Addressing transport emissions through low-/zero emission zones, cities' efforts

Asia Clean Blue Skies Program I Knowledge Sharing Event

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Aviation	Clean air	Emissions modeling
Maritime shipping	Fuels	Emissions control
Fuels	Electrification	Vehicle efficiency
Freight	Fiscal policies	Vehicle testing
	Testing & compliance	Health impacts
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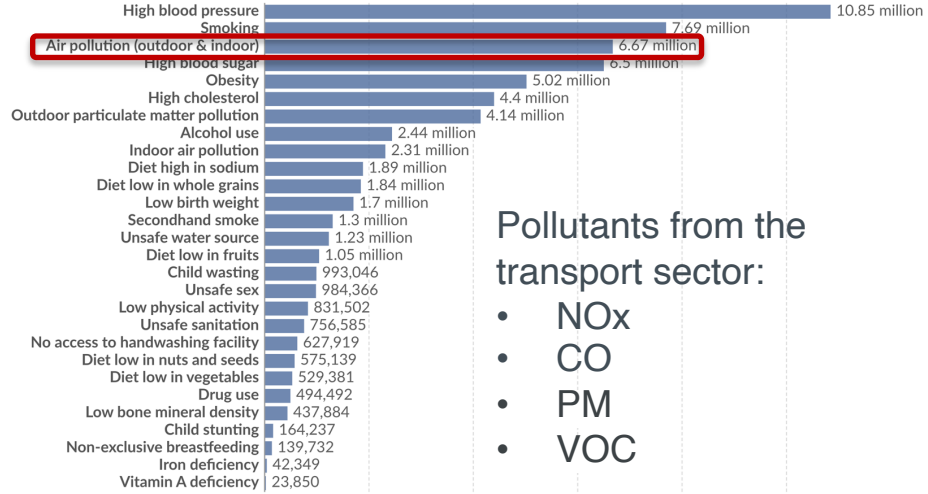
Transport sector is a significant contributor to greenhouse gas emissions and air pollution in urban areas

Deaths by risk factor, World, 2019

Our World in Data

The estimated annual number of deaths attributed to each risk factor[1]. Estimates come with wide uncertainties, especially for countries with poor vital registration[2].



Pollutants from the transport sector:

- NOx
- CO
- PM
- VOC

Data source: IHME, Global Burden of Disease (2019)

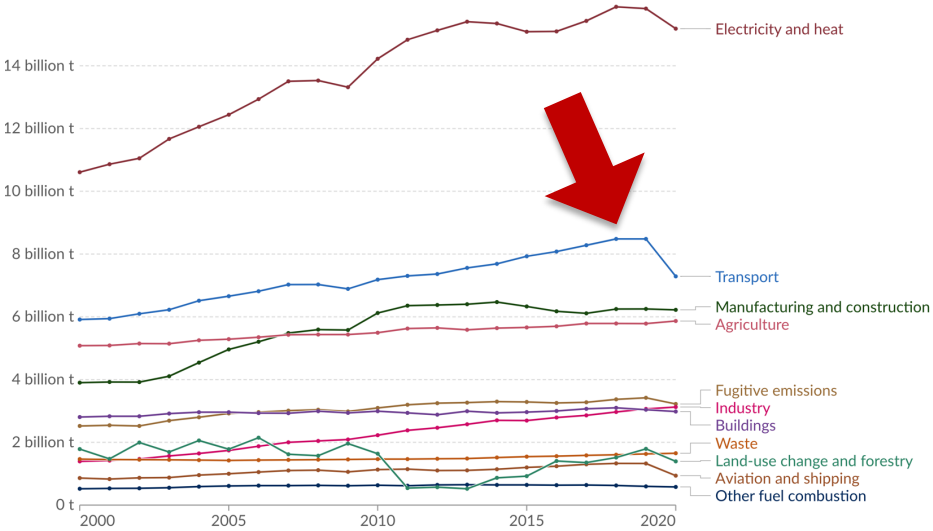
OurWorldInData.org/causes-of-death | CC BY

Note: Risk factors[1] are not mutually exclusive. The sum of deaths attributed to each risk factor can exceed the total number of deaths.

Greenhouse gas emissions by sector, World

Our World in Data

Greenhouse gas emissions[1] are measured in tonnes of carbon dioxide-equivalents[2] over a 100-year timescale.



Data source: Climate Watch (2023)

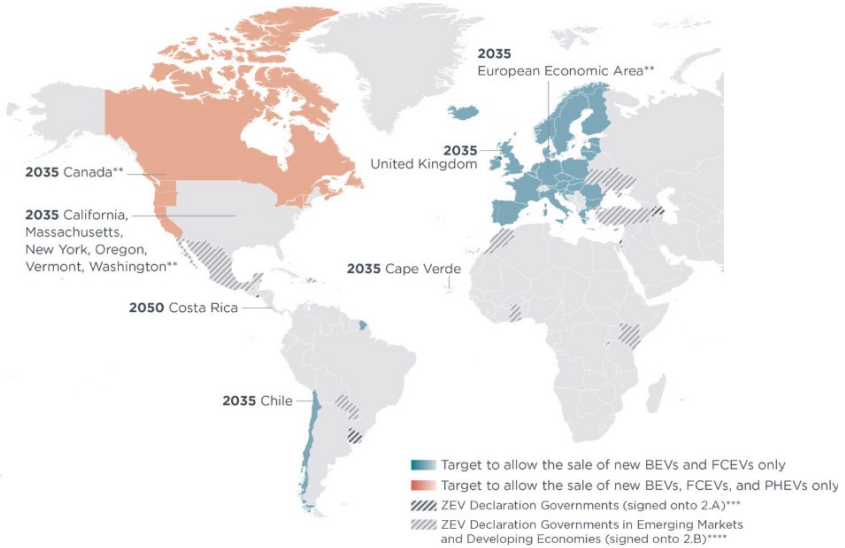
OurWorldInData.org/co2-and-greenhouse-gas-emissions | CC BY

Multiple measures can reduce urban air pollution and GHG emissions:

Avoid travel activities through urban planning	• e.g., discourage sprawl and encourage dense, compact, and mixed-use development
Encourage more low-carbon modes of travel	• e.g., replace private driving with public transport, walking and cycling
Improve fuel quality	• e.g., set stringent fuel consumption standards
Transport electrification	• e.g., buses, taxis, private cars, postal vehicles, urban logistics vehicles, vehicles used in ports and airports
Low-/zero-emission zones	• only low-/zero-emission vehicles are allowed to enter the zones otherwise will face penalties such as fines

Many countries and states have taken actions to electrify vehicle fleets to combat urban air pollution and reduce GHG emissions, and cities are at the forefront

Governments with official targets to 100% phase in sales of new zero CO_2 emission cars and vans/light trucks by a certain date* (Status: Through February 2024)



* Includes countries, states, and provinces that have set targets to only allow the sale or registration of new battery electric vehicles (BEVs), fuel cell electric vehicles (FCEVs), and plug-in hybrid electric vehicles (PHEVs). Countries such as Japan with pledges that include hybrid electric vehicles (HEVs) and mild hybrid electric vehicles (MHEVs) are excluded as these vehicles are non plug-in hybrids.

** The Canadian province of British Columbia has a regulation to enforce its 2040 target, as do California, Massachusetts, New York, Oregon, Vermont, and Washington for their 2035 targets. The European Union (EU) also has a regulation enforcing its 2035 target; it is applicable to the member states of the European Economic Area (EEA), that is the 27 EU member states and, pending adoption by the EEA Joint Committee, to some or all EEA European Free Trade Association (EFTA) states, which include Iceland, Liechtenstein, and Norway. Norway has set a 2025 phase-in target and Austria, Denmark, Greece, Iceland, the Netherlands, and Slovenia have set 2030 phase-in targets, but those are not binding.

*** Zero-Emission Vehicle (ZEV) Declaration signatories to 2.A committed to phase-in targets by 2035 for leading markets and by 2040 globally. Countries with existing official targets (binding and non-binding) are not separately highlighted, including Austria, Belgium, Canada, Cape Verde, Chile, Croatia, Cyprus, Denmark, Finland, France, Greece, Iceland, Ireland, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Slovenia, Spain, Sweden, and the United Kingdom.

**** Zero-Emission Vehicle (ZEV) Declaration signatories to 2.B committed to work intensely toward accelerated proliferation and adoption of zero-emission vehicles.

Summary of planning and promotion actions in place in electric vehicle capitals

Country	Metropolitan area	Total number of policies	City planning: 100% electric sales goal	City planning: 100% electric stock goal	City planning: Existing and planned zero-emission zone	City planning: Low-emission zone in place	City planning: Fossil Fuel Free Streets declaration	Infrastructure: Public charging incentives	Infrastructure: Private charging incentives	Infrastructure: EV-ready building code	Infrastructure: Demand-driven strategy	Fleets: City government fleet electrification goal	Fleets: Taxi fleet electrification goal	Fleets: Electric car-sharing program	Fleets: 100% electric bus goal (stock or sales)	Fleets: 100% electric (or fossil fuel free) bus achieved	Electric vehicle benefits: Financial incentives	Electric vehicle benefits: Electric vehicle parking privileges	Electric vehicle benefits: Road access benefits (high occupancy lanes and bus lanes) and registration privileges	Electric vehicle benefits: Toll, bridges, or ferry discounts	Consumer awareness: Events and campaigns by public agencies, utilities, and/or NGOs
China	Shenzhen	13			×	×		⊗		⊗		×	×	×	×	×	⊗	⊗	×		×
	Haikou	12				×		⊗		○		○	○	○	⊗	×	○	⊗	○		×
	Hangzhou	11				×		⊗	×	⊗			⊗	×	⊗		⊗	×	×		×
	Beijing	10				×		⊗		×		×	×		×		○	×	×		×
	Chongqing	10				×		⊗		×		×			×		○	×	×	×	×
	Liuzhou	10				×		⊗		⊗		×	×		×		○	⊗	×		×
	Shanghai	10				×		⊗		×		×	×	×	×		○	×	×		×
	Tianjin	10				×		⊗		×		×	×		×		⊗	×	×		×
	Zhengzhou	10				×		⊗		⊗		⊗	⊗		⊗		⊗	×	×		×
	Guangzhou	9				×		⊗		⊗			⊗		⊗	×	⊗	⊗	×		×
	Changsha	8						⊗		○			×		×		○	⊗	×		×
	Chengdu	8				×		⊗	×						×		○	×	×		×
	Suzhou	8				×		⊗		⊗				×			○	×	×		×
Netherlands	Amsterdam	17	⊗	×	×	×	×	⊗	×	×	×	○	×	×	×		○	×		○	×
United Kingdom	London	17	⊗	×	×	×	×	⊗	⊗	×	×	×	×	×	×		○	×		×	×
France	Paris	16	⊗	×	×	×	×	×	×	⊗		×	×	×	×		⊗	×	×		⊗
Norway	Oslo	16	⊗	×	×	×	×		×	⊗	×	⊗	×	×	×		○	×	×	○	
	Bergen	13	⊗	×	×	×				○		⊗	×	×	×	×	○	×		○	
Germany	Stuttgart	10				×		○	○	○		×		×			○	×	×		○
	Munich	9				×		⊗	○	○		×		×	×		⊗				⊗
Sweden	Stockholm	9	○			×		○	⊗	×	×	×		×			○				
South Korea	Seoul	11				×	×		×	○	×	×	○	×	⊗		⊗				×
United States	Los Angeles	13	○	×	×		×	⊗	⊗	×		×		×	×		○		○	○	
	New York	11	○					⊗	⊗	×	×	×			×		○		○	○	×
	San Francisco	11	⊗	×				⊗	⊗	×		×			×		○		○	○	×

Notes: × = action by local government; ○ = action by state or national government; ⊗ = action at multiple levels,

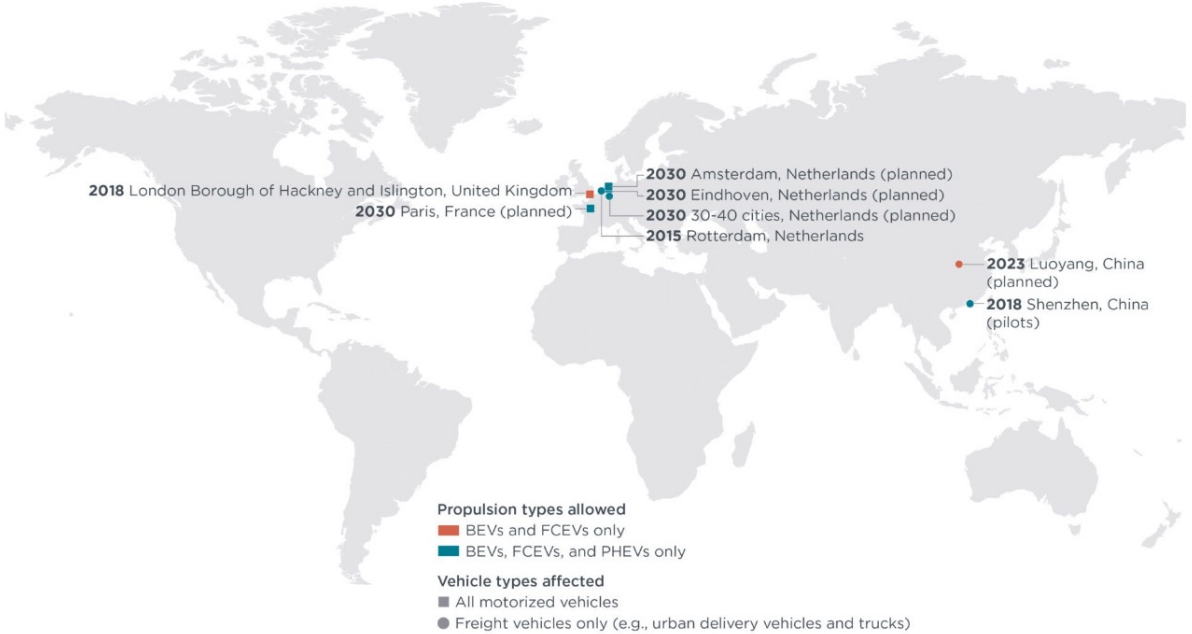
100% electric stock goal is equivalent to a plan for a city-wide zero-emission zone,

100% electric sales goal is assumed as of the effective date of a city's 100% electric stock goal.

Cities are moving forward to low-/zero-emission zones

Motor vehicles

Cities with implemented and planned zero-emission zones (ZEZs) and near-ZEZs globally*
(Status: Through February 2024)



* *Note:* Zero-emission zones (ZEZs) allow battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs) only; near-ZEZs also allow plug-in hybrid electric vehicles (PHEVs). Affected areas of zones range from a single street to an entire city or metropolitan area. The map includes cities that have committed in an offcial policy document or announcement to introduce a ZEZ or near-ZEZ, set a date of introduction/start date, indicated the vehicle types a ected, and set binding requirements for access (such as minimum emissions standard certification). For ZEZs and near-ZEZs covering all motorized vehicles, the applicability to all vehicle types must be clearly stated in the offcial document.

Cities are moving forward to low-/zero-emission zones

Off-road machineries

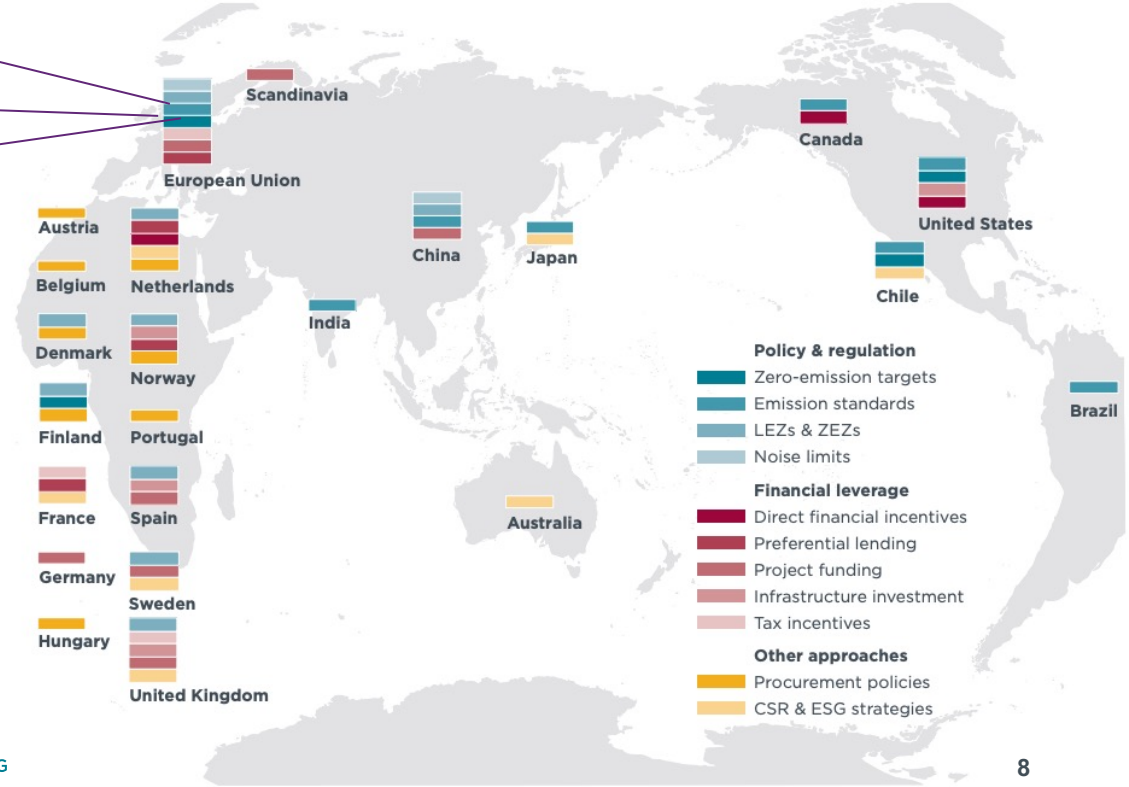
Oslo, Norway

London, UK

Copenhagen, Denmark

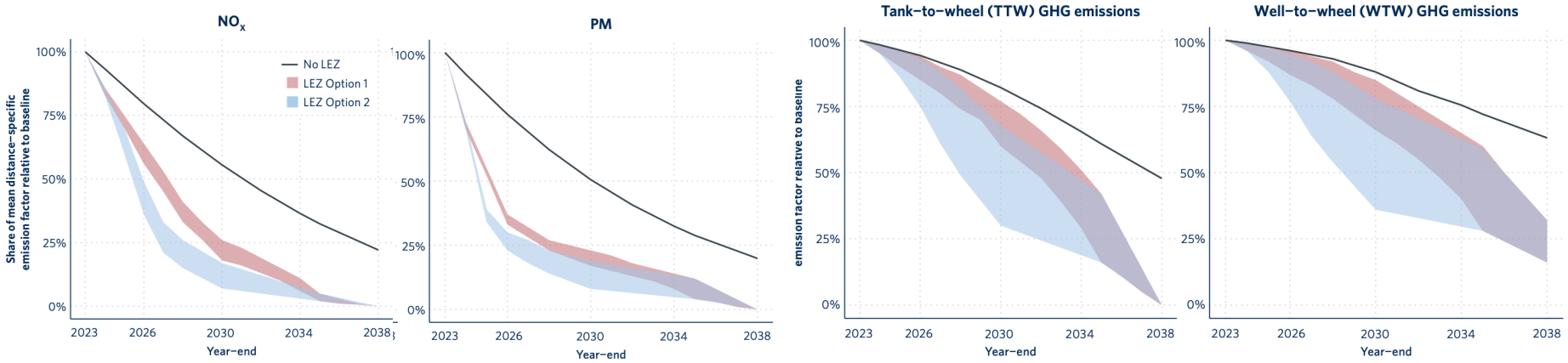
Distribution of low-emission zones for off-road equipment in China

Countries and regions implementing measures to promote zero-emission off-road equipment



Low-/zero-emission zone is effective in reducing air pollution and GHG emissions in urban areas

Case of Warsaw



- Option 1: gradually strengthen restrictions every 2 years from 2024 to 2034
- Option 2: tightens restrictions each year at a more accelerated pace from 2024 to 2028

Reduction in distance-specific emission factors of NOX, PM, TTW and WTW GHG emissions relative to baseline (2023) levels as a result of LEZ Option 1: two-year interval implementation and LEZ Option 2: accelerated implementation schedules. Shaded areas show the ranges of possible emission reductions that depend on the responses of vehicle owners to LEZ restrictions. Responses range from replacing non-compliant vehicles with 100% used vehicles (upper boundary of each shaded area) to switching completely to zero-emission mobility (lower boundary of each shaded area).

Cities’ experiences in implementing low-/zero-emission zones

1. Legal basis is the foundation

Cities in China

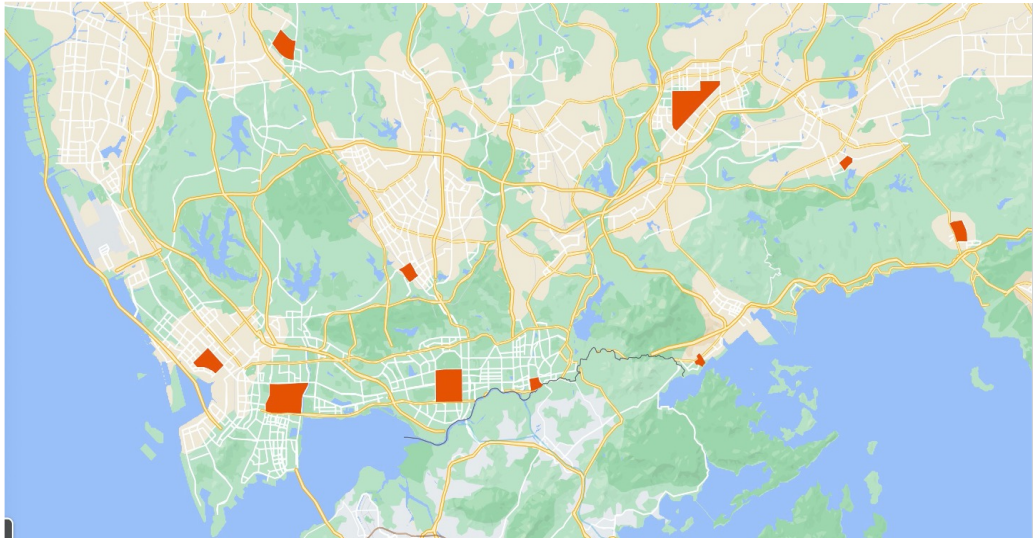
- Shenzhen: China's *Road Traffic Safety Law* empowers local public security bureaus to implement road access restrictions on vehicles
- Hainan: The province's *Vehicle Emission Prevention and Control Rules* empower local authorities to introduce zero-emission zones based on air quality conditions

Cities in Europe

- Paris: France's *Energy Transition for Green Growth Law* empowers local authorities to create low-emission zones
- Oxford: UK's *Transport Act 2000* empowers local traffic authorities to introduce local charging schemes to achieve transport objectives
- Oslo/Bergen: Lacking clear legal framework delays Norwegian cities to introduce zero-emission zones

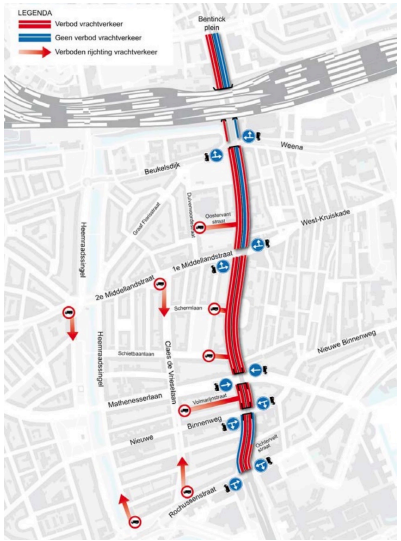
2. Cities could start with freight

Low-emission zones for freight in Shenzhen



- Started as a pilot project in 2018
- Diesel trucks are banned, with exemptions for ambulances, police, military vehicles, etc.
- Operate 24 hours a day, 7 days a week
- Enforced by the police
- Non-compliance: a fine of CNY 300 ($ 45) and deducted points toward a driver's license

Zero-emission zone for freight in Rotterdam



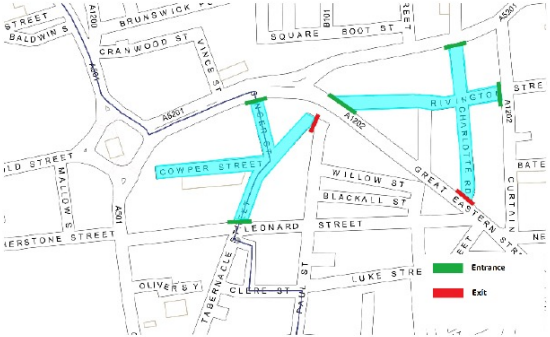
- Implemented in 2015 covering a 1.6-kilomoter-long street
- Only ZE light trucks are allowed to enter
- Operate 24 hours a day, 7 days a week
- Enforced by an automated camera recognition system
- Non-compliant vehicles face a penalty of € 95 ($112) plus a €9 ($11) administration fee

Source: https://theicct.org/publications/global-cities-zez-dev-EN-aug21

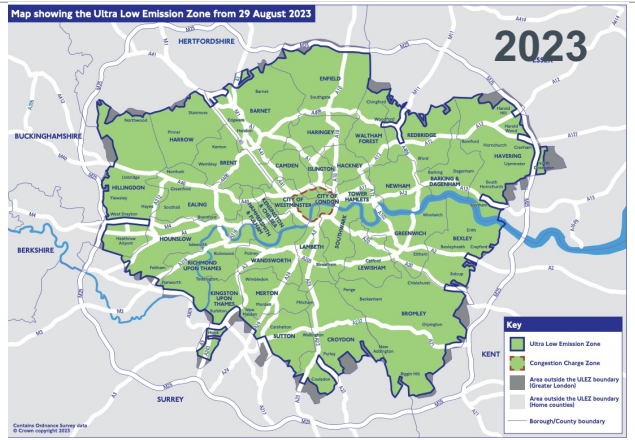
3. Start with pilot streets/small areas and expand to a broader scope

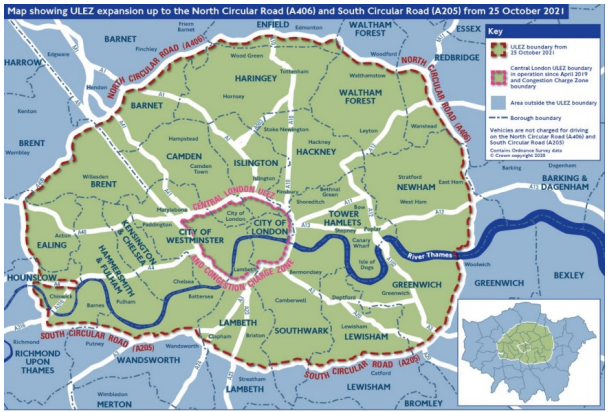
Case of London

Launched in September **2018**, this cross-borough near-ZEZ covers five streets, locally referred as Ultra-Low Emission Streets



In March **2020**, the City of London launched a near-ZEZ pilot covering one 360-meter long street called Beech street, the majority of which is a tunnel under the Barbican Estate.



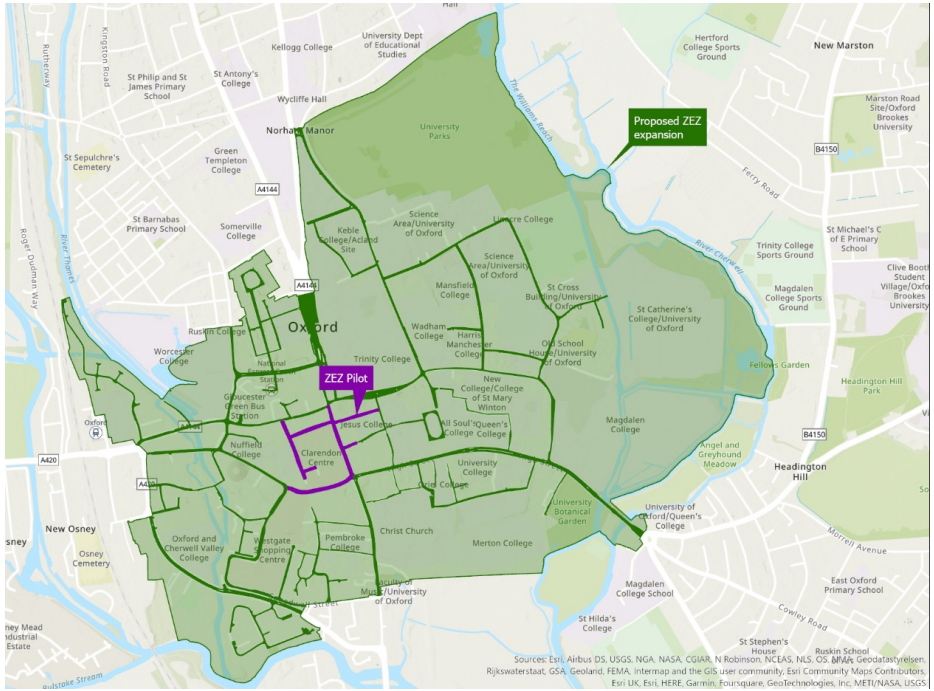


2021

Source: https://tfl.gov.uk/modes/driving/ultra-low-emission-zone

3. Start with pilot streets/small areas and expand to a broader scope

Pilot streets and proposed second phase zero-emission zone in Oxford



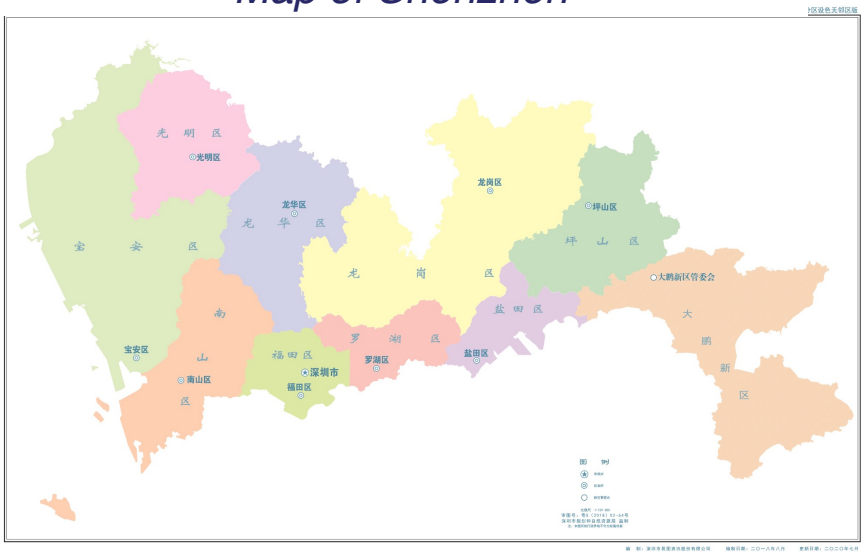
Zero-emission zone in Amsterdam

Source: https://theicct.org/publications/global-cities-zez-dev-EN-aug21

3. Start with pilot streets/small areas and expand to a broader scope

- Implemented low-emission zones for off-road equipment in 2018
- Districts in the city were classified into two types, with type I following higher requirements
- Type I districts:
  - Ban the usage of China I and below off-road machinery starting in 2018
  - Ban the usage of selected China II and below off-road machinery beginning in 2019
  - Ban the usage of all China II and below off-road machinery beginning in 2020
- Encourage the use of new energy off-road equipment
- Starting from April 1, 2024, expand the scope of low-emission zone for off-road equipment to the whole city

Map of Shenzhen



4. Start from a low-emission zone and then upgrade into a zero-emission zone

How the emissions criteria for the Amsterdam LEZ are progressively tightened toward the ZEZ

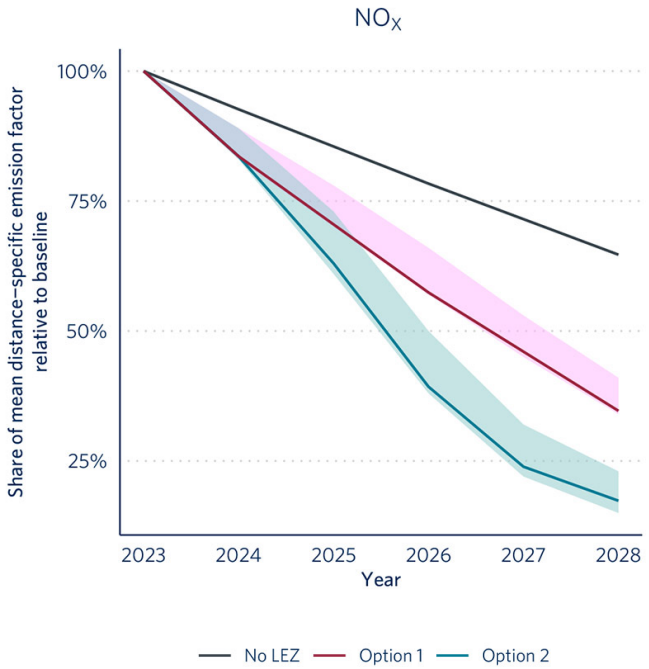
Vehicle category		Vehicles allowed to enter										
		City center				Outside city center but within A10 ring road				Outside A10 ring road but within the built-up area		
		2021	2022	2025	2030	2021	2022	2025	2030	2021	2025	2030
Passenger cars	Diesel	Euro 4/5/6 vehicles, ZEVs			ZEVs	Euro 4/5/6 vehicles, ZEVs			ZEVs	All		ZEVs
	Non-diesel	All			ZEVs	All			ZEVs	All		ZEVs
Taxis	Diesel	Euro 5/6 vehicles, ZEVs		ZEVs		Euro 5/6 vehicles, ZEVs		ZEVs		All		ZEVs
	Non-diesel	All		ZEVs		All		ZEVs		All		ZEVs
Vans	Diesel	Euro 4/5/6 vehicles, ZEVs		ZEVs		Euro 4/5/6 vehicles, ZEVs		ZEVs		All		ZEVs
	Non-diesel	All		ZEVs		All		ZEVs		All		ZEVs
Trucks	Diesel	Euro 4/5/6 vehicles, ZEVs	Euro 6 vehicles, ZEVs	ZEVs		Euro 4/5/6 vehicles, ZEVs	Euro 6 vehicles, ZEVs	ZEVs		All		ZEVs
	Non-diesel	All		ZEVs		All		ZEVs		All		ZEVs
Buses and coaches		Euro 4/5/6 vehicles, ZEVs	ZEVs			Euro 4/5/6 vehicles, ZEVs		ZEVs		All		ZEVs
Mopeds and scooters		Vehicles with first registration of January 1, 2011 or later; ZEVs		ZEVs		Vehicles with first registration of January 1, 2011 or later; ZEVs		ZEVs		Vehicles with first registration of January 1, 2011 or later; ZEVs	ZEVs	

5. Clearer and more detailed targets and data-driven evaluation could make the implementation easier

How the emissions criteria for the Amsterdam LEZ are progressively tightened toward the ZEZ

Vehicle category		Vehicles allowed to enter										
		City center				Outside city center but within A10 ring road				Outside A10 ring road but within the built-up area		
		2021	2022	2025	2030	2021	2022	2025	2030	2021	2025	2030
Passenger cars	Diesel	Euro 4/5/6 vehicles, ZEVs			ZEVs	Euro 4/5/6 vehicles, ZEVs			ZEVs	All		ZEVs
	Non-diesel	All			ZEVs	All			ZEVs	All		ZEVs
Taxis	Diesel	Euro 5/6 vehicles, ZEVs		ZEVs		Euro 5/6 vehicles, ZEVs		ZEVs		All		ZEVs
	Non-diesel	All		ZEVs		All		ZEVs		All		ZEVs
Vans	Diesel	Euro 4/5/6 vehicles, ZEVs		ZEVs		Euro 4/5/6 vehicles, ZEVs		ZEVs		All		ZEVs
	Non-diesel	All		ZEVs		All		ZEVs		All		ZEVs
Trucks	Diesel	Euro 4/5/6 vehicles, ZEVs	Euro 6 vehicles, ZEVs	ZEVs		Euro 4/5/6 vehicles, ZEVs	Euro 6 vehicles, ZEVs	ZEVs		All		ZEVs
	Non-diesel	All		ZEVs		All		ZEVs		All		ZEVs
Buses and coaches		Euro 4/5/6 vehicles, ZEVs	ZEVs			Euro 4/5/6 vehicles, ZEVs		ZEVs		All		ZEVs
Mopeds and scooters		Vehicles with first registration of January 1, 2011 or later; ZEVs		ZEVs		Vehicles with first registration of January 1, 2011 or later; ZEVs		ZEVs		Vehicles with first registration of January 1, 2011 or later; ZEVs	ZEVs	

TRUE modeling highlighted the significant impact of LEZ on Warsaw.



6. Localized policy design and supportive measures are critical

Feasibility analysis is critical to help each city determine the best way to design their own zero-emission zones based on key local conditions

- Environmental goals
- Geographical features
- Population distribution
- Traffic volumes distribution
- Vehicle emissions distribution
- Zero-emission vehicle uptake

Supporting measures are needed to help residents and businesses affected make the transition

- Fiscal incentives
- Charging infrastructure development
- Enhanced public transport, and easier and more friendly access to cycling and walking

7. Humanized considerations of policy design help win the support of the public

Public consultation

ZEZ pilot in the City of London had gone through the public consultation process with local residents, businesses, and road users via telephone and video calls

Fiscal support

People who live or work in the LEZ in Paris can receive additional subsidy (capped at €1,000) for the purchase or the rental of ZEVs

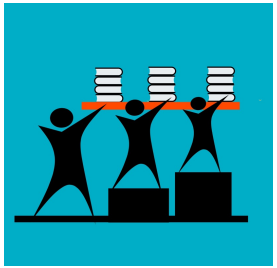
Low-carbon modes' infrastructure availability

The city of Oslo had removed 760 parking lots and retrofitted them into places for walking, cycling, or areas for taking public transport

Exemptions

LEZ in Brussels allows vehicles with non-compliant emissions to buy up to 8 day-passes per year so that residents who drive rarely per year do not need to change their vehicles

Equity measures



In LEZ in Bristol, priority was given to residents earning up to £ 26,000 a year, self-employed people, and small businesses when providing financial support to those affected

More info

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ICCT TRUE Initiative page: https://theicct.org/partnerships/true/

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