(E)MISSION: ZERO

Towards zero-emission mobility in European cities

CleanCities

This briefing was written by the Clean Cities Campaign, a campaign hosted by Transport & Environment.

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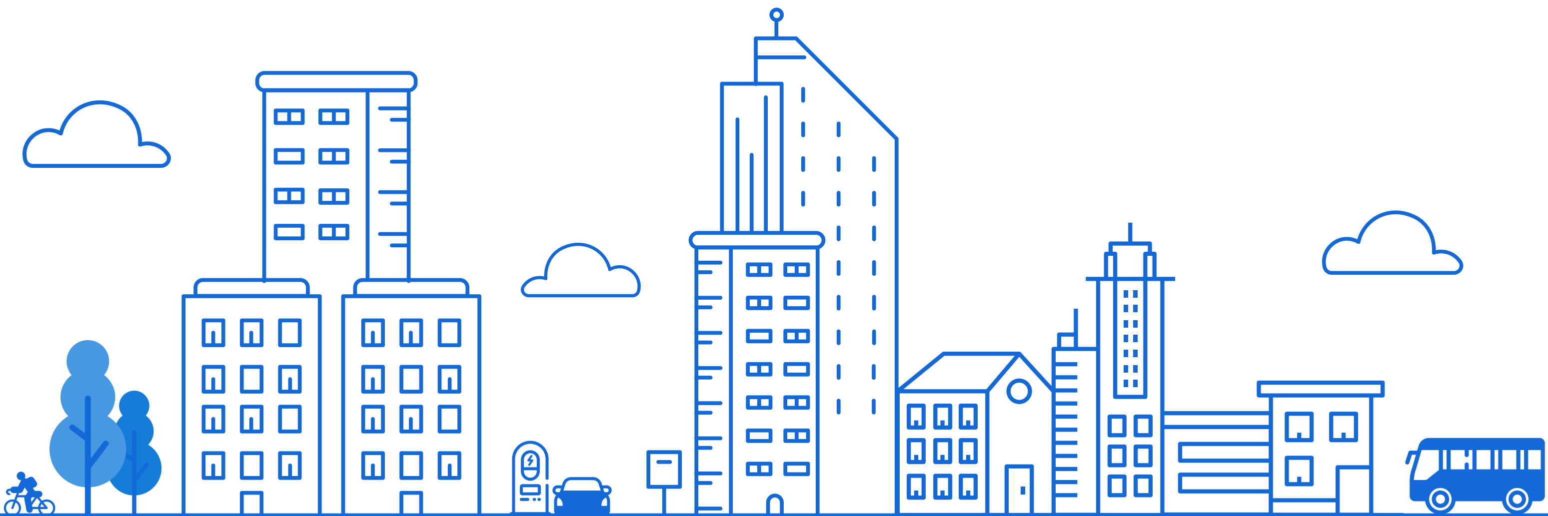


Executive summary

The *Clean Cities Campaign* (CCC) is a European coalition of almost 100 civil society organisations campaigning for zero-emission urban mobility. In order to better understand how the transition to decarbonised urban mobility can be implemented in cities within a relatively short time frame, the CCC commissioned *TRT Trasporti e Territorio* to undertake a high-level modelling study.

This report models policy measures that would allow five selected cities to achieve close to zero-emission transport in European cities by around 2030. It is meant to inform the debate on the decarbonisation of urban transport and to encourage cities across Europe to step up their efforts to create climate-friendly, people-centred and sustainable transport systems and cities.

Five major European cities - Brussels, Madrid, Greater Manchester, Milan, and Warsaw - have been modelled in four different scenarios. The scenarios apply different policy packages, which differ in their focus and emphasis (active, shared and public transport, electrification of vehicles or a combination of both) and the level of ambition (current policies and plans versus transformative measures).

The full results and further details can be found in the accompanying technical reports.

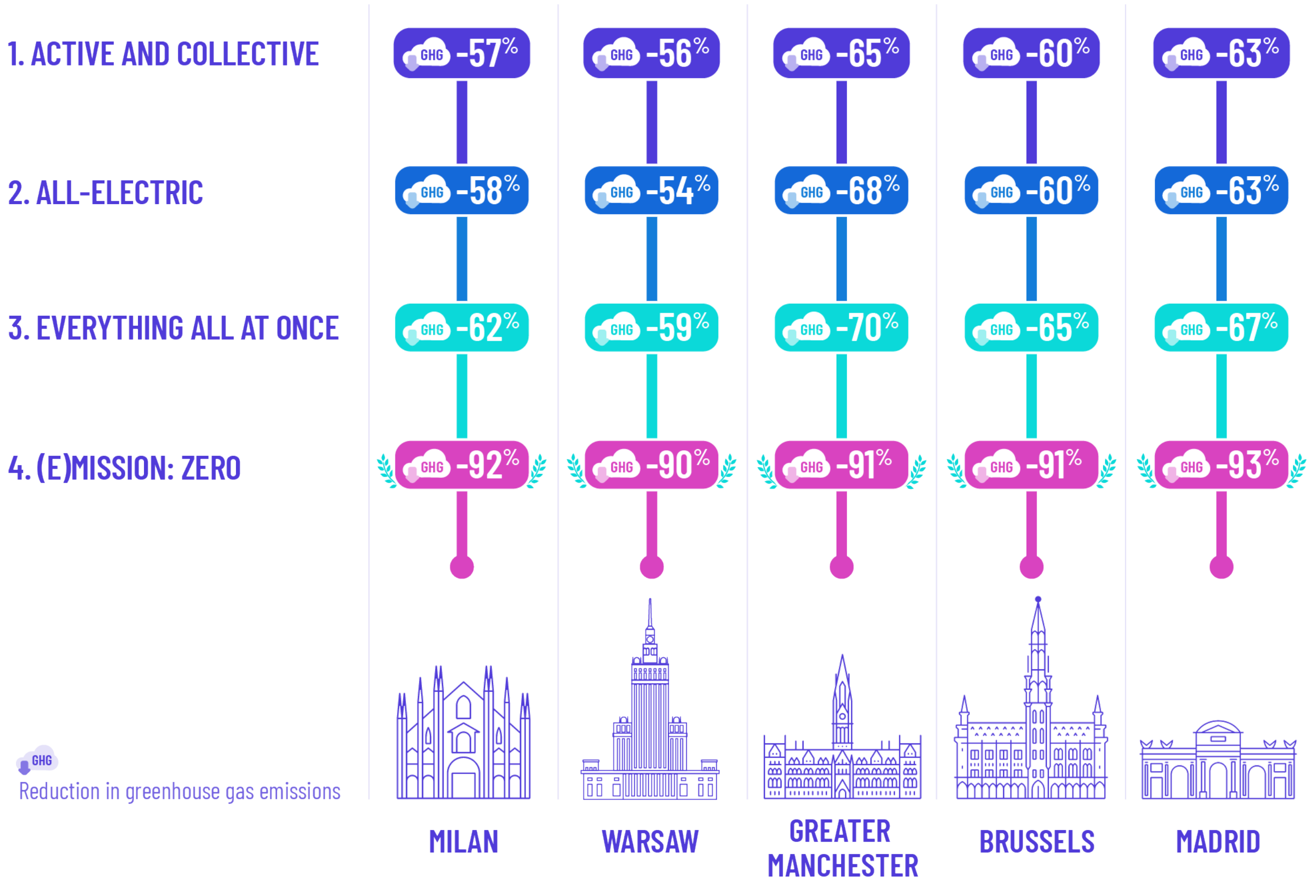
In view of the results, the *Clean Cities Campaign* calls on city leaders to provide a clear vision and plan to transition to zero-emission transport by the 2030s, especially by introducing new or improved low-emission zones that will evolve into zero-emission zones.

Governments and the EU should provide dedicated long-term funding for investment in clean urban transport solutions, implement the phase-out of internal combustion engines (ICE) in cars, vans, buses and trucks and step up the 'EU Mission for 100 climate-neutral and smart cities by 2030'.

The main findings of the study are:

- All scenarios lead to significant greenhouse gas (GHG) reductions from urban transport by 2030, ranging from 55% to 94%. However, only the most ambitious scenario, termed '*(E)Mission: Zero*', achieves a reduction above 90%, thereby bringing the cities closest to the objective of zero-emission mobility.
- It is highly ambitious but possible to reach close to zero-emission transport in the selected cities by around 2030, applying policies and technologies that are already available.
- Measures that encourage citizens to reduce car use and switch to cleaner modes of transport and vehicles are highly effective and therefore indispensable. They include low/zero-emission zones, limited traffic zones but also the electrification of cars, buses and vans/trucks as well as the expansion of cycling infrastructure.
- Large reductions in GHG emissions from urban transport provide important environmental, health and economic co-benefits by improving road safety, reducing air and noise pollution and decreasing transport energy consumption. In most of the scenarios and cities, the benefits strongly outweigh the costs of the measures.

Figure 1 - Per capita GHG emissions (Tank-to-Wheel) from urban transport by city and scenario



List of abbreviations

BEV	Battery electric vehicle
CCC	Clean Cities Campaign
CO	Carbon monoxide
EU	European Union
EV	Electric vehicle
GHG	Greenhouse gases
HGV	Heavy goods vehicle
ICE	Internal combustion engine
ITF	International Transport Forum
LEZ	Low-emission zone
LTZ	Limited traffic zone
TRT	Trasporti e Territorio
MOMOS	MOdello per la MObilità Sostenibile (Sustainable MObility MOdel)
NOx	Nitrogen oxides (nitric oxide (NO) and nitrogen dioxide (NO2))
PM2.5	Fine particulate matter with a diameter of 2.5 μm or less
SUMP	Sustainable urban mobility plan
TEN-T	Trans-European Transport Networks (TEN-T)
TTW	Tank-to-Wheel
VOC	Volatile organic compounds
WTW	Well-to-Wheel

1. Introduction

Florian Wehde (Via Unsplash)

The *Clean Cities Campaign (CCC)* is a European coalition of almost 100 civil society organisations campaigning for the transition to zero-emission mobility in European cities by the 2030s. One of the main questions that the campaign tries to answer is how this transition can be implemented within a relatively short time frame.

This is why the *CCC* commissioned a high-level study modelling the necessary policy changes for five selected cities from different parts of Europe. *TRT Trasporti e Territorio*, a Milan-based consultancy specialised in transport modelling, was selected to carry out the analysis on behalf of the *CCC*. The data collection and analysis took place between March and November 2023.

This report summarises the context, methodology and main findings of the analysis for a non-specialist audience. It should be read in conjunction with the accompanying technical reports produced by *TRT Trasporti e Territorio* which are available for each of the five cities on the CCC website. A detailed description of the methodology, the underlying assumptions, the input data as well as the full results can be found in these reports.

This report is structured as follows: The following section (2) sets out the challenge of decarbonising urban transport, summarises the current state of the transition to climate-friendly, healthy and liveable cities, and presents the aims of the research project. This is followed by a brief overview of the methodology (3) and a summary, as well as a brief discussion of the key findings (4). In the final section (5), conclusions are drawn to formulate policy recommendations for cities, governments and the European Union.

2. Context and aims of the research

In 2021, the European Union (EU) set itself a binding target of net zero greenhouse gas emissions by 2050. [1] In light of the converging climate, environmental, social and economic crises, the rapid decarbonisation of transport is essential to secure a liveable future. [2] Transport not only accounts for a quarter of Europe's greenhouse gas (GHG) emissions (of which three quarters are caused by road transport alone) but is also the only sector in Europe whose emissions have not fallen below 1990 levels. [3]

Cities and urban transport are at the centre of efforts to reconcile mobility needs with climate protection as three in four Europeans live in cities, towns or suburbs [4] and a large share of GHG emissions is emitted in cities. Yet, most cities are currently not on track to decarbonise urban transport according to the CCC's City Ranking, which assessed 36 European cities on their progress towards zero-emission mobility. Most cities still over-rely on private car use and fossil fuels, and haven't created the conditions for a just transition.

At a global level, this finding is echoed by the state of Climate Action 2023 report, which finds that the world is largely off track to meet the 1.5 degree target in the transport sector. [5] The first global stocktake under the Paris Agreement in Dubai in December 2023 likewise recognises the need to "transition[...] away from fossil fuels in energy systems, in a just, orderly and equitable manner [...] so as to achieve net zero by 2050 in keeping with the science." [6]

Recognizing the pivotal roles of cities, the European Commission launched the 'Mission for Climate-Neutral and Smart Cities' in 2021, which aims to deliver 100 climate-neutral and smart cities by 2030. [7] Despite this acknowledgement of the need for cities to lead the way when it comes to decarbonisation, too little is known about the policies and measures that are required to reach this goal in urban transport.

The present study is meant to inform the debate on the decarbonisation of urban transport and to encourage cities across Europe to step up their efforts to create climate-friendly, people-centred transport systems and cities that are fit for the future.

Multiple studies have been conducted on the decarbonisation of road transport at a national or European level and within a 2040 or 2050 time frame, such as Transport & Environment's Roadmap to decarbonising European cars (2018) [8], the International Transport Forum's (ITF) Transport Outlook (2023) [9], but also Climact and the NewClimate Institute's analysis for Greenpeace (2020) [10], the Climate Change Committee's sixth carbon budget for the UK (2020) [11], the Ariadne project's report for Germany (2021) [12] and the Fraunhofer ISI's analysis of net zero carbon transport in Europe (2021) [13]. All these studies came to the conclusion that decarbonising transport is possible but requires significant policy changes and investments. However, they don't provide many insights into how zero-emission transport can be achieved specifically in cities and how this can be achieved within a more ambitious time frame.

Many European cities have already embarked on the transition to sustainable urban mobility and are currently leading the way to more liveable, climate-friendly and just cities. The city of Amsterdam, for instance, is among the frontrunners and aims for all forms of transport within the built-up area to be zero-emission by 2030 as part of the city's wider ambition to become climate-neutral by 2050. [14], [15] Other cities, such as Copenhagen and Oslo, are also working towards zero-emission by electrifying their public transport, encouraging walking and cycling and banning polluting fossil-fuel powered vehicles from their cities.

3. Overview of the methodology

The general approach

To better grasp what policies and levels of ambition are required to achieve zero-emission urban mobility in European cities by the 2030s, the *CCC* commissioned *TRT Trasporti e Territorio* to undertake a modelling study. The purpose of this study was to simulate four different scenarios to reduce GHG emissions from transport in five cities and to quantitatively assess the outcomes and impacts of the different scenarios.

It should be noted that the study does not intend to present the most likely outcome nor attempt to forecast the future of urban mobility. Rather, it aims to define potential transition scenarios for the decarbonisation of urban transport and lays out what would be required to achieve this transition as soon as 2030 in a highly uncertain and constantly evolving context.

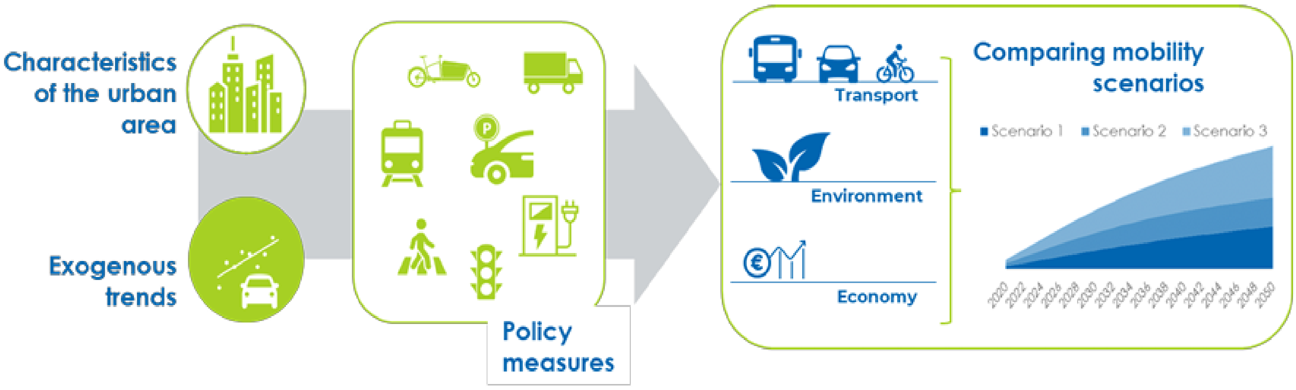
The model and its limitations

The scenarios were modelled using TRT's MOMOS[1] assessment tool (Sustainable Urban MObility MOdel). The MOMOS tool is a high level strategic and aggregated model that has been developed to evaluate different transport policy measures in cities and quantify their transport, environmental and economic impacts. The model represents the current urban mobility system in the baseline year of 2019 (i.e. the situation before the Covid-19 pandemic) and then estimates the impact of policy changes for the forecast year of 2030.

As simplified representations of reality, all models have limitations and the model and approach used for this analysis is no exception. The model does not try to predict future developments and outcomes - which is impossible - but instead extrapolates possible outcomes based on current observations.

Uncertainty about the future economic, political and mobility situation and the challenge to represent non-linear and systemic changes mean there is an inherent uncertainty in all results. Observed data, which is needed to describe the current state as accurately as possible, was not available in some cases and had to be estimated, further affecting the accuracy of the model.

Figure 2 - Simplified modelling approach of the MOMOS assessment tool. Source: TRT



1 Trasporti e Territorio (n.d.) https://www.momos-model.eu/

Furthermore, the impact of policies on cities and the interactions between different elements are often highly complex in nature and there was a need to simplify and represent them with limited detail. Lastly, the model does not incorporate land use and transport interactions and urban planning interventions; any interactions beyond first-order effects are not taken into account.

The results therefore need to be interpreted with the limited level of accuracy and high level of uncertainty in mind. Yet, the model still provides a valuable insight into the expected impacts of transport policies.

Selected cities and policies modelled in this study

A total of five large European cities and city regions with more than one million inhabitants were selected for this modelling exercise:

- Brussels-Capital Region
- Municipality of Madrid
- Greater Manchester
- Municipality of Milan
- Capital City of Warsaw

These urban areas were selected because they reflect the diversity of spatial, geographic and socio-economic realities across Europe's major agglomerations and they face different mobility challenges.

A total of 29 transport policies have been included that are widely applied in cities across Europe and have been proven to reduce GHG emissions from urban transport. These policies cover a wide range of approaches:

- Vehicle electrification and technology improvement
- Shared mobility and innovative solutions
- Transport infrastructure expansion and service improvement
- Traffic planning and management
- Transport demand reduction
- Transport pricing and parking management
- Urban freight consolidation and delivery optimisation

Table 1 – Overview of the policies included in the model. Source: TRT

Vehicle fleet and charging infrastructure
Electric vehicle uptake
Electric vehicle charging infrastructure
Green public transport fleet
Green logistics fleet
Cooperative ITS

Innovative and shared mobility services
Bike sharing
Car sharing
Moped sharing
E-scooter sharing
MaaS
DRT

Transport infrastructure
Cycling network expansion
Bus network expansion
Tram network expansion
Metro network expansion
Park & Ride infrastructure

Traffic management and control
Prioritizing public transport
Limited traffic zones (LTZ)
Low-emission zones (LEZ)
Traffic calming
Pedestrian areas

Transport avoidance
Working from home
Car-free days

Pricing schemes
Congestion and pollution charging
Parking pricing
Public transport fare reduction

Urban logistics
Urban delivery centers
Delivery and servicing plan
Cargo bikes

The scenarios modelled in each city

Based on these policies, four scenarios were developed and modelled in the five selected cities. Four cross-cutting policies (Electrification of the bus fleet, working from home, enhanced parking management and low-emission zones (LEZ)) were applied across all scenarios. The four scenarios are:

- Scenario 1: '*Active and collective*'
- Scenario 2: '*All-electric*'
- Scenario 3: '*Everything all at once*'
- Scenario 4: '*(E)Mission: Zero*'

The first two scenarios represent distinct approaches in that the first one focuses on encouraging active, shared and public transport ('Active and collective'), while the second one aims to increase the uptake of electric vehicles ('All-electric'). The third scenario represents an integrated approach combining the first two scenarios ('Everything all at once'). Finally, the fourth scenario ('(E)Mission: Zero') contains the same broad set of policies as the third scenario, but these are applied with a much higher ambition level in order to assess what interventions are required to achieve close to zero-emission urban transport by around 2030. The table below illustrates which policies are implemented in each of the four scenarios.

Table 2 - Implemented policies by scenario. Source: TRT

Group	Policy	S01	S02	S03	S04
Vehicle fleet and charging infrastructure	Electric vehicle (EV) uptake		✓	✓	✓
	EV charging infrastructure		✓	✓	✓
	Green public transport fleet	✓	✓	✓	✓
	Green logistics fleet		✓	✓	✓
	Cooperative ITS		✓	✓	✓
Innovative and shared mobility services	Bike sharing	✓		✓	✓
	Car sharing	✓		✓	✓
	Moped sharing	✓		✓	✓
	E-scooter sharing	✓		✓	✓
	Moblity-as-a-Service (MaaS)	✓		✓	✓
	Demand-responsive transport (DRT)	✓		✓	✓
Transport infrastructure	Cycling network expansion	✓		✓	✓
	Bus network expansion	✓		✓	✓
	Tram network expansion	✓		✓	✓
	Metro network expansion	✓		✓	✓
	Park & Ride	✓		✓	✓

Group	Policy	S01	S02	S03	S04
Traffic management and control	Prioritizing public transport	✓		✓	✓
	Limited traffic zones (LTZ)	✓		✓	✓
	Low-emission zones (LEZ)	✓	✓	✓	✓
	Traffic calming	✓		✓	✓
	Pedestrian areas	✓		✓	✓
Transport avoidance	Working from home	✓	✓	✓	✓
	Car-free days	✓		✓	✓
Pricing schemes	Parking pricing	✓	✓	✓	✓
	Public transport fare reduction	✓		✓	✓
Urban logistics	Urban delivery centers	✓		✓	✓
	Delivery and servicing plan	✓		✓	✓
	Cargo bikes	✓		✓	✓

Data collection and outputs

To replicate the city's mobility system, input data was collected on a wide array of socioeconomic, spatial and transport indicators for each city. Where possible, data was obtained from official sources for the pre-pandemic situation in 2019. Where this was not possible, data was extrapolated from other years and interpolated from similar cities.

The model produced a series of output indicators for each of the scenarios, including on transport flows, mobility behaviour, GHG emissions, air and noise pollution, road safety and energy consumption. In addition, the costs and benefits of each scenario were estimated and monetized. These outputs allow for the appraisal and comparison of the impacts of each scenario in each city.

Further information

A more detailed overview of the modelling process, the methodology and underlying assumptions, input data and the results for each scenario and city can be found in the accompanying technical reports produced by *TRT Trasporti e Territorio* which are available on the Clean Cities website.

4. Results and key findings

This chapter summarises the modelling results and key findings, starting with the main results: the estimated reductions in greenhouse gas (GHG) emissions.

Reductions in greenhouse gas emissions

All scenarios generate major reductions in GHG emissions by 2030 in all cities, though the extent of these reductions is not the same in all scenarios. The following figures include only tailpipe emissions[2] from transport activities within the defined urban areas as these can be directly influenced by measures taken at the city level. Estimates of 'well-to-wheel' emissions, which are, by definition, higher are provided in the technical reports.

It is important to stress that regulations at the European and national level also have an impact on transport within the selected cities and have therefore been taken into account: The EU's Fit for 55 measures[3], together with projected technological improvements account for reductions of around 30%. This equates to more than half of the achieved overall GHG emission reductions in all but the most ambitious scenario, '(E)Mission: Zero'.

The implemented policies result in a reduction of about 25% in both the 'Active and collective' and the 'All-electric' scenarios, in which the cities see total reductions - i.e. including regulatory changes and technological improvements - in the order of magnitude of 60%.

Total reductions in the combined scenario ('Everything all at once') are only somewhat higher, reaching around 65%. Reasons for this include the strong effect of the shared common policies, the importance of the improvement from regulation and innovation and the partially mutually exclusive nature of the implemented policies (put simply, people can only either shift to walking and cycling or to EVs but not both at the same time).

The '(E)Mission: Zero' scenario, being the most ambitious, generates the highest reductions of more than 90%. While this does not (yet) result in fully zero emission urban transport (which would correspond to a -100% reduction), this clearly shows what large scale reductions would be technically possible and could be achieved in a relatively short period of time. The GHG emissions per capita for each city and scenario can be found in Figure 2.

Mobility and transport changes

In all scenarios and cities, the modal share of public transport and active travel increases, whereas the share of private car use decreases. This change is strongest in the fourth scenario and weakest in the second scenario. Similarly, distances covered by private cars and car ownership decrease in the same manner, as presented in Figure 4 and 5. Vehicle-kilometres for freight increase in all scenarios despite a decrease in heavy goods vehicle (HGV) traffic due to an increase in demand and due to a shift to cargobikes, a trend which is most pronounced in '(E)Mission: Zero' and least pronounced in 'All-electric'.

The uptake of battery-electric vehicles (BEV) amongst passenger cars is highest in the '(E)Mission: Zero' scenario, where it reaches more than 30% fleet share and less high in 'All-electric' and 'Everything all at once'. In the 'Active and collective' scenario, the BEV uptake does not go beyond the uptake driven by EU/national regulation and reduced costs. For commercial vans, the trend is similar, though the fleet share of electric vehicles is much higher than for private cars, with more than two in three vans going electric. For HGV, the share of electric trucks stays below 5% in the first three scenarios, but reaches close to 40% in the '(E)Mission: Zero' scenario.

2 Tailpipe emissions are also known as tank-to-wheel emissions (TTW), these cover only 'downstream' emissions from the use of a vehicle. Well-to-wheel (WTW) emissions, in turn, go beyond the TTW emissions and also account for the 'upstream' emissions such as from vehicle manufacturing and fuel production, electricity generation and distribution.

3 In particular the agreed phaseout of internal combustion engines through the new CO2 standards for cars, vans, trucks and buses as well as the alternative fuels infrastructure regulation but also the Clean Vehicle Directive. In the UK, the key policy driver is the zero emission vehicle mandate.

Figure 3 - Per capita GHG emissions (Tank-to-Wheel) from urban transport by city and scenario

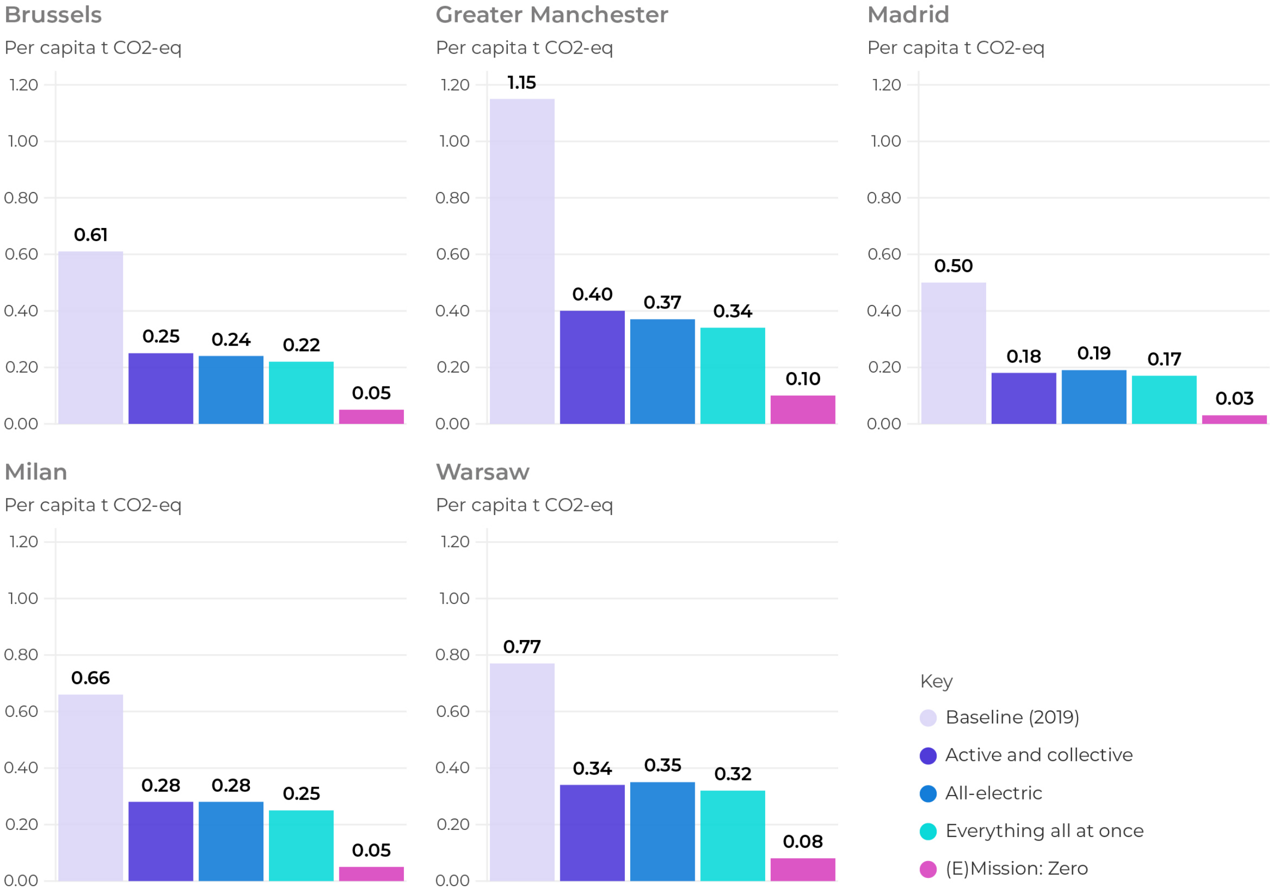


Figure 4 - Total vehicle-kilometres travelled by private car by city and scenario

Co-benefits: Air and noise pollution, energy consumption and road safety

As a consequence of the changes described above, air pollution caused by urban transport decreases significantly, with the biggest reduction in '(E)Mission: Zero', followed by some distance by 'Everything all at once'. The strongest reductions in pollutant emissions of more than 80% are observed for nitrogen oxides (NOx), carbon monoxide (CO) and volatile organic compounds (VOC), while fine particulate matter (PM2.5) emissions are halved in (E)Mission: Zero'. The results for NOx and PM2.5 are illustrated in Figure 6 and 7. Equally, levels of noise pollution decrease in line with the reduction in private car use.

Shifting from private car use to active travel, public transport and from fossil-fuel powered vehicles to electric vehicles reduces overall energy consumption from transport in all scenarios. While electricity demand increases strongly between 2019 and 2030 due to the electrification of motorised transport, fossil fuel consumption decreases by more than 90%. As a result, overall demand for energy from transport is reduced across scenarios and by as much as two thirds in the '(E)Mission: Zero' scenario, as shown in Figure 8.

Figure 5 - Private car ownership per 1,000 inhabitants by city and scenario

Figure 6 - NOx emissions from urban transport in g/capita by city and scenario

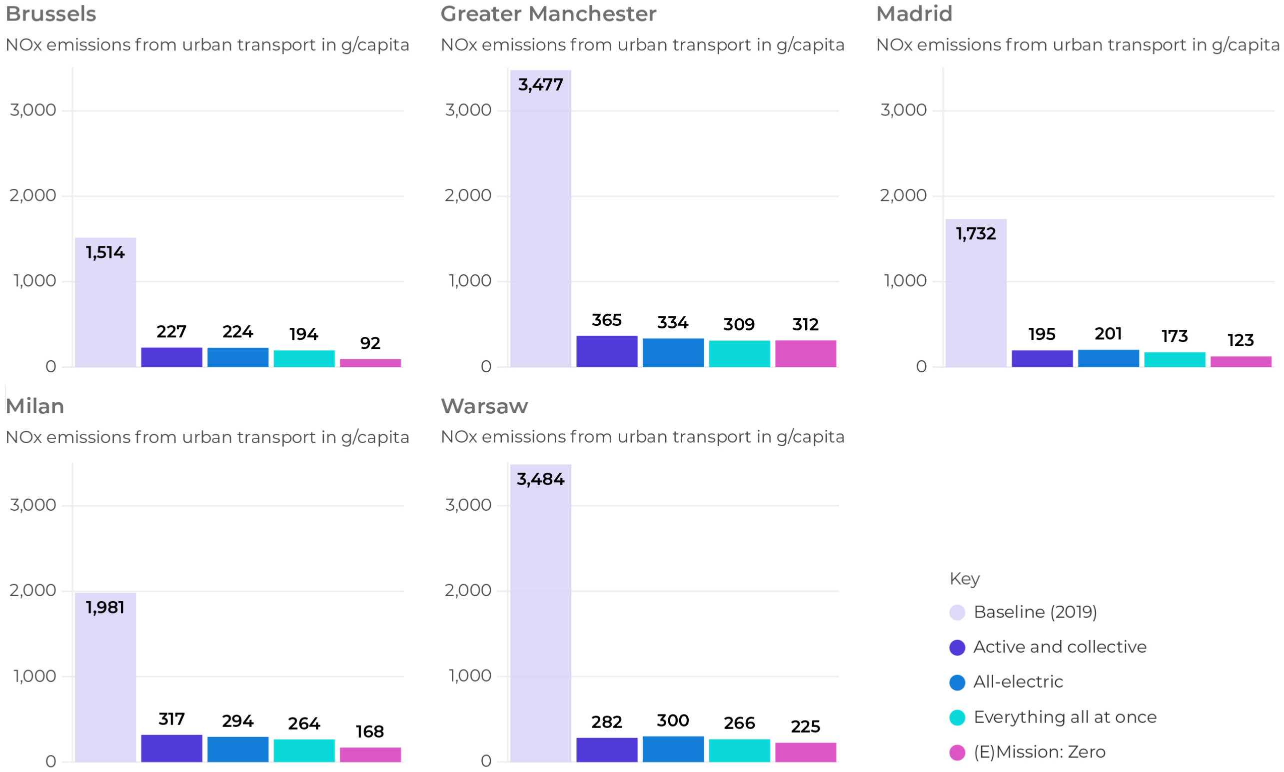


Figure 7 - PM2.5 emissions from urban transport in g/capita by city and scenario

Finally, road traffic collisions and therefore injuries and fatalities decrease in all scenarios. The reduction is however much more pronounced in the scenarios encouraging active travel and public transport ('Active and collective', 'Everything all at once' and '(E)Mission: Zero'). It should be noted that for this study, the health benefits from increased physical activity from walking and cycling have not been estimated for the five cities. However, these are known to be substantial. [16],[17]

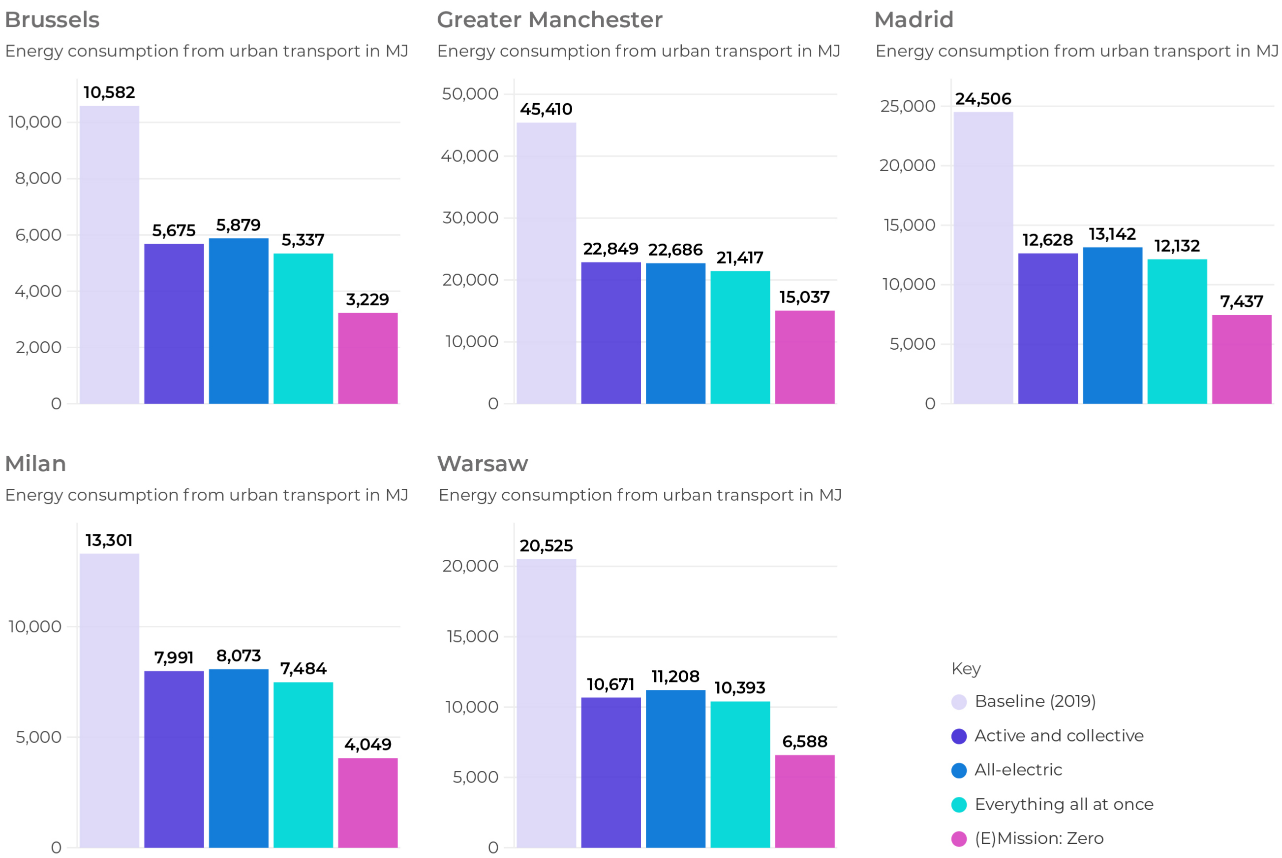
The benefits outweigh the costs of measures in almost all scenarios and cities

While implementing the measures results in important costs across all scenarios and cities, these also generate big (co-)benefits from improved road safety, reduced GHG emissions and air pollution and less noise, with the largest benefits coming from safer roads and the reduction in GHG emissions.

The cumulative costs per scenario and city range from 940 to 2,800 € per inhabitant, and the benefits in form of savings range from 790 to 4,030 €. In all scenarios but 'All-electric', all cities see benefits outweigh the costs. '(E)Mission: Zero' is the most costly of all scenarios, but it is also the one that generates the highest benefits.

In terms of cost per tonne of CO2-eq mitigated (without taking into account the monetized benefits generated by the measures), the cost per tonne ranges between 310 and 720 €, and with the exception of Warsaw, the lowest cost per tonne is obtained in the most ambitious scenario, '(E)Mission: Zero'. Likewise, looking at net benefits per capita, 'Everything all at once' and '(E)Mission: Zero', the two most ambitious scenarios, generate the largest net benefits. This suggests that a more ambitious transformative approach to decarbonising urban transport is also more advantageous, both financially and in terms of co-benefits generated.

Figure 8 - Total energy consumption from urban transport in MJ by city and scenario



Summary of the results

To summarise, all modelled scenarios generate large reductions in GHG emissions, as presented in Figure 9. Yet, the 'Active and collective', 'All-electric', and 'Everything all at once' scenarios that represent typical approaches and current levels of ambitions do not get close to the necessary reduction.

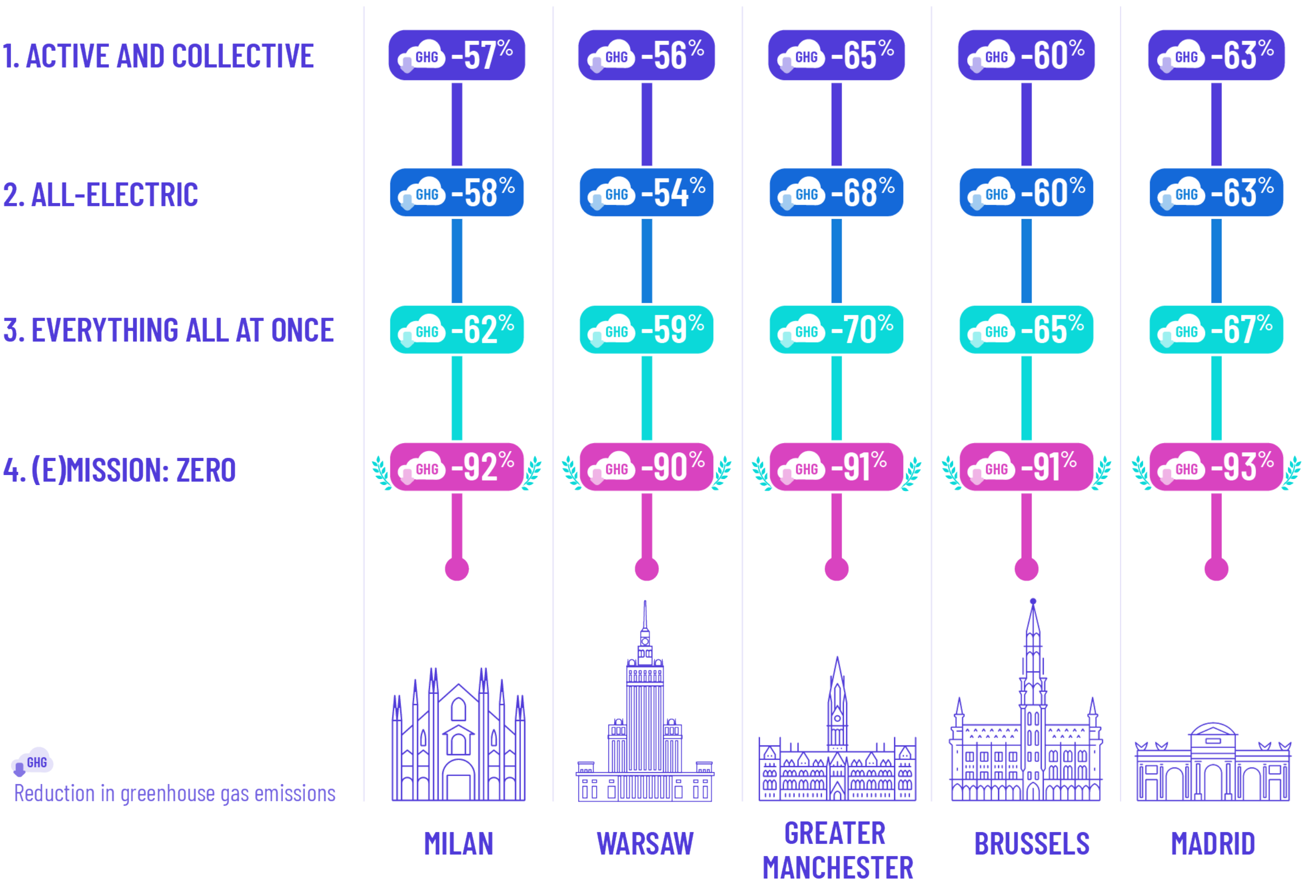
Only the much more ambitious '(E)Mission: Zero' scenario, going far beyond current efforts and entails a profound transformation of urban mobility, delivers reductions of more than 90% and gets close to zero emissions from urban transport by around 2030.

This means that all available solutions need to be deployed together in order to decarbonize urban passenger and freight mobility. In combination with ambitious urban planning and land use interventions (which have largely not been modelled in this study), and by reducing emissions from electricity generation and vehicle manufacturing further, zero emission transport could become a reality in many European cities by the 2030s.

In all scenarios, car ownership and distances driven by private cars go down while electrification increases, as does the modal share of active, shared and public transport. The transport measures in all scenarios also produce significant health, environmental and economic (co-)benefits. Road safety improves, whereas air and noise pollution from transport decrease strongly, as does overall energy demand from urban transport. The additional physical activity from walking and cycling further improves public health. When comparing the overall monetized costs and (co)-benefits, the benefits outweigh the costs in the large majority of cities and scenarios.

The results for each city are presented in more detail in the respective technical reports, and an overview of the results can be found on the results dashboard on the *CCC* website. The following final section draws conclusions from the results and provides policy recommendations.

Figure 9 - Per capita GHG emissions (Tank-to-Wheel) from urban transport by city and scenario



5. Conclusions and policy recommendations

Laurine Peyrard (via Unsplash)

Conclusions

The main conclusions of this high-level modelling study on urban transport in five European cities are:

- It is **difficult, but possible** to reach close to zero-emission transport in the selected cities by around 2030, **applying policies and technologies that are already available**.
- In order to reach close to zero-emission transport within this short timeframe, **all available solutions need to be combined**. To do so, as a matter of priority, **urban freight and deliveries must switch to electric vans, trucks and cargobikes as soon as possible**, a process already under way in many cities.
- **Walking and cycling can be made more attractive with limited investments and within a short time frame**. Likewise, some measures, such as working from home, can help reduce the need to travel.
- In parallel, more **structural changes need to be made**, including the **roll-out of infrastructure** for electric vehicle charging, public transport, shared mobility and active travel. In addition, **land use changes and urban (re-)design interventions can reduce the need to use a car**, making cities more liveable, walkable and child-friendly.
- The switch to zero-emission urban transport delivers **significant environmental, health and economic (co-)benefits**, including reduced air and noise pollution, increased road safety, lower energy consumption, as well as increased physical activity. **In the large majority of scenarios and cities, the benefits strongly outweigh the costs of the measures.**

- While tailpipe emissions matter most for cities as they are more directly under their control, **well-to-wheel emissions should not be ignored**: It remains essential that electricity be generated from renewable sources and that the carbon footprint of manufacturing be reduced. This is already happening [18], [19], but largely outside the control of cities.

- **We need cities to live up to the challenge and take action now**: Waiting to do so will only cause more health and environmental damage, increase costs and fail to provide the necessary clarity to citizens and businesses. **The first and critical step is the adoption and communication of a clear strategy and implementation plan** to fully transition to zero-emission transport by the 2030s, where this hasn't been done yet.

- As earlier research by Clean Cities showed [20], leading cities such as Amsterdam, Rotterdam, Brussels and Stockholm have adopted or are in the process of developing such plans, and show that ultimately a **zero-emission urban transport system will be both necessary and possible.**

- Today's **low-emission zones**, which were primarily designed to curb toxic air pollution, are an **important step towards a zero-emission zone**. They can be tightened over time and provide the necessary clarity and time for citizens and businesses.

On the effectiveness of policy measures

In line with conclusions from other research, this study confirmed that a number of policy measures, when properly implemented, have a particularly strong impact on GHG emissions from urban transport and can thus be recommended as 'no-regret measures' to city leaders:

Policy measure identified as highly effective in this study	Rationale	Evidence from other studies
Low-Emission Zones (LEZs)	By limiting access to the zone to compliant vehicles, LEZs can significantly reduce toxic air pollution. If sufficiently stringent, they also curb motorised transport and GHG emissions in cities.	Tarriño-Ortiz, J et al (2022) [21], Mayor of London (2023) [22], Logika Noise Air Quality Consultants (2022) [23]
Limited traffic zones (LTZ)	LTZ and other local measures that regulate access by car in certain areas (such as a historic city centre, a residential area, or a school street), can discourage car use to and through this area and thereby reduce GHG emissions.	Kuss, P. & Nicholas, K.A. (2022) [24]
Electrification of cars, buses, vans and trucks	Electric vehicles produce, on average, around three times less GHG than fossil-fuel vehicles over their entire life cycle, thus reducing emissions from urban transport.	Transport & Environment (2022) [25], Hoekstra, A. (2019) [26], ICCT (2023) [27]
Expanding cycling networks and facilities	The availability of a cohesive, direct, safe, comfortable and attractive network of cycling infrastructure encourages cycling, which reduces GHG emissions.	Pearson et al (2023) [28], Brand et al (2021) [29]
Working from home	Working from home reduces the need to travel to work and thereby reduces GHG emissions, even when taking into account existing rebound effects.	Hook et al (2020) [30], Kiko et al (2023) [31]

Policy Recommendations

A joint effort is needed at all policy levels in order to swiftly transition to zero-emission urban transport in Europe, with cities at the centre of this effort. In view of the results of the modelling work presented above, the *CCC* makes the following policy recommendations:

Cities: leadership, clarity and investments

- Provide **leadership and planning security** by adopting and communicating a **clear vision and implementation plan** to fully transition to **zero-emission transport** by the early 2030s,
- **Introduce new or step up existing low-emission zones** to curb emissions and support modal shift, and announce a **stepwise transition to zero-emission zones,**
- Review investment plans to prioritise the provision of **reliable, affordable and climate-friendly alternatives** to the use of cars, vans and trucks (e.g. walking and cycling infrastructure, public and shared transport, cargo bikes and logistics hubs).

National governments: the right regulatory framework

- Adopt a **regulatory framework** that sets **stepwise, binding climate targets** and **enables cities to accelerate the transition** to zero-emission transport, especially to allow local authorities to introduce low- and zero-emission zones,
- Provide **dedicated long-term funding** for investments in clean urban transport solutions, including electric buses, shared mobility systems and infrastructure for walking and cycling,

European Union: 'implement the Green Deal' and related measures

- Continue to **implement the EU Green Deal** and, in particular, the **'Fit for 55' Package** [32], which requires **all new cars and vans to be zero-emission after 2035** and thereby also make a critical contribution to the decarbonisation of urban transport.
- **Support the adoption of 'Sustainable Urban Mobility Plans'** (SUMPs) that all urban nodes on the Trans-European Transport Networks (TEN-T) will have to adopt by 2027 as per a recent agreement reached [33] by EU institutions. This includes the timely **definition of data collection and submission requirements** for these urban nodes.
- **Step up the 'EU Mission for 100 climate-neutral and smart cities by 2030'** [7] by earmarking new and additional funding and monitoring closely the implementation of plans and commitments.

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Find out more

The Clean Cities Campaign is a European coalition of organisations hosted by Transport & Environment. Together, we aim to encourage cities to transition to zero-emission mobility by the 2030s and to become champions of active, shared and electric mobility for a more liveable and sustainable urban future.

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