Road pricing (congestion charging)

Introduction

Traffic congestion occurs when there is excessive demand for road space and it therefore mainly affects urban areas. Congestion in the Auckland region is a major problem in terms of lost income, time and pollution. It is estimated to cost the New Zealand economy nearly $1.25 billion per year.

In New Zealand, road users pay fuel excise duty, road user charges, motor vehicle registration and licensing fees. However, many externalities are not totally accounted for, including environmental and economic impacts, such as the cost of crashes and congestion.

As a result, the costs paid by road users fall well short of covering the true cost of providing, maintaining and using such infrastructure. This is especially true on congested roads and at peak times.

Objective

Road pricing is a tool with two main objectives: reducing congestion and raising revenue. The revenue it raises can be hypothecated and used to support other modes such as public transport, to price users off the road (thus reducing congestion) and enforce a behaviour change. It seeks to charge for the full economic, environmental and social costs of road use, and places more of the true cost of driving back onto road users.

Benefits

Congestion reduction	Better use is made of road capacity, therefore reducing congestion.
Economy	Economic benefits from reduced congestion include more efficient movement of freight, lower overall travel costs (through lower fuel costs) and more consistent travel times.
Environment	Environmental benefits include improved air quality, reduced greenhouse gases and improved water quality.
Increased appeal of alternative modes	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.
Fairness	Congestion charging ensures that the people who use the roads pay for their use.
Revenue	Money raised from congestion charging can be spent on public transport and other

	modes.
Health	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.

Strategic interventions for road pricing

Zonal charge

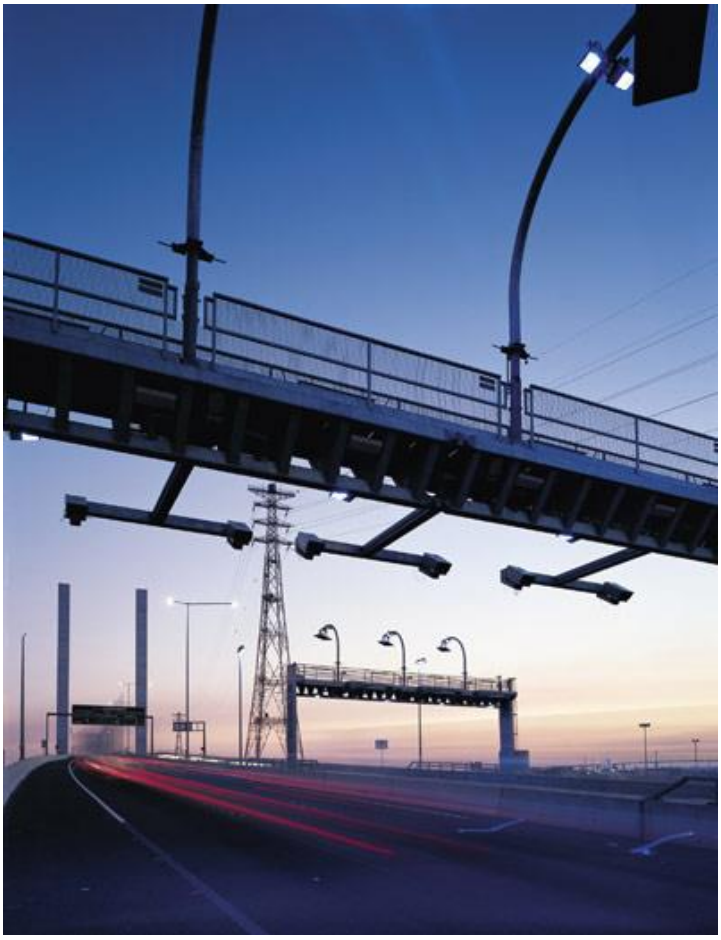
A zonal charge is a way of charging for access to a particular zone. A zone can be stand alone or there can be a number of adjoining zones within a transportation system. This includes area schemes that charge all vehicles moving across a defined area or cordon, e.g. London, Stockholm and Singapore. Zonal charge schemes reduce congestion by discouraging vehicle use into a particular area. The zonal charge reduces demand for travel in private vehicles and typically increases demand for other modes of transport.

Traffic in Stockholm reduced by 22 percent following a modest zone toll.

Strategic interventions for road pricing contd

Fixed length link charge

Road tolls are common and usually in the form of a fixed length charge. Payment is made for the use of a length of the transport network. This is generally toll roads, e.g. Melbourne City Link, French Autoroutes, M6 Toll (see the section on Toll Roads for further information.)



Electronic toll gantries on Melbourne City Link, Victoria, Australia

Strategic interventions for road pricing contd

Distance charging

Distance charging charges motorists for the distance they have travelled. Distance charging can take several forms, ranging from crude measurements to more accurate position determination.

Distance charging is already being implemented in some countries. The Swiss lorry charging scheme calculates distance travelled using tachograph readings. However, tachographs are not present in cars and there is not yet a device available that provides comparable robustness. Another example is the German lorry charging scheme, which calculates distance travelled according to the distance between two junction points on a motorway.

Cell-based charging works on the basis of determining when a vehicle is passing through square cells, of a set size, as an approximation for distance charging. Each cell has an applicable tariff, usually set by time of day. The On Board Unit (OBU) determines how many cells a vehicle passes through and this data is then uploaded to an off-board system.

Comprehensive distance based charging

This system uses satellite position fixes to determine a vehicle's position and then compare this with a stored map of charge zones, charged road sections or specific charge points. This information is then used to determine charges incurred per km against a known tariff table. The unit determines the distance travelled by place and time of day.

Case study – London, United Kingdom

Background

The central London congestion charging scheme has now been operating for over a decade. The principal aim of the scheme is to reduce congestion in central London by encouraging drivers to switch from private car use to other, more sustainable modes of transport.

Prior to the congestion charge being implemented, London suffered some of the worst traffic congestion in the UK and Europe: 'Every weekday morning the equivalent of 25 busy motorway lanes of traffic tried to enter central London and it was estimated that London was losing between £2–4 million every week in terms of lost time caused by congestion' (Transport for London, 2002).

The city of London has a population of over 8 million.

How the scheme operates

During its hours of operation, drivers of vehicles are required to pay a standard daily charge of £10 to travel within the congestion charging zone. This is subject to a number of conditions, discounts and exemptions, e.g. emergency services do not need to pay the charge.

The scheme relies on a network of cameras monitoring every entrance to and exit from the Congestion Charging Zone. The cameras provide digital images of the whole vehicle to automatic number plate recognition software, which reads and records each number plate.

All revenue raised by the charge in invested in improving transport in London. In 2011-12 income from the scheme was £137 million.

Improved public transport

As part of the Mayor's transport strategy, congestion charging was also accompanied by a range of measures designed to make public transport easier, cheaper, faster and more reliable. Transport for London (TfL) brought in extra buses to the capital's streets, introducing more routes and improving the frequency and reliability of other routes.

Work to increase the efficiency and speed of journeys by Tube is ongoing – there are more frequent trains on popular lines, modernised stations and roomier carriages.

Case study – London, United Kingdom

Impact	Following its introduction in 2003, congestion reduced in the congestion zone and traffic entering the zone was reduced by around 20 percent. TfL estimates that the initial traffic and congestion reductions arising from the original central London congestion charging scheme led to overall CO_2 reductions of 16 percent inside the charging zone. Congestion levels have now risen back to pre-charge levels, in part because of reduced road capacity caused by widespread water and gas main replacement work and also because of the extension of the cordon to include Kensington and Chelsea. However, it remains clear that without the congestion charges, congestion levels would be even higher.
Low emissions	The congestion charging scheme has led to an 8 percent reduction in emission of oxides of nitrogen (NOx) and a 6 percent reduction in fine particulate matter (PM10). While the main objective of the scheme remains the reduction of congestion and modal shift away from cars, the scheme also provides an incentive for drivers who still continue to drive in the zone to choose less polluting vehicles. The criteria for congestion charge exemptions based on low emissions were tightened in mid-2013, by Mayor of London, Boris Johnson. To qualify for the new discount, vehicles must be either pure electric or emit 75 g/km or less of CO2 and meet the Euro 5 emission standard for air quality.

Case study – Stockholm, Sweden

Introduction

Stockholm was the third major city, after London and Singapore, to implement a congestion charge, and it has complemented this with IT systems to monitor traffic flows and alter tolls, road signs, and provision of real-time information to make it easy for commuters to get around and to choose the right mode. Stockholm's congestion charge is particularly bold in that it covers the entire city, and charges drivers both on entering and leaving the zone.

Trial

Stockholm officials conducted extensive public consultations, education and outreach in order to guarantee community acceptance of the congestion charge. After a successful trial in 2006, the initiative was put to a public referendum before being made into law.

Although the toll was and remains contentious, studies conducted following the trial and since the official launch in 2007 show that both individuals and businesses are now broadly in favour of the charge.

Variable charges

There are automatic toll stations placed at entry points around the city, which use number plate recognition technology to charge drivers, who then receive a bill at the end of each month.

To ease congestion, promote public transport during working hours, and improve air quality, the congestion charge varies at different times of the day – for example, it is most expensive at peak times, and there is no charge at night.

Green transport

The congestion charge has formed part of a wider integrated set of urban mobility initiatives intended to increase the use of public transport, cycling and walking, and to "green" road transport.

Stockholm has the highest green transport usage of any European capital – 68 percent of people walk or cycle to work. It has increased the number of buses to absorb increased demand for public transport, and 75% of buses run on biofuels. The city has a target to reach 100 percent by 2025.

Results

The introduction of the congestion charge has led to a 20 percent drop in the total flow of traffic in and out of the inner city, and a reduction in CO2 emissions related to vehicle use of between 10 and 14 % in the inner city and 2-3 % in the county.

(Adapted from: http://cityclimateleadershipawards.com/stockholm-congestion-charge/)

Case study – Singapore

Background

The islands of Singapore, located in southeast Asia, have a population of 5.4 million. The country has an extremely constricted land area and congestion is seen as impeding economic growth. The introduction of congestion pricing is one of a number of anti-congestion policies implemented in Singapore since the 1970s.

Singapore Area Licensing Scheme

The first congestion charging scheme, known as the Area Licensing Scheme (ALS), was introduced in the restricted zone situated in Singapore's CBD in 1975. The scheme was subsequently extended to major expressways with the Congestion Charging Scheme. The ALS covered the more congested parts of the CBD, designated as the restricted zone.

Technology for an electronic congestion charging system emerged during the early 1990s. This system allowed frequent changes to be made to the congestion charges, so as to optimise road usage.

Unlike London's flat rate, in Singapore charges are based on the traffic congestion levels at the pricing points. Charges vary according to the class of vehicle, and buses and emergency vehicles are exempt. Annual net profit from the scheme is $61 million.

Objectives of the scheme

The main objective of the pay-as-you-use system was to optimise road usage by making motorists more aware of the true cost of making a journey by car. This would therefore reduce congestion.

Secondary objectives were to:

- encourage use of public transport or car pooling
- encourage use of alternative routes and times of travel
- provide a smoother ride with more assured journey times for drivers who choose to pay the charge.

Traffic reductions

- Traffic in the zone reduced by nearly 25,000 cars during peak times and average traffic speed increased by approximately 20 percent.
- Traffic in the zone reduced by 13 percent during charging periods.
- Total vehicles using the roads in the restricted zone have reduced from 270,000 to approximately 235,000.
- Carpooling has increased and fewer solo motorists drive into the restricted zone.
- Many vehicle trips have shifted from peak to non-peak times.
- The scheme has been effective in maintaining a speed range of 45–65km/h for expressways and 20–30km/h for major roads.

The Singapore Land Transport Authority has been trialling a GPS based electronic road pricing system on one road for a year, with the expectation that the system may well replace the scheme.

If successful, the GPS trial could mean that the 80 gantries currently used would be replaced, and vehicles equipped with the existing card based tag system would need new equipment installed.

However, the Land Transport authority has caused some anxiety by announcing that the new technology may also be used to enforce other laws such as catching speeding vehicles, red light runners and illegally parked vehicles.

Complementary measures

Public transport	The success of any congestion charging scheme targeted at beating congestion is improved when there is an efficient public transport system. Good public transport provision will mean that people are able to choose if they will pay the charge or, alternatively, take public transport for their journey.

What other policies will this address?

Congestion	Reducing congestion results in many economic benefits, such as fewer time delays for freight deliveries and ensuring that staff arrive at employment on time.
Pollution	Congestion charging has the effect of reducing private car use. This results in a number of environmental benefits, such as a reduction in CO2, NO2 and particulate matter. Reduced air pollution has a number of benefits for health.
Urban liveability	Having fewer cars on the road also results in improving the liveability of urban environments.

Further information

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