University at Buffalo
Department of Economics
College of Arts and Sciences

Jim and Matthew Scarpati Honorary Applied Economics Conference

The conference will take place in the Spring 2024 semester. All undergraduate and MA/MS students in Economics as well as non-Economics students with sufficient background in economics are eligible to participate.

The best and runner-up papers, selected by a faculty panel of judges, will be awarded $3,000 and $2,000, respectively.

Interested? Questions?
Contact us at alexanas@buffalo.edu!

Conference Topic:

Economic consequences of traffic congestion pricing in Lower Manhattan

Tuesday, January 30, 5pm-7pm, Fronczak 424: Alex Anas

- Background information on congestion pricing in t Singapore, Stockholm, London , Milan.

    - What congestion pricing policies have been implemented in these places .
    - What the effects of those policies have been.
    - Whether the policies are considered successful or not, and why.

Tuesday, February 6, 5pm-7pm, Fronczak 424: Justin Downs/Aisling Winston

- Basic economic theory of congestion pricing.: **Justin Downs**

    - Externalities and the basics of Pigouvian Taxation.
    - A simple model of commuter decision-making that can be used to assess the “direct” effects of congestion pricing.
    - Some examples of how to apply the model to assess the “indirect” effects of congestion pricing on local labor markets, goods markets, or government revenue/budgets.

- How to write an effective research paper. **Aisling Winston**

    - The basic structure of a research paper, which includes an introduction, background information, analysis, discussion/conclusion, and a reference list/bibliography.
    - The different approaches to addressing the research question, such as a qualitative analysis, empirical/quantitative analysis, theoretical analysis, and how to present them in the context of the paper.
    - The proper way to cite references and what kinds of references are acceptable and/or appropriate given the topic and your intended type of analysis.

Tuesdays, March 5, April 2, and May 7; 5pm-7pm, Fronczak 424

- Check-in times where participants will speak with Dr. Anas, Dr. Downs, or Dr. Winston about the progress of their project, ask questions, and get feedback.

Thursday, May 16 (Conference Day)

- All participants are required to attend and give a presentation summarizing their paper.
- Participants are encouraged to invite classmates and friends to attend.
- Conference judges will discuss the papers and presentations, and announce the winners within approximately one week.

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A review of congestion charging around the world

Presentation by Alex Anas

January 30, 2024

Jim and Matthew Scarpati Applied Economics Conference 2024

Urban traffic congestion is increasing

- According to **INRIX** (2019) the most congested cities are in developing countries followed by major European capitals and large U.S. cities.

- The Texas **Transportation Institute**'s 2019 report states: "The trends from 1982 to 2017 show that congestion is a persistently growing problem... In 2017, congestion caused urban Americans to travel an extra 8.8 billion hours and purchase an extra 3.3 billion gallons of fuel for a congestion cost of $166 billion.

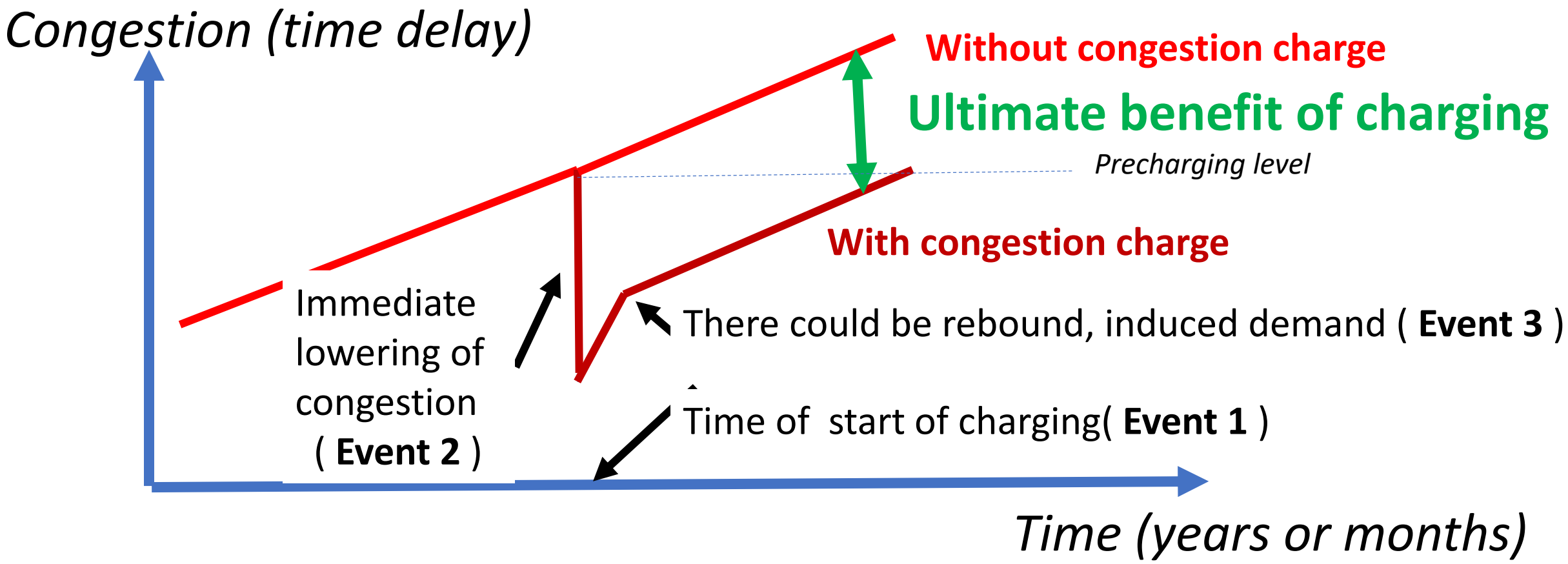
- The average auto commuter spends 54 hours in congestion and wastes 21 gallons of fuel due to congestion at a cost of $1,080 in wasted time and fuel." (Schrank et al. 2019).

References cited

Schrank, D., B. Eisele and T. Lomax. 2019. *2019 Urban Mobility Report*, Texas A&M Transportation Institute and INRIX. Technical Report.

INRIX. 2019. Inrix Global Traffic Scorecard. Technical report, INRIX Research.

While levels of congestion some time after congestion pricing can return to pre-pricing levels, would be worse if there were no congestion charging. (?)



There are four existing applications of congestion pricing that are similar to what is proposed for Lower Manhattan

- **Singapore** (Area Licensing System 1975-1998; Electronic Road Pricing since 1998)
- **London**, United Kingdom (since 2003)
- **Stockholm**, Sweden (since 2006)
- **Milan**, Italy (since 2008)

Singapore

- Singapore is a City-State confined to an island
- Area of Singapore = 719 km-squared. Population 2023 = 6 million
- Area of NYC = 778 km-squared. Population 2023 = 8.9 million

The ALS Restricted Zone (RZ), 6 sq.km, Singapore.

The ALS (1975 – 1998)

- **Singapore has implemented a congestion pricing program from 1975 - 1998, the Area Licensing System (ALS)**

- The ALS charged a flat fee of S$3.0 (~US$1.30) for vehicles entering the 2.0 square-mile central business area between 7:30 and 9:30 in the morning. His was later expanded to a larger area and broader times.

- Passenger cars with four or more occupants, taxis, public buses and service vehicles were exempted.

- A 42% reduction in traffic was achieved within the area.

- Carpool pick-up points were set up.

- In 1989 more users were required to pay the fee, as motorcycles and heavy vehicles made up about two-thirds of the traffic entering the RZ. Only buses and emergency vehicles were exempted.

- Later, the exemption for carpools was abolished, because many private cars were picking up bus commuters just to avoid the payment.

- Before the ALS , 32,500 vehicles entered, the RZ and after the ALS in June 1975, entering vehicles dropped to 7,700, between the hours of 7.30 am to 9.30 am, a 76% reduction.

- 9% of the users switched to transit.

- The use of transit for work related trips into the RZ *"sharply increased from 33% before the ALS to about 70% by 1983"*.[

- In 1994 ALS was extended to a full day, resulting in an immediate 9.3% drop in traffic in and out the RZ.

1995 RPS Extension of the ALS to manage diverted congestion

- In 1995 and 1997 congestion pricing was also applied to three major expressways, the East Coast Parkway (ECP), the Central Expressway and the Pan Island Expressway.

- The Central Expressway speed at peak hour rose to 67 km/h from 31 km/h.

- This extension was necessary as through traffic was diverted to routes that bypassed the RZ, increasing demand on these arterials and creating a need for expanding the capacity of the road network outside the RZ.

The ERP (1998-present)

- The **Electronic Road Pricing (ERP)** system was introduced in 1998.
- The ERP system consists of gantries (sensors) located at all roads linking into Singapore's Central Area, and along expressways and arterial roads with heavy traffic.
- The ERP system calculates the toll based on the distance traveled and the time of day.
- The ERP reduced traffic in the restricted zone by 20% within the first few months.

Car ownership in Singapore

- To buy a car in Singapore you must first participate in an auction where people bid for a license to own a car (a COE).

Singaporeans Need $73,549 Just for Right to Buy a Car

Singaporeans need $73,549 just for right to buy a car | The Peninsula Qatar

- Revenue from motor vehicle taxes and **certificates of entitlement** (COE) rose by 15.2 per cent to **$6.46 billion** in 2022.

- Motor vehicle taxes were expected to rise by 5.9 per cent to **$2.53** billion, likely on the back of bigger and more luxurious cars being sold.

- Annual revenue from the ERP is **$50 million ($80 million SGD)**, compared to the $10 million ($16 million SGD) annual operation costs of the ERP.

- **The island nation geography:** There are no commuters in and out of Singapore which limits traffic compared to New York City and other major cities.

- **Roads and public transport:** The road network and the bus and subway systems are in excellent condition, low cost and extensive.

- **Public transport is profitable:** The revenue from the 'Public Transportation' segment of the shared mobility market in Singapore was forecast to increase between 2024 and 2028 by in total **75.8 million U.S. dollars** (+5.68 percent).

Basic sources for more detailed information

- Area Licensing Scheme – Wikipedia
- Electronic Road Pricing - Wikipedia

London

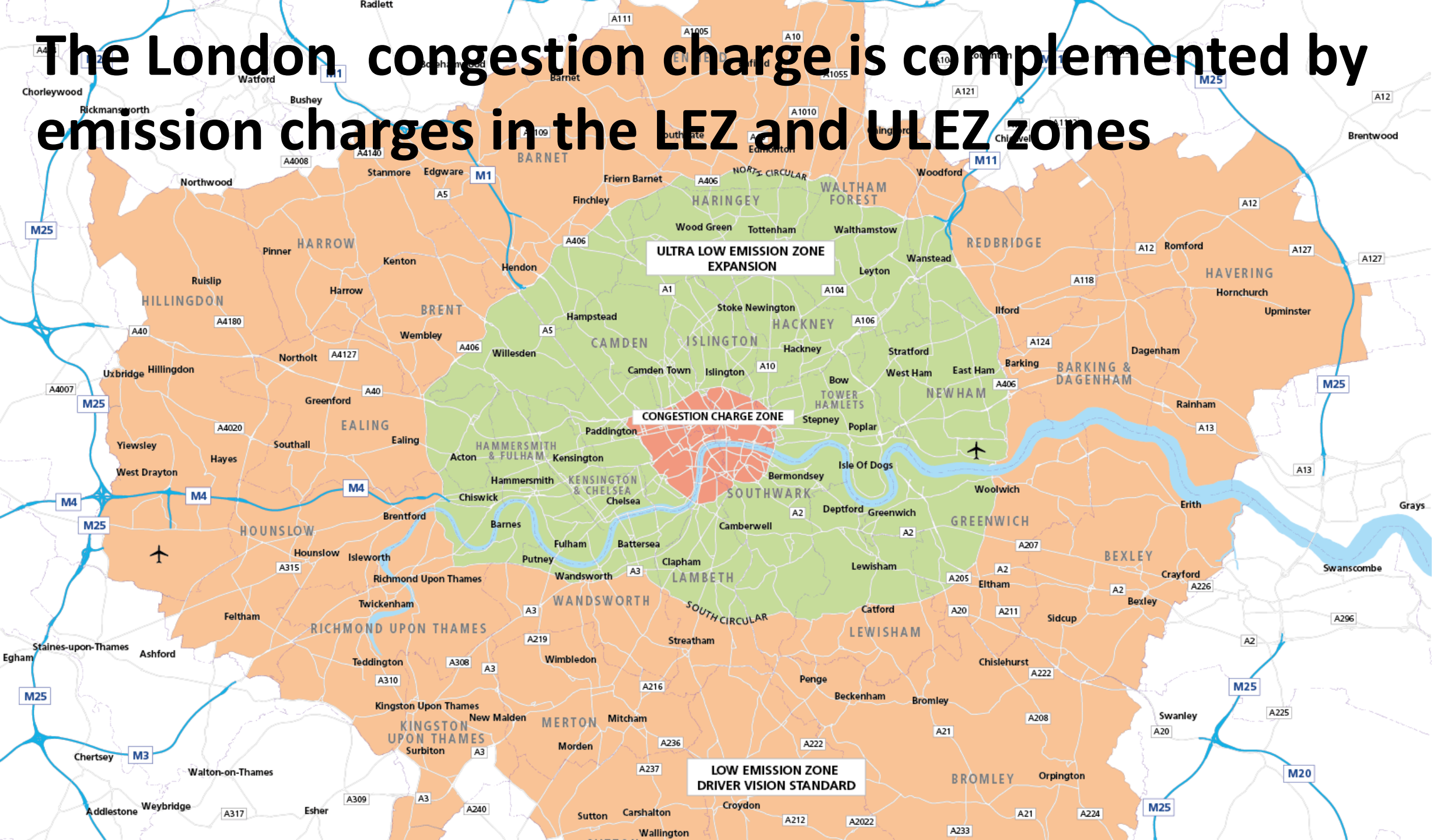
- The Congestion Charge is a £15 daily charge for driving in the Congestion Charge zone 7:00-18:00 Monday-Friday and 12:00-18:00 Sat-Sun and bank holidays.

- No charge between Christmas Day and New Year's Day bank holiday (inclusive).

- The easiest way to pay is by setting up Auto Pay. Exemptions and discounts are also available.

- If your vehicle does not meet the Ultra Low Emission Zone (ULEZ) standards, you must also pay the ULEZ charge.

The London congestion charge is complemented by emission charges in the LEZ and ULEZ zones



ULEZ and LEZ charges

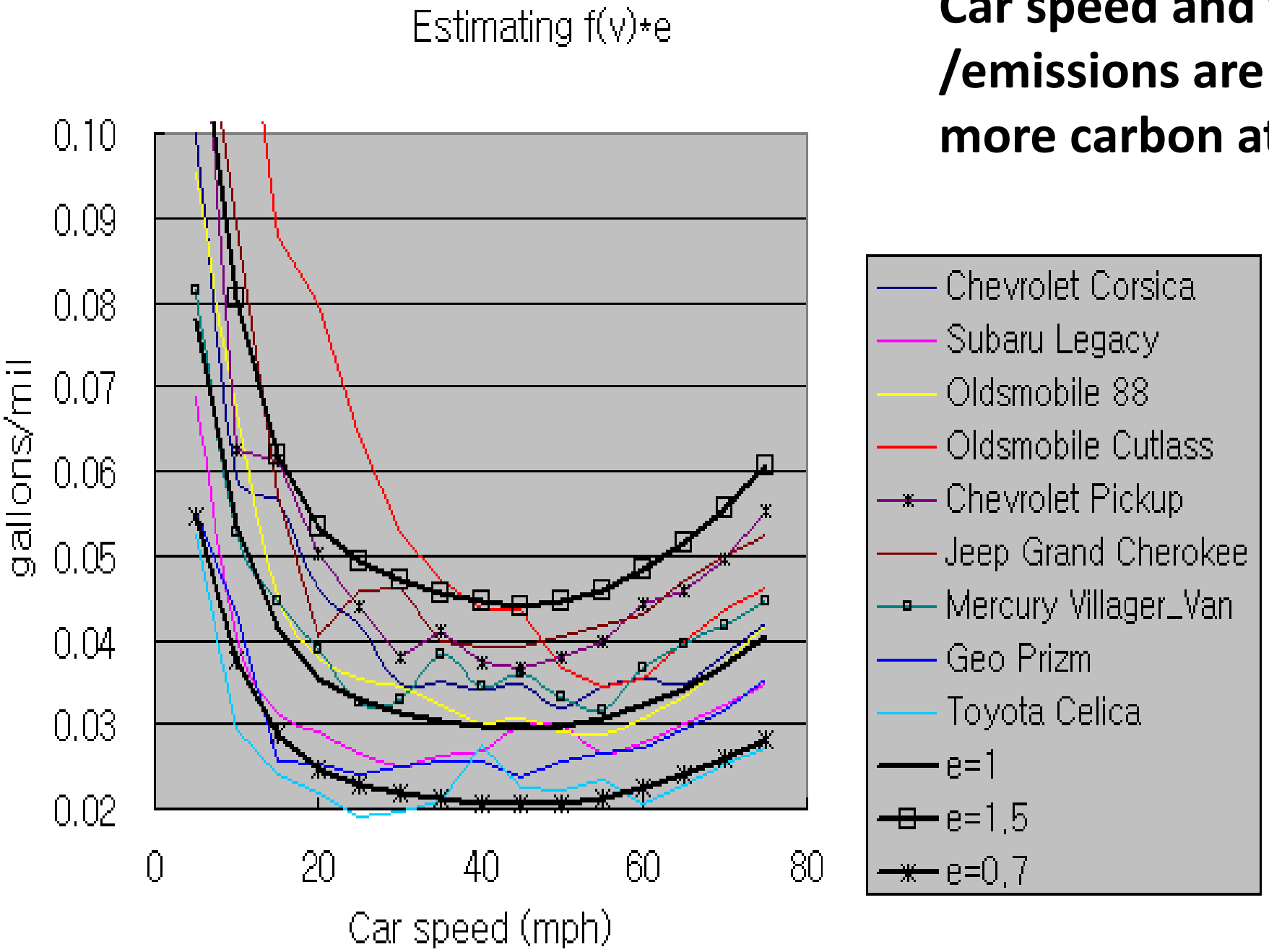
- The Ultra Low Emission Zone (ULEZ) operates **24 -7 -365 days**, across all London boroughs, and does not include the M25.

- If vehicle doesn't meet the ULEZ emissions standards and isn't exempt, it pays a £12.50 daily charge to drive in the zone.

- Lorries, vans or specialist heavy vehicles (all over 3.5 tonnes) and buses, minibuses and coaches (all over 5 tonnes) do not pay the ULEZ charge. They pay the LEZ charge if they do not meet the Low Emission Zone (LEZ) emissions standard.

- **The ULEZ has expanded across all London boroughs. Find out more.**

Car speed and fuel consumption /emissions are related. Cars emit more carbon at lower speeds




Central London Ultra Low Emission Zone and the Extension to the North/South Circular Boundary
BARNET
HARROW
Stanmore
Edgware
Finchley
Friern Barnet
Edmonton
Chigwell
Woodford
Wood Green
HARINGEY
Tottenham
Walthamstow
WALTHAM FOREST
REDBRIDGE
Hendon
Harrow
Hornsey
Wanstead
Ilford
Leyton
Hampstead
CAMDEN
Stoke Newington
HACKNEY
Islington
ISLINGTON
BRENT
Wembley
Willesden
Camden Town
Hackney
Stratford
NEWHAM
East Ham
Barking
BARKING & DAGENHAM
Finsbury
Bethnal Green
Bow
West Ham
Shoreditch
Marylebone
City of London
CITY
TOWER HAMLETS
Stepney
Poplar
EALING
Ealing
Acton
Paddington
KENSINGTON & CHELSEA
HAMMERSMITH & FULHAM
CITY OF WESTMINSTER
Canary Wharf
Isle of Dogs
Woolwich
Lambeth
Bermondsey
Chelsea
Brentford
Chiswick
Battersea
Camberwell
SOUTHWARK
Deptford
Greenwich
GREENWICH
HOUNSLOW
Barnes
Fulham
Brixton
Lewisham
BEXLEY
Isleworth
Putney
Clapham
LAMBETH
Richmond
Wandsworth
LEWISHAM
Catford
WANDSWORTH
Twickenham
RICHMOND UPON THAMES
Streatham
MERTON
Teddington
BROMLEY
KEY
ULEZ extension to the North and South Circular Boundary from 25 October 2021
Central London ULEZ from 8 April 2019 and Congestion Charge
North and South Circular boundary road is not charged


Transport for London
Congestion charging
Central ZONE
Mon - Fri
7 am - 6.30 pm
Zone ENDS

The congestion charge

- The **London congestion charge** is 15.50 British pounds (up from 5.00 in 2003), charged on most motor vehicles driven in the Congestion Charge Zone (CCZ)[1]in Central London 7:00 am and 6:00 pm Monday to Friday, and 12:00 noon and 6:00 pm Saturday and Sunday.

- In 1995, the London Congestion Research Programme concluded that the city's economy will benefit from a congestion charge.

- The Road Traffic Reduction Act 1997 required authorities to reduce traffic volumes and future London mayors were given the power to introduce "Road user charging" by the Greater London Authority Act 1999.In his manifesto for the 2000 London Mayoral election, Ken Livingstone proposed a £5 charge for vehicles entering central London.

Praise

- In November 2003, *Scientific American* listed Ken Livingstone as one of the top 50 visionaries building a better world and contributing most to science and technology during the year.

- They praised the mayor for his "guts and leadership" in introducing the charge which had reduced traffic and his "courage" in combating a classic case of externality, i.e. "the exploitation of common resources by some people at the expense of others".

- They noted that other cities were now considering similar projects.

Expected benefits

- The scheme was expected to reduce through traffic, reduce congestion both within and outside the zone, improve the speed of buses and the quality of life in central London.

- Improved traffic flows would make London more attractive to business investment.

- Substantial net revenues to be invested in London's transport system.

- 90% of those who responded to the scheme, viewed reducing traffic congestion in central London as 'important'.

Results

- On launch day, an extra 300 buses (out of a total of around 8,000) were introduced.

- Over the first month traffic was consistently down at least 15% on pre-charge levels, with the second week seeing the reduction drop to 20%.

- Some shops and businesses are reported to be heavily affected by the charge, both in terms of lost sales due to reduced traffic and increased delivery costs, as recognised by the London Chamber of Commerce

- Cars and delivery vehicles entering the central zone was 60,000 fewer than the previous year.

- 50–60% of this reduction was due to switches to public transport, 20–30% to journeys avoiding the zone, 15–25% switching to car share, and the remainder to reduced number of journeys, more travelling outside the hours of operation, and increased use of motorbikes and bicycles.

- Journey times were 14%.lower .

- 4,000 fewer people visited the zone daily.

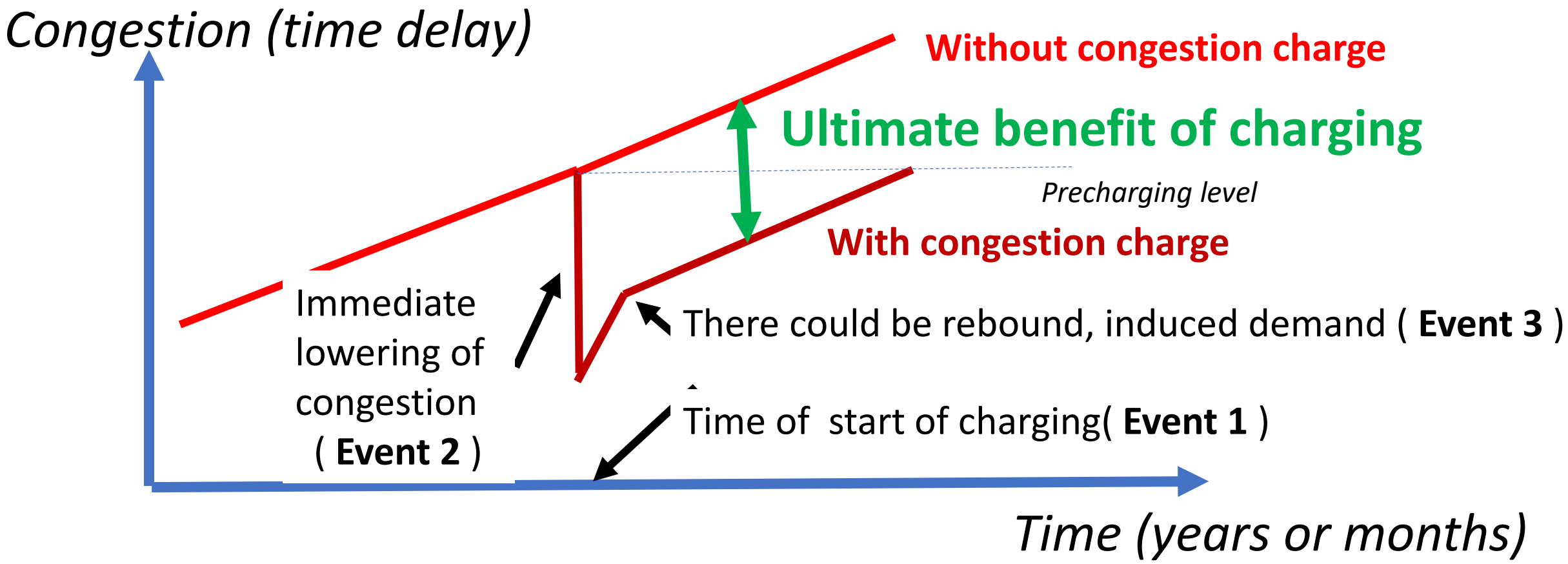
- The charge was responsible for only a small fraction of the 7% drop in retail sales reported.

- By comparison, the initial seven-month trial in 2006 of the Stockholm congestion tax in the Swedish capital saw an average 25% reduction in traffic numbers.

- In May 2007, a survey of 150 local businesses stated they had seen an average drop in business of 25% following the introduction of the charge. **Transport for London** disputed the findings, stating that there had been "no overall effect" on business and that business in the Central Zone had outperformed the rest of the UK in the central zone during 2006.

- In February 2013, Transport for London reported a 10% reduction in traffic from baseline conditions. The scheme contributed to an overall reduction of 11% in vehicle kilometers in London between 2000 and 2012.

While levels of congestion in central London are close to pre-charging levels, traffic would be worse without the Congestion Charging. (Transport for London)



Effects on air quality

- In 2007, the *Fifth Annual Monitoring Report* stated that from 2003 to 2006, NO_X emissions fell by 17%, PM10 by 24% and CO_2 by 3%, with some being attributed to the effects of reduced levels of traffic flowing better, with the majority being as a result of improved vehicle technology.

- The fall in CO_2 has been almost 20% as of 2007.

Effects on accidents

- Of the reduction from 2,598 personal injury crashes inside the zone in the year before the scheme to 1,629 by 2005 Transport for London estimated that some 40 and 70 injuries may have been avoided annually due to the introduction of the charging zone, with most of the remaining reduction attributed to other changes to the road network.

Revenue & profitability

- For 2017–18 revenues from the congestion charge were £229.8m representing 4.3% of annual revenues of Transport for London. A quarter of this was spent on the cost of running the toll system. The congestion charge brought in an annual operating net income of £155.9m for Transport for London.

- This income compares with TfL's total revenue that year from bus and tube fares of £4.319 billion.

- From 2003 to 2013, gross revenue reached £2.6 billion, of which, over £1.2 billion (46%) has been invested in transport, £960 million on improvements to the bus network; £102 million on roads and bridges; £70 million on road safety; £51 million on local transport/borough plans; and £36 million on sustainable transport and the environment.

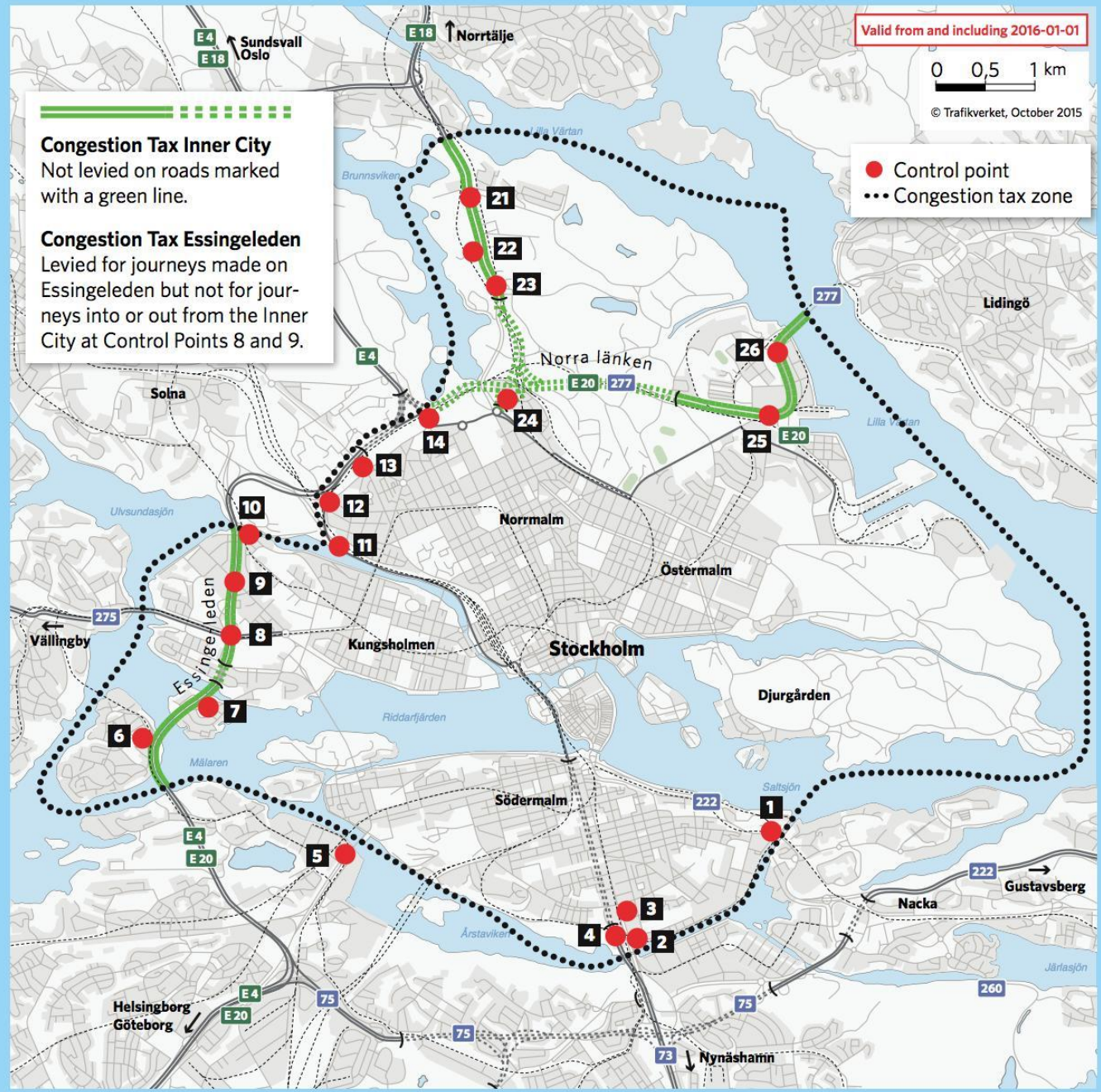
Basic sources for more detailed information

- London congestion charge – Wikipedia
- London’s congestion charge and its low emission zones (oecd.org)

Stockholm

- The **Stockholm congestion tax** (Swedish: *Trängselskatt i Stockholm*), also referred to as the **Stockholm congestion charge**, is a congestion pricing system implemented as a tax levied on most vehicles entering and exiting central Stockholm, Sweden.

- The congestion tax was implemented on a permanent basis on August 1, 2007, after a seven-month trial period between January 3, 2006 and July 31, 2006



The map shows where the limits are for the congestion tax zones. The red dots indicate where the control points are located.

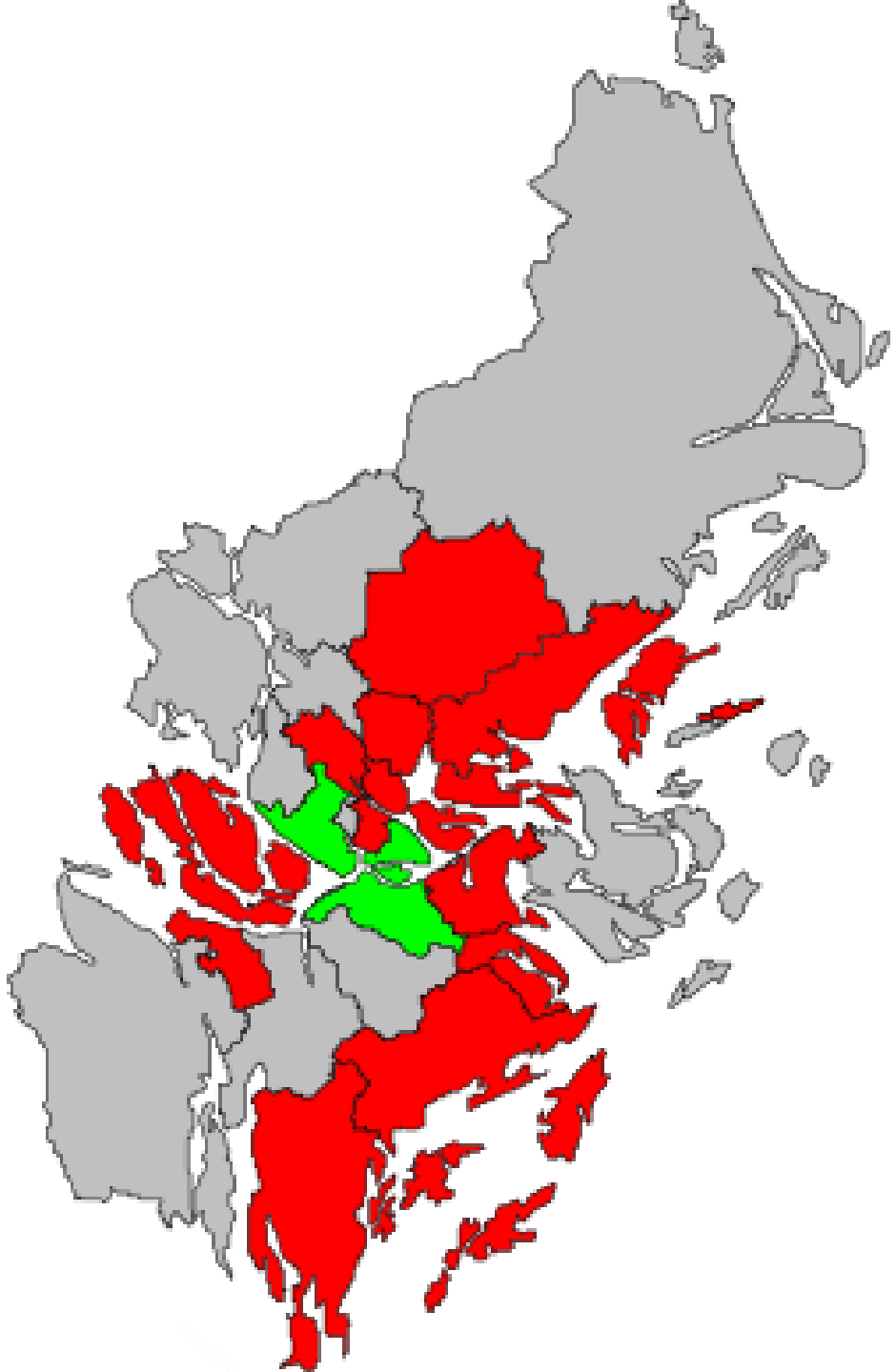
Trial period and referendum

- During the trial period, public transport in the City of Stockholm was improved and residents of Stockholm voted 53% to 47% in favor of the congestion tax, but all outside areas voted against. **In aggregate 47.5% were in favor and 52.5% were against.**

- The tax was implemented (giving more weight to Stockholm residents) with funds from the tax to be used to build and improve roads around Stockholm.

- The tax varies by time of day from 1.6 euros to 3.2 euros and is paid upon both entering and exiting the charging area.

- The congestion tax is deductible from taxable income.



Map showing the results of the referendum in each municipality.

GREEN: 'Yes'-majority.
RED: 'No'-majority.
GREY: No referendum held.

Annual Stockholm congestion index from 2006 when the congestion tax was first applied

Basic sources for more detailed information

- Stockholm congestion tax - Wikipedia

- Wayback Machine (archive.org)

Milan

- **Area C** is a congestion charge area in the city center of Milan. It was introduced in 2012, replacing the previous pollution charge Ecopass and based on the same designated traffic restricted zone. The area is about 8.2 km^2 (3.2 sq mi) with 77,000 residents (4.5% and 6% of the city total, respectively) and is accessible through gates monitored by traffic cameras.

- The objective to reduce traffic, promote public transport, and decrease the smog in the city.

- All net revenues from the system are used to promote public transport and sustainable mobility.

- Like its predecessor Ecopass, the congestion charge was highly criticized, although it decreased vehicle entrances into the city by about 30%, increased average speeds of buses, and reduced levels of pollution.

Area C traffic restricted zone (ZTL)

- The charge is on vehicle entering, Monday to Friday from 7:30 am to 7:30 pm, except on Thursdays, when it is free after 6 pm.

- Every vehicle entering pays €5 regardless of its pollution level. Residents of the zone also pay, but they have 40 free accesses per year and a discounted fare of €2.

- Access to the area is forbidden for diesel Euro 3 or below, gasoline Euro 0, and private vehicles over 7 m (23 ft) long. Electric vehicles, motorcycles and scooters, public utilities' vehicles, police and emergency vehicles, buses and taxis are exempt Hybrid electric and bi-fuel natural gas vehicles (CNG and LPG) were exempt until 1 January 2013. This was later extended until the end of 2016[15] and later to September 2022

Basic sources for more detailed information

- Milan Area C – Wikipedia
- Wayback Machine (archive.org)

Lower Manhattan

- In 2024, the MTA will start charging motorists a fee to drive into New York City's crowded midtown Manhattan.

- The aim of the congestion pricing plan, the first in the US, is to reduce traffic and pollution while raising **$15 billion** for the city's subways, buses and commuter rails.


60th St
Potential Zone Pricing Boundary
Does Not Include FDR Drive North of the Brooklyn Bridge

Basic sources for more detailed information

- NYC congestion pricing plan: zone, map, everything to know (fastcompany.com)

- Congestion pricing in New York City - Wikipedia