaluated against four key criteria – effective and efficient land transport in the public interest that is feasible.

- **Effective** means magnitude that people will value and use the policy
- **Efficient** means using resources in the most productive way
- Land transport means surface transport by any means
- **Public interest** means the common interests of people in society including:
  - Accountability – the link between providers and those who pay
  - Safety – the impact on traffic safety
  - Equity – the impacts on different groups
  - Privacy – the impact on personal information
  - Climate emissions – the impact on greenhouse gas emissions
- **Feasible** means achievability in the prevailing political economy.

What scope will options be considered within?

52. The options have been assessed against the status quo described above, which involves continuation of our current average charging system, reallocation of road space, relatively limited use of traffic management tools, and use of revenues to invest in extending existing roading or public transport linear infrastructure.

53. They include a supply-side option (Option One), that aims to better align supply with demand, a demand-side options that aims to align demand with supply (Option Two), and an option that aims to align both demand and supply (Option Three).

54. The options identify classes of intervention that can improve travel-time rather than specific interventions. The empirical evidence for the options is mixed. The analysis therefore explores the range of impacts these types of tools can have, concluding with a qualitative rather than quantitative assessment of the net value of the options.

55. The options are not mutually exclusive. All options could be undertaken independently or in combination with the other options. They would also combine with the status quo approach, deferring the need for some big projects, bringing forward some or reshaping others.

56. In land transport, Treaty of Waitangi implications mainly arise in connection with measures that are likely to impact on land ownership or control. None of the options considered in this assessment directly impact on land rights, including Māori land rights, beyond any impact improved traffic-flow has on land development potential.

57. The counterfactual is continuation of the status quo, without action on any of the identified options.

What options are being considered?

58. Three options have been identified that are representative of three different ways of improving traffic flow as follows:

- **Option One: Traffic management** - better use of existing traffic-flow tools
- **Option Two: Time of use charging** - enabling a new local variable road charging tool where charges can be adjusted depending on time of use
- **Option Three: Variable road charging** - enabling a sophisticated, national level charging system, that can be adjusted based on location, time of use, distance covered and vehicle weight.

Option One: Traffic management

Description

59. This option involves making better use of the traffic management tools that are currently available. This is the supply-side option. These tools have been used elsewhere to deliver road service levels that exceed those being delivered in our main cities.

60. The option involves having a coherent network wide traffic management strategy and consistent plans for each suburb that improve traffic-flow on main roads and liveability in residential and business neighbourhoods.

61. The core concepts consist of a traffic management plan that identified:

a. neighbourhoods – residential and commercial - where through traffic will be excluded and traffic slowed in streets where property access has priority over movement of people and goods.
b. distributor roads – motorway, arterial and collector roads – where safe traffic-flow will be maximised to support movement of people and goods over access to properties.

62. Interventions in neighbourhoods would include closure of some side-street connections to main roads to vehicle traffic; direction of traffic through a limited number of controlled intersections on main roads: provision of slow points within neighbourhoods to slow traffic: and adoption of subdivisional standards that create neighbourhoods in new developments that conform to this traffic design.

63. Interventions on main road would include traffic light coordination to achieve green waves; clearways at peak times; high occupancy vehicles lanes when that increases peak hour passenger movements, contra-flows at morning and evening choke points, bus-stops clear of traffic lanes, cycle lanes on sections of high cycling demand and pedestrian crossings primarily at controlled intersections.

64. Cost benefit analysis of a selection of traffic management projects of the sort listed above suggests that returns of more than $12 per $1 spent (clearways) and $14 per $1 spent (traffic light co-ordination) could be anticipated in 2016 dollars.[20]

Analysis

65. Comparisons with other similarly sized cities in Australia suggests we could reduce travel times in our main urban areas by between 10 and 30 percent using existing traffic management tools that improve traffic-flow.

66. Achieving these results in the New Zealand context, with road deliver split across 68 providers, each with their own priorities, capacity and capability, is likely to prove challenging.

67. The arguments against increased use of traffic management tools include:

    a. ultimately you can't build your way out and need to limit demand
    b. improving service levels would increase vehicle kilometres travelled (increasing in climate emissions and road crashes) and will induce demand
    c. developments fronting onto increasingly busy roads have reduced amenity and value

68. The arguments for increased traffic management tools include:

    a. there is considerable scope for high value traffic-flow investments within the existing roading footprint. Service level improvements benefit many more existing trips than they induce.
    b. increasing household travel, and household and business formation are best responded to by making more use of existing road resources
    c. reducing travel times and maximising road capacity increases the effective density of our cities, increasing urban productivity and access to opportunities.
    d. there is an inherent trade-off between movement between properties and property access. Properties fronting directly onto main roads will invariably experience more traffic effects than properties on neighbourhood streets.

69. To be effective the approach to traffic management outlined above would need to be implemented at a regional scale, which would require a consistent shift in approach across the network. The main lever available to a government to incentivise greater use of traffic management tools that optimise traffic-flow would be to link the availability of National Land Transport Funding to the successful adoption of these tools.

Option Two: Time of use charging

Description

70. This option involves additional charges on parts of the network where flow-breakdown is occurring at peak times. This is the demand-side option. Charges of this sort have been used in Singapore to maintain traffic-flow on their main roads.

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[20] Auckland Transport Alignment Project, Arterial Roads Report, 2016

71. The aim of the extra charge is to encourage those making lower-value trips to avoid that part of the network, freeing up available capacity for higher value trips. Lower value trips are like to be those of least value to users. Those that can be rerouted, retimed, or redirected at least cost to the user. They are not necessarily the trips made by the lowest income users. A trip to work is likely to be more valuable to a low-income user than a trip to the gym for a higher-income user. Only a relatively small number of trips need to be avoided to prevent flow-breakdown and keep networks flowing at optimal capacity.

72. Charging could be applied at selected points on a road (corridor charge), all points entering a road or collection of roads (cordon charge), or for the distance travelled on a road or collection of roads (area charge). Charging schemes could incorporate a combination of these charge types.

73. Cost benefit analysis of a selection of Auckland congestion charging schemes suggests that returns ranging from $1.70 per $1 spent (central cordon) through $1.80 per $1 spent (Strategic Corridors) and $0.70 per $1 (Regional Network) could be anticipated in 2019 dollars.[21]

Analysis

74. The Congestion Question work undertaken in Auckland identified that charges across the Auckland strategic network could reduce congestion by around 10 percent, creating traffic conditions like those during school holidays. That design used number plate recognition to charge those entering the main road network, without charging based on the distance travelled.

75. The arguments against increased use of local variable charges include:

    a. charges are regressive and inequitable and would fall disproportionately on low-income groups and the disabled. As such, the public transport system needs to be a credible alternative to cars before charging occurs.
    b. increasing charges for those experiencing the most congestion would be unfair as they have already paid for these roads.
    c. government tracking of movements is totalitarian and a risk to personal freedom and privacy.
    d. the net benefits are marginal with considerable risk that actual costs will exceed the benefits.

76. The arguments for increased use of local variable charges include:

    a. to be effective transport revenue tools need to reflect the costs that users impose on society.
    b. pricing signals are needed as the existing average charge-based system is poor at identifying the true value of time.
    c. it is unfair that users are not paying charges that reflect the actual costs of their network use.

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[21] Congestion Question, Cost benefit analysis, 2019

77. Currently there is no legislative provision for local variable charging schemes, limiting the tools available to predict and provide measures. Well-designed and implemented schemes have the potential to deliver net benefits to society if they keep control over costs and are responsive to user willingness to pay. The regional impacts associated with each charging proposal do need to be assessed, including both the impacts on transport networks and on society, to enable well informed decisions to be made about whether a proposed scheme can deliver these net returns.

78. A series of local, regional, and national checks are proposed before schemes proceed. Additionally, the proposed charging regime would enable users to establish if the intended improvement in service levels is being achieved, while scheme providers will be able to respond flexibly to actual revealed willingness to pay.

Option Three: Variable Road charging

Description

79. This option involves charges that vary up and down across the network to reflect actual service levels. Charges of this sort have been investigated in several places, including locally in the 1990s, but are yet to be implemented anywhere.

80. The aim is to move toward charges that better reflect the marginal costs of each trip. Charges that are more like fees and less like taxes. The distance, time, location, and weight of vehicles could all be factored into charges.

    a. In urban areas charges would be at their highest in locations and at times of highest demand, and at their lowest at times and locations of low demand.
    b. In rural areas charges would be at their highest on low-volume roads with high costs of provision per trip, and at their lowest on higher volume roads with lower costs of provision per trip.
    c. In both urban and rural contexts, where users prove willing to pay service level improvements should follow.

81. Both demand and the supply response would change under this form of network wide charging.

    a. Users would be faced with the actual costs of their network use, rather than costs averaged across many people and many trips. This should enable them to make better decisions about how they value each trip, reducing over and under use of the network.
    b. Providers would have access to clear signals about how users value trips at different times and places, rather than receiving funding averaged across many people and many trips. This should enable investment to be better matched to user needs, reducing over and under investment.

82. Four major shifts would need to occur.

    a. Average charges - fuel excise duty, road user charges and rates – would need to be replaced by fees that vary based on actual distance, time, location and weight

b. Subsidies for merit goods[22] – public transport, walking and cycling – would need to be replaced by taxes raised in a way that reflect the benefits conferred on society as a whole
c. Governance structures – split across NZTA and 78 local authorities – would need to be replaced by providers aligned with the regional nature of our transport networks[23]
d. Collection methods – fuel excise duty, road user charges and rates - would need to be replaced by systems capable of identifying the time, location, distance and vehicle weight in real time, probably using in-vehicle GPS tracking and cellular communication systems.

83. No systematic work has been done on network wide variable pricing since the 1990s so its in hard to identify the likely current net value. In 1999 road pricing reforms were expected to deliver net gains within 5 to 10 years equating to 10 to 25 percent of the 1999/2000 land transport budget.[24]

Analysis

84. Many of the issues raised by local variable charges apply to network wide variable charges, albeit amplified as they would apply to all trips not just those in a few locations subject to local variable charges.

85. Work in the 1990's identified potential net benefits in network wide variable charges (called road pricing) that would extend the benefits able to be secured from local area charging and enable a systematic move away from average charging.

86. This finding was subject to availability of relatively low cost in-vehicle charging technology that would enable cost effective extension of variable charging to the entire network. These technologies have subsequently been proven to be viable as collection systems through adoption of the electronic Road User Charges system for many heavy vehicles.

87. The arguments against increased use of national variable charges are the same as for local variable charging with the addition of the following points:

a. all movements would be tracked magnifying the implications for personal freedom and privacy.
b. the unit cost of installing in-vehicle collection equipment in the entire fleet could make network wide charging uneconomic.

88. The arguments for increased use of national variable charges are also the same as for local variable charging with the addition of the following points:

a. Extending charges to the entire network has two additional types of benefit compared to congestion focused urban variable charges.

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[22] Merit goods are services that the government feels people would under-consume if they weren't subsidised.

[23] 98 percent of passenger trips and 95 percent of freight trips start and end in the same region.

[24] *Better Transport Better Roads*, New Zealand Government, 1999

i. It would allow lower charges for trips on parts of the network with lower-than-average costs, such as freight trips on low-cost medium-volume rural state highways.
ii. It would enable higher charges for trips that have higher than average costs, such as freight trips on poor quality low-volume rural roads.

b. it avoids distortions (i.e. traffic diversion) and unfairness (i.e. cross-subsidies) inherent in variable charges that only apply to some parts of the network and some trips.
c. It would trigger a reconsideration of current delivery arrangements, with their poor alignment between network use (regional) and provision (national and local).
d. GPS and cellular communication technologies have become less expensive, albeit that the labour costs in installing equipment are significant and there are currently 4.5 million vehicles in the fleet.

89. It is not currently clear if we could achieve the necessary economies of scale, and lift in network productivity in a transport system of our size to deliver fleet wide variable charging in a way that is affordable and efficient.

How do the options compare to the status quo/counterfactual?

90. The following table sets out a qualitative assessment of the three options compared to the continuation of current average charging and network management practice. A qualitative assessment is adopted rather than a quantities assessment as the options are all enabling rather than directive, so the extent to which and way in which they would be taken up by providers can't be known. Additionally, there is little to no international or local experience with the forms of variable charging that would be enabled under Options 2 and 3.

91. A rating of ++ or + suggests results better than the status quo. A rating of -- or - suggests results worse than the status quo. A rating of 0 suggests results about the same as the status quo.

	Option One: Traffic management	**Option Two:** Time of use charging	**Option Three:** Variable road charging
Effective	++ Proven internationally	+ Likely to be effective within selected charging areas	++ Potentially capable of delivering fleet wide gains and fairer
Efficient	+ High value in the short to medium term, but in the long-term limited capacity to cope with demand growth	+ Potential to influence demand in selected areas but risks diverting demand onto less suitable parts of the network	+ Potential to influence system wide demand and supply positively but unproven
Public interest	++ Systemic gains from improved neighbourhood amenity and smother traffic-flow	+ Potential gains in urban productivity, while risking weak accountability and emission, safety and privacy concerns	++ Potentially systemic gains in productivity and fairness, while risking emission, safety, and privacy concerns
Feasible	0 Patchy institutional willingness to improve arterial	+ Cross party support for congestion charging, but	- Expensive to implement and regionalisation of

	road traffic-flows, but growing recognition of the opportunities	technically costly to implement	provision would be challenging for current providers
Overall assessment	+	+	+

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

92. All three options have the potential to improve traffic-flow and advance the objective of improving network capacity in our main urban areas. Each of the options have strengths and weaknesses that largely balance out across the options.

93. In the Ministry of Transport's view all three options are worth pursuing in parallel or in series.

- **Traffic management** could commence immediately without primary legislation, relying on GPS guidance, with implementation ongoing for the foreseeable future. A key challenge is that it depends on securing support across multiple road providers to be fully effective. Draft GPS 2024 renews the focus on getting better value from existing transport infrastructure.

- **Time of use charging** requires enabling legislation but could be implemented relatively quickly at relatively low risk if initial schemes are limited in scale and designed to provide proof of concept before increasing the scale of the scheme. A key challenge is securing public acceptance of additional charges on a network that users will continue to pay for through fuel excise duty, road user charges and rates. The proposed Land Transport Management (Time of use charging) Amendment Bill would enable time of use charging.

- **Variable road charging** involves all vehicles in the fleet and lends itself to a more phased and extended implementation, first bring all vehicles into the existing RUC system, then extending charging from distance and weight to include time and location. Transitioning the entire fleet to real-time charges and shifting the provider approach to one that better aligns with network use are key challenges. Draft GPS 2024 commits to transitioning the vehicle fleet from fuel excise duty to road user charges, a step on the path to national variable charging.

94. There is only a limited amount of quantitative evidence available on the relative costs and benefits of the three options, but that evidence reports returns from common types of traffic management in the order of $12 to $14 per $1 spent and returns from local variable charging in the order of $1.70 to $1.80 per $1 spent. Both traffic management and variable charging options are potentially cost effect, with the larger returns per dollar likely coming from traffic management.

95. The Ministry of Transport considers that traffic management practices focussed on improving traffic-flow need to become business-as-usual for the land transport system, while time of use charging should be enabled in legislation and eventually incorporated into fleet wide variable charging.

What are the marginal costs and benefits of the option?

96. The following assessment of costs and benefits deals with time of use charging as this is the only options currently subject to new regulation.

97. Quantified monetised costs from The Congestion Question (TCQ) work are presented in the following table. These reveal net welfare impacts ranging from somewhat positive to negative depending on scheme design. These results should only be taken as broadly indicative of potential welfare impacts.

Costs and benefits	Impacts	Comment
Additional costs of the preferred option compared to taking no action		
Capital costs - Roadside cameras and back-office charging systems	$46m to $580m	There is likely to be wide variation in capital costs between options. Currently capital costs are typically under-estimated. These values should therefore be seen as minimums.
Annual operating costs - The annual cost of collection to the public provider	$10m to $267m	It is not clear if the cost of time to the public in paying charges is included. As with capital costs, our current capacity to anticipate operating costs is low and these figures should be taken as minimums.
Periodic operating costs - The costs of periodically updating the collection systems	$14m to $174m	Technology tends to be quickly outdated. Periodic costs are likely to be material. As with other costs, the cost of maintaining operating capacity is commonly under-estimated and these values should be seen as minimums.
Additional benefits of the preferred option compared to taking no action		
Travel time savings	$25m to $190m	These values account for only a proportion of the time cost of excess congestion in Auckland ($250m and $927m). This confirms that charges have the potential to reduce rather than eliminate excess congestion.
Vehicle operating cost savings	$2m to $52m	This result is consistent with needing to only alter the behaviour of a modest number of trips to secure time savings for the remaining trips.
Climate and health emission savings	$0.5m to $3m	The scale of emission impacts is small, within the margin of error of modelling. This confirms that charging to reduce excess congestion is unlikely to have a material impact on climate and health emissions.
Net welfare impacts of TCQ options		
Present value benefits	$305m to $2,733m	The value of benefits identified in TCQ modelling exceeds the costs of excess congestion identified in two studies of Auckland congestion costs ($250m and $927m). Both can't be right.
Present value costs	($182m to $3852m)	Options covering small parts of the network have lower costs and lower benefits. Options covering larger parts of the network have higher benefits but much higher costs. Options that focus on the highest volume parts of the network (motorways) are likely to be more cost-effective,
Net present value	$124m to ($1.118m)	Net welfare impacts vary widely with scheme design and implementation.
Benefit-cost ratio	0.7 to 1.8	Well-designed and implemented charging schemes appear to have the potential to make a modest though cost-

		effective contribution to net welfare.

98. Given the potential variation between schemes, limited real world experience with charging and the limitations of current quantitative assessment tools, a qualitative assessment has also been undertaken to complement the quantitative assessment. The results are summarised in the following table.

Affected groups	Comment	Impact	Evidence Certainty
Additional costs of the preferred option compared to taking no action			
Regulated groups – Motorists	Additional compliance and collection costs TCQ identified public sector costs ranging between $70m (city centre) and $1b (regional network) Time costs in paying charges There would be additional privacy implications	Medium	High – compliance costs will be material, but the number of trips affected is uncertain due to the enabling nature of the legislative framework.
Providers – Territorial Authorities and NZTA	Additional cost and complexity of collection systems TCQ identified operating costs of $24 million (city centre) and $441 million (regional network) annually in gross revenues	Medium	High - collection costs will be materially higher than existing costs of collection.
Others adversely impacted – property owners and public transport users	Loss of property value due to any increase in the cost of access There is potential for distributional implications for business, if charges exceed the value of time savings. Unanticipated crowding of existing PT services would impose costs on existing public transport users	Low	Medium – The distribution impacts on property values will vary between schemes, with adverse impacts likely to be concentrated among properties where supply exceeds demand.
Collective impact – road users not paying charges, safety and climate and health emissions	Loss of value due to traffic diversion and sub-optimal trip times, routes, destinations, or modes Safety and emission are unlikely to be adversely impacted but benefits	Medium	Medium – The adverse impacts will vary with each scheme depending on the locations and charges applied. If charges are set to optimise capacity, rather than raise revenue, only a modest number of lower value trips should be impacted.

	identified in TCQ were marginal and could be revealed to be marginally negative.		
Total monetised costs	-	-	-
Non-monetised costs		*Medium*	
Additional benefits of the preferred option compared to taking no action			
Regulated groups - Motorists	Reduced time for higher value peak period trips TCQ identified public sector benefits ranging between $27m (city centre) and $243m (regional network)	Medium	High – Time savings to those who continue to use the charged route are reasonably certain, but those charged off the regulated route would reduce the net value of time savings. The net effect is likely to be a modest gain.
Providers – Territorial Authorities and NZTA	Increased user willingness to pay TCQ identified public sector revenues of $21 million (city centre) to $261 million (regional network) annually in gross revenues	Medium	High - An effective charging scheme should increase service levels, willingness to pay and therefore provider revenues. However, charges may only need to be moderate to achieve the capacity objective, so net gains to the provider seems likely to be modest.
Other beneficiaries - property owners and public transport users	Increased capacity to support new housing and business services The value of time savings to staff or customers may not necessarily translate into market benefits to business where their existing access to markets exceed their current capacity. Any increase in investment in public transport would benefit public transport users	Medium	Medium – The distributional impacts on property values will vary between schemes, with impacts varying with the locations and charges applied. Charges are likely to have a moderately positive impact on housing and business capacity if they are successful in materially increasing the effective capacity of existing networks.
Collective impact – road users not paying the charges, safety and the environment	Increased number and average value of peak period trips Safety, climate, and health emission benefits seem likely to be nominal. TCQ identified emission benefits ranging between $0.4m (city centre) and $3m (regional network)	High	Medium – Successful charging schemes should increase effective network capacity, but if revenue is given priority or charges are poorly designed the scale of benefits may be more limited.
Total monetised benefits	-	-	-

Non-monetised benefits	Increased network productivity in moving people and goods	*Medium*	

99. The outcome of the time of use charging cost benefit assessment largely depends on the ability of schemes to deliver the collective benefits associate with improved traffic-flow, with the other costs and benefits tending to cancel each other out. Traffic-flow benefits will depend more on how schemes are designed and implemented than on design of the enabling legislation.

Section 3: Delivering an option

How will the new arrangements be implemented?

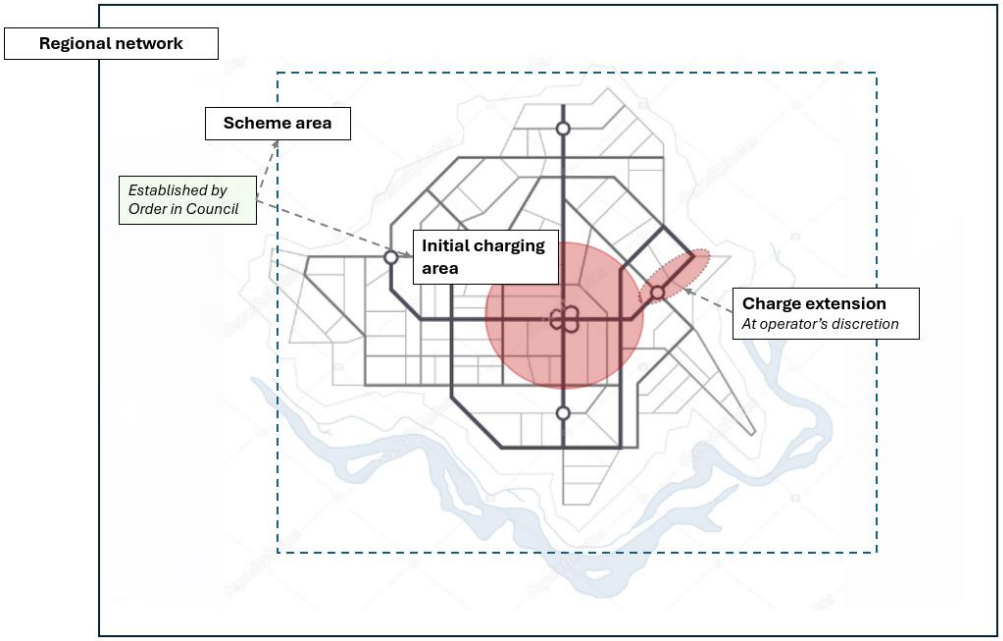
Time of use charging concept

100. Enabling legislation is needed to implement time of use charging. The aim is to set charges at a rate that changes the behaviour of those making the lowest value trips. As a rule of thumb, only about five percent of trips need to be moved out of peak times to maintain traffic-flow and materially improve service levels for the remaining trips. The charges need to be increased over time to maintain this effect.

101. Charges could be at selected points on a road (corridor charge), all points entering a road or collection of roads (cordon charge), or a charge for the distance travelled on a road or collection of roads (area charge). Charging schemes could also incorporate a combination of these charge types.

102. Charging scheme proposals will need to consider the impacts on the roads subject to charges (charging area), how the initial charging area will be expanded into the surrounding areas that are able to be charged (scheme area), the impact of charges on the wider network (regional network) and the impacts on society (distributional impacts).

Figure 8: Time of use charging network area, scheme area, and charging area



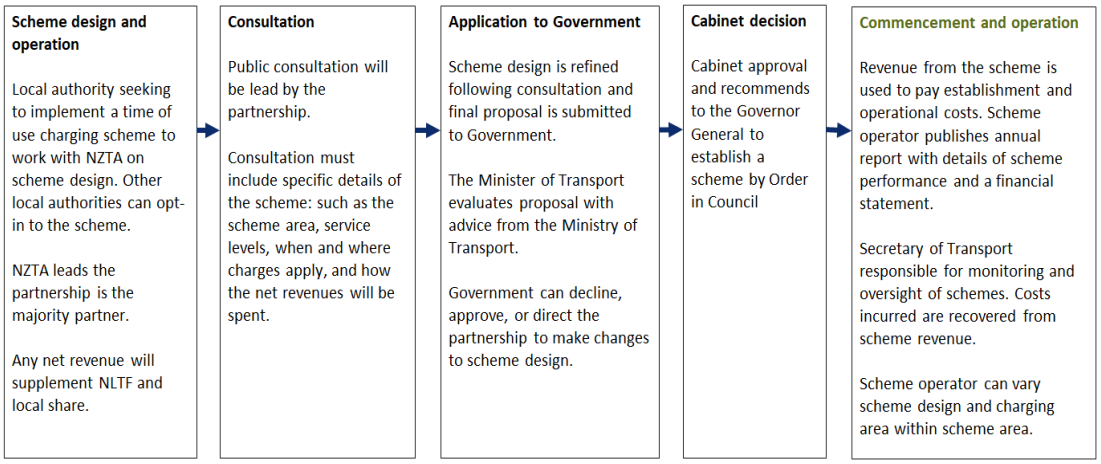
103. To gain public acceptance schemes need to be clear about the improvement in service levels and the initial charges need to deliver those service levels. Careful design is needed to avoid simply shifting trips onto other roads that can't cope with the extra trips. The revenues also need to be invested in a way that those paying the charge will see as adding value locally.

104. Charging schemes should be jointly developed and delivered by the NZTA and any local authorities that initiated the scheme as the scheme agency. Public consultation

would be undertaken on proposed schemes and on extension of the charging area of approved schemes.

105. The process for introducing a charging scheme is summarised in the following flow-chart.

Figure 9: Charging scheme development process



106. Collection arrangements would be determined by each scheme, including the technology used for collection, the back-office and payment arrangements. Standardised data on scheme performance and revenues will need to be produced to aid in scheme monitoring and reporting.

107. In addition to Minister's having to be satisfied schemes are in the public interests before recommending an Order in Council, the responsible Minister would be able to replace a scheme operator or revoke a scheme that wasn't delivering as claimed in the scheme design. The Minister would be assisted by an independent expert advisor, in the form of the Commerce Commission.

How will the new arrangements be monitored, evaluated, and reviewed?

108. A key aspect of the proposed charging scheme design is that they state the improved level of service to be delivered by charges. This should ensure that users and oversight agencies can tell whether the charging scheme is preforming as claimed.

109. To enable charge operators to consistently achieve these service levels over time, the proposed design gives operators considerable flexibility in setting charges within an approved range, enabling them to adjust charges up and down to achieve and maintain traffic flow. The charging scheme in Singapore has successfully used this approach to achieve its service level targets.

110. The lead role of the NZTA in charging schemes will maintain the current lines of electoral accountability, with central government setting vehicle charges and local government setting property charge. If enough electors are sufficiently dissatisfied with charging schemes, they can replace their elected representatives. This electoral risk should lead to a reasonable careful approach to new charging scheme design and how schemes are implemented.

111. In addition to these scheme specific measures, Minister's will have a system oversight role, supported by an impartial independent expert with expertise in infrastructure

network performance and monopoly pricing. The Secretary of Transport will be charged with ongoing oversight of scheme operation and performance. The responsible Minister would be able to replace a scheme operator or revoke a scheme that wasn’t delivering as claimed in the scheme design.