

GREEN & HEALTHY STREETS

**How C40 cities are
implementing zero
emission areas**



C40 Cities connects 96 of the world's largest and most influential cities committed to taking bold climate action to create a healthier and more sustainable future for all. Representing 700+ million citizens and one quarter of the global economy, mayors of the C40 cities are committed to delivering on the most ambitious goals of the Paris Agreement at the local level, as well as to cleaning the air we breathe.

This guidebook is produced with the support of the Transformative Urban Mobility Initiative (TUMI). TUMI is the leading global initiative on sustainable mobility implementation that is formed through the union of 11 prestigious partners. TUMI supports mobility projects globally and supports city-level policy-makers with the tools to enable them to make decisions that positively transform mobility in their cities. We believe in a future that allows all citizens access to Sustainable Urban Mobility.

www.transformative-mobility.org



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EXECUTIVE SUMMARY

As at Spring 2020, 35 global cities have set out to establish a significant area of their city as zero emission by 2030 as part of their commitment to the C40 Green and Healthy Streets Declaration.

This document analyzes the approaches being taken by some leading cities to implement a zero emission area (ZEA). Designating a significant area of the city as “zero emission” by 2030 will require holistic and multi-faceted thinking and a timetable of strategic actions designed to shift the whole urban system onto a zero emission trajectory.

We have two main audiences in mind for this analysis: decision-makers in signatory cities who are interested in comparing approaches and ambitions in other cities; and those in non-signatory cities who are contemplating signing the C40 Green and Healthy Streets Declaration and are seeking inspiration on how they might achieve those commitments.

To achieve a ZEA by 2030, cities are already working on interventions in 2020. Four distinct implementation progressions are emerging:

Street based pilots: A hyperlocal initiative in which very strict access restrictions are introduced on a few streets from 2020 onwards with an expansion programme towards 2030. **Examples: Oxford**

District-scale design: A plan to transform an entire area, beginning in 2020. A timetable of significant interventions to support shifts towards public transport, walking and cycling which ultimately will lead to less overall vehicles in the area by 2030. **Examples: Oslo and Auckland**

Vehicle regulation cordons: Concentric cordons of urban vehicle access restrictions (UVARs), with the strictest regulations at the centre, are being introduced. Dirty vehicles are being phased out and cleaner vehicles phased in. By 2030, a clearly cordoned area of the city will permit zero emissions vehicles only. **Examples: London, Milan, Seoul and Barcelona**

Timetable to a ZEA in 2030: a published pathway and timeline of interventions for the area to 2030. **Examples: Amsterdam**





**Foreword by Mark Watts,
Executive Director C40 Cities**

Urban planning that prioritises private cars over everything else creates gridlocked cities in which pollution-belching vehicles poison the lungs of people forced to share the streets with them. It's also a system that perpetuates inequalities by excluding anyone who can't afford to run a motor vehicle.

A quarter of global premature deaths are caused by some form of human-induced pollution; those same emissions are a major contributor to the climate breakdown that poses even bigger risks to human health and well-being.

But instead of choking urban life, we can transform the streets to make them work for people, creating liveable streets where citizens can enjoy clean air and quiet roads. To date, 35 mayors have signed the C40 Green and Healthy Streets Declaration, committing to people-friendly planning policies and accelerating the shift to zero-emissions vehicles.

What is so significant about this declaration is the diversity of cities that have signed. If Barcelona, Seoul, Seattle and Mexico City can establish a zero emission area by 2030 – cities of vastly different size, location and history – there is no reason for any city to hold back from adopting people-centred policies. At the same time, the ambition of a zero emission area by 2030 sends the signal to all vehicle manufacturers that cities are demanding emission free products and services.

The future of our cities is not one powered by fossil fuels. Any business who ignores that reality will be left behind.



**Foreword by Daniel Moser,
Management Head at Transformative
Urban Mobility Initiative (TUMI) GIZ**

All around the world, city mayors are taking bold action to transform urban mobility to deliver a better future for humanity empowered by strong and clean mobility.

TUMI is proud to support C40 Cities and is pleased to provide support in the compilation of this knowledge document which details how leading city signatories of the C40 Green and Healthy Streets Declaration are planning to establish a major area of their city as zero emission by 2030.

If a city manages to improve the quality of its streets by converting them into inclusive, healthy and attractive spaces, the additional benefits that flow from such a shift are remarkable: millions of pollution-related premature deaths avoided each year; economic growth from thriving communities; money saved from health budgets as public health improves thanks to more active lifestyles; less inequality between rich and poor neighbourhoods, and reduced greenhouse gas emissions.

This is the joint vision of thriving cities with enhanced economic, social and environmental performances in line with the New Urban Agenda, the Agenda 2030 and the Paris Agreement.

At the TUMI partnership, we are united in one goal: changing mobility for the benefit of people and the environment by enabling policy makers to transform urban mobility. We believe in sustainable mobility for a better future.

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ZEA VISION



INTRODUCTION

THE GREEN AND HEALTHY STREETS DECLARATION

In 2017, C40 Cities launched the Green and Healthy Streets Declaration (GHS). As of September 2020, the Declaration has been signed by 35 global cities.

Cities commit to two transformative actions that can shift cities onto the right trajectory and reduce emissions from urban mobility at the scale required to meet the ambition of the Paris Agreement:

- 1. Procure, with our partners, only zero emission buses from 2025**
- 2. Ensure a major area of our city is zero emission by 2030**

This document focuses on the second commitment – to *establish a significant area of the city as zero emission by 2030* – and explains how various C40 cities are planning to implement these areas by 2030.

THE ZERO EMISSION AREA COMMITMENT

Achieving a zero emission area requires a package of mobility measures delivered in a coordinated and ambitious way within a deadline of 2030. All cities are implementing policies and incentives which promote the following outcomes:

- Significantly more trips by walking and cycling
- Public transport priority and connectivity
- Less vehicles overall in the area
- Increasing the take up of zero emission vehicles and phasing out fossil fuel vehicles

The shift towards zero emission mobility will not only reduce greenhouse gas emissions, it will result in less congestion, quieter cities, cleaner air, healthier spaces and safer roads.

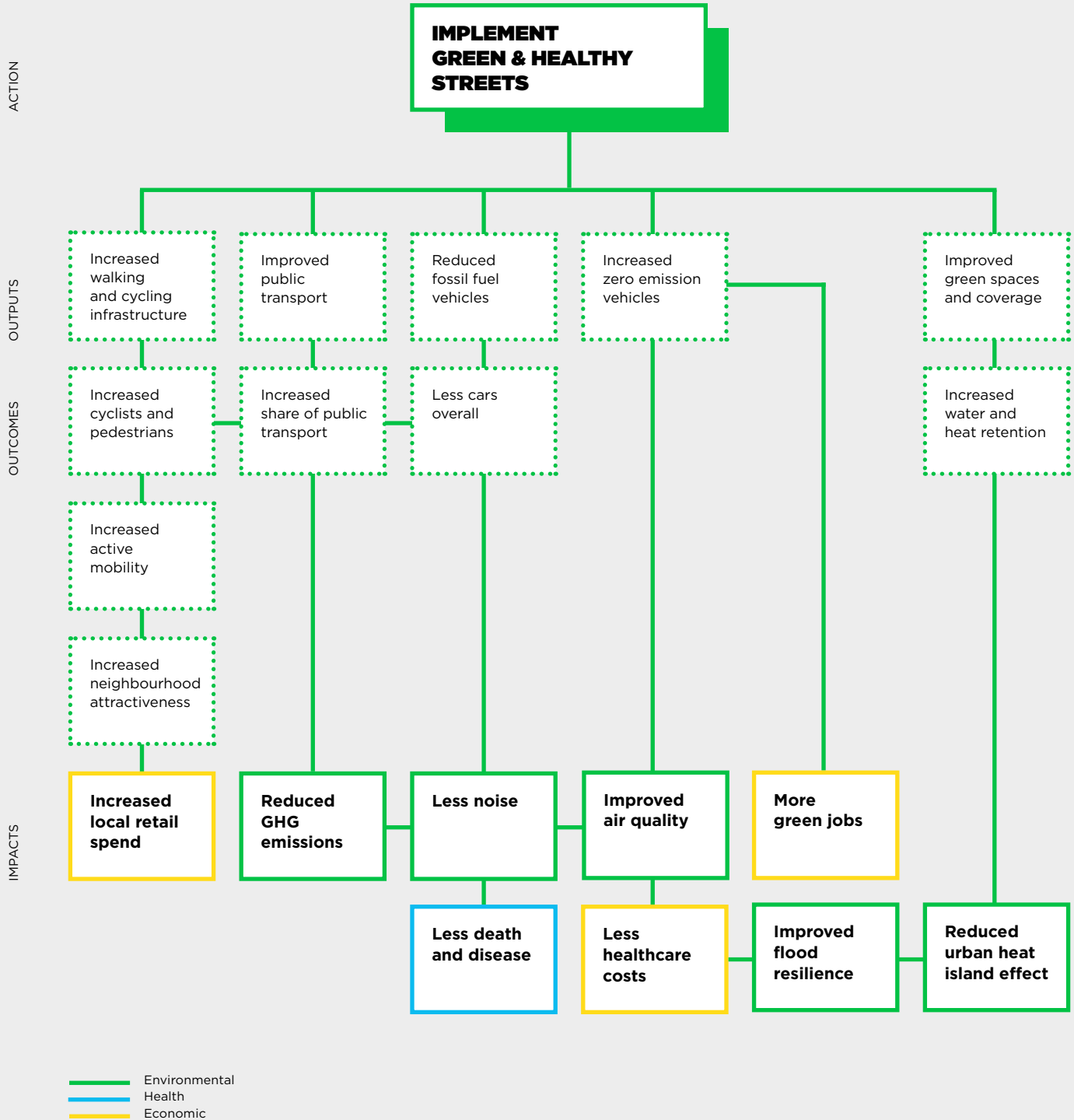
The ZEA commitment is transformative: catalysing the potential for mobility shifts which will improve the quality of life for all citizens, deliver local economic gains and help tackle the global climate crisis.

WHY ARE MAYORS CAMPAIGNING FOR ZERO EMISSION AREAS?

Zero emission areas bring health, equity, local economy, safety and security as well as environmental benefits.



Pathway showing the causal chain between an action (Green and Healthy Streets), its outputs, outcomes, final impact on the environmental, health and economic systems, and case studies.



LIMA

Lima's pedestrianisation of the historic city centre led to 60% less car traffic and 23% more pedestrians.

MEDELLIN

Medellin's Green Corridors help to reduce average city temperatures by 2°C and improve air quality.

QUITO

Switching 1,200 old buses to electric will mean 100,000 TCO₂e avoided per year.

MEXICO CITY

189,600 car trips and thus 360t of CO₂ emissions were avoided annually following Mexico City's investment in cycle parking facilities.

PARIS

Establishing a completely zero emission area within the Paris Ring Road would lead to 385 premature deaths avoided per year.

BARCELONA

The noise reduction from Barcelona's Superblocks could avert an estimated 160 preventable cardio vascular deaths.

LIMA

Pedestrianising the historic city centre would result in one additional year of life expectancy per citizen.

MEDELLIN

Achieving 100% clean buses by 2030 would lead to 60 additional days of life expectancy per citizen.

JAKARTA

Switching the public transport fleet to EV buses would achieve 100 less hospital admissions per year.

LOS ANGELES

Growing the publicly available charging infrastructure in Los Angeles by 2025 would create 1,500 new jobs.

LONDON

In London, walking and cycling investments in high streets and retail centres boosts spending by 30%. Cycle parking delivers 5 times the retail spend per square kilometre than the same area of car parking.

LOS ANGELES

Public transport investments will reduce time spent in traffic by 15% per day by cutting 5 million vehicle miles that would otherwise be traveled.

MEXICO CITY

The potential net present benefits of Mexico City's bike lanes total more than US\$65 million. This is almost 6 times the original cost of the cycling infrastructure.

LONDON

Encouraging Londoners to walk and cycle for 20 minutes every day would save a potential £1.7bn in health cost over 25 years.

ZEA CONCEPT



ZERO EMISSION AREAS CONCEPT

A ZEA is a multi-faceted intervention that seeks to create a space where:

- **There are fewer vehicles overall**
- **All trips are zero emission**

In all cities, a zero emission area is delivered as a package of mobility measures, often by tying together several existing mobility projects with a coordinated and ambitious approach within a deadline of 2030. By doing so, cities can reduce their greenhouse gas (GHG) emissions from mobility in line with the goals of the Paris Agreement.

WHAT TYPES OF TRIPS ARE DEFINED AS “ZERO EMISSION”?

For the purposes of ZEAs, “zero emissions” means “zero tailpipe GHG emissions from buses, trucks and cars”. This framing was selected and endorsed by the leading signatory cities to the Green and Healthy Streets Declaration to ensure it would encourage the most significant improvements in both air quality and carbon reduction.

Although the definition is intentionally technology-neutral, the only vehicle technologies currently on the market that are zero emission at tailpipe are hydrogen fuel cell (HFC) or battery-electric vehicles (BEVs).

Although lifecycle emissions from both HFC and BEVs depend on how the hydrogen and the electricity are generated, they offer the potential for a dramatic reduction in lifecycle emissions as electricity generation is decarbonised.

Significantly, other sustainable modes of travel that do not create tailpipe GHG emissions such as walking, bicycles, electric cargo bikes and so on are also included in this definition. Further information on how GHS signatories define “zero emissions” can be found in the technical note at Appendix A.

ZEMISSION AREAS: PILOTING THE FUTURE WE WANT

ESTABLISHING ZEAS PROVIDES DEMONSTRATION PILOTS FOR A CLIMATE SAFE MOBILITY SYSTEM

C40 mayors are delivering a climate safe future. This requires significant shifts in urban mobility to create a system of zero emissions, greener streets, healthy air, quieter roads and cleaner urban transport. The process of establishing a ZEA creates a pilot or testing ground for temporary interventions: a space to explore the impact of interventions, experience and measure the benefits of changes, and a focal point for collaboration with citizens, businesses and other partners. A ZEA is a space where a city demonstrates the multi-faceted urban mobility transformation in a single, well-defined area and how this transformation could improve public health, wellbeing and equity. The intention is that successful interventions can then be expanded and replicated across the city.

ZEAS WILL HAVE A NETWORK EFFECT ON THE WIDER CITY

ZEAs are “transformation pockets” which will increasingly influence mobility shifts and traffic reduction, and encourage more zero emission mobility choices across the broader city as they are established, replicated or expanded. For example, a ZEA might affect how people decide to get to and from that area and influence what types of vehicles enter or pass through it. Through these mechanisms, ZEAs have the potential to create both direct and indirect network effects on mobility decisions in the wider city.

ZEAS ARE OPPORTUNITIES TO PRIORITIZE AND INCREASE WALKING AND CYCLING

Creating a zero emissions mobility system requires a significant increase in the proportion of journeys made by walking and cycling, and reallocation of road space towards these modes of transport. By rebalancing the urban realm, ZEAs allow for trials of walking and cycling solutions, and improved connections to mass transit, as replacements for vehicle traffic. The multiple benefits of these interventions should be highlighted and explained, whether they relate to public health, air quality improvements, improved public space, greater equity and socio-economic prosperity.

ZEAS ARE OPPORTUNITIES TO PRIORITIZE PUBLIC TRANSPORT AND TRANSIT-ORIENTED DEVELOPMENT

Establishing a ZEA requires mass transit solutions to be prioritized. ZEAs offer an opportunity to shift the balance of urban space towards transit-oriented development – including connections to public transport using walking and cycling – and to reduce reliance on private vehicles. The benefits of transit-oriented placemaking interventions should be highlighted, including links between renewed public space and economic prosperity, as well as the improvements in public health and air quality.

ZEAS ARE OPPORTUNITIES TO INCREASE THE USE OF ZERO EMISSION VEHICLES

As part of designing and implementing a ZEA, cities can learn from local stakeholders about the demand and supply of zero emission vehicles within the pilot area. With this understanding, decision-makers can develop strategies and policies that accelerate the use of zero emission vehicles in the city, in public transport, freight and taxi fleets in particular. A ZEA is also an opportunity to demonstrate an alternative vision of a city where only zero emission vehicles operate, one which is quieter, and the air is cleaner.

ZEAS ARE OPPORTUNITIES TO ADVANCE ZERO EMISSION FREIGHT

A sustainable future for urban freight must come from two angles: more zero emission vehicles, and fewer unnecessary vehicle miles. ZEAs provide an opportunity to engage the freight and servicing industries around demonstration pilots and possible challenges and solutions (e.g. EV model availability, EV charging infrastructure, last-mile delivery models, kerbside loading/unloading). Cities and operators can focus attention on the proposed design and regulation for the area and experiment together on solutions that contribute to the placemaking aims of the ZEA. By collaborating on the ZEA, they are also creating a context for a broader discussion on the pathways and obstacles to achieving zero emissions freight in the future across the city.

ZEAS ARE COMMUNITY ENGAGEMENT TOOLS

Public and stakeholder engagement will be critical to the ambition of achieving a completely zero emission area by 2030. To engage the community and make the case for ZEAs it will be important to articulate the anticipated benefits of a systemic change towards greener, healthier more prosperous cities. Moving towards a ZEA by 2030 provides an opportunity for cities to anticipate, measure, evaluate and ultimately provide evidence of the benefits of ZEA interventions. The process will present opportunities for tactical urbanism and projects that demonstrate the benefits of ZEAs will help gain buy-in from stakeholders. This in turn will support replication and expansion in the future.

MAYORAL DELIVERY

Mayoral powers, mandates and functions vary widely amongst C40 cities, and the commitments of the Green and Healthy Streets Declaration will be delivered through different strategies in different cities.

Many mayors have some authority over city roads and bus assets, and several have regulatory power over certain fleets, such as taxis. Yet for other mobility assets – like private vehicles or bicycles – cities’ powers are usually more limited. For example, they may only be able to regulate parking, or designate the amount of road space made available.

To give a sense of the range of mayoral powers, we’ve outlined six different types of mayoral influence in the figure below. Most city mayors are able to exert some or all of these types of power, to some degree, to build a city’s capacity for climate action – for example, by creating a ZEA.

C40 research¹ shows that stronger mayoral powers do not necessarily lead to more climate action, or air-quality action in a city. Cities with more limited mayoral power, or powers that might be considered “weaker” such as vision setting, have shown they can drive positive city-wide changes, including ZEAs. These cities are working at scale, using innovative approaches to encourage other actors to join them in climate action where they cannot necessarily take direct action themselves.

In fact, most cities collaborate with an array of partners to multiply their influence and impact. These might include national and state governments, civil society, intergovernmental institutions, the private sector and academia. For instance, a city might collaborate with national government on the implementation of a vehicle emissions regulation scheme or work with the freight industry on a zero emission vehicle pilot scheme. By finding and working towards shared goals, mayors and partner-organisations are able to achieve more than either could alone.

TYPE OF POWER	EXPLANATION	EXAMPLES
Commanding power	A mayor uses regulation and enforcement to create change and enact policy.	Shifting the city taxi fleet towards zero emission vehicles using licence regulation or prioritising curbside or area access for zero emission vehicles during peak loading times.
Implementing power	A mayor acts through the delivery of a project or programme.	Making significant interventions to the urban realm to prioritize pedestrians, cyclists and access to transit or establishing an electric vehicle (EV) fast-charging hub for taxis to accelerate the take up of EVs by taxis.
Providing power	Mayoral influence is characterised by a high level of control over service delivery.	Committing to electrify the municipal fleet by a certain date or implementing preferential procurement regulations which favour service providers with zero emission offerings.
Legislating power	A mayor achieves progress by setting policy and legislation that requires others to act.	Setting building regulations for new developments which will support a ZEA such as setting a maximum number of parking spaces or requiring residential EV charging spaces.
Collaborating power	A mayor commonly acts in partnership with other actors to leverage their respective powers.	Working with the local transit authority to set targets and break down barriers for the procurement of electric buses for the city fleet or working with local innovation incubators to better understand barriers to private sector transition.
Vision setting power	A mayor may sometimes have limited power to take action directly but still initiates change by setting a vision and making a political case for change. A mayor can create an attractive environment within which others can act.	Using the Mayoral profile to draw media attention to inequalities in the mobility system and draw clear links to the unfairness of air quality impacts or convening collaborative solution finding initiatives between businesses and academia around a vision for a ZEA.

ZEA IMPLEMENTATION PATHWAYS

As at Spring 2020, the Green and Healthy Streets Declaration has been signed by 35 global cities. All cities are implementing policies and incentives which will promote the following outcomes:

- Significantly more trips by walking and cycling
- Public transport priority and connectivity
- Less vehicles overall in the area
- Increasing the take up of zero emission vehicles and phasing out fossil fuel vehicles

There are four different implementation approaches emerging among cities. Some cities are combining different approaches in an overall strategy. Others are using these approaches as a pathway in itself, progressing from one stage to another as the ZEA matures.

The ZEA implementation pathway, there is constant engagement with communities, communicating and providing evidence of the benefits that a zero-emission area will have for the urban environment, for health and for the economy.

Cities are also investing in support for the accelerated take up of zero emission alternatives to assist citizens, businesses and stakeholders with the shift away from fossil fuel vehicles.

In the city case studies following, we have used the icons above to signal where, along the trajectory of ZEA implementation, a city is currently progressing.



Street-based pilots

- Improves walking and cycling infrastructure
- Experiments with freight access
- Engagement with stakeholders, businesses and citizens
- Establishes a flagship street



Establish vehicle regulation cordon(s)

- Reduces vehicles in the area
- Disincentivises dirtier and fossil fuel vehicles
- Incentivises take up of zero emission vehicles



Design the ZEA at a district scale

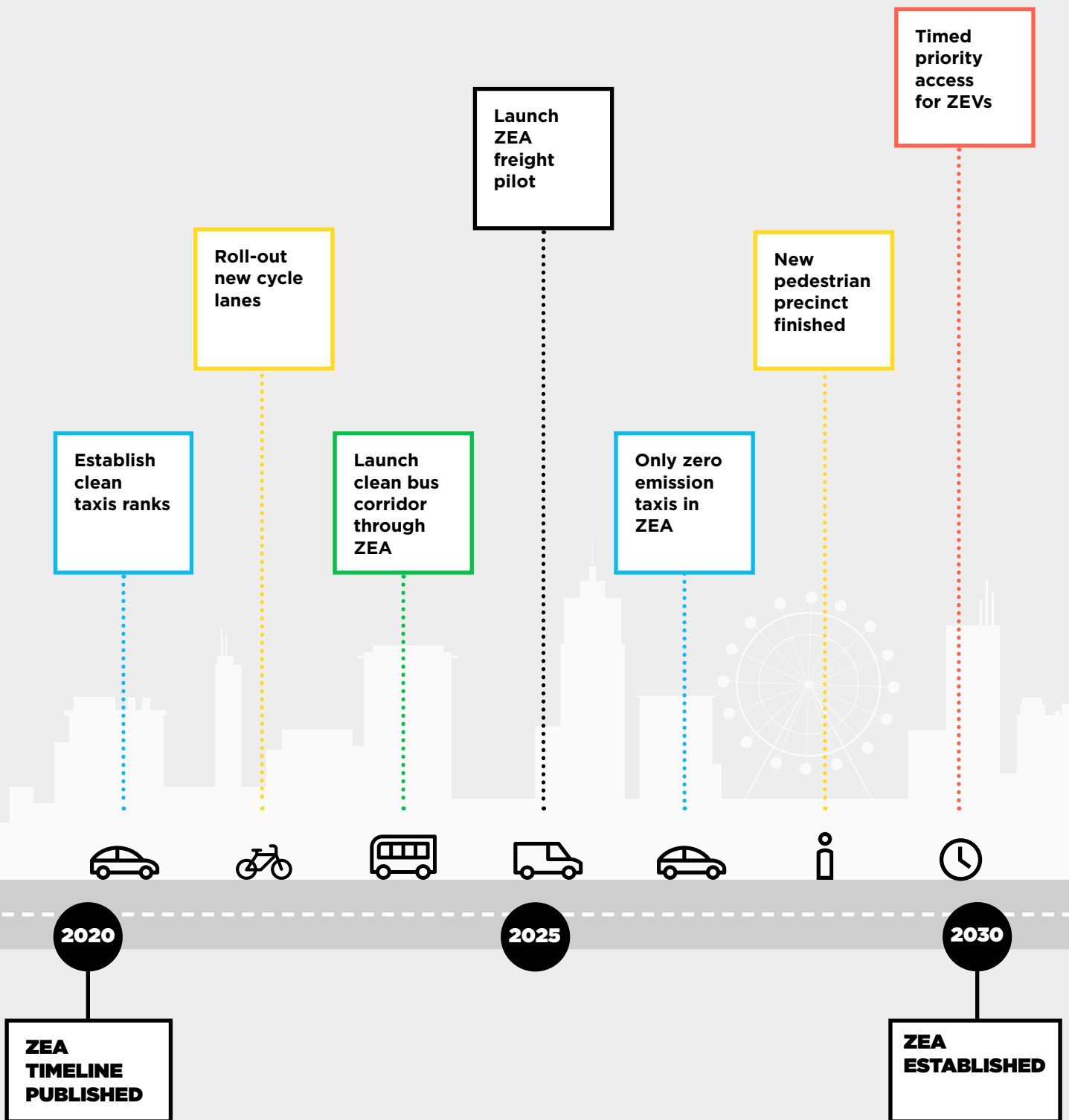
- Sets the scale of the ZEA
- Significantly improves walking and cycling infrastructure
- Increases public transport priority and connectivity
- Reduces vehicles in the area
- Engagement with stakeholders, businesses and citizens



Publish a clear timetable to achieve a ZEA by 2030

- Sets the vision for the ZEA
- Makes the pathway clear to stakeholders
- Establishes the deadline

Example of a Zero Emission Area implementation timeline.



CITY CASE STUDIES



ESTABLISHING AN AREA IN 2020

Amsterdam is well established as a global leader in prioritising walking and cycling and public transport trips, so is working from a strong base in its ambition to make a major area of the city a zero emission area by 2030.

In April 2019, Amsterdam published the *Clean Air Action Plan* with the aim of achieving emission free mobility by 2030 (i.e. the entire city of Amsterdam will be a zero emission area by 2030).

Amsterdam currently has five low emission zones where vehicles that cause the most pollution are banned. Over time, these zones will be expanded and regulations tightened. Increasingly they will become zero emission zones, and petrol, diesel or gas vehicles will not be permitted.

The first important milestone is, from 2020, vehicles with diesel engines are excluded from the city centre area.²

Between 2025 and 2030, Amsterdam will steadily expand the zones from the city centre so that all motorized traffic in Amsterdam will become emission free. This approach uses a concentric expansion that has already been successful for a low-traffic Amsterdam and the regulation of coaches. Furthermore, as an extra measure to eliminate upstream CO₂ emissions, all of the electricity and hydrogen required for transport in Amsterdam will be generated sustainably by 2030.



PLAN TO ACHIEVE A ZEA BY 2030

In the Amsterdam Clean Air Action Plan, the pathway to a zero emission city is summarized in two key milestones:

- **2025:** All traffic including taxis, passenger vehicles, pleasure craft and municipal ferries, but with the exception of private cars and motorbikes must be emission free within the A10 ring road.
- **2030:** All traffic within the built-up area must be emission free.

SUPPORTING ZERO EMISSION ALTERNATIVES

The Amsterdam Clean Air Action plan outlines the following approaches to achieve the policy ambition of emission free Amsterdam by 2030.

Communication. Clearly explain the importance of clean air and suggest ideas for personal action (*give people a sense of engagement with the possibilities*), including:

- A campaign to inform everyone of their role in creating clean air
- Making it easier to choose the clean option, with the municipality setting the right example

Stimulation. Make the transition to a clean alternative appealing (*the alternative is enticing*), including:

- Continued use of various subsidies to promote the affordability of emission free transport
- Using privileges to reward early adopters

- Area-specific measures for emission free traffic on a number of very busy streets where the air quality is particularly bad

Facilitation. Make the transition to a clean alternative possible (*the alternative is realistic*), including:

- Continued development of both a demand-driven EV charging network and intensifying charge-point installation in anticipation of demand
- Making the charging infrastructure smarter to increase the capacity of the EV charging network
- Increasing EV charging in car parks and at private locations

Regulation. Compel the transition to a clean alternative (*the stick as well as the carrot*), including:

- Intensification and geographic expansion of current environmental zones
- Introduction of a new environmental zone
- Introduction of emission free zones



The key milestones in Amsterdam's Clean Air Action Plan. In 2020, following the COVID-19 crisis, the Deputy Mayor in Charge of Air Quality and Mobility cancelled a plan to allow only zero emission buses and coaches in the inner city from 2022. Amsterdam's current zero emission milestones are reflected in the illustration above.

Source: [Amsterdam Clean Air Action Plan](#)

THINKING ABOUT ZERO EMISSION FREIGHT

In 2019, in the Netherlands, the National Climate Agreement defined a series of measures to be taken nationally to reduce greenhouse gas emissions by at least 49 per cent by 2030, with 1990 levels as the baseline. The Agreement set out a requirement that the 30–40 largest cities in the Netherlands introduce zero emission zones for freight by 2025 as one key action for sustainable mobility and logistics.

This requirement built on a voluntary Zero Emission City Logistics Green Deal in 2014, which was signed by a number of Dutch cities including Amsterdam, The Hague, Rotterdam and Utrecht and over 50 Dutch companies, and which was launched by the national government to foster partnerships in support of the same goal.

A 2019 research report – [Charging Infrastructure for Electric Vehicles in City Logistics](#) – looked in depth at the kind of charging infrastructure that would be required in a city such as Amsterdam if BEVs were used to make zero emission zones possible for city logistics.³

The research used data from CBS (Statistics Netherlands) on the vans and trucks entering Amsterdam’s low-emission zone, and the authors calculated where demand for charging points will probably be greatest. Estimates were also made of the projected impact on the power grid and required number of charging point. Based on these results, and the choices made, a vision emerges of where, when and how fast vehicle charging might take place, allowing grid operators and municipal authorities to develop plans in terms of both charging infrastructure and spatial planning.

Setting a long-term goal. All vehicles in the city emission-free in 2030.

Amsterdam is already an established cycling city and a frontrunner in the field of electric vehicles, and in the coming years efforts to promote these modes will be further intensified.

Amsterdam has a high ratio of charging infrastructure per capita. Residents who buy an electric car can apply for a charging station in their neighbourhood, and the municipality can provide extra charging stations. At present the majority of EV charging infrastructure

is on-street and EV drivers have priority for parking and loading spaces. For residents and companies that switch to EVs, there is support in the form of advice and/or subsidies.

“Dirty substances in the air cut more than a year from the life of every inhabitant of Amsterdam.”

Foreword by Sharon Dijksma, Alderman Air Quality, Amsterdam, Amsterdam Clean Air Action Plan (April 2019)

More information on Amsterdam:

Amsterdam Clean Air Action Plan Charging Infrastructure for Electric Vehicles in City Logistics (2019)

EV Charging Infrastructure: A quick guide for cities – a joint 2020 report from C40 and the International Council on Clean Transportation on Amsterdam and other cities’ investment in EV charging infrastructure to support the take-up of zero emission alternatives



ESTABLISHING THE AREA IN 2020

In 2019, Auckland completed public consultation on its City Centre Masterplan refresh, which included the Access for Everyone (A4E) concept, a new idea to create more space.

The concept for the area is rooted in reallocating street space in favour of people, operations and street functions and reorganising access to prioritize trips needed to support the city centre, such as deliveries, construction and emergency services.

A4E takes a holistic, proactive approach to Auckland's city centre operations, bearing in mind that the city centre is a system, and changes in one place will affect others.

A4E introduces a new traffic circulation system where private vehicles would access city centre zones from the main highways at the edge of the city rather than using small local roads. It organizes the city centre into nine low-traffic neighbourhoods, including a pedestrian-priority zone in the Waihorotiu-Queen Street Valley. The plan prioritizes access *to* the city centre, not *through* the city centre, and makes space for current and proposed public transport infrastructure which will support the rapidly increasing numbers of workers, residents and visitors in central Auckland and make streets more inclusive.

Central to A4E is a plan to create car-free transit streets, low-traffic neighbourhoods and a new traffic circulation system through which private vehicles access the city centre from major roads (motorways and Mayoral Drive) on the city's edges.

A4E plays a key role in delivering a ZEA in Auckland by establishing the physical street changes required to reduce the impacts



of road transport on city centre air quality. At this stage, A4E and the ZEA are high-level concepts; implementation plans are currently being developed.

PLAN TO ACHIEVE A ZEA BY 2030

Focusing on the city centre, Auckland plans to:

- Accelerate the transition to electric public buses, with all being zero emissions by 2030
- Complete the City Rail Link which will increase rail capacity to the city centre by 150 per cent
- Complete the Downtown Ferry Basin redevelopment to improve accessibility and greater operational flexibility. This will also help accommodate increased passenger numbers
- Investigate a low emission vehicle area as a transition to a ZEA



Access for Everyone (A4E) concept diagram: Auckland city centre with an indicative low-traffic neighbourhood surrounding a pedestrian-prioritized Queen Street Valley. Source: [Access for Everyone](#)

SUPPORTING ZERO EMISSION ALTERNATIVES

Auckland has a number of current and proposed interventions to ease, and speed, the transition to zero emission options:

- Encouraging the use of EVs by offering over 40 charging stations at public car parks
- Incentivizing car sharing companies to provide EVs by providing car parking and charging facilities in premium locations
- Continuing to deliver the cycling programme, including delivery of the 10-year Cycle Strategy, which encourages replacing car journeys with bicycle journeys
- Auckland Council is committed to replacing all retired fleet vehicles with an electric vehicle, where possible

“Let’s be clear, we are fundamentally changing how our city centre and its transport system works, we must take Aucklanders along with us on this journey of change.”

Councillor Chris Darby, Planning Committee Chair. Source: [Council’s bold city centre vision gets the big tick](#)

More information on Auckland

[Access 4 Everyone in Auckland](#)

Hyperlocal air quality monitoring will be used to evaluate the benefits of the ZEA in Auckland

Auckland is using air quality monitoring data to target and advocate for infrastructure and design changes in the city centre. Concentrations of hazardous air pollutants on Queen Street, the busiest shopping street in Auckland, are higher than other locations across the city. Furthermore, the city's data demonstrated spikes in poor air quality during morning and afternoon peak traffic hours but a prominent drop-off on the weekend.

A multi-layered air monitoring network across Auckland city centre is proposed, to monitor the changes once A4E is implemented. Two regulatory standard stations and 12 medium-cost, lamppost mounted monitors will be located near people counters to assess exposure suffered by pedestrians in the area. At the same time, the city will monitor noise and traffic volume.

Finally, a fleet of ultra-low-cost sensors are being developed to augment the lamppost fleet and create a dense network providing raw data points that give a fuller understanding of spatial and temporal changes in concentration levels.

This information will ultimately help to demonstrate the air quality improvements and related health and economic benefits of the interventions to achieve a zero emission area in Auckland.

ESTABLISHING AN AREA IN 2020

From 1 January 2020, Barcelona permanently established the low emission zone of the Ronda de Barcelona area (ZBE - Zona de Baixes Emissions, Rondes de Barcelona), an area of 95 square kilometres. This zone regulates the entry of vehicles which do not have an environmental badge issued by the Direcció General de Tràfic (DGT).⁴

The goal is to reduce environmental pollution and improve air quality and thus public health. It is part of a wider strategy to reduce polluting emissions by 30 per cent in 15 years.

The LEZ is projected to reduce nitrogen oxides (NO_x) and PM₁₀ emissions by up to 31 per cent and 39 per cent, respectively.

PLAN TO ACHIEVE A ZEA BY 2030

Over the next decade, Barcelona will increase the restrictions in the LEZ to gradually phase out fossil fuel vehicles.

SUPPORTING ZERO EMISSION ALTERNATIVES

The city of Barcelona offers several interventions to stimulate more sustainable mobility choices:

- Socially progressive fare pricing on public transport
- On-street parking discounts for EVs and discounts on the use of charging stations. Charging stations can be located via a dedicated app⁵
- Incentives for the purchase of low and zero emission vehicles. These cover professional drivers (i.e. taxi and freight) and private users⁶



- Graduated registration taxes on (for example) vehicles for the disabled, vehicles with more than nine seats, etc.⁷
- Discounts on the cost of motorway tolls, including:
 - 40 per cent discount on vehicles with high occupancy (3+ passengers)
 - 75 per cent discount on EVs
 - 30 per cent discount on low emission vehicles (e.g. plug-in hybrid)⁸
- A high occupancy bus lane to encourage use of public transport and sustainable mobility and also to reduce congestion on the Vallès motorway⁹
- Ongoing improvements to public transport, extending its cycle lane network, and shifting the fleet of municipal vehicles towards cleaner fuels
- From 2019 onwards, no further diesel taxi vehicles have been licensed in the Barcelona Metropolitan Area

The City of Barcelona is also pioneering an entirely new urban model based on the implementation of **Superblocks** – pedestrianized and pedestrian-friendly areas around the entire municipality.

Once complete, the Superblocks programme will convert 70 per cent of the city’s streets to pedestrian and cyclist priority, an increase from 74ha to 750ha of re-allocated urban space.

Each Superblock is a grid of roads, approximately 400 by 400 metres. Various features, within and outside its boundary, help to lay the foundation for establishing a ZEA in the interior. The streets within the

block are closed to motorized vehicles and above-ground parking, and pedestrian traffic is prioritized. The inner streets can be used by residential traffic, services, emergency vehicles, and loading/unloading vehicles under special circumstances, but pedestrians, cyclists and public space take precedence.

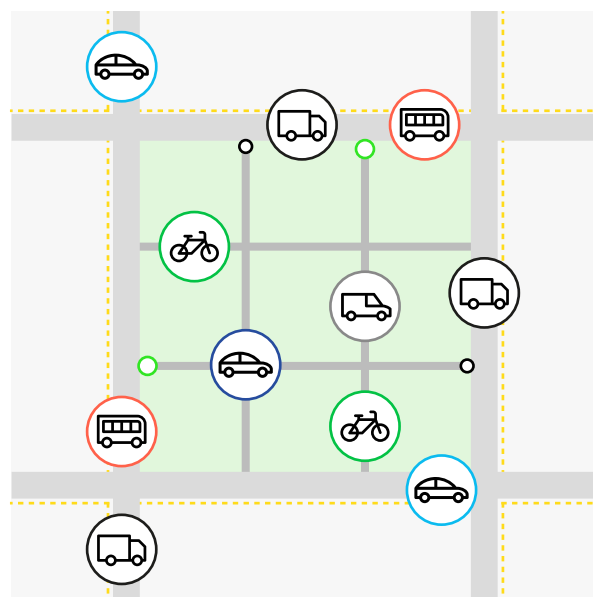
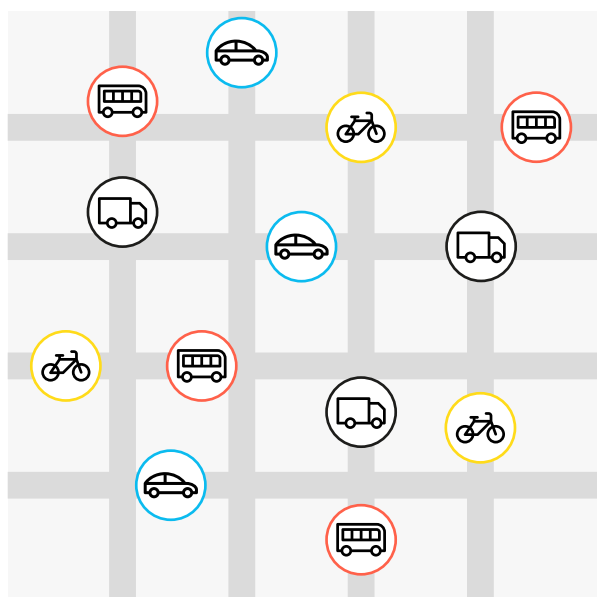
“The climate emergency is already a reality and we must all face it with courageous and ambitious proposals that prioritize people and health.”

Ada Colau, Mayor of Barcelona. In [We Have the Power to Move the World: A mayors’ guidebook on sustainable transport](#)

More information on Barcelona

[Superblocks model](#)

[Barcelona’s Low Emission Zone](#)



Current model

- Public transport network
- Private vehicles network
- Bicycle signposts (reverse direction)
- Dum carriers
- Basic traffic network

Superblocks model

- Single platform (pedestrian priority)
- Bicycles main network (bike lane)
- Resident vehicles
- Free passage of bicycles
- Urban services and emergency
- Dum proximity area
- Access control

Thinking about equity - Barcelona's T-green ticket for scrapping a vehicle

The City of Barcelona has found that restricting the most polluting vehicles affects people with higher incomes the most, as they have more vehicles and depend more on those private vehicles.

The 2016 Weekday Mobility Survey shows that households in lower-income neighbourhoods have fewer cars (even older ones) and use less cars and motorcycles than those in higher-income neighbourhoods.

If someone has a highly polluting vehicle - one which does not qualify for a "green label" from the DGT - the City of Barcelona offers a T-green ticket in exchange for (a) scrapping that vehicle and (b) not buying a new one for three years.

The T-green ticket entitles the holder to free public transport on all ATM (Autoritat del Transport Metropolità - *Metropolitan Transport Authority*) services. It is a free, three-year public transport pass for the entire metropolitan area.

The following vehicles are eligible for scrappage:

- Diesel cars usually registered before 2006
- Petrol or gas cars usually registered before 2000
- Motorcycles usually registered before 7 January 2004
- Mopeds usually registered before 17 June 2002

ESTABLISHING AN AREA IN 2020

London currently has two concentric cordons which regulate vehicles on the basis of their emissions:

- **The inner cordon** is the Ultra Low Emission Zone (ULEZ), an area of 22 square kilometres in central London. It is the same area in which London's Congestion Charge operates
- **The outer cordon** is the city-wide Low Emission Zone (LEZ) which covers the entire area of Greater London

London's Mayor Sadiq Khan introduced the ULEZ in 2019. The ULEZ is an emissions-based charge and uses a daily charging mechanism to disincentivize the use of more polluting vehicles. The disincentive charge is in place 24 hours, seven days a week and only vehicles which meet strict emissions standards are free from the ULEZ charge (although they may still need to pay the Congestion Charge).

Electric, hydrogen and (until 2021) plug-in hybrid vehicles are permitted free of charge (providing the hybrid vehicles meet the emissions standard for their petrol engine) in the ULEZ and a 100 per cent discount to the Congestion Charge also applies. Thus, zero emission vehicles effectively operate for free within this area.



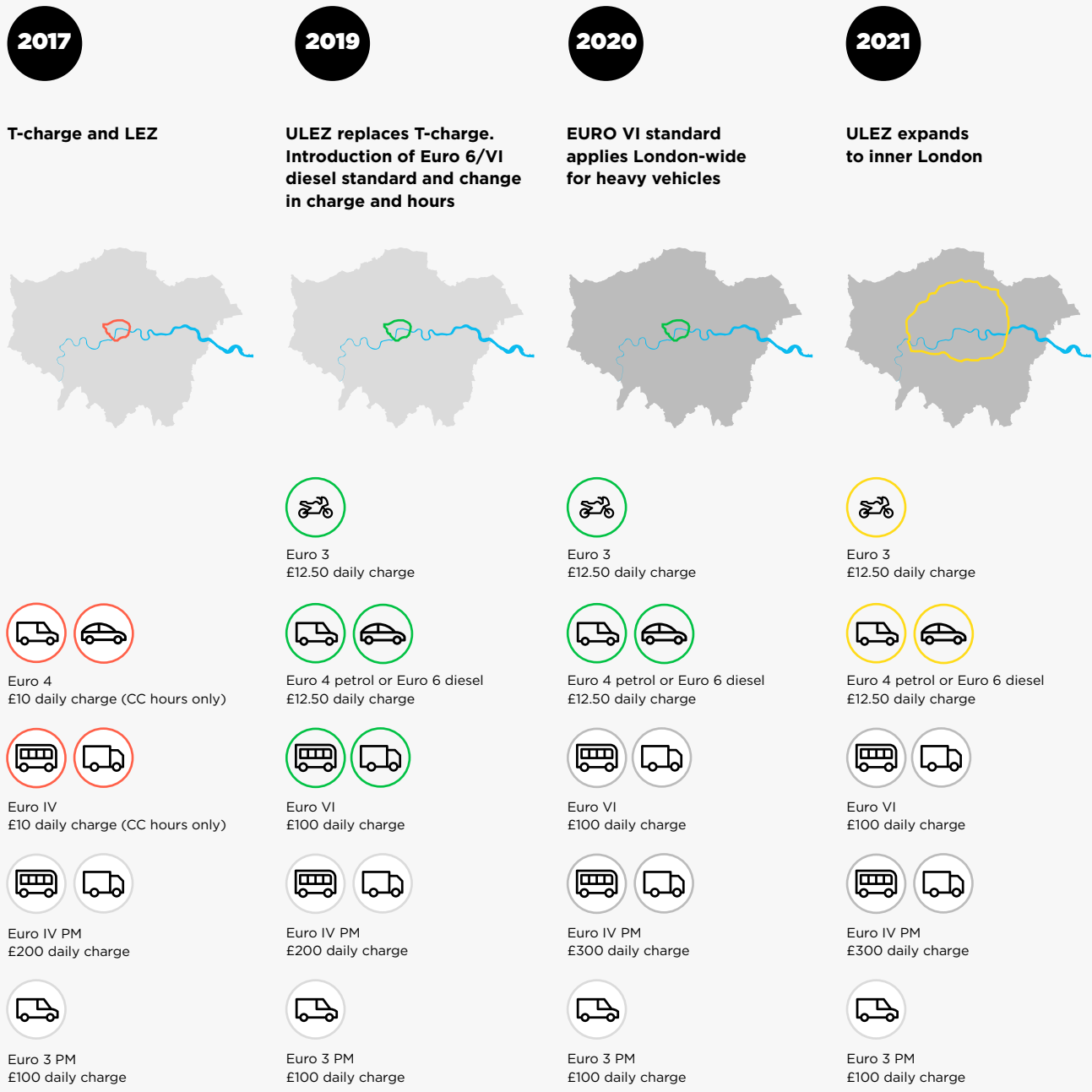
The Mayor has announced plans to expand the ULEZ to a larger area in 2021, representing an 18-fold increase in the size of the inner cordon for cars, vans and motorcycles. Plans to tighten the standards for the LEZ have been impacted by the recent COVID-19 crisis and TfL have delayed enforcement of the new standards for at least six months.

VEHICLES TYPE	CONGESTION CHARGE	ULEZ CHARGE	TOTAL DAILY CHARGE
Vehicles below ULEZ standard	£11.50	£12.00	£22.00
Internal combustion vehicles that meet or exceed ULEZ standard	£11.50	Not subject to charge	£11.50
Electric, hydrogen and compliant plug-in hydrogen vehicles	100 per cent discount applies	Not subject to charge	£0

Example of charges for vehicles within central London (7am-7pm).

The planned timetable of air quality schemes in London is illustrated in the diagram below.

Source: Transport for London (TfL) (2018). Mayor's Transport Strategy



PLAN TO ACHIEVE A ZEA BY 2030

The Mayor's London Environment Strategy (2018) and the Mayor's Transport Strategy (2018) set out the Mayor's goal that by 2050 London will become a "zero carbon city" and will have the best air quality of any

major world city, going beyond the legal requirements set by central government to protect human health and minimize inequalities. Since the ambition for a zero carbon London by 2050 can only be achieved if all vehicles are zero emission by that date, the Mayor's Transport Strategy sets

out a roadmap to achieving zero emission transport and to encourage the uptake of ultra-low and zero emission technologies. To deliver the ambition of zero emission transport, an increase in trips undertaken by walking, cycling and public transport will be required, with all remaining vehicle trips conducted with zero emissions.

Specifically, the Transport Strategy sets out the following targets – milestones on the route to achieving zero emission road transport by 2050:

- 80 per cent of all trips in London to be made on foot, by cycle or using public transport by 2041
- Reduction in overall traffic levels by 10–15 per cent by 2041
- Remaining vehicles on London’s roads to be zero emission by 2050, including:
 - All licensed taxis and private hire vehicles being zero emission capable by 2033
 - A zero emission bus fleet by 2037

Furthermore, the Mayor’s Transport Strategy sets out a commitment to introduce zero emission zones in London from 2020, including supporting the city’s boroughs to deliver local zones.

As part of this support, in 2019 TfL published [guidance for boroughs on zero emission zones](#) to enable them to take forward the proposal in a consistent London-wide approach. This includes guidance on different approaches to delivery, suggested standards and possible exemptions. It also provides advice around managing and engaging with freight operators and businesses when developing a zone.

SUPPORTING ZERO EMISSION ALTERNATIVES

Since 2018, every new taxi licensed in London has to be zero emission capable.¹⁰ There is a plug-in vehicle grant for taxis which shift to zero emission capable vehicles.¹¹

As of March 2020, London now has 73 rapid-charge points dedicated to taxis.

Furthermore, the Mayor of London established an Electric Vehicle Charging Infrastructure Taskforce, bringing together representatives from business, energy, infrastructure, government and London boroughs to publish recommendations around how, when and where to increase London’s electric vehicle infrastructure up until 2025. [The delivery plan is available here.](#)

A key output from the delivery plan has been the publication of [Electric Vehicle Charge Point Installation Guidance](#) by TfL. The guidance is aimed at city planners, engineers and other interested parties to help inform how best to implement and deliver charging infrastructure across London.

“This is an issue of social justice – with the poorest people often suffering the worst impacts of air pollution, despite driving the fewest cars.”

Sadiq Khan, Mayor of London.
[In We Have the Power to Move the World: A mayors’ guidebook on sustainable transport](#)

More information on London

[Mayors Environment Strategy \(2018\)](#)

[Mayors Transport Strategy \(2018\)](#)

[Guidance for boroughs on zero emission zones \(2019\)](#)

Results from the ULEZ in London

A 2019 impact evaluation¹² of the ULEZ six months after it was launched indicated that 13,500 fewer polluting cars were being driven into central London every day and there was a significant drop in harmful air pollution.

- Roadside nitrogen dioxide (NO₂) pollution had reduced by 36 per cent in the zone (measured from the date the Mayor publicly confirmed the policy and people started to prepare for the scheme). The reduction in NO₂ pollution solely attributable to the ULEZ from the date it was initiated is 29 per cent.
- No increase in NO₂ pollution at the ULEZ boundary roads.
- A large reduction in the number of older, more polluting, non-compliant vehicles detected in the zone: some 13,500 fewer on an average day, a reduction of 38 per cent.
- 77 per cent of vehicles in the zone meet the ULEZ emissions standards rather than pay the charge.
- A reduction in traffic flows in central London in May and September 2019 of between 3 and 9 per cent when compared to 2018, indicating the wider benefits of the ULEZ in encouraging people to switch to walking, cycling or using public transport.
- After six months, CO₂ emissions from road transport in the central zone were 4 per cent (9,800 tonnes) lower than if there had been no scheme. Notably these CO₂ emissions reductions are above and beyond the impact of the existing congestion pricing scheme.¹³

The Mayor's air quality programme, including the introduction of the ULEZ, had already contributed to a reduction of 44 per cent in roadside NO₂ in central London between February 2017 and January 2020. Following the Government announcement of coronavirus-related travel restrictions, traffic levels on TfL roads fell by as much as 60 per cent and harmful NO₂ was down by around 50 per cent on some of London's busiest roads. This shows that proportional policies such as the ULEZ are extremely effective tools.

ESTABLISHING AN AREA IN 2020

Milan currently has two concentric cordons which regulate vehicles on the basis of their emissions:

- **The inner cordon** is “Area C” an area of 8.2 square kilometres in central Milan covering 4.5 per cent of the city and almost 5 per cent of the population.
- **The outer cordon** is “Area B” the city-wide Low Emission Zone – an area of 132 square kilometres covering almost 70 per cent of the city and 97 per cent of the population.

Area C was implemented in the inner core of Milan in 2012. The regulations require

that all vehicles pay to enter the zone and completely prohibits the most polluting vehicles (such as those with diesel engines). In contrast, electric vehicles, motorcycles, taxis and public transit vehicles are exempt from the charge. By 2015, three years after Area C was implemented, CO₂ levels within the zone decreased by 33 per cent in comparison to 2010 levels. Furthermore, reducing the number of vehicles in the area through the Area C scheme enabled Milan to repurpose 15,000 square metres along the front of the Castello Sforzesco into a pedestrian area, and replace on-street parking spaces with bike-share and car-share stations throughout the city.



Milan’s vehicle emission zones: Area B and Area C.

In February 2019, Milan launched “Area B”, the largest limited traffic zone (LTZ) in Italy and one of the largest low emission zones in Europe, which is introducing incremental prohibitions on the most polluting petrol and diesel cars.

The restrictions of Area B complement existing restrictions in Area C. By initiating a series of concentric zones in the city with increasingly demanding vehicle emissions standards, and measures such as congestion charging to reduce vehicle numbers in the centre of the city (where the majority of trips are made), Milan is creating strong incentives for regular drivers to move away from dirty vehicles and invest in zero emission alternatives.

Milan has published a timetable against which vehicle emissions standards for Area B and Area C will be increased over time. By 2030, diesel cars will be completely prohibited within Area B. Notably, electric vehicles can access both Area C and Area B and are not subject to any congestion charge.

PLAN TO ACHIEVE A ZEA BY 2030

The City Council of Milan has made a political commitment that the historical city centre of Milan within Area C will be free from fossil fuel vehicles by 2030 and diesel vehicles will be banned within Area B. Furthermore, the city centre will be a 30 km/hour zone.

SUPPORTING ZERO EMISSION ALTERNATIVES

The overall goals of Milan’s urban mobility strategy are to:

- Separate citizen mobility needs and the use of private cars
- Redistribute public spaces in favour of active mobility
- Encourage, integrate and innovate low-impact public transport services and modes



- Ensure proper safety levels for any road users (pedestrians, cyclists, bikers and motorists)
- Reduce energy consumption and emissions of air pollutants
- Ensure economic efficiency in the mobility system and optimize the use of mobility resources

With the launch of Area B, the city proposed a scrappage scheme for old diesel vehicles, offering up to €2,000 to buy a used and less polluting car, or a foldable bicycle, or an electric scooter, or a two-year public transit pass with a rebate of 70 per cent (bringing the value of this to €99).

“We are investing today in a city to live, work and raise children.”

Giuseppe Sala, Mayor of Milan.

[In We Have the Power to Move the World: A mayors' guidebook on sustainable transport](#)

Deep dive on the COVID-19 response - from Milan and C40 Mayors

Under Italy's nationwide lockdown in response to COVID-19, traffic congestion in Milan fell between 30 and 75 percent, along with traffic-related air pollution.

As a recovery response, Mayor Giuseppe Sala of Milan committed to the "15-minute city" framework with a guarantee that essential services would be within walking distance for all residents, preventing a surge in car travel (and accompanying emissions and air pollution) after lockdown. City and business leaders entered into discussions to co-design ways to encourage remote working.

Milan reopened all of its street markets as soon and as safely possible and by June 2020 had created 35 kilometres of new cycle lanes. The city had also pedestrianized several school streets before September 2020.

In June 2020, C40 Mayors launched a Mayors Taskforce report - [C40 Mayors' Agenda for a Green and Just Recovery](#) - which included tangible actions for a green recovery:

- 15-minute cities
- Protecting mass transit
- Giving streets back to people
- Prioritizing nature-based solutions in development and infrastructure
- Creating new, good, green jobs fast
- Supporting essential workers
- Training and upskilling workers
- Providing fundamental public services for all

To read more about C40 Mayors taking action on COVID-19 recovery to create Green and Healthy Streets, please see [the C40 Knowledge Hub](#).

ESTABLISHING AN AREA IN 2020

In 2017, Oslo initiated the Car Free Liveability Programme for the city centre, with a plan of action including both long- and short-term measures.

The interventions include accelerating the removal of parking spaces and redistributing the space to city life activities, more space in the public realm for people with disabilities, and more room for goods deliveries and commercial parking. Long-term and short-term plans shared a strategic focus, that pedestrians, people with disabilities, and cyclists should be prioritized, and private vehicles discouraged.

The aim was to further develop pedestrian-friendly streets, where culture and city life could thrive, adding benches and vegetation for more resting places in the city centre, creating more playgrounds and establishing pedestrianized streets. Another immediate measure saw coherent north-south and east-west cycling routes established across the city centre, for the first time.

Finally, the city initiated a number of pilots to investigate the needs and opportunities around emission-free forms of transport and to test possible solutions between various destinations. This includes freight deliveries by cargo bike and the development of private consolidation centres with zero emission deliveries. The City of Oslo has launched a plan (2020–2023) for further city life initiatives. These will expand to include all of Oslo, but with a focus on the centre and the inner-city districts of Tøyen and Grønland.

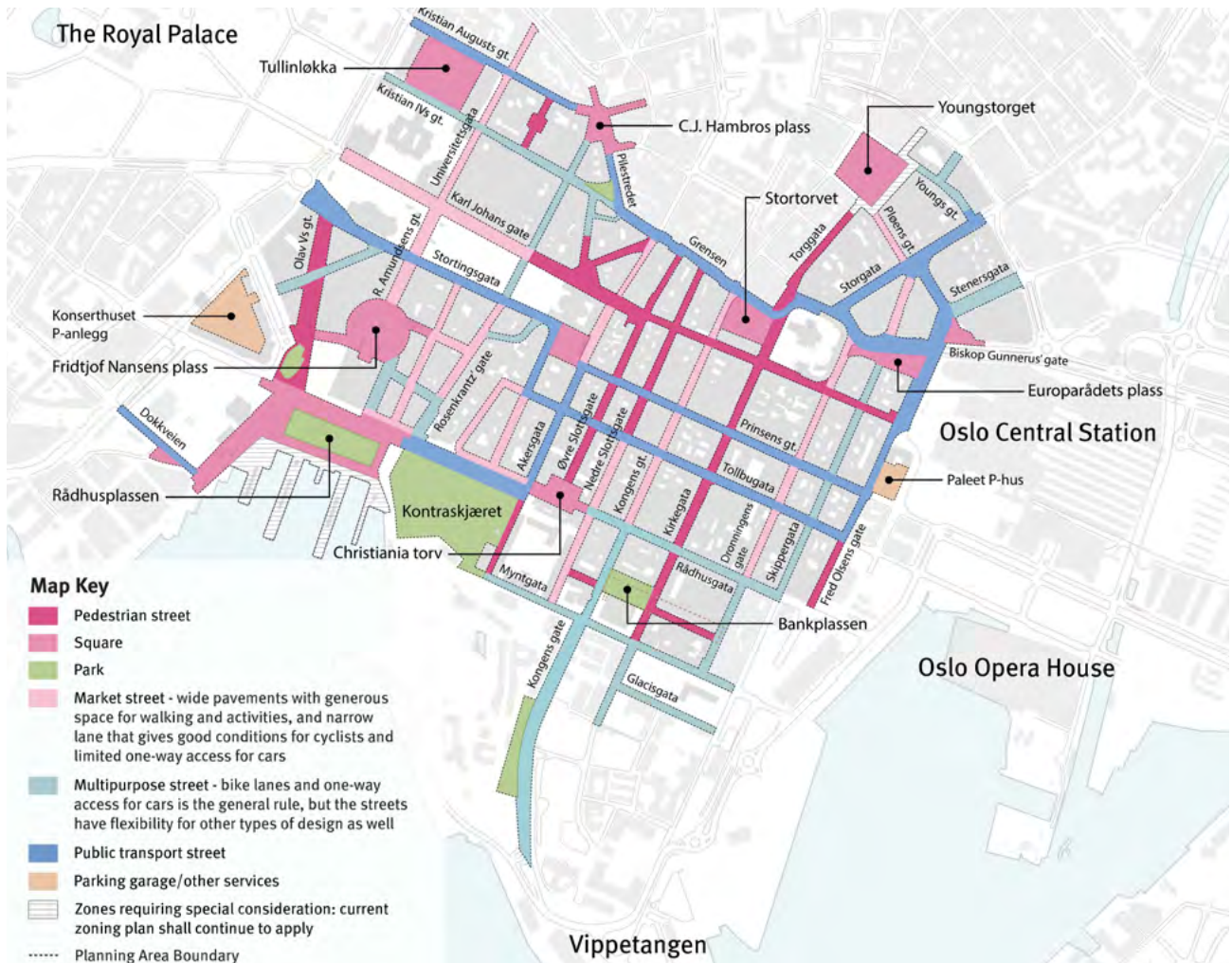
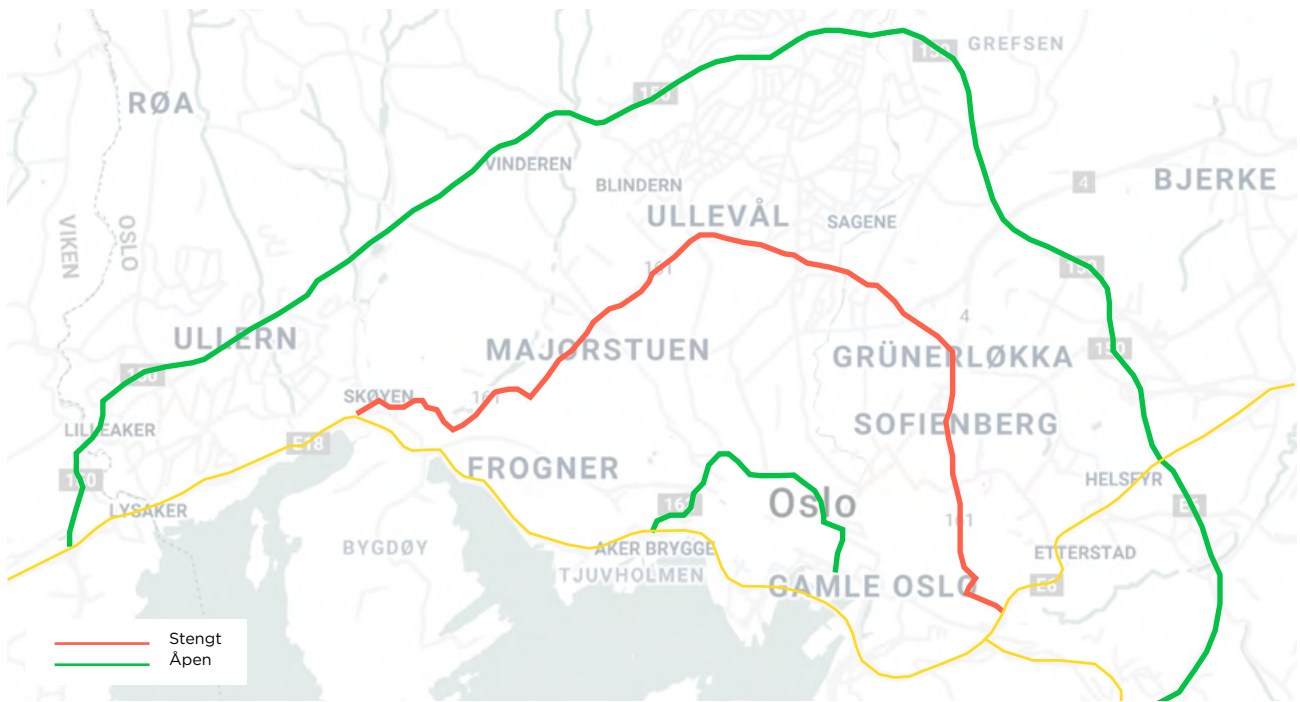


PLAN TO ACHIEVE A ZEA BY 2030

In addition to the above Car Free Liveability Programme, Oslo requires that all taxis be zero emission by 2024. Oslo's climate goal is to reduce direct emissions of *all greenhouse gases* from all sources by 95 per cent by 2030, which implies that all transport will need to be free of GHGs and pollutants by that date.

PLANS FOR THE WIDER AREA SURROUNDING THE ZEA

Oslo operates a tiered “toll ring” system in which the ‘rings’ represent concentric charging zones. The charges take account of both congestion and environmental impact as follows:



Proposed new zoning plan for Oslo city centre. Source: Agency for Planning and Building Services, Oslo City

- It is more expensive to pass through a toll ring during rush hour, i.e. 6.30–9am and 3–5pm
- It is more expensive to pass with a diesel vehicle; regular prices apply to petrol and hybrid vehicles; it is heavily discounted for electric private cars; and free for hydrogen-driven cars. It is also free for zero-emission commercial vehicles
- Oslo is working to develop zero-emission zones and seeks national cooperation to regulate them

Oslo's climate budget contains a number of measures to support the development of zero emission transport, such as a zero emission port, sufficient charging infrastructure for private cars and dedicated parking spaces for zero emission vehicles.

Oslo's congestion and environmental tolls also contribute to the zero emission ambition. The toll points are organized in three rings: at the outermost ring, you are only charged on your way into the city; at the two inner rings, you have to pay for every time you pass a toll point. This is illustrated in the diagram above.

SUPPORTING ZERO EMISSION ALTERNATIVES

Norway levies a tax on all vehicle purchases and at present electric vehicles are exempt from this tax. This makes the cost of EVs comparable with that of internal combustion engines. As a result, over 60 per cent of new vehicle sales in Oslo are zero emission.

Further incentives favouring zero emission vehicles include discounts on the toll ring charges, free parking and access to bus lanes.

“In Oslo, we are aiming to reduce our CO₂ emissions by 95% by 2030. To succeed, we will continue to step up investments in public transport, bicycle paths and pedestrian walkways.”

Ramond Johansen, Mayor of Oslo
in [We Have the Power to Move the World: A mayors' guidebook on sustainable transport](#)

More information on Oslo

[Oslo's Car Free Liveability Programme](#)

[A Step Towards the City Centre of the Future: Car-free liveability 2017-2019](#)

[Climate budget](#)

ESTABLISHING A STREET PILOT IN 2020

In January 2020 Oxford City Council and Oxfordshire County Council in the UK published final draft proposals on plans to establish an area of six streets in the heart of Oxford city centre – Bonn Square, Queen Street, Cornmarket, Ship Street, St Michael’s Street and New Inn Hall Street as a zero emission zone. This is locally referred to as the “Red Zone”.

Following the coronavirus outbreak, final consultations were postponed to late 2020 and the aim is to implement the scheme in summer 2021. It is intended that the Red Zone will be in effect from 7am–7pm daily, with a £10 daily charge to all non-zero emissions vehicles entering the zone.



PLAN TO ACHIEVE A ZEZ BY 2030

The Oxford scheme plans to alter vehicle charges in stages between 2020 and 2030. The table below shows how these will increase over time, and which vehicles/drivers would be exempt (based on March 2020 proposals). Notably, buses and licensed taxis are not

subject to charges in the area as they already have agreed timelines to achieve zero emissions fleets. Oxford has also published proposals for an expanded “Green Zone” covering the rest of the city centre. The Green Zone would be governed by a tiered emissions-based charge. This could involve a charging scheme with graduated charges based on the emissions standard of a vehicle and no charge for zero emission vehicles.

VEHICLE	1 DECEMBER 2020 TO 31 JANUARY 2021	1 FEBRUARY 2021 TO 31 JULY 2025	1 AUGUST 2025 TO 31 JULY 2030	1 AUGUST 2030 ONWARDS
Compliant zero emission vehicle	£0	£0	£0	£0
Car/moped/motorcycle	£0	£10	£20	£20
Light commercial vehicle	£0	£10	£20	£20
Heavy goods vehicle	£0	£10	£20	£20
Blue badge holder	£0	£0	£10	£20
Vehicles registered to businesses within the zone	£0	£0	£10	£20
Red Zone residents’ vehicles	£0	£1	£2	£20

SUPPORTING ZERO EMISSION ALTERNATIVES

Income raised by the emissions reduction scheme must, by law, be used to improve local transport. The city proposes to use any income to support businesses and residents in the Red Zone in making the transition to zero emission transport. This could include:

- Installing or providing grants for vehicle charging points
- Supporting freight consolidation
- Providing financial assistance for residents and businesses to switch to zero emission vehicles

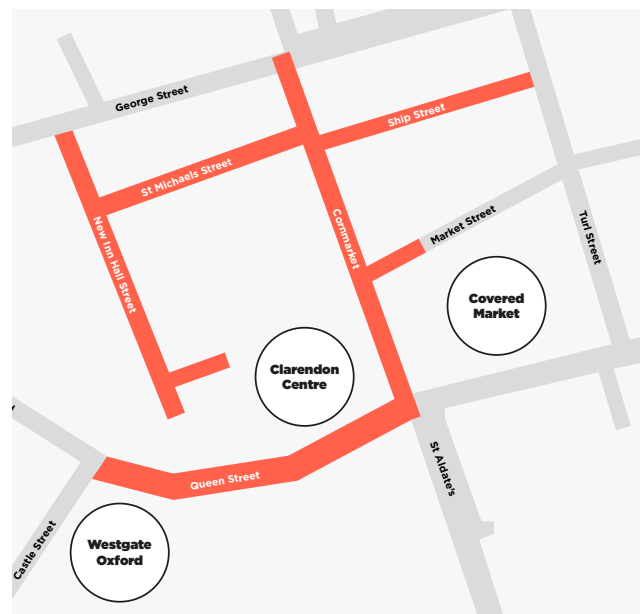
The Oxford councils have been working with partners to support the acceleration of zero emission transport and have been upgrading their own fleets to zero emission where possible. Oxford has initiated a number of projects to support the establishment of the zero emission zone, including:

- Facilitating a trial of a giant battery to store grid energy and power thousands of electric vehicles via rapid charging stations
- Testing low-cost innovative air quality sensors to map air pollution and exposure
- Advice for businesses on zero emission delivery and servicing solutions
- Investment in electric vehicle charging for taxis
- Investment in electric and low emission buses

In 2019, Oxford trialled the world's first on-street residential pop-up EV chargers on roads nominated by residents.

“Our councils are committed to cleaning up our air, protecting people’s health, and addressing local causes of climate breakdown.”

Cllr Tom Hayes, Cabinet Member for Zero Carbon Oxford, Oxford City Council



Oxford's proposed Green Zone and Red Zone.

More information on Oxford

www.oxford.gov.uk/zez

www.oxfordshire.gov.uk/zeroemissionzone

ESTABLISHING AN AREA IN 2020

Seoul has two concentric cordons which regulate vehicles on the basis of their emissions.

- **The inner cordon** is an area of 16.7 square kilometres in central Seoul.
- **The outer cordon** is what Seoul officially calls the “Low Emission Zone” which covers the entire city of Seoul and its neighbouring metropolitan area, including the city of Incheon and most of Gyeonggi-do Province.

Since 2012 Seoul has restricted dirty old diesel vehicles – “grade-five vehicles” – registered in Seoul and the metropolitan area within its Low Emission Zone. Grade-five vehicles include diesel cars manufactured before 2002 or 2005 (depending on size) and petrol cars released before 1987. While grade-five vehicles account for a mere 10.6 per cent of all the registered cars nationwide, they are responsible for 53.4 per cent of PM_{2.5} (particulate matter) emissions from vehicles. After a six-month pilot in 2019, Seoul’s former Mayor Park Won-soon announced the permanent introduction of a grade-five vehicle ban in the Green Transport Zone from 1 December.



The Green Transport Zone covers the 16.7 square kilometres of the city centre within the historic city walls. Forty-five gateways in and out of the zone are fitted with surveillance cameras. The cameras enforce the restrictions and help to manage the entire system with real-time data collection. Any person driving a grade-five vehicle inside this area

	LOW EMISSION ZONE	GREEN TRANSPORT ZONE
Vehicle	Grade-five diesel cars without emissions reduction devices	Grade-five diesel and gasoline cars without emissions reduction measures
Area	The entire area of Seoul and neighbouring metropolitan area	16.7 square kilometre city centre within the city walls
Operation	24 hours (365 days)	6am–9pm (365 days)
Fine	200,000 (approximately \$166) won per violation per month	100,000 won (approximately \$82) per violation per day (200,000 won if over three violations)

Access restrictions and fines for Seoul’s Low Emission Zone and Green Transport Zone.

will be subject to a fine of 100,000 won (approximately \$82) for a first-time violation, but the fine goes up to 200,000 won for those who violate the ban over three times a day.

Exceptions are made for vehicles equipped with a diesel particulate filter, emergency vehicles and cars belonging to a person with a disability permit.

RESULTS OF THE GREEN TRANSPORT ZONE

After the introduction of the Green Transport Zone, the number of polluting grade-five vehicles in the zone fell by 41.6 per cent, and the number of grade-five cars without emissions reduction devices fell by 68.9 per cent.

Seoul is planning to create similar zones in other parts of the city - in Yeouido and Gangnam - by 2021.

PLAN TO ACHIEVE A ZEA BY 2030

The Low Emission Zone and Green Transport Zone are part of the city government's response to worsening air pollution,

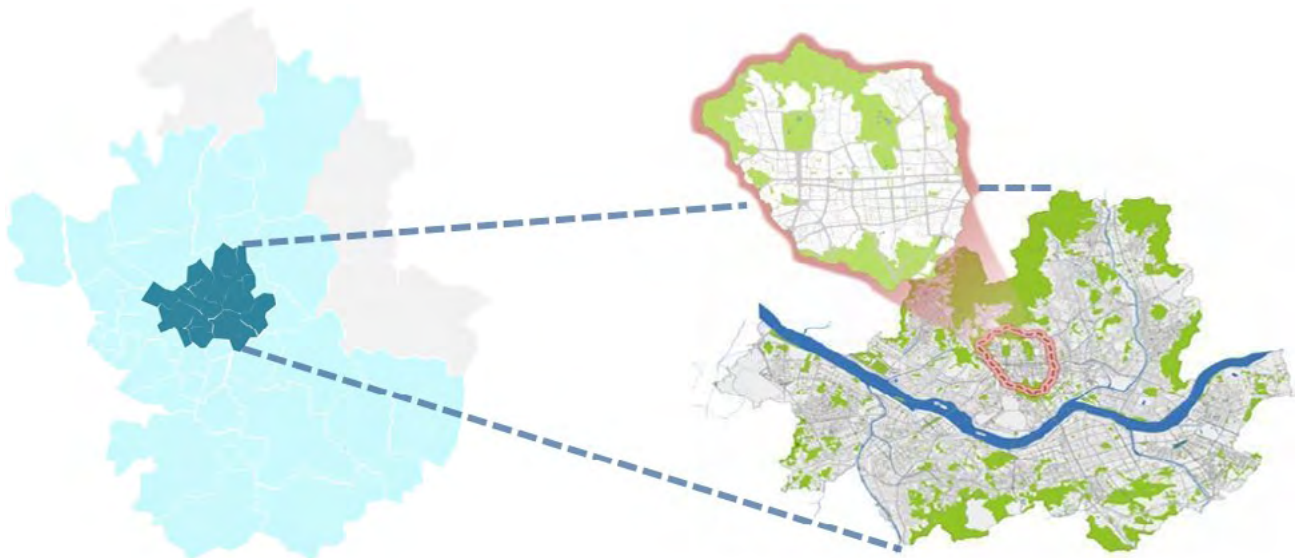
particularly in winter months. Seoul is striving to reach its goal of cutting PM_{2.5} levels to 15 µg/m³ by 2025 to improve the air quality.

Seoul is also developing a long-term climate action plan to reach carbon neutrality by 2050. To achieve this, any car driving in or around Seoul - even those not registered in the city - will need to be electric or hydrogen fuel cell. Seoul's Green New Deal which was published in July 2020 includes a proposal to limit registrations of new vehicles to only electric and hydrogen from 2035. Various measures are in place to accelerate this transition, and many more will follow as part of this new climate action plan.

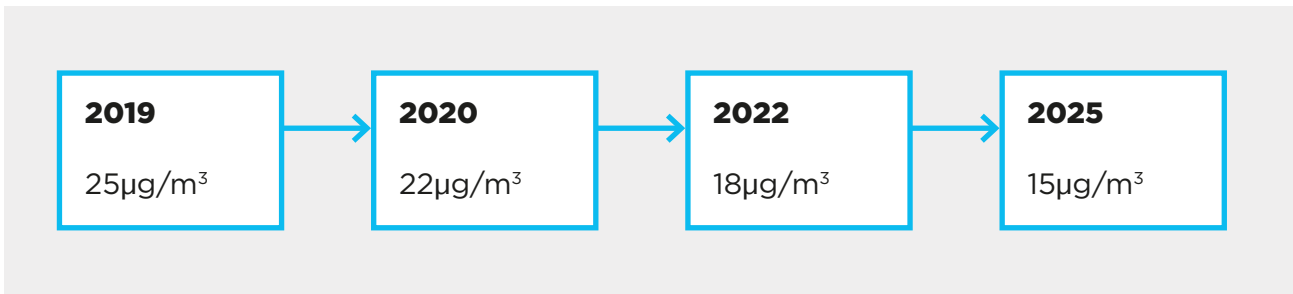
SUPPORTING ZERO EMISSION ALTERNATIVES

Measures to promote eco-friendly mobility are already in place in the Green Transport Zone. More roads are being pedestrianized and the speed limit for vehicles has been lowered. Cycling infrastructure and bus rapid transit (BRT) networks are being expanded as well.

Seoul has 25,000 public bikes at 1,540 docking stations, built at intervals of 500 metres. Seoul is planning to increase the number of bikes



Location of Green Transportation Zone in Seoul Metropolitan area.



Seoul's PM_{2.5} reduction goals.

and stations to 40,000 and 3,040 respectively by the end of 2020 to improve public access.

Four car-free streets are in operation in Seoul at certain times on certain days, as part of the city's efforts to create a safe environment for pedestrians. Sejong-daero, Deoksugung-gil, Cheonggyecheon-ro and Daehak-ro host small music concerts and flea markets on car-free days.

A city subsidy is currently available to attach a particulate exhaust filter to the engine of a grade-five vehicle. Alternatively, a scrappage scheme offers a subsidy to those exchanging a high-emission vehicle for a new, cleaner model.

There are subsidies for zero-emission vehicle buyers as well. Those who scrap their grade-five vehicle for an EV are entitled to an additional subsidy worth 700,000 won (\$600). Residents in the Green Transport Zone can receive 1 million won in an extra subsidy for a switch to an electric car.

“We rely on our citizens to tackle two of the biggest challenges facing our city and the entire nation, climate and air pollution.”

Park Won-soon, Former Mayor of Seoul

CONCLUSION

C40 Cities and signatories to the [C40 Green and Healthy Streets Declaration](#) are already moving quickly to put in place the interventions which – over a little less than a decade – will completely shift their mobility systems onto a zero emission pathway.

Four distinct implementation progressions are emerging in cities: 1) street pilots, 2) district-scale design, 3) vehicle regulation cordon(s) and 4) a timeline to 2030. We see clear consistency in the interventions applied by cities, including incentives to regulate vehicle access to the area and encourage a shift towards zero emission vehicle use, and a stronger focus on public space and increased walking, cycling and public transport.

The messaging and communications narrative supporting ZEAs focuses on the urgency of the health risks and importance of the climate crisis. It emphasizes regaining urban space from vehicles and returning it to people, through plans which are bold and ambitious and supported by the public.

Thanks to the commitment of mayors worldwide, citizens will see changes in their streets, and within areas of the city. They will find a new normal of urban mobility emerging, where public transport, walking and cycling are prioritized, there are fewer vehicles overall and any vehicles which do operate will be zero emission.



TECHNICAL NOTE - ZERO EMISSION AREAS

The aim of this technical note is to provide detailed guidance on the scope of the commitments of the Green and Healthy Streets Declaration and what actions and technologies are consistent with those commitments. The declaration aims to set committed cities on a pathway to fossil-fuel-free streets, reducing the most polluting vehicles on the roads, and a future where walking and cycling and shared transport are how the majority of citizens travel around their cities.

The declaration requires the introduction of ZEAs as an important action to improve air quality, support the transition to a decarbonised transport sector and improve liveability in cities. The ZEA commitment in the declaration refers to transport only and is not inclusive of other sectors such as buildings.

Each city will implement the ZEA commitment in a way that is best suited to the policy and legal frameworks and the culture of their own city. Each city will designate the ZEA taking into consideration air quality, congestion, access, health and transportation needs.

SIZE AND SCOPE OF THE ZERO EMISSIONS AREA

The size of the zone or area will be determined by each city. However, C40 is working with cities to be ambitious in the implementation of their zero emissions areas to have the greatest impact on the health of their citizens and the biggest influence on the market for zero emission vehicles. The area can be one major contiguous area or multiple smaller areas that collectively add up to a major area of the city.

For example, one approach might be to strengthen the criteria of existing diesel bans or low emission zones that exist in a number of cities to restrict access to all fossil fuel and non-zero emission vehicles. Another approach could be to make specific neighbourhoods ZEAs by allowing access only to zero emission vehicles, and prioritize walking, cycling and zero emission public transport access.

We recommend focusing on high-activity and high-intensity areas as ZEAs (such as ports) or prioritizing population density (such as residential or shopping areas) as these can bring the most significant benefit in terms of exposure to air pollutants. A focus on non-motorized travel such as cycling and walking in parts of the city is encouraged, such as working with partners to introduce bike-share schemes.

POWERS AND ENFORCEMENT

City powers and mandates vary considerably, so cities will need to use a range of strategies to establish ZEAs. For example:

- Where cities have the power to ban the most polluting vehicles they could restrict access to the area for non-zero emission vehicles
- Where cities do not have the power to ban the most polluting vehicles they could introduce incentives and road user charging mechanisms to clearly prioritize zero emission vehicles in these areas
- Where cities have the power they could close areas to all vehicles or certain types of vehicles (such as pedestrianized

zones, or walking, cycling and public transport-only zones)

- Where cities' powers are limited, the mayor can work closely with relevant authorities to develop a ZEA

WHAT TYPES OF VEHICLES AND FUELS WOULD BE ALLOWED IN ZEAS?

“Zero emissions” refers to zero greenhouse gas (GHG) tailpipe emissions. This framing was selected and endorsed by the leading signatories to GHS to ensure the GHS declaration would encourage the most significant improvements in both air quality and carbon reduction.

While the GHS declaration is intentionally technology neutral, currently the only technologies on the market that are zero emission at tailpipe are **hydrogen fuel cell (HFC) or battery-electric vehicles (BEVs)**. Although lifecycle emissions from both HFC and BEVs depend on how the hydrogen and electricity are generated, they offer the potential for a dramatic reduction in lifecycle emissions as electricity generation is decarbonized.

Other sustainable modes of travel that do not create tailpipe GHG emissions such as bicycles, electric cargo bikes, etc are also clearly within scope.

For a ZEA, no vehicle running on an internal combustion engine, including biogas and biofuel vehicles, would meet the criteria for entry as they emit tailpipe air pollutants. Plug-in hybrids are the one potential exception as running on electric mode in the zero emission area may be an acceptable way to meet the criteria (perhaps using a technology such as geofencing) with strong monitoring and enforcement, but this needs further research.

Outside of the ZEA, the Green and Healthy Streets declaration intentionally allows for the use of non-fossil fuels in cities, with the understanding that there are limited options for zero emission technologies for certain vehicle types such as heavy goods vehicles (HGVs) in the short to medium term. However, the declaration specifies the use of zero emission buses and zero emission areas to give a consistent message to manufacturers: that the lowest possible emitting vehicles in both lifecycle GHG emissions and air pollutants are required in cities. For HGVs and delivery vehicles in cities, we also recommend that cities explore smarter freight options including last mile delivery options, and freight consolidation outside of city centres, and so on.

The [C40 Green and Healthy Streets declaration webpage](#) includes the full text of the declaration, current signatory cities, and a PDF which provides an overview of how each city intends to deliver against their commitments.

ACRONYMS AND ABBREVIATIONS

A4E	Access for Everyone
ATM	Autoritat del Transport Metropolità (Barcelona)
BEV	battery electric vehicle
CBS	Centraal Bureau voor de Statistiek (Statistics Netherlands)
CO₂	carbon dioxide
DGT	Dirección General de Tráfico (Spain)
EV	electric vehicle
GHG	greenhouse gas
GHS	Green and Healthy Streets (declaration)
HFC	hydrogen fuel cell
LEZ	low emission zone
LTZ	limited traffic zone
NO₂	nitrogen dioxide
NO_x	oxides of nitrogen
PM	particulate matter
TfL	Transport for London
ULEZ	Ultra Low Emission Zone (London)
UVAR	Urban vehicle access restriction
ZBE	Zona de Baixes Emissions (Barcelona)
ZEA	zero emission area
ZEZ	zero emission zone

REFERENCES

TITLE	PUBLISHED BY	ONLINE REFERENCE
Amsterdam's Clean Air Action Plan	Amsterdam	www.amsterdam.nl/en/policy/sustainability/clean-air/
Access for Everyone Idea - City centre masterplan refresh	Auckland	www.aucklandcouncil.govt.nz/have-your-say/topics-you-can-have-your-say-on/city-centre-masterplan-refresh/Documents/access-everyone-full-text.pdf
Urban Mobility Plan (2013-2018)	Barcelona	https://ajuntament.barcelona.cat/ecologiaurbana/en/what-we-do-and-why/active-and-sustainable-mobility/urban-mobility-plan www.barcelona.cat/mobilitat/en/about-us/urban-mobility-plan
Barcelona low emissions zone (ZBE)	Barcelona	www.barcelona.cat/infobarcelona/en/tema/low-emissions-zone
We Have the Power to Move the World: A mayor's guidebook on sustainable transport.	C40 Cities Climate Leadership	www.c40knowledgehub.org/s/article/We-have-the-power-to-move-the-world-A-mayors-guidebook-on-sustainable-transport?language=en_US
EV Charging Infrastructure: A quick guide for cities	C40 Cities Climate Leadership	www.c40knowledgehub.org/s/article/Electric-Vehicle-Charging-Infrastructure-A-quick-guide-for-cities?language=en_US
Mayor's Transport Strategy	London	www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf
Guidance for boroughs on zero emission zones	London	https://tfl.gov.uk/info-for/boroughs-and-communities/zero-emission-zones
Emissions standards for taxis	London	https://tfl.gov.uk/info-for/taxis-and-private-hire/emissions-standards-for-taxis
Emissions standards for private hire vehicles (PHVs)	London	https://tfl.gov.uk/info-for/taxis-and-private-hire/emissions-standards-for-phvs
ULEZ car and motorcycle scrappage scheme	London	https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/car-and-motorcycle-scrappage-scheme
Scrappage scheme for vans and minibuses	London	https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/scrappage-scheme
Electric vehicle infrastructure delivery plan	London	https://tfl.gov.uk/modes/driving/electric-vehicles-and-rapid-charging
Oslo's Car Free Liveability Programme	Oslo	www.oslo.kommune.no/getfile.php/13319592-1553857948/Content/Politics%20and%20administration/City%20development/Car%20free%20city/The%20Car-free%20Livability%20Programme%202019.pdf
Oxford's zero emission zone	Oxford	www.oxford.gov.uk/zez www.oxfordshire.gov.uk/zeroemissionzone

ENDNOTES

- 1** www.c40.org/blog_posts/new-research-from-c40-and-arup-shows-how-city-governments-are-changing-the-world.
- 2** Within the S100 ring road, south of the railway.
- 3** Otten, M. and Tol, E. (2019). Charging Infrastructure for Electric Vehicles in City Logistics. CE Delft: www.cedelft.eu/en/publications/2356/charging-infrastructure-for-electric-vehicles-in-city-logistics.
- 4** As of September 2020, the zone places a restriction on petrol cars that do not meet the Euro 3 standard (usually registered before 2000), diesel cars that do not meet the Euro 4 standard (usually registered before 2005 or 2006) and motorcycles and mopeds that do not meet the Euro 2 standard (usually registered before 2003).
- 5** For more detail about parking and charging incentives see areaverda.cat.
- 6** For more about these incentives, see livebarcelona.cat.
- 7** To learn more about vehicle taxes, see agenciatributaria.gob.es.
- 8** For more on motorway discounts, see territori.gencat.cat (Spanish/Catalan only).
- 9** For more on this VAO project, see transit.gencat.cat.
- 10** To meet Zero Emission Capable requirements a vehicle must: emit no more than 50 g/km CO₂ and be capable of being operated with no (zero) exhaust emissions for a minimum range of 10 miles (16.093 km) or emit no more than 75 g/km CO₂ exhaust emissions and be capable of being operated with no (zero) emissions for a minimum range of 20 miles (32.187 km). As a minimum, the vehicle must also meet the Euro 6 emissions standard.
- 11** Transport for London (TfL). Emissions standards for taxis: <https://tfl.gov.uk/info-for/taxis-and-private-hire/emissions-standards-for-taxis>. From 2020, every new licensed private hire vehicle (which include Uber and Ola in London) under 18 months old should be zero emission capable and those older than 18 months old should be compliant with the Euro 6 standard. For more information on the how the regulations affect private hire vehicles (PHV), see Transport for London (TfL). Emissions standards for PHVs: <https://tfl.gov.uk/info-for/taxis-and-private-hire/emissions-standards-for-phvs>.
- 12** Mayor of London (Oct. 2019). Central London Ultra Low Emission Zone – six month report: www.london.gov.uk/sites/default/files/ulez_six_month_evaluation_report_final_oct.pdf.
- 13** For more on the GhG emissions reduction from London’s congestion pricing scheme, see here: www.c40.org/case_studies/londons-congestion-charge-cuts-co2-emissions-by-16.

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