

Update on zero-emission zone development progress in cities

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Zero-emission zones (ZEZs) are implemented by city governments as one way to help facilitate the conversion of fleets from internal combustion engine (ICE) vehicles to zero-emission vehicles at the tailpipe, in other words, battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs). ZEZs are geographically defined areas within a city that fully restrict access to ICE vehicles. Their key goals are to tackle transport-related air pollution and traffic congestion in cities and to help reduce greenhouse gas (GHG) emissions by encouraging a switch to zero-emission vehicles. They can help deliver substantial health benefits to those living in neighborhoods affected by high levels of air pollution and encourage mode shift from driving to walking, cycling, and public transport.

In August 2021, the ICCT published a detailed overview of the cities that had implemented or were planning to introduce a ZEZ or a variant of a ZEZ.¹ This paper is an update of that, with a focus on new progress through July 2022. Similar to the 2021 briefing, traffic-free areas or zones which are limited to pedestrians and cyclists, public transport, and/or authorized vehicles independent of fuel type are not discussed.

GLOBAL OVERVIEW OF ZEVS AND VARIANTS

We define ZEZs as regulated areas where only motorized vehicles with zero tailpipe emissions (BEVs and FCEVs), pedestrians, and cyclists are allowed access. The term zero-emission area (ZEA)² is sometimes used, as well, but this paper uses ZEZ throughout. The area covered by a ZEZ can range from one street to an entire city or metropolitan area. We call zones that also grant access to plug-in hybrid electric vehicles (PHEVs) near-ZEZs and recognize them as a variant of ZEZs. Zones that would also allow certain ICE vehicles to enter are subsumed under the term low-emission zone (LEZ) and are not regarded as a variant of ZEZs. While ZEZs and

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¹ Hongyang Cui, Pramoda Gode, and Sandra Wappelhorst, *A Global Overview of Zero-Emission Zones in Cities and Their Development Progress*, (ICCT: Washington, D.C., 2021), <https://theicct.org/wp-content/uploads/2021/12/global-cities-zev-dev-EN-aug21.pdf>

² C40 Cities Climate Leadership Group and Transformative Urban Mobility Initiative (TUMI), "How C40 Cities are Implementing Zero Emission Areas," December 2020, https://www.c40knowledgehub.org/s/article/How-C40-cities-are-implementing-zero-emission-areas?language=en_US

near-ZEZs are expected to affect all vehicle types from motorized two-wheelers to heavy-duty trucks eventually, some ZEZ schemes focus only on freight transportation in the initial stage; freight vehicles range from urban delivery vehicles to medium- and heavy-duty trucks. We label such zones that only allow BEVs and FCEVs as zero-emission zone for freight (ZEZ-F) and those that also allow PHEVs as near-ZEZ-F; we treat both as variants of ZEZs.

Figure 1 gives a global overview of implemented and planned ZEZs and variants through July 2022. For schemes with a phased implementation timeline, the map shows the dates when all vehicle types would need to be BEVs or FCEVs in the case of ZEZs, or BEVs, FCEVs, and PHEVs in the case of near-ZEZs (the same applies for ZEZ-Fs and near-ZEZ-Fs). To qualify for inclusion in the map, cities must:

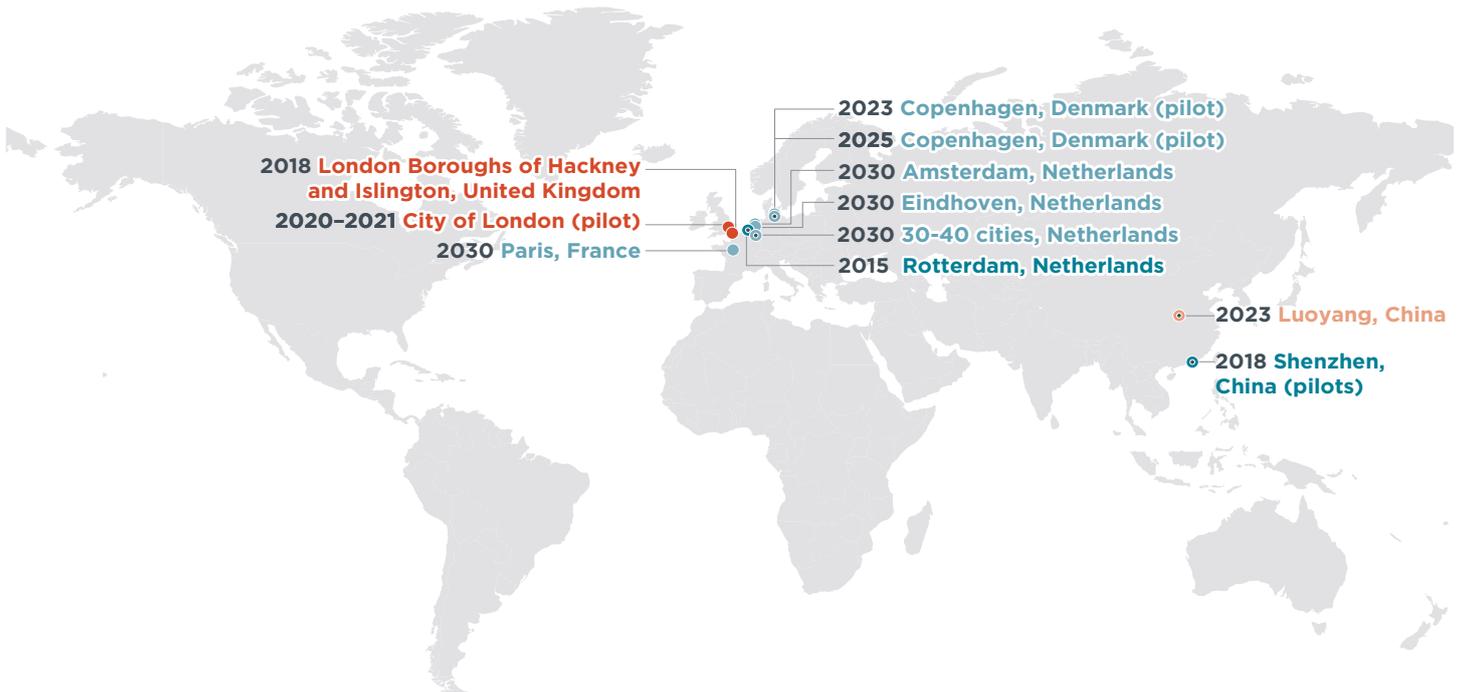
- » have made a **commitment as part of an official policy document or official announcement** to introduce a ZEZ or one of its variants
- » have **set a date** of introduction/start date
- » have indicated **vehicle types** affected, specifically **all vehicle types** in the case of ZEZs and near-ZEZs and the **type of freight vehicles** in the case of ZEZ-Fs and near-ZEZ-Fs
- » have or will likely have **binding requirements** for access based on things like emission performance standards

Some schemes fulfill some of the four criteria, but not all. These include the voluntary zero-emission delivery zone implemented in Santa Monica, California, in the United States.³ Additionally, some zones would allow drivers of an ICE vehicle to enter when paying a fee, such as the scheme in Oxford in the United Kingdom.⁴ Others like those in Oslo and Bergen in Norway intend to allow vehicles running on biogas. While none of these are considered ZEZs here, these schemes are briefly touched upon below.

3 David Shultz, "URB-E Joins Santa Monica's Zero-Emission Delivery Zone Pilot," *dot.la*, May 5, 2022, <https://dot.la/urb-e-2657266421.html>

4 Oxfordshire County Council, "Oxford Zero Emission Zone (ZEZ)," accessed July 31, 2022, <https://www.oxfordshire.gov.uk/residents/roads-and-transport/oxford-zero-emission-zone-zez>

Cities with implemented and planned zero-emission zones and variants globally* (Status: Through July 2022)



	Zero-emission zone (ZEZ) to allow BEVs and FCEVs only	Near-zero-emission zone (near-ZEZ) to allow BEVs, FCEVs, and PHEVs only
Implemented	—	●
Planned	●	—

Applies to all motorized vehicles

	Zero-emission zone for freight (ZEZ-F) to allow BEVs and FCEVs only	Near-zero-emission zone for freight (near-ZEZ-F) to allow BEVs, FCEVs, and PHEVs only
Implemented	●	—
Planned	●	●

Applies to freight vehicles only (e.g., urban delivery vehicles and trucks)

*For planned ZEZs and near-ZEZs, the dates displayed are the dates when all vehicle types would need to be battery electric vehicles (BEVs), fuel cell electric vehicles (FCEVs), or plug-in hybrid electric vehicles (PHEVs). Affected areas of zones range from a single street to an entire city or metropolitan area.

Figure 1. Cities with implemented and planned zero-emission zones and variants globally.

IMPLEMENTED AND PLANNED ZEVS AND NEAR-ZEVS

No city has implemented a ZEZ based on the criteria outlined above, but four cities, all in Europe, have announced their intention to implement a ZEZ in the 2023 to 2030 time frame; for some, not all vehicle types would be affected in the initial stage. The dates listed first below are when the planned zone would affect all vehicle types. In addition, two Boroughs in the UK capital city of London have implemented a near-ZEZ.

» **2023.** Denmark's capital city of **Copenhagen** plans to test three types of ZEZs, one that might cover the historic city center and affect passenger cars and a smaller, yet-to-be-defined area where there are many daycare centers that would affect all vehicle types from 2023.⁵ The third planned scheme would be a zero-emission delivery zone (see more details in the next section). To legally allow municipalities to establish a ZEZ, a proposal published in May 2022 would amend the national Environmental Protection Act by adding a section on ZEZs; it contains details such as implementation date (from July 2024), allowed vehicles (vehicles with emissions of 0 g CO₂/km and plug-in hybrids up to December 2025), a 6-month notice by the municipality prior to the implementation or extension of a ZEZ, and

5 City of Copenhagen, "København Klar med Model, der Skal Gøre de Første Byområder fri for Benzin- og Dieslbiler [Copenhagen Ready with Model to Make the First Urban Areas Free of Petrol and Diesel Cars]," April 20, 2021, <https://www.kk.dk/nyheder/koebenhavn-klar-med-model-der-skal-goere-de-foerste-byomraader-fri-for-benzin-og-dieslbiler>

public involvement.⁶ While the proposal has not yet been adopted, Copenhagen's Municipal Plan 2019 already called for the establishment of a ZEZ in part of the city to support the use of electric cars.⁷

- » **2030.** The Dutch capital city of **Amsterdam** intends to implement a ZEZ covering the inner-city area and affecting all vehicle types except passenger cars by 2025. Additionally, in the entire built-up area of the city, only zero-emission mopeds and scooters would be allowed beginning in 2025. The long-term goal is to gradually tighten the access criteria of the current inner-city LEZ to become a city-wide ZEZ affecting all motorized transportation by 2030.⁸ This was outlined in the city's Clean Air Action Plan from 2019.⁹ The Dutch city of **Eindhoven** is planning a ZEZ in the inner city affecting lorries, delivery vans in business use, and buses from 2025.¹⁰ The plan for 2030 is to tighten access criteria for all non-zero-emission vehicles under its existing LEZ scheme, which currently affects buses, coaches, and trucks of certain emission standards. The **metropolitan region of Paris** in France also plans to gradually tighten its current metropolitan-wide LEZ to become a ZEZ by 2030 and it will affect all vehicle types.¹¹

The following are examples of implemented near-ZEZs:

- » **2018.** The two **Boroughs of Hackney and Islington** in the United Kingdom's capital city of London introduced a cross-borough near-ZEZ in September 2018, and it is locally known as an Ultra-Low Emission Vehicle (ULEV) street.¹² The zone covers nine streets and allows access to vehicles that emit not more than 75 g CO₂/km; BEVs, FCEVs, and PHEVs that can operate with zero-tailpipe emissions for at least 10 miles are allowed. The zone operates Monday to Friday, 7 am to 10 am and 4 pm to 7 pm. Despite being part of the London ULEZ, the tighter requirements of the near-ZEZ still apply.
- » **2020.** The **City of London** in the United Kingdom sought to reduce air pollution and bring nitrogen dioxide (NO₂) levels within World Health Organization guidelines with an 18-month pilot that ran from March 2020 to September 2021 and covered the 360-meter-long Beech Street. The scheme operated 24 hours a day, 7 days a week and only granted access to vehicles that emit not more than 75 g CO₂/km, have a zero-emission range of at least 20 miles, and are compliant with Euro 6/VI-equivalent emission standards for nitrogen oxides (NO_x).¹³ After the pilot ended and the restrictions were removed, mean NO₂ concentrations increased again.¹⁴ Initially the plan was to eventually make the scheme permanent. Indeed, a public consultation is being prepared for a permanent scheme and the consultation was to be launched after the London local election in May 2022.¹⁵ No further details have been announced.

6 Høring\$Portalen, "Høring af Udkast til Lov om Andring af Miljøbeskyttelsesloven (Nulemissionszoner, m.v.) [Hearing on the Draft Law Amending the Environmental Protection Act (Zero Emission Zones, etc.)], accessed July 31, 2022, <https://hoeringsportalen.dk/Hearing/Details/66540>

7 City of Copenhagen, "Copenhagen's Municipal Plan 2019 - World City with Responsibility," 2020, <https://kp19.kk.dk/copenhagen-municipal-plan-2019>

8 City of Amsterdam, "Low Emission Zone for Diesel Vehicles," accessed July 31, 2022, <https://www.amsterdam.nl/en/traffic-transport/low-emission-zone/>

9 City of Amsterdam, *Clean Air Action Plan*, (April 2019), http://www.citylogistics.info/wp-content/uploads/2019/05/RD63-Handout-Lyon-EVS32_A4-3.pdf

10 Municipality of Eindhoven, "Milieuzone [Environmental Zone]," accessed July 31, 2022, <https://www.eindhoven.nl/stad-en-wonen/verkeer/milieuzone>

11 Paris, "La Zone à Faibles Émissions (ZFE) [Low Emission Zone (LEZ)]," July 7, 2022, <https://www.paris.fr/pages/la-zone-a-faibles-emissions-zfe-pour-lutter-contre-la-pollution-de-l-air-16799>

12 Hackney, "Ultra low emission streets," accessed June 30, 2022, <https://hackney.gov.uk/ulev-streets>

13 City of London, "City of London's Beech Street Set to Become UK's First 24/7 Zero Emission Street," December 16, 2019, <https://news.cityoflondon.gov.uk/city-of-londons-beech-street-set-to-become-uks-first-247-zero-emission-street/>

14 Louise Mittal, *Air Quality Effects of the Implementation and Removal of Zero Emission Street Restrictions at Beech Street in the City of London*, Imperial College London, Environmental Research Group, accessed July 31, 2022, <https://eeh.hpru.nihr.ac.uk/wp-content/uploads/2022/03/Beech-Street-Zero-Emission-Street-Summary-005.pdf>

15 City of London, "Beech Street Zero Emissions Scheme," June 6, 2022, <https://www.cityoflondon.gov.uk/services/streets/traffic-schemes-and-proposals/beech-street>

Table 1. Summary of implemented and planned ZEZs and near-ZEZs globally (through July 2022).

City (country)	Type	Status	Implementation date	Vehicle types affected	Area affected	
Zero-emission zones (ZEZs)						
Copenhagen (Denmark)	ZEZ (pilot)	Planned	2023	Passenger cars	Unspecified area in historic city center	
	ZEZ (pilot)		2023	All	Unspecified	
Amsterdam (Netherlands)	ZEZ	Planned	2025	Buses, coaches, taxis, passenger shipping	Inner city	
					Mopeds, scooters	Citywide
			2030	All	Citywide	
Eindhoven (Netherlands)	ZEZ	Planned	2025	Lorries, delivery vans in business use, buses	Inner city	
			2030	All		
Paris (France)	ZEZ	Planned	2030	All	Metropolitan-area-wide	
Near-zero-emission zones (near-ZEZs)						
London Boroughs of Hackney and Islington (United Kingdom)	Near-ZEZ	Implemented	September 2018	All	Nine streets	
City of London (United Kingdom)	Near-ZEZ (pilot)	Completed	March 2020 to September 2021	All	360 m long street	

Note: Bold years are when all vehicle types were/will be affected.

Other cities are vaguer in their intentions and fulfill only one or a few of the criteria. For those, it is not clear if, for example, all vehicle types would be affected, if PHEVs would still be allowed, and/or when they would be implemented. This includes Germany's capital city of **Berlin**, which wants to implement a ZEZ "in the medium-term," as outlined in its Urban Development Plan for Mobility and Transport published in March 2021. In a first stage, it is envisioned that the ZEZ would cover the current inner-city LEZ, an area of around 88 km².¹⁶ Details about vehicle and fuel types affected have yet to be announced. The plan highlights various prerequisites for the implementation of a ZEZ, including the creation of national- and state-level legal frameworks.

Another is the Indian city of **Kevadia**, which intends to only allow battery-operated vehicles in an area around the Statue of Unity; no start date or further scheme details have been announced.¹⁷ **London**, United Kingdom aims to have a ZEZ in central London by 2025, a larger zone in inner London by 2040, and to implement a citywide ZEZ by 2050 at the latest, as stated in the Zero Emission Zones Guidance for London boroughs wishing to implement local ZEZs.¹⁸ No further details have been announced in terms of vehicle and fuel types affected.

The Canadian city of **Montreal** is considering a ZEZ in its city center by 2030 with gradual implementation. According to the city's Climate Plan 2020–2030, published at the end of 2020, the goal is to increase the share of electric vehicles.¹⁹ Still, which vehicle types would be affected and if PHEVs would be allowed has yet to be announced. Washington State's largest city of **Seattle** published a Transportation

16 Senatsverwaltung für Umwelt, Mobilität, Verbraucher- und Klimaschutz, *Stadtentwicklungsplan Mobilität und Verkehr* [Urban Development Plan for Mobility and Transport], accessed July 31, 2022, <https://www.berlin.de/sen/uvk/verkehr/verkehrspolitik/stadtentwicklungsplan-mobilitaet-und-verkehr/>

17 Pramoda Gode, "Kevadia: A Launch Pad for a New Era of Urban Vehicle Access Regulations in India?" *ICCT* (blog post), September 15, 2021, <https://theicct.org/blog/staff/kevadia-launch-pad-india-pv-hdv-sept21>

18 Mayor of London and Transport for London, "Zero Emission Zones – Taking Forward the Mayor's Transport Strategy Proposal for Zero Emission Zones," September 1, 2019, <https://content.tfl.gov.uk/tfl-guidance-for-local-zero-emission-zones.pdf>

19 Montréal, "Montréal Climate Plan: Objective Carbon-Neutral by 2050," December, 15 2020, <https://montreal.ca/en/articles/montreal-climate-plan-objective-carbon-neutral-2050-7613>

Electrification Blueprint in 2021 that discusses having a major area of the city with zero emissions from transportation, including “streets or blocks that restrict cars and promote walking, biking, electrified transit, and electric goods delivery and services.”²⁰ This commitment is based on the C40 Cities Green and Healthy Streets Declaration (see further below). To meet this commitment, Seattle’s Blueprint also suggests pilot ZEZs in the city center following a community-driven approach that considers the needs of communities of color and those of all income levels, abilities, and ages.²¹

IMPLEMENTED AND PLANNED ZEZ-FS AND NEAR-ZEZ-FS

Variants of ZEZs presented in this section are those only focusing on freight vehicles, with affected vehicles ranging from urban delivery vehicles to medium- and heavy-duty trucks.²² There are two cities globally that have implemented a ZEZ-F, and about 30 cities planning to introduce one. As above, the dates stated are when all freight vehicles, as defined by the scheme, would have to be zero-emission at the tailpipe to enter and drive in the zone.

- » **2015.** The city of **Rotterdam** in the Netherlands introduced a street-based ZEZ-F in 2015. The street is 1.6 km long and situated in west of the city center. The scheme only allows zero-emission trucks equal or above 3.5 tons and operates 24 hours a day, 7 days a week.²³
- » **2018.** The Chinese city of **Shenzhen** implemented a ZEZ-F pilot in each of its 10 districts in 2018, and locally these are referred to as Green Logistics Zones. These ZEZ-F pilots apply to light-duty trucks with a weight less than 4.5 tons. The schemes operate 24 hours a day, 7 days a week.²⁴ Shenzhen has continuously extended this pilot scheme, and the end date of the latest extension is July 21, 2023.
- » **2025.** Denmark’s capital city of **Copenhagen** intends to implement a ZEZ-F, referred to as zero-emission delivery zone, which would cover vans from 2023 and trucks from 2025.
- » **2030.** Based on the 2019 National Climate Agreement, the Dutch government gives all cities and municipalities the option to implement ZEZ-Fs from 2025 and to only allow zero-emission delivery vans and trucks in city centers and surrounding neighborhoods. A transitional phase will be granted for delivery vans of emission class 5 and 6 (Euro 5 and 6) up to 2027/2028 and Euro VI rigid trucks and tractor-trailers up to 2030. The vision is to implement these zones in the **30 to 40 larger Dutch cities**.²⁵ About 30 cities and municipalities have committed to implement ZEZ-Fs or are investigating them, including Amsterdam and Eindhoven, listed above.²⁶

20 City of Seattle, “Transportation Electrification Blueprint,” March 2021, <https://www.seattle.gov/environment/climate-change/transportation-/transportation-electrification/transportation-electrification-blueprint>

21 Ryan Packer, “Four Years Later, Seattle Emissions-Free Area Has Gone From Promise to Draft Plan,” *The Urbanist*, October 29, 2021, <https://www.theurbanist.org/2021/10/29/four-years-later-seattle-emissions-free-area-has-gone-from-promise-to-draft-plan/>

22 Transport Decarbonisation Alliance, C40 Cities, POLIS, *How-to Guide Zero-Emission Zones – Don’t Wait to Start with Freight!*, (December 2020), https://www.polisnetwork.eu/wp-content/uploads/2020/12/ZEZ-F-How-to-Guide_low.pdf

23 City of Rotterdam, “Vrachtautoverbod ‘s-Gravendijkwal [Truck ban’s-Gravendijkwal],” accessed July 31, 2022, <https://www.rotterdam.nl/werken-leren/sgravendijkwal/>

24 Shenzhen Public Security Bureau, “关于设置绿色物流区禁止轻型柴油货车通行的通告 [Notice on Setting Green Logistic Zones to Ban the Use of Light-duty Diesel Trucks],” July 20, 2022, http://www.sz.gov.cn/cn/xxgk/zfxjg/tzgg/content/post_9969657.html

25 Rijksoverheid, “Kabinet Komt Ondernemers Tegemoet bij Overstap op Schone Bestelbus of Vrachtwagen [Cabinet Meets Entrepreneurs To Switch to Clean Delivery Van or Truck],” October 5, 2020, <https://www.rijksoverheid.nl/actueel/nieuws/2020/10/05/kabinet-komt-ondernemers-tegemoet-bij-overstap-op-schone-bestelbus-of-vrachtwagen>

26 Zero Emissie Stadslogistiek, “First 19 Zero-Emission Zones Online,” accessed July 31, 2022, <https://www.opwegnaarzes.nl/actueel/nieuws/zero-emissiezones-online#:~:text=Om%20te%20helpen%20bij%20de,op%20deze%20kaart%20zichtbaar%20worden>; evofenedex, “Zero-Emissiezones Binnen Gemeenten [Zero-Emission Zones Within Municipalities],” accessed July 31, 2022, <https://www.evofenedex.nl/grenzenzero-emissiezones>

While there are no implemented near-ZEZ-Fs, one city in China is planning to implement one:

- » **2023.** The Chinese city of **Luoyang** adopted a near-ZEZ-F scheme, locally referred to as Road Access Restriction Area for Urban Delivery Trucks, in April 2020, and it is set to be implemented on April 30, 2023. The zone is to cover the city center and apply to urban delivery trucks, and it is intended to operate 24 hours a day, 7 days a week. Further, all urban delivery trucks, regardless of fuel type, are banned from entering the zone during rush hours, 7 am to 9 am and 5:30 pm to 7:30 pm.²⁷

Table 2. Summary of implemented and planned ZEZ-Fs and variants globally (through July 2022).

City (country)	Type	Status	Implementation date	Vehicle types affected	Area affected
Zero-emission zones for freight (ZEZ-Fs)					
Rotterdam (Netherlands)	ZEZ-F	Implemented	January 2015	Heavy-duty trucks > 3.5 tons	1.6 km long street
Shenzhen (China)	ZEZ-F (pilot)	Implemented	July 2018	Light-duty trucks < 4.5 tons	~ 22 km ²
Copenhagen (Denmark)	ZEZ-F (pilot)	Planned	Q25	Delivery vans and trucks	Unspecified larger area which might overlap the planned historic city center ZEZ
30-40 cities (Netherlands)	ZEZ-F	Planned	2030	Delivery vans and trucks	City centers
Near-zero-emission zones for freight (Near-ZEZ-Fs)					
Luoyang (China)	Near-ZEZ-F	Planned	2023	Urban delivery trucks	City center

Note: Bold years are when all freight vehicles as defined in the scheme were/will be affected.

Another planned scheme is in the Chinese city of **Foshan**, which intends to introduce near-ZEZ-F pilots, locally referred to as Green Urban Delivery Demonstration Zones, but no start date has been set nor are there scheme boundaries. It is intended that the zone will apply to urban delivery trucks and operate every day between 6 am and 10 pm.²⁸ To accelerate freight decarbonization, the county of **Los Angeles** in the U.S. state of California suggests programs such as zero-emission delivery zones, and these are listed in the draft 2045 Climate Action Plan.²⁹ Further details have not been published.

OTHER ZONE DEVELOPMENTS

- » **United Kingdom.** In 2013, the city of **Oxford** established a LEZ for public buses that affected certain streets in the city center.³⁰ Subsequently, the ambition to implement a ZEZ was set out in Oxford's Transport Strategy, published in 2015; the strategy stressed the city's plan to implement a city center ZEZ for all vehicles by 2020 and then to extend the zone citywide by 2035.³¹ The 2020 deadline was missed, though, and at the end of February 2022, the city started what is locally referred to as a pilot ZEZ and it covers part of the city center. The zone includes nine streets or street sections and operates from 7 am to 7 pm, seven days a week, all year long. It is combined with a

27 Luoyang Public Security Bureau, "关于进一步规范和优化城市物流配送货车通行管理的通告[Notice on Further Normalizing and Optimizing Road Access Management of Urban Delivery Trucks]," April 21, 2021, <http://zw.lyd.com.cn/system/2021/04/21/032019328.shtml>

28 Foshan Transportation Bureau, "佛山市城市绿色货运配送办法 (征求意见稿) [Proposal on Foshan Green Urban Delivery Rules]," March 3, 2021, http://jty.foshan.gov.cn/gkmlpt/content/4/4718/post_4718486.html#367

29 County of Los Angeles, Department of Regional Planning, *Draft 2045 Climate Action Plan*, (April 2022), https://planning.lacounty.gov/site/climate/wp-content/uploads/2022/04/LA_County_2045_CAP_Public_Draft_April_2022.pdf

30 Oxford City Council, "Oxford's Low Emission Zone (LEZ)," accessed July 31, 2022, https://www.oxford.gov.uk/info/20299/air_quality_projects/208/oxfords_low_emission_zone_lez

31 Oxfordshire County Council, *Oxford Transport Strategy*, (2015), https://mycouncil.oxfordshire.gov.uk/documents/s33711/Background%20CA_JUN2816R12%20Connecting%20Oxfordshire%20vol%208%20part%20i%20-%20Oxford%20Transport%20Strategy.pdf

payment scheme for non-compliant vehicles which allows them to enter and drive in the zone. Vehicles with emissions of more than 0 g CO₂/km pay a daily charge ranging between £2 and £10 (€2.40 to €12) depending on their CO₂ emissions level.³² After the pilot, in the second phase (the time for this has yet to be defined), the objective is to make the zone permanent, include a larger area, and, starting in August 2025, increase the daily entrance charges for non-compliant vehicles to £4 to £20 (€4.80 to €24).³³

- » **Belgium.** The capital city of **Brussels** is planning to gradually tighten access regulations for certain non-zero-emission vehicle types to its existing LEZ, which covers the Brussels-Capital Region. While only mopeds that are BEVs and FCEVs will be allowed to enter the LEZ by 2028, the date for motorcycles, passenger cars, vans, and minibuses is 2035, and no end date has been set for heavy-duty buses and trucks.³⁴
- » **Norway.** In its Climate and Energy Strategy from 2016, the capital city of **Oslo** set its ambition to introduce a ZEZ.³⁵ Under current plans, a pilot would start in 2023. There are two geographical options under consideration, one within Ring 1, the city center area, and a second in a larger area within the inner ring (Ring 2) that includes the city center area and areas a little farther outside the city center; the latter would only apply to municipal roads and not state roads or tunnels. It is envisioned to start with all light vehicles such as cars and vans in 2023 and phase in medium- and heavy-duty vehicles in 2025.³⁶ Based on current plans, heavy vehicles including buses operating with biogas would also be allowed to enter and drive in the ZEZ in addition to BEVs and FCEVs. The city of **Bergen** aimed in its 2016 Green Strategy to introduce a ZEZ in parts of the city center by 2020 and then citywide by 2030.³⁷ As of mid-2022, however, the city plans to introduce a pilot ZEZ in a select part of the city center in autumn 2023.³⁸ There are different geographical options under discussion. One would cover all vehicle types, beginning with cars and vans in 2023 and then including heavy-duty vehicles from 2025 onward. However, the city is also considering allowing vehicles operating on biogas in these zones. From the legal side, the Norwegian Public Roads Administration is collaborating with the governments of Bergen and Oslo to investigate how ZEZs can be legally anchored.³⁹
- » **United States.** The city of **Santa Monica** in California introduced a voluntary zero-emission delivery zone (ZEZ-F), the first of its kind in the country, in 2021 and the pilot will run through December 2022. The one-square mile area covered by the ZEZ-F is situated in the commercial activity core of Santa Monica and supports zero-emission modes for last-mile deliveries. It provides priority curb access for zero-emission delivery vehicles in what are locally referred to as loading priority curb areas.⁴⁰

32 Oxfordshire County Council, "Charges for Oxford's Zero Emission Zone (ZEZ)," accessed July 31, 2022, <https://www.oxfordshire.gov.uk/residents/roads-and-transport/oxford-zero-emission-zone-zez/charges-oxfords-zez>

33 Oxfordshire County Council, "About Oxford's Zero Emission Zone (ZEZ)," accessed July 31, 2022, <https://www.oxfordshire.gov.uk/residents/roads-and-transport/oxford-zero-emission-zone-zez/about-zero-emission-zone>

34 Brussels LEZ, "In Practice: Everything You Need to Know About the LEZ in the Brussels-Capital Region," accessed June 30, 2022, <https://www.lez.brussels/mytax/en/practical?tab=Agenda>

35 Oslo Kommune, "Climate and Energy Strategy for Oslo," June 22, 2016, <https://www.klimaoslo.no/wp-content/uploads/sites/88/2018/06/Climate-and-Energy-Strategy-2016-English.pdf>

36 Oslo Kommune, "Nullutslippssone [Zero Emission Zone]," accessed July 31, 2022, <https://www.oslo.kommune.no/slik-bygger-vi-oslo/nullutslippssone/#gref>; Klima Oslo, *Utredning Nullutslippssoner - Faglig Grunnlag for Videre Arbeid Med Bestilling [Study of Zero Emission Zones - Professional Basis for Further Work with Ordering]*, 2021, <https://www.klimaoslo.no/wp-content/uploads/sites/88/2021/02/Rapport-om-nullutslippssoner-faglig-grunnlag-for-videre-arbeid-med-bestilling-Redusert-filstorrelse.pdf>

37 Bergen Kommune, "Green Strategy - Climate and Energy Action Plan for Bergen," September 21, 2016, https://mycovenant.eumayors.eu/storage/web/mc_covenant/documents/8/65nOG32AUwcbNnxv2lYXYsYmS QiydgyW.pdf

38 Bergen Kommune, "Nullutslippssone i Bergen [Zero Emission Zone in Bergen]," accessed June 30, 2022, <https://www.bergen.kommune.no/hvaskjer/tema/vi-bygger-bergen/veier-byrom-og-parker/gronn-mobilitet/nullutslippssone-i-bergen>

39 Ibid.

40 City of Santa Monica, "Zero Emission Delivery Zone," accessed July 31, 2022, <https://www.santamonica.gov/zero-emission-delivery-zone>

- » **India.** The city of **Gurgaon** launched an electric three-wheelers zone pilot in August 2021. Autorickshaws running on diesel and compressed natural gas (CNG) are not allowed to operate in the zone.⁴¹
- » **China.** The province of **Hainan** passed the Amendment to Hainan Provincial Motor Vehicle Emission Control Regulation in December 2021, and it lays out the legal basis for cities in the province to implement ZEZs to improve air quality.⁴² No ZEZs have been implemented yet.
- » **Global.** Thirty-six cities have committed, through the **C40 Cities** Green and Healthy Streets Declaration, to ensure that a major area of their city will be zero emission by 2030. Establishing ZEZs is one of the pathways to help the cities fulfill the commitment.⁴³ Signatories of the declaration include several cities mentioned above: Amsterdam, Berlin, Copenhagen, and London, Los Angeles, Oslo, Oxford, Paris, Rotterdam, Santa Monica, and Seattle.

CONCLUSIONS

There is continued interest in and experimentation with ZEZs and variants globally. These aim to improve local air quality, limit congestion, and help spur the decarbonization of the vehicle fleet. Few examples exist outside Europe, but some cities in China have implemented or are planning to implement ZEZs or near-ZEZs, most with a focus on freight vehicles. We also find activities outside Europe and China, particularly first approaches in the United States and India. Some high-level insights emerge from this review:

- » **Schemes typically start as pilots or progress from existing LEZs.** Some cities start with pilots and aim to make them permanent, while others are progressing from an existing LEZ to a ZEZ. Geographical scopes range from single streets to entire metropolitan areas. Additionally, some cities are creating a transitional phase for delivery vans and trucks, including the Dutch cities and municipalities implementing ZEZ-Fs.
- » **Legal frameworks are an important precondition to establishing those zones.** In Denmark, the legal framework for ZEZs is currently being discussed, and Berlin has also highlighted how the creation of both national- and state-level legal requirements are crucial before it can implement its planned ZEZ. Similarly, the Norwegian Public Roads Administration is collaborating with the city governments of Bergen and Oslo to investigate how ZEZs can be legally anchored.
- » **Equity considerations should be an integral part of the decision-making process.** The broad public and particularly communities affected by the zones should be consulted and involved prior to the implementation of a ZEZ. Importantly, this could increase awareness and acceptance. Additionally, a community-driven program with active engagement might help to identify strategies that would allow for the ZEZ while still meeting the needs of various groups, including communities of color and people of all incomes, abilities, and ages. This is already highlighted as part of Seattle's proposal.

41 Grusharan Bhalla, "'Electric Vehicle Only' Zone Launched In Gurgaon; Diesel & CNG Autos Prohibited," *Indiatimes*, August 17, 2021, <https://www.indiatimes.com/news/india/electric-vehicle-only-zone-launched-in-gurgaon-diesel-cng-autos-prohibited-547390.html>

42 Standing committee of Hainan Provincial People's Congress, 海南省机动车排气污染防治规定（2021修订） [Hainan Provincial Motor Vehicle Emission Control Regulation (amended in 2021)], (2021), http://www.hnqi.org/index.php?m=Open&a=detail&column_id=76&id=3108

43 C40 Cities, *Green and Healthy Streets Declaration*, (February 2022), https://www.c40.org/wp-content/uploads/2022/03/C40-Green-and-Healthy-Streets-Declaration_Public-progress-report_Feb-2022.pdf

There are other aspects to consider when designing a ZEZ, including the coverage of the public charging infrastructure network and whether there are effective subsidies for the purchase of BEVs and FCEVs. Overall, establishing ZEZs at the city level can be one important measure to support the shift to zero-emission vehicles. We will continue tracking ZEZ developments.