RESEARCH NOTE

PRICING OUT CONGESTION

Experiences from abroad

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I will begin with the proposition that in no other major area are pricing practices so irrational, so out of date, and so conducive to waste as in urban transportation.

— William S. Vickrey (1963)[1]

Summary

As part of The New Zealand Initiative's transport research series, this study focuses on the international experiences around congestion pricing, i.e. the use of road charges encouraging motorists to avoid traveling at peak times in busy routes.

More than just a driving nuisance, congestion constitutes a serious global economic problem. By some estimates, congestion costs the world as much as a trillion dollars every year. In response, cities across the globe are turning to decades of scientific research and empirical support in the use of congestion charges to manage road overuse.

From the first congestion charging implementation in Singapore in 1975 to London, Stockholm and Dubai in the 2000s to the expected 2021 New York City launch, myriad road pricing schemes are successfully harnessing the power of markets to fix road overcrowding – and providing valuable lessons along the way.

In short, congestion charging works. The experiences of these international cities can be an excellent blueprint for New Zealand to learn from and tailor a road pricing scheme that is *just right* for us. By analysing the international experience on congestion pricing, this research note provides further insights towards a more rational, updated and un-wasteful urban transport system.

When the price is right, a proven solution to chronic road congestion is ours for the taking.

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Congestion pricing — A global perspective

Chronic road congestion is a global epidemic, plaguing poor and rich countries alike. In dozens of cities around the world, from Bogota to Rome, from Moscow to Boston, from Toronto to Dhaka, from Sydney and Melbourne to Auckland and Wellington, the average motorist wastes more than a hundred hours every year idling behind the wheels in overcrowded routes (Figure 1).

Traffic congestion is more than just an annoyance for drivers trapped in gridlocks on their way to work or the shops. It is a serious problem for the economy too. By some estimates, congestion costs the world as much as a trillion dollars every year.

According to INRIX, a global transport consultancy, congestion costs nearly US$87 billion in lost productivity each year in the United States alone.[2] Similarly, the European Commission assesses that traffic gridlocks waste around 100 billion euros annually in Europe.[3] The Asian Development Bank found road congestion costs Asian economies "an estimated 2%–5% of gross domestic product (GDP) every year due to lost time and higher transport costs."[4]

Figure 1: Average annual hours lost in congestion per driver in selected cities (2018)

Bogota	272h	Moscow	210h	Cape Town	162h
Rome	254h	Belo Horizonte	202h	Sydney	138h
Dublin	246h	Toronto	164h	Melbourne	118h
Paris	237h	Boston	164h	Auckland	150h
Mexico City	218h	Istanbul	157h	Wellington	118h

Source: INRIX, "INRIX 2018 Global Traffic Scorecard," Website.

In a nutshell, congestion pricing means introducing user charges designed to encourage drivers away from overcrowded roads at peak times. Unsurprisingly, congestion pricing has become a common theme in transport policy circles, with several cities globally embracing this simple but effective solution.

The concept is not new. As early as 1920, English economist Arthur Pigou advocated a congestion tax to force drivers to account for the social costs of adding their cars in a congested area.[5] But it took a few more decades until Nobel-laureate William S. Vickrey produced a more sophisticated theoretical framework, one that is still prevalent.[6]

Little dispute exists nowadays that congestion pricing represents "the single most viable and sustainable approach to reducing traffic congestion."[7] But that was not always the case. Scepticism, misinformation, and most of all, technological constraints were significant hurdles in the early days.

Singapore

Singapore was the first country to try out the new system when in 1975 it started charging drivers entering downtown during morning rush hours. Known as the Area License Scheme (ALS), the world's first congestion charging system had to rely on "paper decal" technology – i.e. drivers entering the restricted CBD zone had to buy a piece of paper from a local post office, gas station, convenience store or even roadside booths and display the paper license on their car windshield. For enforcement, wardens would stand at strategic check-points and inspect passing vehicles.[8]

Notwithstanding a rudimentary operation system, ALS proved to be a great success: "an immediate 73-percent decline in the use of private cars, a 30-percent increase in the carpools, and a doubling of buses' share of work traffic."[9] That translated to a 13% congestion reduction and a 22% average speed increase.[10]

As the years passed, the Singaporean government implemented a series of adjustments to continually improve outcomes – from curbing vehicle exemptions, an enlarged operation area, to variable peak/off-peak fees.

Ultimately, as technology advanced, the manual road pricing scheme evolved towards a fully automated charging system in 1998. Under the new Electronic Road Pricing (ERP) system, onboard unit transponders were installed in all cars, with congestion charges automatically paid using a debit card. Instead of costly wardens, giant gantries collected fees through dedicated short-range communication (DSRC) technology.[11]

After nearly 45 years of persistent improvements, Singapore's congestion pricing scheme is now widely considered to be the world's most sophisticated and effective.[12] In 2020, the island nation of six million people and approximately the size of Auckland[13] is expected to launch its new satellite-based congestion pricing technology, rendering redundant the unpleasant-looking gantries throughout the city.[14]

The United Kingdom

After Singapore, the United Kingdom became the second country to implement congestion pricing as a road demand management tool. The United Kingdom had been debating a road pricing scheme since the 1960s, when the government-commissioned Smeed Report first called for congestion charges.[15] But, as with every other related government-sponsored study in the mid-1990s, British policymakers kept shelving the idea fearing public backlash and uncertainty over technology.[16] But all that changed as Automatic Number Plate Recognition (ANPR) became more reliable and cheaper by the turn of the century.

The first British road pricing scheme started in 2002 at a UNESCO World Heritage site in Durham.[17] This tiny 0.2-square mile site comprises the city's "Cathedral and Castle, the main retail centre, the Chorister School, several colleges of Durham University, some private residences, and the Market Place."[18]

The Durham congestion charge was small in size but huge in results. By charging drivers just £2 a day, the ANPR-led scheme reduced traffic volumes by 85%, while increasing pedestrian activity by 10%.[19]

However, attention turned to London in 2003, as it became the first major European city to introduce congestion pricing. The London Congestion Charge scheme comprises a 21-square kilometre area with a £11.50 daily charge for all (non-exempted) users inside the zone.[20]

The verdict on the London experience is mixed. On the one hand, the scheme is a success as it reduced congestion in the targeted zone by as much as 30%.[21] On the other hand, original traffic reductions were progressively eclipsed by the significant re-allocation of road space to public transport, walking and cycling over the years.[22] Besides, an extended list of fee exemptions and discounts (including for taxis and private hire services) have reduced the effectiveness of the scheme.[23]

After 15 years of operation, it is clear the London Congestion Charge scheme needs a revamp, with new satellite technology allowing a more flexible congestion charging environment.[24] A 2017 London Assembly Transport Committee report lists a series of challenges, claiming the scheme is "no longer fit for purpose".[25] For one, the scheme area is too small to have a meaningful impact on the city's congestion problem. Greater London is now one of the most congested cities in the world, with the average driver wasting more than 227 hours per year on overcrowded roads.[26]

Following the momentum created by the Singapore's ERP system and London Congestion Charge scheme, many other cities in the world launched renewed attempts at congestion pricing implementation. Some succeeded, others did not – but produced valuable lessons either way.

The referenda in Edinburgh and Manchester proved that poor communication strategies were key in failing to win public support. In Edinburgh, despite apparent strong initial public support, residents overwhelmingly rejected a double-cordon congestion scheme in 2005, with 74% of voters saying no to the council's plan.[27] A follow-up academic study found that the public were not convinced the proposed congestion scheme would be effective or fair, with opposition groups leading a successful negative narrative attack on mainstream media.[28]

A similar fate befell Manchester's 2008 referendum, with nearly 80% of voters rejecting the council's congestion charge double cordon proposal. This was despite the economic case showing the proposed charging zone would not only improve road traffic flows but also benefit labour market connectivity and public transport funding.[29]

Symptomatic of politicians' failure to communicate effectively was Manchester's straightforward referendum question failing to directly mention congestion charges ("Do you agree with the Transport Innovation Fund proposals?"). This further raised public suspicions about the proposal. The timing of the referendum in the midst of the Global Financial Crisis was not helpful either, with the public concerned about any new taxes.[30]

Despite these setbacks, other cities persevered with their own road demand management strategies. In 2007 alone, Valletta, Dubai and Stockholm successfully implemented congestion pricing schemes.

Valletta

Similar to Durham, the congestion pricing scheme in Valletta, capital of the island nation of Malta, was a small but successful experience in using pricing powers to harness desired traffic outcomes.[31] Valletta's Controlled Vehicular Access (CVA) scheme is largely influenced by the recommendations of the original 1964 British Smeed Report, while relying on up-to-date automatic number plate recognition camera technology, variable pricing charges, and a seamless 'pay-as-you-go' billing system.[32]

Dubai

At the heart of the United Arab Emirates, the Dubai Salik (meaning "open") scheme came into operation in July 2007, applying congestion charges on a few targeted highway corridors.[33] Although successful in reducing traffic *inside the charging zone*, the scheme is more of a guide for how not to implement congestion pricing.

First, in line with political establishment culture, the Dubai Salik project was a top-down decision with little public engagement or transparency of inner project details. Second, caps on daily charges and exemptions for taxies that prevailed until 2013 curbed the scheme's full potential. Third, and most importantly, the scheme's focus on main highway corridors unintentionally led to traffic diversion and, consequently, congestion onto parallel routes.[34]

Stockholm

Contrasting with the Dubai Salik scheme, the Stockholm congestion tax cordon provides a list of best practices for policymakers worldwide. Thorough public engagement was a critical component, with a simple message that focused on accurate modelling capability and a rules-based pricing guideline (i.e. congestion charges were primarily set to maintain a steady traffic speed rather than discretionary revenue raising goals).[35]

Most of all, the message stressed the wider gains of reducing congestion. That included an emphasis on reduction gains in unnecessary pollutant emissions, which brought environmentalists fully on board – the Green Party's support was key to creating political momentum.[36]

As part of a grand political deal, the government agreed to a six-month pilot followed by a referendum. Opponents wrongly assumed the public would vote down the scheme, repeating the fate of Edinburgh a year before, particularly as media coverage was predominantly negative and public surveys showed low popular backing.[37]

The full-scale pilot in Stockholm, which ran from January to June 2006, was a resounding success. Traffic volume dropped by 22% per day on average, and emissions fell by 30%.[38] Media coverage quickly became more positive. The referendum found support among 53% of voters, leading to the introduction of a permanent congestion pricing scheme in August 2007.[39]

Gothenburg

On the back of the Stockholm success story, in 2013, the Swedish government implemented a similar congestion cordon scheme in Gothenburg – but with a fatal difference. The scheme was unashamedly rooted in revenue raising – leaving congestion reduction and environmental concerns almost as an afterthought.[40] Besides, little political capital was devoted to public engagement.[41]

The Gothenburg cordon scheme achieved what it was set to do – producing large tax revenues (eight times higher than operational costs) with some marginal gains in traffic reduction.[42] Despite the government commitment to hypothecate congestion tax revenues to fund additional road and public transport projects, the public was still not convinced. In the 2014 referendum, 57% rejected the Gothenburg cordon scheme – but the government decided to keep it running regardless.[43]

Milan

In Italy, actions to curb traffic circulation focused on reducing notoriously high air pollution. Traditionally, limited traffic zones were created with measures such as banning private vehicles for non-residents during weekdays.[44] It was only in 2008, after a long series of debates, that Milan decided to launch the Ecopass, an ANPR-enforced daily license to further limit pollutant emissions in the 8^{-} square kilometre city centre known as *Cerchia dei Bastioni*.[45]

Ecopass had a complex charging system with an extensive exemption list, which reduced its efficacy. Despite initial improvements in air quality, high pollution levels crawled back in following years. That led to increasing popular support to strengthen the scheme, and in 2011, voters overwhelmingly approved a number of local environmental and transit referenda to do just that. Cerchia dei Bastioni's Ecopass was soon revamped in 2012 to become what is now "Area C", a fully fledged congestion pricing system.[46] The following year (and since then), traffic reduction was three times more effective when compared to the last year of the Ecopass scheme.[47]

New York City

The latest addition to the cities embracing congestion pricing schemes is New York City. In April 2019, the New York State legislature and Governor Andrew Cuomo agreed to levy a charge as soon as January 2021 on motor vehicles entering South Manhattan.[48]

Authorities are still hammering out the specifics of scheme, but the NYC congestion pricing project is certain to have two objectives: i) reduce congestion levels, and ii) raise revenue to be distributed to "the New York City Transit Authority, Long Island Railroad, and Metro-North Railroad in an 80-10-10 split, respectively."[49] Given New York City is the largest and second-most congested city in the country – and a wealth powerhouse – revenue generation will be between US$2 billion and 4 billion per year.[50]

Figure 2: Congestion pricing schemes worldwide

▲ Approved schemes (implementation year)

- ▲ Singapore (1975)
- ▲ Durham, UK (2002)
- ▲ London, UK (2003)
- ▲ Dubai, UAE (2007)
- ▲ Valletta, Malta (2007)
- ▲ Stockholm, Sweden (2007)
- ▲ Gothenburg, Sweden (2013)
- ▲ Milan Area C, Italy (2012)
- ▲ New York City, USA (2021)

■ Hybrid variations

- ■ Taipei, Taiwan
- ■ Tokyo, Japan
- ■ U.S. HOT lanes
- ■ Norway

● Advanced discussions/proposals

- ● France
- ● Australia
- ● New Zealand
- ● The Netherlands
- ● Copenhagen, Denmark
- ● Helsinki, Finland
- ● Hong Kong, China
- ● Jakarta, Indonesia
- ● Vancouver, Canada
- ● Seattle, USA

Sources: Patrick Carvalho, "The Price is Right: The Road to a Better Transport System" (Wellington: The New Zealand Initiative, 2019); D'Artagnan Consulting, "Review of International Road Pricing Schemes, Previous Reports and Technologies" (Wellington: Ian Wallis Associates, 2018); Auckland Council and the New Zealand Government, "Phase One Report: The Congestion Question – Could Road Pricing Improve Auckland's Traffic?" (Wellington: 2018); Lewis Lehe, "Downtown Congestion Pricing in Practice," Transportation Research Part C: Emerging Technologies 100 (2019), 200–223; Marion Terrill, "Right Time, Right Place, Right Price: A Practical Plan for Congestion Charging in Sydney and Melbourne" (Melbourne: Grattan Institute, 2019); International Transport Forum, "Smart Use of Roads" (Paris: OECD Publishing, 2019); Seattle Department of Transportation, "Phase 1 Summary Report: Seattle Congestion Pricing Study" (2019); Mobility Pricing Independent Commission, "Metro Vancouver Mobility Pricing Study: Findings and Recommendations for an Effective, Farsighted, and Fair Mobility Pricing Policy" (2018); Feargus O'Sullivan, "France plans congestion pricing for big cities," CityLab (25 October 2018); Christopher Jones, et al. "Congestion Pricing in NYC: Getting it Right" (New York City: Regional Plan Association, 2019).

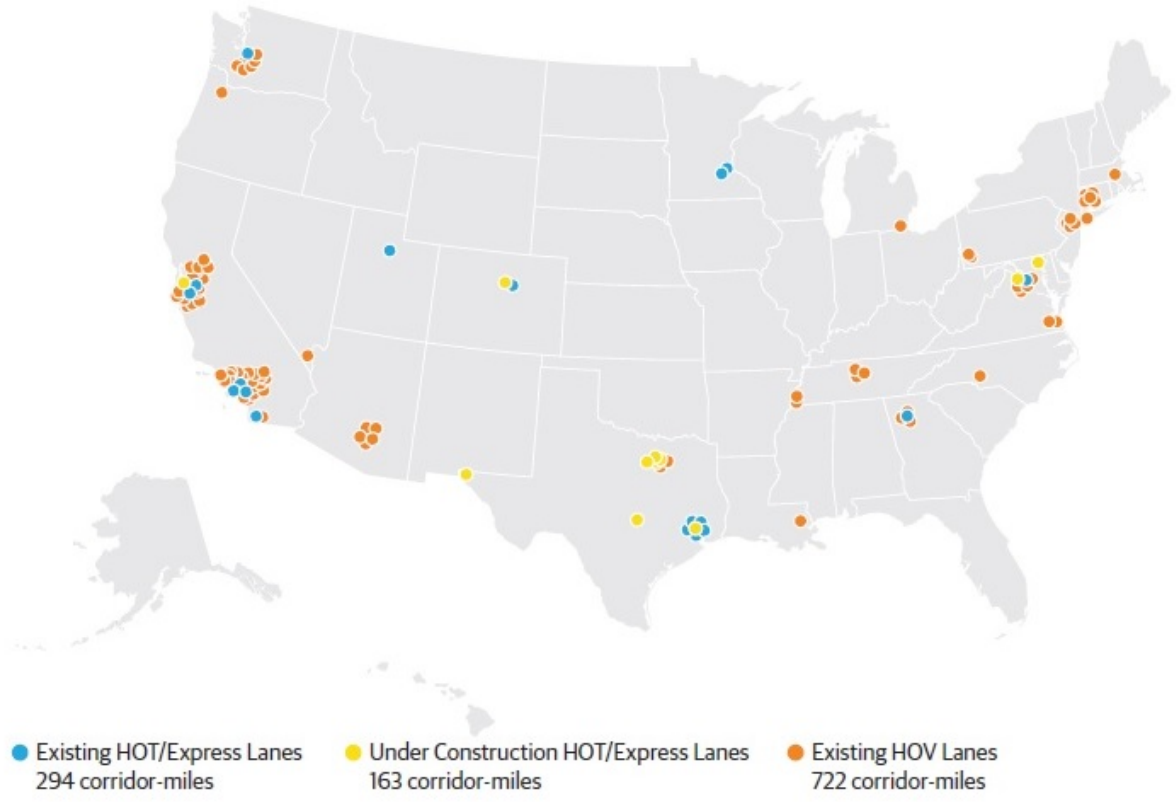
Moving forward

The international examples show congestion pricing is, if well designed, a viable and effective alternative in managing road demand. Many other jurisdictions are considering the advantages and challenges of implementing these pricing tools to achieve optimal levels of road use, while others are seamlessly merging the principles of congestion charging to their existing road pricing schemes (Figure 2).[51]

On the latter, it is worth mentioning the success story of "priced lanes" in the United States. American states have long applied the concept of reserving one lane (or more) in multi-lane carriageway roads to be used in exchange for a toll payment under certain conditions. Commonly referred to as high-occupancy toll (HOT) lanes – or simply express lanes – these are a special case of HOV lanes that allow high-occupancy vehicles (generally with three or more passengers) to use them for free while also allowing other vehicles under a fee collection.[52] The purpose of HOT lanes is to function both as way to raise extra revenue and provide a congestion-free alternative, particularly as HOV lanes are underused most of the time.

The first American HOT lane started operating in 1995 in Orange County, California, on the State Route 91.[53] Since then many followed suit, with now nearly 300 express lanes running across the country – and other 163 corridor-miles under construction (Figure 3).[54] Moreover, under federal law, states may readily convert HOV lanes to HOT ones at their discretion, as was done on Interstate Highways 10, 15 and 394.[55]

Figure 3: HOT lanes and HOV lanes in the United States



Source: Urban Land Institute, "When the Road Price Is Right: Land Use, Tolls, and Congestion Pricing" (2013).

Does it work?

Congestion pricing works. By letting drivers face the costs of adding a vehicle on clogged roads, congestion charges encourage commuters to find trip alternatives such as other travel times, routes and transport modes. That reduces the overuse of road services at peak times, providing several benefits to the community beyond saving travel time (Box 1).[56]

Besides, no other alternative is as effective or cost-efficient as congestion charges.[57] Although building more and better roads is a welcome initiative to increase average throughput volume, it is not the best strategy to reduce rush-hour congestion. That means to build roads targeting peak capacity is simply not the best use of budget resources, particularly when road space on increasingly high-value public land will be underused most of the time.[58]

Another important stylised fact about congestion pricing is the non-linear relationship between travel demand and travel time.[59] As the US Department of Transportation puts it, "by removing a fraction (even as small as 5%) of the vehicles from a congested roadway, pricing enables the system to flow much more efficiently, allowing more cars to move through the same physical space."[60]

Box 1: Benefits of Congestion Charging

- ✓ *Better use is made of road capacity, therefore reducing congestion.*
- ✓ *Economic benefits from reduced congestion include more efficient movement of freight, lower overall travel costs (through lower fuel costs) and more consistent travel times.*
- ✓ *Environmental benefits include improved air quality, reduced greenhouse gases and improved water quality.*
- ✓ *People are encouraged to use more sustainable modes, such as walking, cycling and public transport where available, as these modes become more appealing. This is why hypothecation is very important since it returns the revenue raised into the transport system.*
- ✓ *Congestion charging ensures that the people who use the roads pay for their use.*
- ✓ *Money raised from congestion charging can be spent on public transport and other modes.*
- ✓ *Where road pricing makes people move away from private cars, this may help to increase the use of active modes and thus improve public health.*

Source: Excerpt from The New Zealand Transport Agency, "Road pricing (congestion charging)," The NZ Transport Agency's BCA Strategic Options Toolkit (Wellington: 2014).

Table 1: Impact of congestion charging on traffic volume and vehicle speed (Implementation year)

	Reduced traffic volume	Reduced travel times
Singapore (1975)	-44% (1975) and additional -10 to -15% when technology changed in 1998	Dynamic rates to maintain speeds between 45–65 km/h (expressways) 20–30 km/h (other roads)
London, UK (2003)	-16% for all vehicles entering the zone	-30%
Dubai, UAE (2007)	Between -25% and -45% depending on the charging point	-50%
Stockholm, Sweden (2007)	-20% across the cordon	-33%
Milan Area C, Italy (2012)	-34% for all vehicles	-30%
Gothenburg, Sweden (2013)	-10% across cordon, plus -2,5% vehicle-km in the Gothenburg region	-10% to -20% travel time reduction in corridors

Sources: Dirk van Amelsfort and Karin Brundell-Freij, "Congestion Charging: Policy and Global Lessons Learned" (Sweden: WSP, 2018); D'Artagnan Consulting, "Review of International Road Pricing Schemes, Previous Reports and Technologies" (Wellington: Ian Wallis Associates, 2018).

Table 1 shows the impact of congestion charging on traffic volume and vehicle speed in major schemes worldwide.[61] In Central London, for instance, traffic volume inside the charging zone was reduced by 16%, enough to have a positive impact on reduced travel time by 30% – even though the number of buses and bicycles increased by 25% and 49% respectively during the period. Similar shortened travel time savings were observed in Dubai, Stockholm, Milan and Gothenburg.

Of note, the Singaporean experience is the most encouraging. By relying on a transparent rules-based congestion pricing system, the city-state ensures traffic speeds are always maintained at 45–65 km/h on expressways and 20–30 km/h on arterial city roads. The scheme operates through a pricing formula, reviewed every three months, aimed at optimising traffic flow: "When speeds fall below the target levels prices are increased. When speeds rise above the target range, prices are reduced."[62]

What about the charges?

A key feature of any congestion pricing scheme are the charges, including the level and variability of rates, the location of charging points, their exemptions, the total amount collected, and the destination of revenues. Table 2 describes the main aspects of congestion charges in major road pricing schemes.

The first inference from the table is that charging rates do not need to be high to produce effective results. A prime example is the Singaporean cordon with collection points charging from as little as NZ$0.51 to a maximum of NZ$4.05, ensuring a steady flow of vehicles even during rush hour. Behind the Singaporean success is the variability of charging rates set to manage road demand – a feature found in the Stockholm and the Gothenburg schemes too.

Time-varying charging rates produce a dynamic (or *Vickreyan*) effect on road demand, which focuses on spreading the traffic flow rather than reducing it by charging higher rates during peak-travel hours

and lower rates during off-peak or shoulder hours (Box 2). That means capitalising on motorists avoiding congested hours and looking for slightly alternative travel times.

Another important, and often undermined, feature regards the list of exempted cars entering the congestion charging zone. As an implicit rule, the higher the number of exemptions, the less effective is the scheme – and therefore the higher are the charges needed to produce the same level of decongestion. In this regard, the London and the Singaporean schemes are contrasting examples.

Whereas in Singapore only emergency vehicles are exempted from congestion charges, in London many other types of road users are either exempted (e.g. taxis and rideshares) or benefit from steep discounts (e.g. 90% discount for in-zone residents). Also, the London scheme only charges motorists once a day, no matter how many times motorists cross the charging zone and irrespective of peak/off-peak times. So once a driver pays the daily one-off charge, they have no further incentive to avoid using the roads inside the charging zone.

Lastly, despite low charging rates, congestion pricing can generate sizeable revenue amounts. This leads to the question of what to do with net totals. Most schemes earmark congestion revenues to a transport fund, except in Singapore and Dubai where all collections go straight to the general government coffers.

Box 2: Vickreyan 'dynamic' charges

Known among economists as 'the father of congestion pricing', Professor William S. Vickrey won the Nobel Prize in Economics in 1996 for his ground-breaking research on transport mobility. In his seminal 1963 paper, Vickrey noted that congestion charges could be used to prevent traffic gridlocks without necessarily reducing car usage: "You're not reducing traffic flow, you're increasing it, because traffic is spread more evenly over time."[63]

Vickrey's revolutionary idea was to use dynamic (i.e. time-varying) charges to induce drivers to adjust their departure times so that road capacity is not reached – and traffic bottlenecks are prevented.

Let us say a certain city centre can accommodate an even flow of 1,000 vehicles per hour without congestion delays, meaning up to 3,000 vehicles could pass through in a three-hour period as long as no more than 1,000 cars do it any single hour. If 1,200 cars drive to the city centre in the first hour, it will cause a gridlock that reduces the traffic flow to, say, 400 cars per hour for the next two hours. By charging higher rates as congestion peaks, dynamic congestion charges can spread the traffic flow, and therefore allow more cars to pass through the roads as opposed to unrestricted road access.

Source: Patrick Carvalho, "The Price is Right: The Road to a Better Transport System" (Wellington: The New Zealand Initiative, 2019).

Table 2: Congestion charges among major road pricing schemes

	Charging rates	Scheme type	Exemptions	Total annual revenue (operating costs)	Purpose
Singapore	NZ$0.51 to NZ$4.05 per charging point crossed with no cap	Highway and cordon charging, with 77 charging points	Emergency vehicles	NZ$154m (NZ$16m per annum)	General government revenue
London	NZ$20.75	Area charge with a single flat fee per day, with 174 charging points	Emergency vehicles, all buses and coaches, all taxis and private hire vehicles, all disabled (blue badge) and all zero-emission vehicles are either 100% discount or exempt. Residents' vehicles 90% discount	NZ$410m (NZ$164m per annum)	Hypothecated transport fund
Dubai Salik	NZ$1.52 per crossing	Corridor charges, with 7 charging points	Military, emergency vehicles, buses, vehicles with disabled owners	NZ$305m (not available)	General government revenue
Stockholm	NZ$1.79 to NZ$5.68, depending on time of day and route	Cordon charge, with 26 charging points	Buses over 14 tonnes, emergency vehicles, motorcycles, military vehicles, vehicles with disabled parking permits	NZ$138m (NZ$39m per annum)	Hypothecated transport fund for roads and public transport
Milan Area C	NZ$3.17 to NZ$7.91 per day depending on vehicle type (e.g. passenger, service vehicle) and residential status	Cordon unlimited trips in one day, with 43 charging points	Emergency vehicles, motorcycles, registered disabled. Low emission vehicles until October 2019. Residents' vehicles have 40 free entrances per annum	NZ$47m (NZ$22m per annum)	Fund for public transport, active transport mode infrastructure, new park, and ride
Gothenburg	NZ$1.46 to NZ$3.57, depending on time of day	Cordon charge, with 36 charging points	Buses over 14 tonnes, emergency vehicles, motorcycles, military vehicles, vehicles with disabled parking permits	NZ17m (NZ$2m per annum)	Hypothecated transport fund for rail and road improvements

Source: D'Artagnan Consulting, "Review of International Road Pricing Schemes, Previous Reports and Technologies" (Wellington: Ian Wallis Associates, 2018).

Vox populi

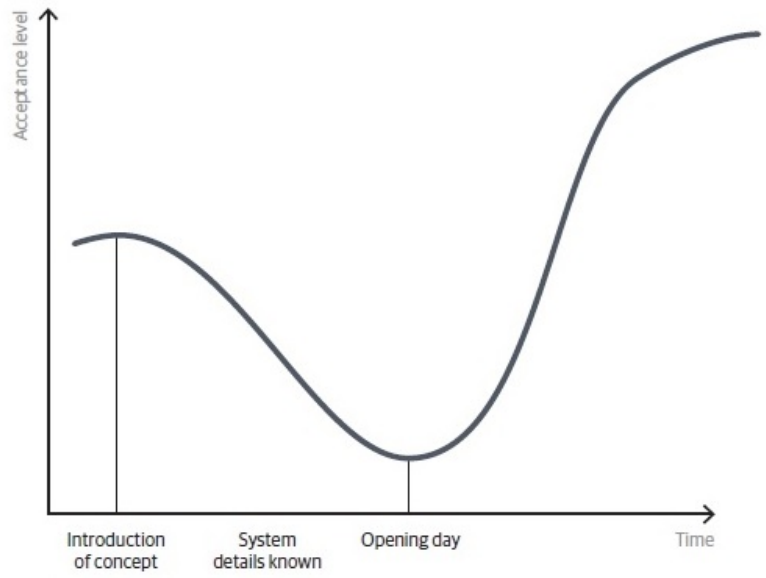
As the saying goes, *the voice of the people is sacred* – and in a democracy it is vital. Ultimately, every congestion pricing scheme must win public approval to become a sustainable and legitimate option.

Research shows that although public acceptance is not always the same everywhere, it does follow a general pattern: decreasing in the months leading to the launch of the scheme only to increase over time after implementation.[64] Figure 4 presents a typical dynamic pattern of public responsiveness towards congestion pricing in light of international experience.[65]

During the early stages of discussions on introducing congestion charges, the public is usually somewhat open to the idea, given the conspicuous costs of congestion. In New Zealand, for instance, a recent public survey conducted by the Automobile Association shows about two-thirds of Auckland drivers think "the Government should consider charging tolls on congested roads to encourage people to avoid them at busy times."[66]

As the details of the scheme are laid out ahead of implementation, though, the public becomes more wary of how it will personally affect them. Lively debate about the "winners and losers" of the new scheme follows, generally leading to a dip in public acceptance. Opposition groups capitalise on the nosedive momentum to exploit anecdotal personal misfortunes, spreading negative ads on "how unfair congestion charges are" – despite never questioning *how unfair the current system of unconstrained congestion actually is*. As a result, public acceptance dips significantly as the new scheme approaches implementation.

Figure 4: Typical dynamic pattern of public acceptance towards congestion pricing



Source: Dirk van Amelsfort and Karin Brundell-Freij, "Congestion Charging: Policy and Global Lessons Learned" (Sweden: WSP, 2018).

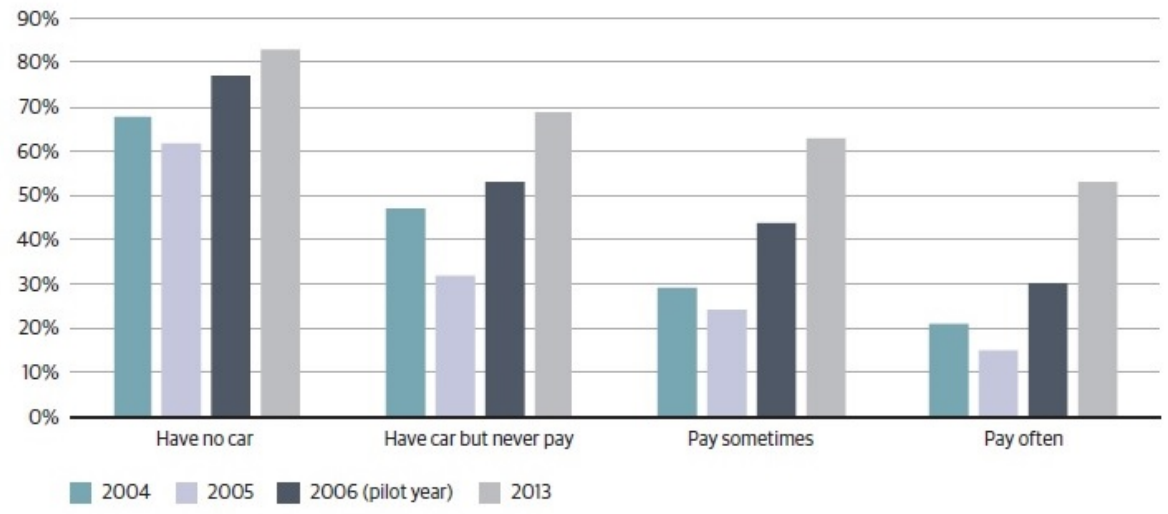
However, the effectiveness of the programme soon begins to change the hearts and mind of road users after implementation: decongestion means in practice faster, safer and more reliable travel trips; behavioural penalties such as travel mode shifts and congestion charge payments are less costly than anticipated; and adaptation to the new status quo quietly becomes reality, with people no longer evaluating the new congestion pricing scheme as a "change".[67]

No other example better illustrates this dynamic pattern of public acceptance than the Stockholm congestion pricing scheme experience. In a study published in 2014, researchers showed versions of the stylised acceptance pattern across all main types of road users (Figure 5).[68]

As expected, public support for those not owning a car (i.e. more likely to use public transport) was consistently the highest, starting at 68% in 2004 down to 62% in the year preceding the 2006 pilot implementation, to reaching a peak of 83% in 2011. A similar pattern, although at slightly lower levels of support, was observed with those owning a car but never subject to congestion charges – as well as for car owners sometimes paying the tolls.

Interestingly, during the same period, public acceptance more than tripled among Stockholm motorists who often pay congestion charges, from 15% before implementation to 53% in 2011 (i.e. five years down the track).

Figure 5: Public support for congestion charges in Stockholm



Source: Jonas Eliasson, "The Role of Attitude Structures, Direct Experience and Reframing for the Success of Congestion Pricing," *Transportation Research Part A: Policy and Practice* 67 (2014), 81–95.

Other jurisdictions experienced analogous turnarounds in public acceptance towards congestion charges (Table 3). For instance, public opinion surveys in the United States show support for congestion charges on HOT lanes jumped from about 30% to 70% after road pricing implementations.[69] Similar results were seen in London (from 39% to 54%), Gothenburg (from 27% to 46%) and Milan (80% approval after implementation).[70]

Table 3: General public support for congestion charges following scheme implementations

	Before	After
Stockholm	21%	67%
Gothenburg	27%	46%
London	39%	54%
United States	30%	70%
Milan	n.a.	80%

Source: David Meyer, "Congestion pricing was unpopular in Stockholm – Until people saw it in action," *Streetsblog NYC* (28 November 2017); Maria Börjesson and Ida Kristoffersson, "The Gothenburg Congestion Charge: Effects, Design and Politics," CTS Working Paper 2014:25 (Stockholm: Centre for Transport Studies, 2014); D'Artagnan Consulting, "Review of International Road Pricing Schemes, Previous Reports and Technologies" (Wellington: Ian Wallis Associates, 2018); Federal Highway Administration, "Congestion Pricing: A Primer – Overview" (Washington, DC: US Department of Transportation, 2008); Sunny Kodukula, "The Ecopass pollution charge and Area C congestion charge – Comparing experiences with cordon pricing over time," ICLEI Case Studies (July 2013).

The lessons for New Zealand

New Zealand has much to benefit from implementing the right congestion pricing scheme. We are well placed to implement a comprehensive, world-class road pricing scheme and reduce the adverse impacts of congestion. Moreover, as an island economy with a unitary government, we do not face the regulatory hurdles of other jurisdictions such as in the United States and the European Union.[71]

As our Ministry of Transport puts it, "Mobility is the lifeblood of commerce and community. It is the key to unlocking not only productivity and business growth, but strengthening our social and cultural connections within and between our regions, towns and cities."[72] Therefore, it is paramount to have a road transport system that is free from chronic, high congestion levels.

In this regard, the international experience provides 10 resourceful and insightful lessons for New Zealand:

1. **Congestion charges are an effective tool to manage road congestion.**
   International data confirms that congestion pricing is the single most active means to reduce overcrowded road use. Empirical studies also show even small charges are able to reduce both travel times and traffic volumes. As a result, societies benefit from shorter, safer and more reliable commutes, higher levels of productivity and wages, and a valuable source of information for future transport investments.

2. Peak and off-peak rates are already part of our daily lives.

From electricity bills and cinema tickets to hotel rates and public transport fares, variable peak/off-peak pricing is a ubiquitous element of modern life – even casual drinks are relatively cheaper during happy hours. The same logic should apply to road charges. While variable fees are still "virtually unknown in transit",[73] as Vickrey noted in his early studies on road pricing, the increasing number of congestion pricing schemes worldwide shows that a more rational approach is possible and desirable.

3. Each congestion pricing scheme is unique.

Congestion pricing schemes must consider the distinctive features of each transport system. The Swedish experience shows that the success in Stockholm could not be replicated in Gothenburg, which had completely different road travel patterns. For New Zealand, while schemes abroad may offer valuable insights and benchmarks, specifications must match our distinctive transport requirements and social customs.

4. Technology is on our side.

Recent advances in geolocation technology have reduced the barriers of costly congestion pricing infrastructure. Singapore's road pricing authority, for instance, is set to soon replace its conspicuous detection and enforcement gantries for a seamless satellite system. In New Zealand, the same technology already being used to collect electronic road user charges on diesel-powered vehicles could be easily converted to charge for time and location (i.e. effectively implementing congestion pricing).[74]

5. Managing public support is vital.

The greatest obstacle for congestion pricing implementation is turning around the public's misunderstanding and fears. Failed scheme proposals such as in Manchester and Edinburgh show how poor public engagement can be fatal – even when science and empirical evidence irrefutably point to the benefits of congestion charges.

6. Schemes should be simple, not simpler.

Not all congestion pricing schemes are created equal. It is wise to keep the rules of the scheme simple to facilitate the programme communication. A convoluted scheme is a hard sell, with project sponsors losing control of public messaging. But simplicity cannot compromise the overall efficacy of a good congestion pricing scheme, which happened in London where a daily flat cordon charge generated the wrong incentives to game the system.[75]

7. Revenue-raising should not be the scheme's goal.

At the heart of the general public's suspicion against congestion pricing is that it becomes just another money-grabbing tax. Failed proposals in Oslo, Manchester, Edinburgh and Copenhagen are testament that voters will not easily back the development of revenue-based schemes.[76] Earmarking congestion charge revenues to transport spending is a common strategy, but it would be better still to secure a revenue-neutral commitment. That means every net dollar raised through congestion charges shall be offset by, say, a dollar less through property rate collection or lower fuel taxes.[77]

8. Minimise discounts and exemptions to improve efficacy.

A common strategy to mitigate social equity concerns is to concede discounts and exemptions, such as to emergency vehicles, drivers with disabilities, low-emission vehicles, taxis, and residents in the congestion charging area. But that can easily erode the scheme's efficacy, prompting motorists to game the system (including outright fraud) and political concessions.[78] The classic example is London, where half the fleet circulating in its congestion charging zone is estimated to benefit from some discount or exemption.[79]

9. Clear communication and focus on congestion-reducing objective are crucial.

A steadfast political campaign must be waged understanding the swings in public opinion to create the right momentum for implementation. Clear communication and focus on the congestion-reducing objective of the scheme are key. A Stockholm-like pilot programme can be an effective tool to showcase the net benefits of congestion pricing. Besides, while there is no ideal timeframe for implementation, lengthy preparation periods can be tricky to manage, as demonstrated in the failed cases of The Netherlands, Edinburgh and Hong Kong.[80]

10. Political leadership ultimately constitutes the missing piece.

The lack of political leadership and public wariness towards congestion pricing are the opposite sides of the same coin. Without a political champion, no scheme should go forward – even in the face of the strongest cases (e.g. Manchester's failed proposal).[81] That is the ultimate cautionary message for New Zealand: Despite all major political parties supporting congestion pricing, no scheme shall be successfully launched if the government of the day is not prepared to face the nadir (and the occasional wrath) of public acceptance dynamics.[82]

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