City of Amsterdam

Clean Air Action Plan

Emission-free Amsterdam

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Final draft April

Emission-free Amsterdam

Index

Foreword

A true Amsterdammer wants to be part of the city. Experience its vibrancy. Enjoy the quiet. Meet the world. Soak up the atmosphere and twitter about the life of the metropolis. The quality of Amsterdam also attracts companies and visitors drawn by the charm of this global village. As city executive, we dedicate ourselves every day to ensuring that the city remains a fantastic place to live. Most of what we do is visible. But sometimes we also have to address less tangible issues. In this case, the quality of the air we breathe.

Dirty substances in the air cut more than a year from the life of every inhabitant of Amsterdam. One less year of vibrant life, quiet, contact with others…. Some of these substances are blown in from far away and are difficult to prevent. But there are things we can do about the rest. By urging the national government to adopt central measures, but above all by taking action ourselves. And that is what we intend to do.

This Clean Air Action Plan outlines our plans to make the city a cleaner and healthier place by 2030. We anticipate that the measures in this plan will extend the life of the average resident of Amsterdam by three months! The most effective measure we can take to achieve this is to eliminate emissions from traffic. That is something the municipality can influence directly. Hence my mission is to make Amsterdam the 'world capital of emission-free mobility'. During its term of office, the city executive intends to adopt a large number of specific measures, both large and small, to realise this ultimate goal. Those measures will also extend to other sources of air pollution besides traffic, such as industry, shipping and wood burning in the city. Some will be implemented through voluntary and binding agreements and regulations, others by lobbying and via the national government.

Creating an emission-free Amsterdam will not be straightforward. It is an ambitious objective. We will therefore be adopting and implementing new policy instruments. The transition to emission-free transport demands a contribution from everyone in the city: businesses, residents and visitors. We therefore intend to engage in a dialogue with stakeholders and interested parties to define the conditions under which the plans can be implemented.

Before the summer we hope to start talks with the city to determine the conditions that need to be met if these ambitious plans and proposals are to succeed. We will hold a series of consultative meetings at which interested parties can provide useful and detailed input on specific aspects of the plans. The detailed plans will then be finalised in the autumn and presented to the public and the city council.

A package of measures will be in place by the end of this year. A package with public support, with dynamism and with the perspective of a healthier city. A true Amsterdammer wants to enjoy the city every day – not miss a single day, never mind a year. Let's work together to ensure they can!

Sharon Dijksma
Alderman Air Quality

Summary

Dirty air is unhealthy air

Air pollution is the third-largest health risk for the people of Amsterdam, after smoking and the combination of a poor diet and too little exercise.The main culprits are nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). Some of these hazardous substances originate elsewhere, but some come from emissions within the city and the region, mainly from traffic, mobile machinery, maritime transport and industry. The city's dirty air reduces the average life expectancy in Amsterdam by just over a year. There are European standards for emissions and air quality, but they do not yet adequately protect public health.

Improving air quality at the source

The aim of the Clean Air Action Plan is to improve the air quality with a view to extending the average life expectancy of Amsterdam's inhabitants by three months in 2030. To achieve this, the Municipality intends to eliminate sources of pollution as far as possible. It will focus its efforts on sources where its measures will have the greatest impact: road traffic, passenger vessels and pleasure craft, mobile machinery and the burning of biomass and wood. The measures envisaged in the action plan are designed to ensure that Amsterdam quickly complies with the EU's air quality standards, but the city's ultimate target is to comply with the World Health Organization's (WHO) guideline for $PM_{2.5}$ by 2030, whereby it would also comply with the WHO's less stringent guideline for PM_{10}. Calculations have shown that implementing the measures relating to traffic will reduce the concentration of atmospheric particulate matter ($PM_{2.5}$) below the WHO's guideline of 10.0 µg/m^3 (microgram per cubic meter) by 2030. The NO_2 concentration will also decline to 14.4 µg/ m^3. The action plan is also relevant for achieving Amsterdam's climate targets. The combination of traffic-related measures will lead to a quieter, more liveable city and contribute greatly to reducing CO_2 emissions. Mobility accounts for 9% of CO_2 emissions in Amsterdam and if mobility is entirely electric and electricity production is entirely sustainable CO_2 emissions can be reduced by that 9%. Every year an independent body will analyse the progress being made towards meeting the CO_2 targets for 2030 and 2050. The results will be incorporated in the Road Map for a Climate-Neutral Amsterdam

Coherent measures are most effective

The approach taken in the Action Plan can be described as 'from the centre out' and 'from business to private'. In 2022, the city centre (see box) will be an emission-free zone for buses and coaches. In 2025, the area within the A10 ring road will be a zero-emission zone for road traffic, with the exception of passenger cars and motorbikes, and pleasure craft. In 2030, only emission-free vehicles will be permitted within the built-up area.

These goals will be achieved with a coherent package of measures designed to motivate Amsterdam's inhabitants to change their lifestyle. The measures fall into four categories: communication (highlighting the need for change); acilitation (ensuring that e-transport is feasible in practice); stimulation (promoting desirable behaviour); and regulation (making rules).

Specific measures make the difference

Communication: a publicity campaign will be launched to raise awareness about the importance of clean air and to inform businesses and residents about e-transport. The municipality will act as a forerunner and role model in making Amsterdam an emission-free city..

Stimulation: there will be subsidies for various target groups and extra privileges, such as parking permits, for e-drivers. Subsidies will be used to promote actions that reduce emis-

sions and to increase public acceptance of the measures that are being taken. A range of specific measures will be adopted to improve the air quality in the most polluted streets.

Facilitation: the emphasis will be on expanding the network of charging points for electric vehicles. The process will continue to be demand-driven (anyone who buys an electric car will be able to apply for a charging point in their neighbourhood), with more charging points at busy strategic locations. As the technology improves, the role of high-speed charging will grow. The target is to have 62 highspeed chargers by 2026, concentrated as far as possible at multi-functional locations such as load transfer points. A strategy will be formulated to guarantee the reliability of the charging network.

Regulation: the environmental zones will be expanded. This will result in part from the national harmonisation of environmental zones, but Amsterdam will also introduce emission-free zones, specific areas of the city that certain types of vehicle will only be allowed to enter if they have a zeroemission engine.

The principal targets are:

2020 Creation of an environemtal zone within the A10 ring road for passenger cars from emission standard Euro 4 and geographic expansion of environmentalzones

2022 Emission-free zone for buses and coaches within the S100 south of the railway line. The emission standard for trucks entering the environmental zone is raised to Euro 6.

2025 Entire built-up area is an emission-free zone for mopeds and scooters
Emission-free zone within the A10 ring road for heavy goods vehicles and vans, taxis, buses and coaches. Emission-free zone for passenger vessels, pleasure craft and public ferries.

2030 Entire built-up area is an emission-free zone for all modalities

Getting started!

The adoption of the action plan by the city council will initiate a public consultation process during which the measures will be fleshed out. What are the precise criteria for subsidies? What conditions will the charging infrastructure have to meet? What conditions have to be met to secure public acceptance of the emission-free zones? What exceptions can legitimately be made for environmental zones? The action plan provides the framework for the answers to all of these questions.
The issues covered in the action plan will be submitted individually for a vote in the city council after the summer.

Definitions

Zone definition: the environmental zones and emission-free zones in this action plan are defined in relation to the 'Centre', which is the central area within the S100. Unless otherwise stated, the zone is always the area within the ring road to the south of the railway line and Central Station.
'Within' means that the zone does not include the S100 itself. The same applies for the A10 ring road: a zone referring to the A10 means the area within the ring road.

Vehicles: vehicles with an electric engine are generally referred to with the prefix e- in this document; an e-car refers to an electric car.

Euro standards: for the sake of convenience, the indicator of the Euro standard for engine blocks is always given in Arabic numerals: Euro 4 or Euro 6.

Nitrogen: Nitrogen oxides (NOx) are the compounds of nitrogen and oxygen emitted by a combustion engine. In the air, NOx are converted into nitrogen dioxide (NO_2).
For the sake of convenience, in this action plan all nitrogen oxides are referred to as nitrogen, except in section 1.3 and the two appendices which focus on the technical details.

Particulate matter: PM_{10} and $PM_{2.5}$ are both particulate matter. The '10' and '2,5' indicate the maximum size of the particles in micrometers. Unless otherwise stated, in this action plan particulate matter means $PM_{2.5}$.

1 The mission: clean air

1.1 Why clean air?

Dirty air is, after smoking and the combination of a poor diet and lack of exercise, the third greatest health risk in Amsterdam (as measured by the total disease burden). Since almost everyone is exposed to air pollution, the health effects at population level are substantial. Children, the elderly, patients with cardiovascular diseases and asthma patients are some of the 'high-risk groups'. With the current level of air pollution, the effect on every person in Amsterdam is the equivalent of inhaling second-hand smoke from six cigarettes a day (according to the Municipal Health Service (Gemeentelijke Gezondheidsdienst, and further referred to as the GGD Amsterdam). Air pollution ultimately shortens the life of the average resident of Amsterdam by just over a year.

The ultimate goal is to reduce the disease burden and to extend life expectancy by three months in 2030.

1.2 Standards for clean air

The municipality of Amsterdam has been striving to improve the city's air quality for more than ten years. And it has certainly had some success. Air quality has steadily improved in the last few years. Most places in Amsterdam now comply with the EU standard for nitrogen dioxide (NO_2) and the entire city complies with the standard for particulate matter (PM_{10} and the even smaller $PM_{2.5}$).

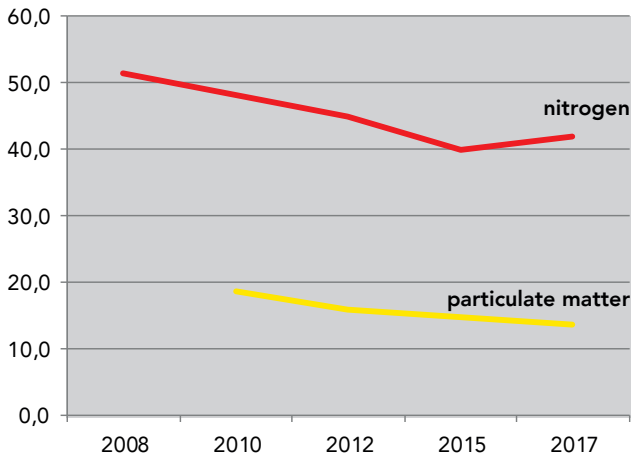
Under these European standards, the average annual concentration of nitrogen dioxide (NO_2) at the worst-affected locations may not exceed the limit value of 40.5 µg/m³ (40.5 microgram per cubic meter). For particulate matter, the maximum average annual concentration is 40.0 µg/m³ (for PM_{10}) and 25 µg/m³ (for $PM_{2.5}$). However, scientific research shows that the European standards do not adequately protect human health. The World Health Organization (WHO) therefore adopts more stringent guideline values: an average annual concentration of particulate matter of below 20 µg/m³ (PM_{10}) and 10 µg/m³ ($PM_{2.5}$).

Nitrogen oxides: emissions and concentration

Nitrogen oxides (NOx) are the compounds of nitrogen and oxygen emitted by vehicles with a combustion engine. In the air NOx is converted into NO_2 (or nitrogen dioxide), thereby increasing the concentration of NO_2 in the air. For the sake of convenience, in this action plan nitrogen oxides are referred to as nitrogen emissions and nitrogen concentrations. A worst-affected location is a location where the EU standard for nitrogen concentration is exceeded (measured within a 100m² section of a road).

Concentrations of nitrogen and particuate matter measured on busy road sections (µg/m³)

source: GGD Amsterdam



The WHO's guideline value for nitrogen dioxide (NO_2) is the same as the EU limit value.

The goal of this action plan represents a new milestone: compliance with the WHO's guideline value for air quality for particulate matter ($PM_{2.5}$) by 2030, whereby the WHO's (less strict) guideline value for PM_{10} will also be met. This is an ambitious objective, because the WHO's guideline value for particulate matter is twice as stringent as the EU's limit value for particulate matter.

With a combined and determined effort this objective can be achieved.

1.3 Tackling pollution at the source

Stricter standards call for stricter policy. At the same time, it is important to consider what measures will have the greatest effect. That starts with a policy of addressing pollution at the source. What doesn't exist, doesn't have to be cleaned up. Another factor is the scope of the municipality's influence. What can't be influenced, can't be cleaned up.

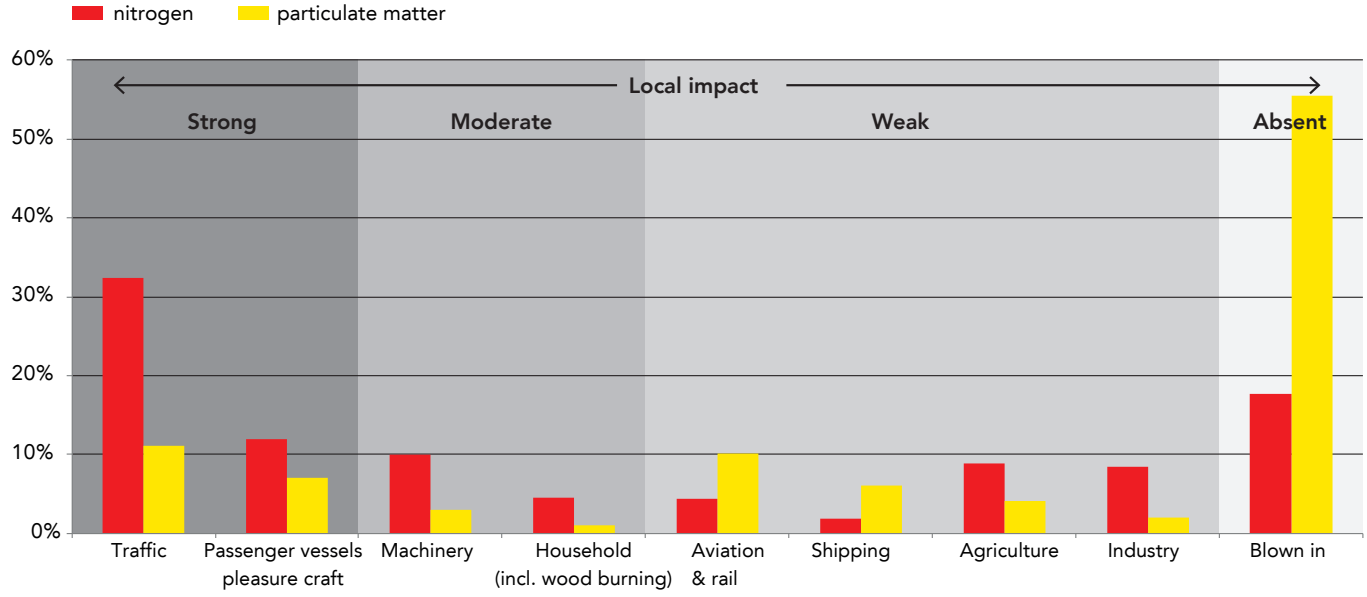
A significant proportion of the nitrogen in the air is emitted by **traffic**. Traffic and transport cause a fifth of all the particulate matter in the city. Measures to make these sources of pollution cleaner are efficient (because they are major sources of pollution) and effective (because the municipality can influence them directly). Besides helping to improve air quality, it also contributes greatly to reducing CO_2 emissions, which is relevant for achieving Amsterdam's climate ambitions as laid down in the Roadmap for a Climate-neutral Amsterdam 2050. Every year an independent party will calculate the progress being made in achieving the plan's targets for CO_2 for 2030 and 2050. The results will be included in the Roadmap for a Climate-neutral Amsterdam.

Passenger vessels and pleasure craft represent a second source of emissions that the municipality can influence. The technology for emission-free sailing is advancing very rapidly and quickly creating the prospect of clean and quieter waterborne transport in Amsterdam. While 76% of passenger vessels are already emission-free, that applies for less than 5% of the pleasure craft.

(Mobile) machinery such as excavators, cranes and diggers are mobile but do not fall into the category of traffic. These machines usually run on diesel and therefore make a significant contribution to the city's air pollution. The municipality of Amsterdam can help improve air quality by making lower emissions from these machines a criterion in tenders and the awarding of contracts. It will therefore do so in the coming period. The municipality has less influence over private building projects, such as renovations.

Household emissions are a third source. These mainly affect air quality through emissions from open fires, pellet stoves and fireworks, but this category also includes biomass power stations. Wood burning makes a substantial contribution to the level of particulate matter

Concentration in the air by source (source: RIVM)



High levels of NO_2 in 2010 (> 40,5 µg/m³). Source: RIVM

High levels NO_2 in 2017 (> 40,5 µg/m³). Source: RIVM

and soot in the city. Bearing in mind the national guidelines, Amsterdam is taking steps to reduce the negative effects of wood burning, starting with a campaign to raise awareness among the residents and businesses in Amsterdam and with local policy.

The municipality has less direct influence on other sources of emissions. To reduce these emissions, the city depends on action by third parties. For example, particulate matter literally blows in from other countries, and industry, agriculture and aviation also cause emissions of nitrogen dioxide and particulate matter into the air. The municipality will use every instrument at its disposal to reduce the pollution from these sources as well. Industry and the business community must comply with the EU and national rules and are regulated in association with the North Sea Canal Area Environmental Service. Amsterdam approves of Schiphol airport's policy of granting preferential treatment to cleaner and quieter aircraft over polluting and noisy planes. The Netherlands Environmental Assessment Agency (RIVM) is currently investigating the health effects of emissions of ultrafine particulate matter by planes. GGD Amsterdam is involved in this research. The results of the study will determine further policy in this area. The municipality is engaged in the discussions on emissions from industry and agriculture through its lobbying in The Hague. Inland shipping and river cruise vessels, both national and international, use shore-side electricity wherever possible, although this is not yet a realistic option for international marine cruise ships in Amsterdam.

How do we know how clean the air is in Amsterdam?

The air quality in Amsterdam is measured annually on the basis of monitoring and calculations. NO2, PM_{10} and $PM_{2.5}$ are moni-tored at 11 GGD monitoring stations and with 124 Palmes diffusion tubes and calcu-lated for more than 7,000 locations in Am-sterdam by the National Air Quality Cooperation Programme (NSL). This monitoring network is one of the best in the world and provides a good indication of the air quality.
The RIVM also monitors air quality on na-tional roads, provincial roads and municipal roads in the local main road networks of cities throughout the country. It uses statistics for traffic, weather, background values and physical features of streets. This monitoring is required by the European Union and is the legally recognised assessment framework. There is more information about the monitoring and calculation of air quality in appendix 1 (p. 40).

Concentrations of pollutants in the air fluctuate greatly from year to year and from moment to moment and depend on the climate. To identify trends in air quality, the findings are usually expressed in terms of annual averages.
The calculations and the monitoring by the GGD Amsterdam have both shown that the air quality in the city has gradually improved in the last few years. But not by enough!

Amsterdam's approach of prevention at the source is intended to achieve the maximum possible reduction of emissions from traffic, pleasure craft, wood burning and mobile machines. These sources are the largest polluters and can be influenced, at least to a reasonable extent, by the city.

1.4 Beter air, better climate

Reducing the volume of traffic and electrifying the fleet of vehicles will make the air in the city cleaner and extend the life expectancy of the average resident of Amsterdam. It will also have positive effects on noise pollution and climate.

Electric vehicles cause less noise pollution in the city at locations where traffic is slow-moving, which enhances the quality of life and well-being of the city's inhabitants. If all the energy required for electric transport is generated sustainably, implementation of this action plan will also reduce CO_2 emissions in the city by 9% in 2030. That represents a substantial contribution to achieving Amsterdam's climate ambitions as set out in the Roadmap for a Climate-neutral Amsterdam.

1.5 The mission: fewer, smarter and cleaner

Amsterdam is a growing city. More residents, visitors and businesses means more commuters and more cars, bicycles and scooters. It is forecast that the growing number of residents, businesses, commuters and visitors to the city could generate up to 40% more traffic movements by 2040. The traffic congestion has consequences for the living environment. The space for peace and quiet, for relaxation, for green nature or for playing on the street is steadily shrinking. The balance between liveliness and liveability has been disrupted. The life of the average resident of Amsterdam is shortened by a year due to the often unhealthy air in the city.

The city cannot survive without traffic. It is essential for supplying the shops and businesses in the city, for example. But it does not have to remain as it is. The municipality promotes traffic and transport that has less impact on space and health. And it is not alone in that. Residents, visitors and businesses use their feet, the bicycle or public transport for 70% of their trips. In the city, this is usually the smart and healthy choice. For the other 30%, the municipality promotes fewer, smarter and cleaner movements.

Fewer vehicles and kilometres driven in the city and more room for green, playing, recreation and healthy traffic. That goal implies that there will be less room for the car and that parking spaces will disappear, but there will still be room for the essential traffic flows in the city, such as deliveries to shops. The Agenda autoluw [Agenda for a low-traffic Amsterdam], the Bicycle Programme and the municipal parking policy are all designed to achieve this.

Smarter design of the traffic flows will make it easier to transfer from the car to public transport, bicycle or e-scooter, on the periphery of the city for example. The people of Amsterdam and visitors will be encouraged to change the way they travel and will be offered clean and realistic alternatives such as eBuurtHubs and Mobility as a Service. In this way, everyone in Amsterdam will have a full range of travel options, from car sharing to bicycle sharing. With well-located logistics hubs, trucks will be encouraged to transfer goods to electric vans or e-transport by water. The urban logistics and smart mobility programmes include various projects designed to come up with innovative concepts to promote that objective.

Cleaner traffic refers to the ambition of reducing the pollution caused by the remaining traffic in the city. Starting in the city centre, the number of districts where only emission-free vehicles are allowed to enter, will gradually expand outwards. In practice, these vehicles will be passenger cars, trucks, vans and scooters that use batteries or a combination of hydrogen and fuel cells. The drivers will be helped to make the transition with subsidies and privileges. Important milestones in this process are planned in 2020, 2022 and 2025. Emission-free mobility will yield tremendous benefits in terms of air quality and CO_2 emissions. This Clean Air Action Plan paves the way for this final step: clean traffic.

The combination of this Clean Air Action Plan, the Agenda for a low-traffic Amsterdam and the smart mobility programme together form a coherent strategy for fewer, smarter and cleaner vehicles in Amsterdam.

2 Emission-free Amsterdam

2.1 Ambition

Clean air for everyone in Amsterdam. The municipality is pursuing this objective by making traffic emission-free and reducing emissions from the other sources referred to earlier. The goal is to comply with the World Health Organization's guideline values for air quality. On the way to an emission-free city, a growing number of districts and traffic flows will become emission-free.

The first important milestone is the declaration of the city centre (within the S100, south of the railway) as an emission-free zone for coaches and buses on 1 January 2022. Vehicles with heavily polluting (diesel) engines are already and will continue to be excluded from the environmental zone. Only vehicles with emission-free transmission will be allowed to enter the emission-free zones.

We will then steadily expand our plans from the city centre, so that between 2025 and 2030 all motorised traffic in Amsterdam will become emission-free. This is in line with the idea of concentric expansion that has also been adopted in the Agenda for a low-traffic Amsterdam and the action plan for coaches. To also eliminate CO_2 emissions, all of the electricity and hydrogen required for transport in Amsterdam will be generated sustainably.

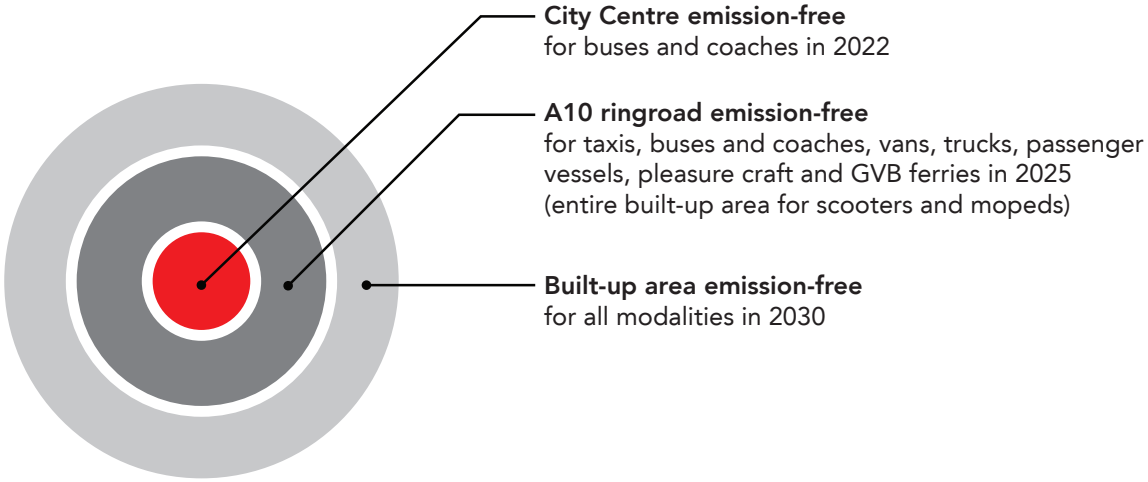
This approach can be summed up as from the inside out and from business to private.

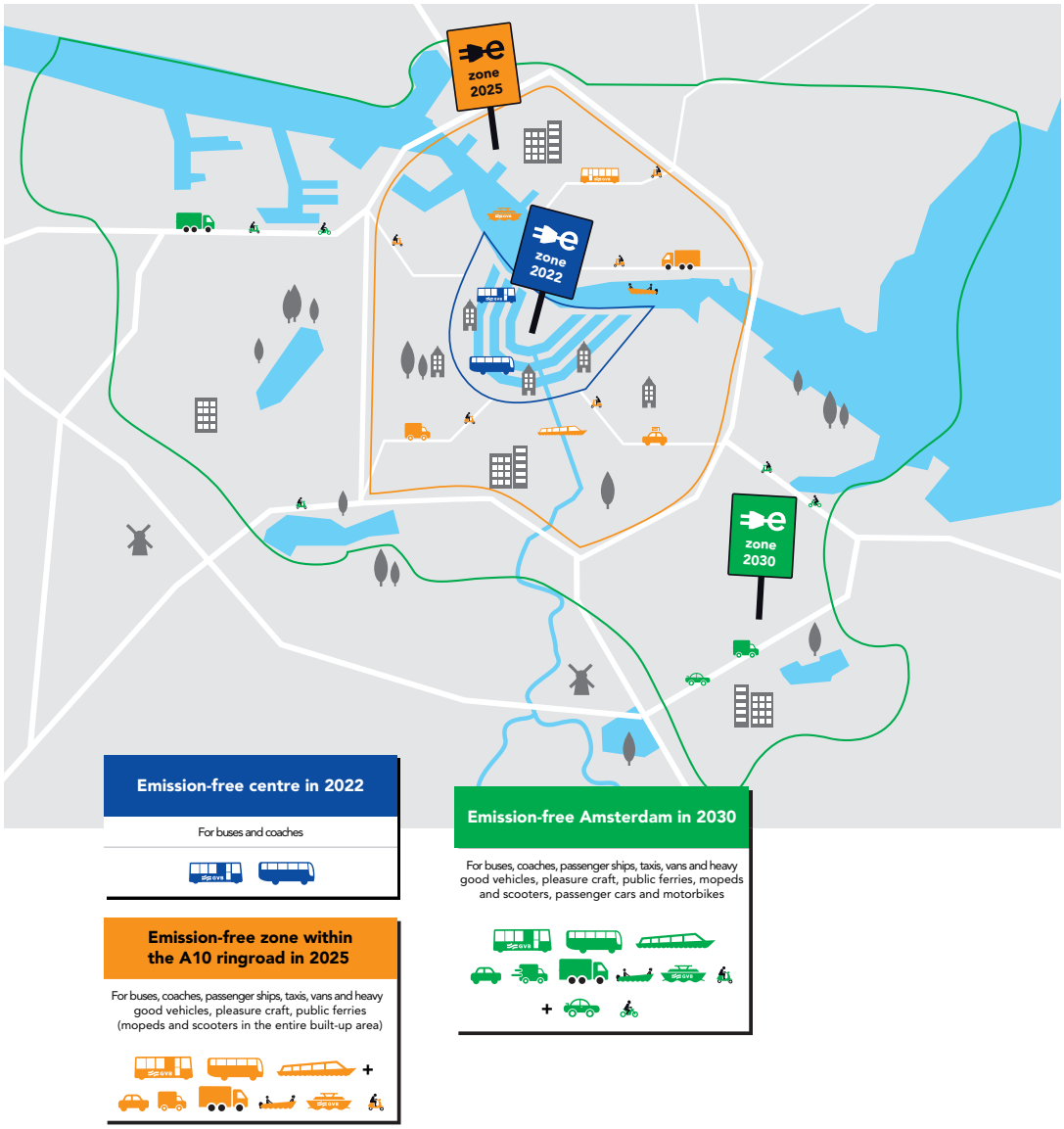
It can be encapsulated in three key points:

2022 only emission-free buses and coaches will be permitted in the city centre (within the S100 to the south of the railway line);

2025 all traffic, including taxis, passenger vessels, pleasure craft and municipal ferries, but with the exception of passenger cars and motorbikes, must be emission-free within the A10 ring road (the entire built-up area applies for scooters and mopeds);

2030 all traffic within the built-up area must be emission-free.





2.2 Strategy

The municipality of Amsterdam has for years been taking specific measures to reduce the number of cars in the city, both moving and stationary, and to promote cleaner and electric vehicles, while also encouraging people to walk, cycle and use public transport. Not only in the interests of cleaner air and to reduce CO_2 emissions, but also to stimulate physical exercise, ease congestion and create more space in the city. With these measures, Amsterdam has made evident progress with the transition towards emission-free transport. More than 27% of all taxis operated by the certified taxi organisations are electric; five environmental zones have been established; and the density of the city's charging infrastructure is internationally renowned.

Using the lessons from the past, the further steps we are taking in the transition to emission-free transport are based on the following points of departure:

- No single instrument can achieve enough. We have therefore opted for a combination of push (regulation) and pull (stimulation/facilitation). Experience has shown that this method is effective in making the transition to emission-free transport.
- The municipality will set the right example.
- We will continue to follow the approach in recent years of mainly targeting frequent businesses motorists and heavy polluters. We will continue to focus heavily on the biggest polluters.
- But we are now entering a new phase. The battery technology and the action radius of electric vehicles are improving very rapidly. In some respects, the group of first adopters has grown into the early majority. In the coming years we will be asking everybody to make a contribution, so communication will be added as a separate element of the strategy.

3 Approach to emission-free

The approach taken in this action plan can be encapsulated as follows:

Communication will clearly explain the importance of clean air and suggest ideas for personal action (give people a sense of engagement with the possibilities)

Stimulation will make the transition to a clean alternative appealing (the alternative is enticing)

Facilitation will make the transition to a clean alternative possible (the alternative is realistic)

Regulation will compel the transition to a clean alternative (the stick as well as the carrot).

3.1 Communication

A campaign to inform everyone of their role in creating clean air

Every resident and visitor contributes to the air quality. Both in terms of causing pollution and making the air cleaner. Awareness of the threat from dirty air is an initial trigger for a change of behaviour. A life shortened by a year; the equivalent to the second-hand smoke from six cigarettes a day: these are powerful images that have a deterrent effect. But they mainly instil fear, which quickly turns into resignation unless people are given suggestions about what they can do. The municipality is therefore planning a continuous campaign to prompt people to consider their choices at appropriate moments. Do you make the clean choice or choose to cause pollution? The campaign will show residents, visitors and businesses the effect of their own actions and how they can help to improve the health of the city. The campaign will not be conducted on a city-wide basis, but will instead be targeted at specific groups and occasions when they make decisions, generally via social media and at physical locations.

Making it easier to choose the clean option, with the municipality setting the right example

A change in behaviour is the result of a great many factors. With the strategy of facilitation,

stimulation and regulation, we will ultimately make it possible for everyone to choose the clean option. But more is needed to bring about a permanent change of behaviour. Habits have to change, social norms must be revised, etc. For every modality, the triggers for change will be identified and addressed with additional measures. Depending on the situation, this could lead to measures such as test drives in electric cars on industrial estates (you discover that it is possible), a four cities rally (to counter range anxiety), the involvement of residents in verifying current and objective air quality data (greater control over your personal situation) and celebration of e-taxi drivers for the good example they set.

At least as important is the example set by the municipality itself. The municipality will serve as a role model by becoming emission-free itself and by accelerating the pace at which its own fleet of vehicles is made emission-free.

3.2 Stimulation

Continued use of various subsidies

Amsterdam has promoted electric driving for years, for example with subsidies for business transport. Subsidies have a dual effect. They stimulate the market, which promotes innovation and leads to lower prices. The regulatory measures can also have major consequences for individuals. In combination

Affordability of emission-free transport

The total cost of ownership (TCO) of an electric car is often already lower than that of a fossil car (TCO is calculated over the purchase price, charging costs and mainte-nance).

Nevertheless, the initial purchase price is still significantly higher and electric cars are therefore out of reach for some people. However, the market is growing rapidly and the price of electric cars is falling steadily. There is even a small second-hand market. With Amsterdam's clear ambition, and the announcement of a national ban on the sale of new diesel cars from 2030, the growth of the market in second-hand electric cars is expected to accelerate.

Another development is the shift from ownership to use. Instead of buying a car, some people now buy a transport movement that is tailored to their needs and which can, for example, be by bicycle or public transport.

These factors will be taken into account in working out the details of the subsidy scheme. The aim is to ensure that the less well-off are also able – at least in time – to use an emission-free vehicle.

with the subsidy schemes, dispensations can remove the most disproportionate consequences. The transition to the favoured modes of transport can then be accomplished sooner. Accordingly, measures to reduce harmful substances follow two paths: directly targeting emissions per vehicle and generating public support The current subsidy schemes (until October 2019) focus primarily on the frequent business traveller, but here the focus will shift. In future, electric driving will be an attractive alternative for a growing number of users, especially if a replacement market of second-hand electric vehicles emerges in the coming years.

On the basis of that shift in demand, we are currently investigating what measures we can adopt to have the greatest impact on air quality while also mitigating any undesirable social effects of those regulatory measures. One option that is explicitly being considered is a demolition or replacement scheme. The package of stimulatory measures will be adopted before the end of 2019.

The use of privileges to reward early adopters

A privilege is a temporary measure that benefits the early adopters of electric driving. Since 2017, pilot projects with privileges have been carried out in the city centre. For example, there are discounts on the fees charged and dispensations for electric vehicles for people who are moving house. Parking spaces near charging points are already reserved exclusively for e-cars. And residents and companies with an electric vehicle are given priority when applying for parking permits. The advantage of a privilege will disappear if there are only electric vehicles.

At present, for businesses in particular 'soft benefits' like this can form an extra motivation to switch to emission-free transport. The policy of granting privileges will therefore be expanded to include exclusive loading and unloading locations for emission-free trucks and vans, and clean taxi ranks. With the central government, the municipality is exploring the possibilities of differentiation of parking rates on the basis of emission class (emission-free). A proposal for such a measure will be drafted in the coming period.

Parking permits will ultimately be reserved exclusively for emission-free vehicles. Until then, additional conditions will be considered. One possibility is that a new application will only be accepted if the vehicle is emission-free. Existing privileges such as the priority for electric cars in granting parking permits and the city-wide permit for electric car-sharing schemes will be retained. For private car sharing arrangements, a proposal will be drafted to allow participants to receive a parking permit for two areas.

Area-specific measures for emission-free traffic

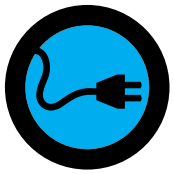
Amsterdam has a number of very busy streets where the air quality is particularly bad. These are the Prins Hendrikkade, Valkenburgerstraat, Weesperstraat, Wibautstraat, Amsteldijk, Stadhouderskade, Nassaukade and Overtoom. The volume of traffic on these streets cannot be substantially reduced because they are important traffic arteries.

The general measures in this action plan will greatly improve the situation in these streets. You could say that the entire city will be helping to keep these specific streets clean. But it is still not enough. To make these most polluted streets as clean as possible, additional measures will be taken for each of them with the aim of increasing the share of emission-free traffic and limiting emissions from the remainder of the traffic. In each case, the best solution for that particular street will be explored.

The following approach will be taken to make these routes more appealing for emission-free traffic:

- The use of electric vehicles by the municipality of Amsterdam
- Increasing the proportion of electric (shared) cars on these routes by expanding charging facilities
- Further electrification of the taxi ranks around these routes
- Research with business organisations into the possibilities of organising cleaner and more efficient logistics streams
- Adapting loading and unloading points for electric traffic along these routes
- Integration of measures from the Agenda for a low-traffic Amsterdam to improve the traffic flow.

3.3 Facilitation



Continued development of a demand-driven charging network and intensification of anticipatory installation

Amsterdam has had a charging network for electric cars (further referred to as e-cars) since 2009. There are now 3,000 charging points at public parking spaces in the city. New charging points are installed at the request of (prospective) drivers of e-cars. This means they are used effectively. A large and visible charging network instils confidence in prospective e-drivers.

Projections show that the demand for e-cars will rise very steeply in the near future. In 2018, the number of e-cars increased nationally by 15% to around 138,000. In Amsterdam, the growth has been even faster. The number of unique monthly users of charging points rose by 25% last year, and the number of charging sessions by 30%. The number of public charging points increased by 16% in the same period.

To create sufficient capacity for the medium term, the demand-driven expansion of the charging network will be intensified. Amsterdam anticipates that by 2025 it will need between 16,000 (according to the national trend) and 23,000 (according to the faster growth rate in Amsterdam in recent years) charging points in the public space to adequately facilitate e-drivers. At the same time, autonomous growth in the number of charging points in semi-public (e.g., public car parks) and private properties will also be needed. The municipal subsidy per charging point can remain the same with the further increase in the number of charging points, and could possibly decline in the future. In the longer term, the number of e-cars per charging point will probably decline again due to a larger battery capacity, the greater density and clustering of charging points and a shift from street parking to car parks (in the low-traffic city). In addition, the number of charging points in the wider region is growing.

Larger batteries and faster charging at higher voltages will call for a more extensive charging network. High-speed charging points can meet that demand. But the available space is scarce and this type of facility has an impact on the city's electricity network. Certain target groups, particularly taxis, shared cars and e-vans, demand faster charging. This demand will have to be met on the peripheries of the city, close to the inner city and at other relevant locations near the A10 ring road. Exclusive access for these target groups will increase the appeal and reliability of the network and reduce the number of traffic movements by these groups.

In 2019, the network of public high-speed charging points, which is mainly intended for taxis, will be expanded from 13 to at least 20 points. The present concession runs until 2026 and provides for further growth in the number of high-speed charging points to 62. The expansion

Definitions relating to charging

Charging post: a facility where an e-car can be charged with electricity. A charging post can have multiple (often two) charging points.

Charging point: a plug-in connection (a charging post generally has two).

Normal charging: charging at a relatively low voltage with the charger in the car, suitable for charging while parked, for example at night or at the work place.

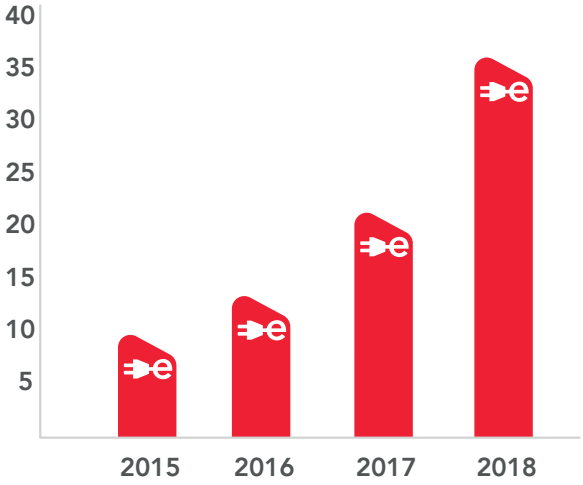
High-speed charging: charging with a high voltage whereby the charger is in the high-speed charging post. The charging strength begins at 50kW and rises to 350kW for ultra-fast charging. Particularly suitable when parking for shorter periods (approx. 20 minutes).

Flexible charging: the speed with which a car is charged during a session varies in the course of the day. The charging posts take account of expected peaks and dips on the electricity grid. An example: you connect your car to the charging post at 3.00 p.m. and start charging at the regular charging speed. From 5.00 p.m. the charging speed declines slightly because there is a peak in demand on the electricity grid. From 8.00 p.m. the car again charges at the regular charging speed, and possibly even faster than normal during the night if there is a surplus of recoverable energy..

Smart charging: the charging speed depends on the total energy demand on the network and the supply of locally generated renewable energy. The vehicle's battery can also contribute to the grid during peak demand. This also requires smart charging posts where the owner of the vehicle can control the process, including the level of the tariff.

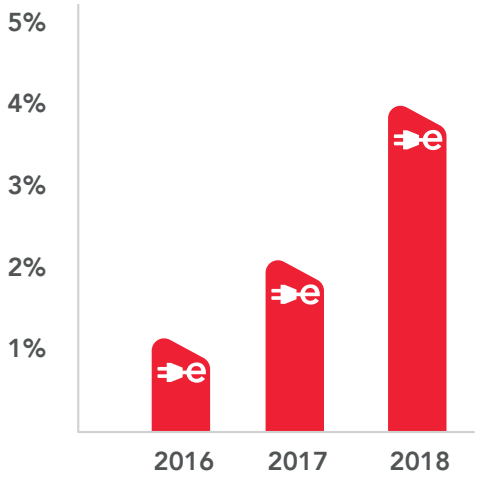
Registered electric passenger cars

The Netherlands (x 1,000)



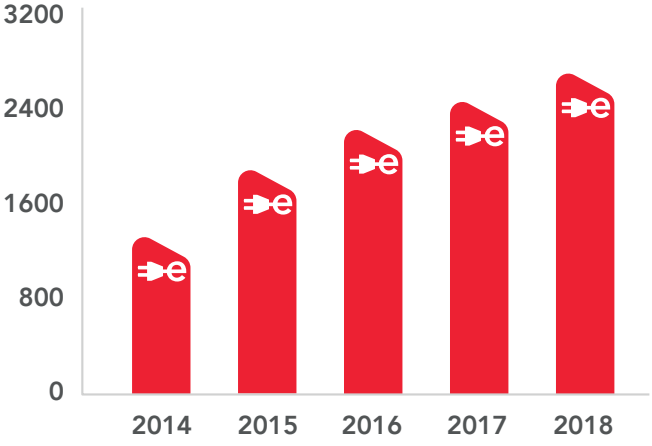
Share electric vehicles in car sales

The Netherlands



Number of charging points

Amsterdam



will follow the use made of the network. The next step is a study into the demand for public ultra-fast charging, in addition to the existing concession. It is impossible at the moment to predict the future balance between normal charging and high-speed charging. The municipality is therefore explicitly planning for a mix of charging options.

In addition, this year Amsterdam will formulate a strategy for the charging infrastructure, which will set out proactive policy that takes account of the spatial integration of charging points and their potential impact on the electricity network and will be drafted in consultation with internal and external parties.

The charging infrastructure outside Amsterdam (at terminals and along corridors) will support the further transition to electric transport. If the growth in the number of charging facilities outside the city fails to meet expectations, the pressure on the Amsterdam charging infrastructure could increase further. We are therefore working together with the Metropoolregio Amsterdam Elektrisch, which facilitates the creation of a charging infrastructure in the region.

The municipality's plans for the logistics sector provide for further expansion of the logistics hubs, where goods are clustered smartly and then transferred to smaller e-vehicles before entering the city. There are currently ten of these hubs, half of which also have a (private) charging infrastructure. The space for new hubs will have to be found on the peripheries and outside the city. These hubs could lead to dual use of the charging infrastructure. The charging points will then be similar to traditional petrol stations with facilities at strategic locations.

As with the normal charging network, the business case will become increasingly favourable with further growth of electric transport and high-speed charging locations. At present, the municipality still subsidises losses on the charging infrastructure. In future, the municipality will probably be paid to provide sites for operators of high-speed charging points.

Making the charging infrastructure smarter to increase the capacity of the electricity network

Because of their relatively low voltage, the public charging points can be easily integrated into the electricity network and the longer parking period creates more flexibility. We therefore expect that the regular charging points will still be able to meet most of the demand for charging in 2025.

The length of time that an e-car can park at public charging points is usually more than enough to fully charge the car's battery. The charging current can therefore be managed in such a way as to avoid peaks in demand on the electricity network and to encourage the use of locally generated renewable energy. Under the name Flexpower, around 900 charging points (450 charging stations) will be converted to the flexible model in 2019. These charging points will be fitted with a stronger power connection. There will be slightly less electricity available during peak periods and a little more electricity available outside peak periods. This is the first project in the world where cars are charged on a public charging network with alternating energy output.

A subsequent step will be to use the e-car's battery as a buffer or temporary supplier to the electricity network, building or neighbourhood. In that way, mobility will become an important component of the energy system and the energy transition. Amsterdam is involved in various innovative projects in this area. We expect to be able to use them on a scalable basis in area development and in the existing city from 2021. One example is the City-Zen project in Amsterdam's New-West district, where the electricity grid makes it possible to exchange energy between residents and to use car batteries to store energy.

Charging in car parks and at private locations

People's view of mobility is changing. Low parking standards in new-build developments, less parking on the street, the focus on parking in garages and developments such as shared mobility, mobility as a service and autonomous transport demand a planned approach. Particularly because the time will come when it will not be possible to expand the charging network on public land sufficiently to meet the demand.

Public garages, the garages of homes and locations for permit holders and P+R locations will have sufficient charging infrastructure. The role of private sites, existing buildings and area and property developments is also being reviewed. An additional advantage is that it is easier and cheaper to install charging infrastructure on a large scale in car parks than in public space, although modifications to the building's installation, energy management and connection to the grid can lead to high initial costs.

The municipality has drawn up guidelines and a list of requirements for charging points in new garages and garages that are being renovated. Consequently, future car parks will provide charging facilities without major and expensive modifications. A tender procedure is currently being prepared for charging points in existing municipal car parks. The municipality's role in promoting the installation of charging infrastructure in existing private garages will be investigated this year. The municipality will encourage parties such as Associations of Owners (VVEs) to play a role in this process.

3.4 Regulation

Intensification and geographic expansion of current environmental zones

Environmental zones are the principal regulatory instrument for keeping old and polluting (diesel) vehicles out of the city. In 2008, Amsterdam created an environmental zone for older, polluting diesel trucks. Since then, five environmental zones have been gradually introduced for trucks, vans, taxis, buses/coaches and mopeds and scooters In the coming years, the existing environmental zones will be expanded to cover a wider area and the rules will be intensified.

At present, there are exemptions for some industrial areas in the existing environmental zones for trucks, buses, vans and taxis: Amstel Business Park, Houthavens, Schinkel, Westpoort, Rai, Cruquius and Zeeburgereiland. The residential function has become more prominent in some of these areas and the original reason for exempting these areas from the environmental zones has therefore disappeared.

In addition, a study is being conducted into a number of other areas, including Amsterdam-Noord and IJburg. We will also consider whether the expansion of the environmental zone for buses to the entire built-up area, which was planned in 2016, is still necessary in light of the other ambitions and measures for buses.

A final decision on what expansion is needed will be made in conjunction with the decision on traffic-related measures. To provide certainty for road users, the point of departure is that the contours of all the environmental zones, with the exception of scooters and mopeds, will remain the same as far as possible.

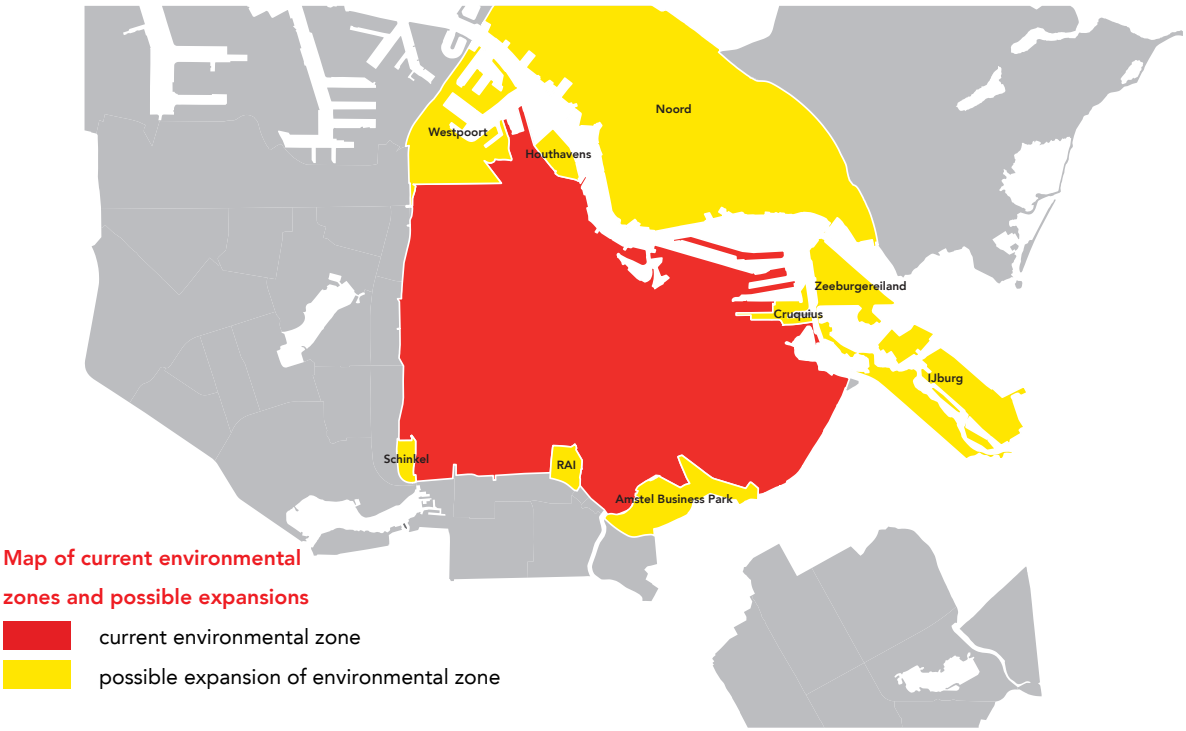
Introduction of a new environmental zone

Amsterdam is dependent on the national harmonisation of environmental zones for the establishment of a new environmental zone for diesel cars. Under the harmonised rules, vehicles with Euroclass 3 or higher or Euroclass 4 or higher can be admitted to the environmental zone. Amsterdam has opted for the more ambitious approach: Euro4 and higher. The harmonisation stipulates that the rules must be introduced in 2020. The decision to allow only vehicles with Euro4 and higher into the environmental zone will represent a significantly larger reduction of particulate matter and nitrogen in absolute terms than if Euro3 cars were admitted. However, more people will also be affected. During the public consultation process we will consider whether the transition can be encouraged in specific cases by offering subsidies (see also the strategy on stimulation) or by offering tailored dispensa-

National harmonisation of environmental zones

There will be a national regulation for envi-ronmental zones. Its introduction is ex-pected to commence in 2020. It will lead to uniform rules and designs for the environmental zones throughout the country. The national regulation will allow for some discretion to reflect local circumstances. For Amsterdam, the national regulation has consequences for the existing environmental zones for vans, trucks and taxis. The national regulation also provides for an environmental zone for passenger cars.

The national government is not formulating specific rules for scooters and mopeds or for buses. These zones will therefore not have to be changed.



Map of current environmental zones and possible expansions

current environmental zone

possible expansion of environmental zone

tions. A final decision will be made on this at the end of 2019.

Introduction of emission-free zone

In addition to the environmental zones, Amsterdam intends to create emission-free zones in the coming years. Emission-free zones are low-traffic areas where high levels of air pollution and traffic policy impact on one another. The use of this instrument is new. It has not only an environmental effect, but will also affect the volume of traffic by reducing the number of vehicles and the number of kilometres driven.

Amsterdam will initially apply this measure to taxis, buses and coaches in the inner city (broadly defined as the area within the S100 ring road south of the railway line). These vehicles make an above-average contribution to the poor quality of the air in the city and are a major cause of the European standards for air quality being exceeded in the inner city. This is in line with the concentric concept that is also being adopted in the Agenda for low-traffic Amsterdam and the Action Plan for coaches. The measure will be introduced in 2022. Whether certain routes can be exempted from the emission-free standard and for which target groups temporary exemptions will be offered are both under review.

The emission-free policy for taxis will be intensified in the period leading up to 2025. The roll-out of clean taxi ranks will be accelerated and the extent to which access roads to taxi ranks can be made clean/emission-free will be investigated. We will also hold talks with companies and institutions that order transport for their guests with a view to reaching agreement that they will only order emissions-free taxis and coaches.

Access to the emission-free zone in the city centre (S100 ring road) will be granted in an intelligent manner on the basis of the system of environmental zones. This intelligent access will allow for a customised approach to granting dispensations (by place and time), but can also be extended with other measures to regulate traffic. Arranging access in this way ensures that enforcement is in order. This measure will be implemented in conjunction with other inner-city programmes, such as those for a low-traffic area, taxis and coaches, and the renovation of quays and bridges. The details will be fleshed out in the Agenda for a low-traffic Amsterdam, in consultation with the Chief Technology Officer (CTO), among others.

A long-term goal: all vehicles in the city emission-free in 2030

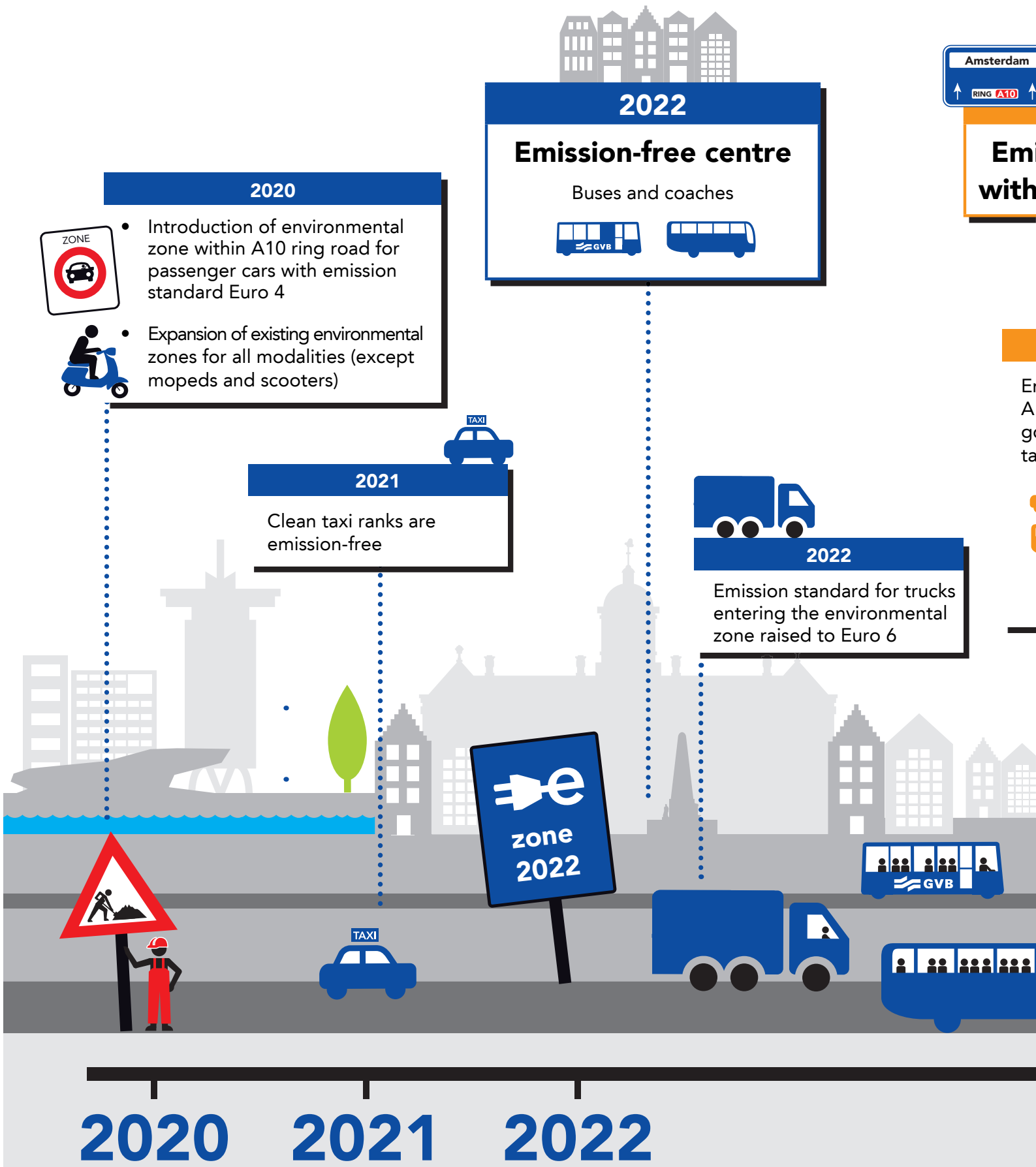
The combination of regulatory measures will lead to an emission-free zone within the A10 ring road in 2025. The regulations that make this possible will be backed up with the range of facilitating, stimulating and communication measures. Considerable progress has already been made towards achieving this ideal through voluntary agreements made with the logistics sector (vans and trucks), the taxi sector and the city's public transport company GVB. The regulations will formalise this process, but the sectors concerned also deserve a compliment for the major efforts they have been willing to make.

The timetable for the implementation of all the policy instruments and ambitions is as follows:

2020	introduction of an environmental zone for Euro 4 diesel passenger cars within the A10 ring road
2020	existing environmental zones intensified and expanded, except for scooters and mopeds
2021	ban on taxis operating on green gas at clean taxi ranks
2022	city centre is emission-free zone for buses and coaches (within the S100 south of the railway line))
2022	environmental zone for (diesel) trucks tightened up to Euro 6
2025	environmental zone in built-up area for scooters and mopeds becomes emission-freej
2025	emission-free zone for trucks and vans within the A10 ring road
2025	emission-free zone for taxis, buses and coaches within the A10 ring road
2025	all canals in Amsterdam an emission-free zone for passenger vessels, pleasure craft and municipal ferries
2030	built-up area an emission-free zone for all modalities

From 2030 a national ban on the sale of new fossil vehicles will apply (Euro-E)

Phased plans for traffic



2025

ission-free zone
in A10 ring road

2025

mission-free zone within
10 ring road for heavy
oods, vehicles and vans,
xis, buses and coaches

2025

Entire built-up area is emission-free zone for mopeds and scooters

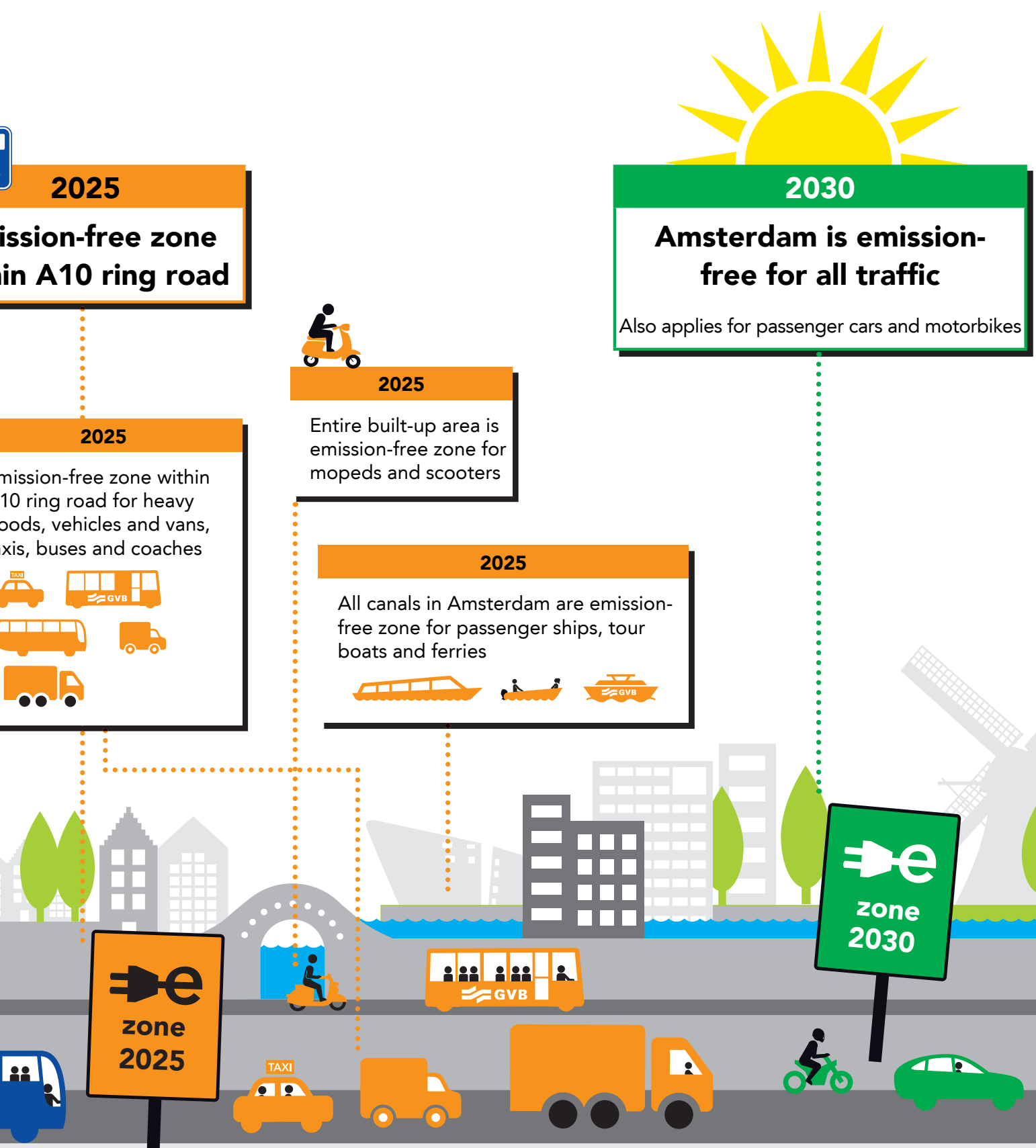
2025

All canals in Amsterdam are emission-free zone for passenger ships, tour boats and ferries

2030

Amsterdam is emission-free for all traffic

Also applies for passenger cars and motorbikes



2025 **2030**

4 Consequences

4.1 Impact of Action Plan on air quality

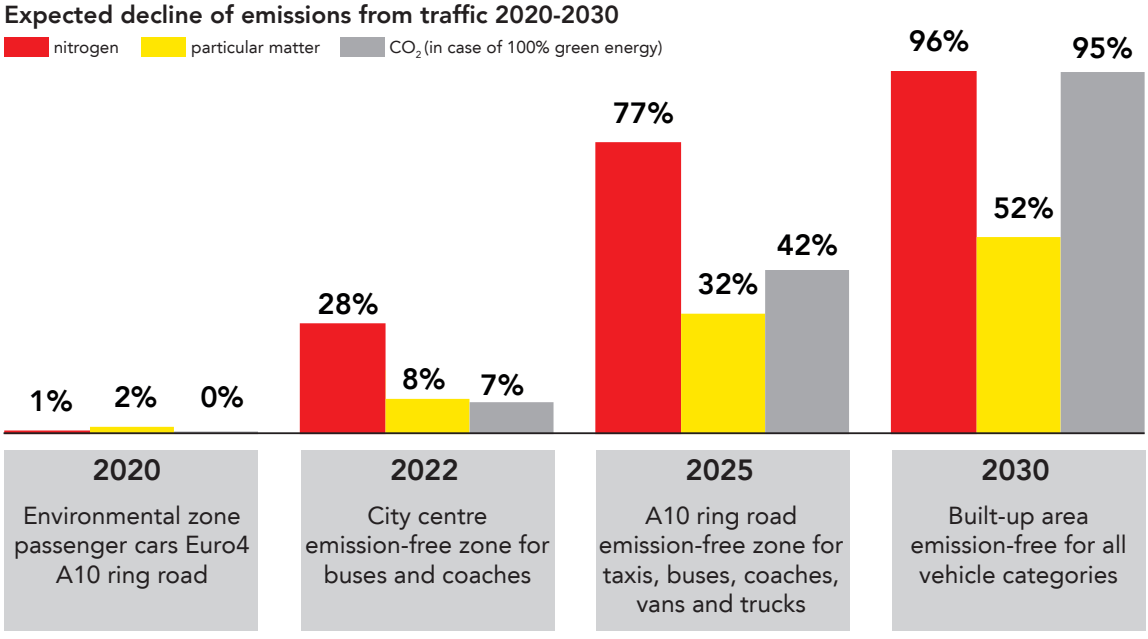
The measures in this Action Plan will enable Amsterdam to comply with the European standards for air quality as soon as possible. The plan then focuses on complying with the World Health Organization's (WHO) guideline values for $PM_{2.5}$ by 2030. The measures will lead to a reduction in the number of kilometres driven by vehicles with a combustion engine. As a result, emissions of particulate matter and nitrogen will decline, as will their concentrations in the air.

The proposed measures are projected to lead to a reduction of 95% in the number of kilometres driven in fossil vehicles. Consequently, in 2030 there will be almost no nitrogen emissions from the relevant categories of vehicle. Because, in addition to its exhaust, tyre wear also causes emissions, particulate matter will decline less rapidly. Emissions of nitrogen and particulate matter from the other sources will also decline in the coming years due to market developments and national and international policy (autonomous development).

In addition to reducing nitrogen and particulate matter, the measures will lead to a reduction of CO_2 emissions, which will help to achieve Amsterdam's climate targets and promote the energy transition as a whole. Road traffic accounts for 9% of total CO_2 emissions in the city. By making road traffic entirely emission-free, by 2030 there will be no CO_2 emissions from this source. The energy that is used for emission-free vehicles will be generated sustainably.

With the measures in this Action Plan, the municipality is targeting the sources where they will have the greatest impact and where it has the greatest influence. The proposed measures in this Action Plan will therefore also greatly accelerate the process of making the air cleaner. The additional 'knock-on effect' will further help to create cleaner air. For example, the measures will also encourage vehicle owners who are not directly affected to switch to clean transport. It is calculated that the combination of autonomous development, the measures in this Action Plan and the knock-on effect will ultimately enable Amsterdam to comply with the WHO's guideline

Expected decline of emissions from traffic 2020-2030



Measuring the results
All of the results in this section are based on the best possible calculations and projections by the National Institute for Public Health and the Environment (RIVM) and the Netherlands Organisation for Applied Scientific Research (TNO). However, these calculations cannot provide any guarantees.

values for nitrogen and particulate matter by 2030.

For most of the measures in the Action Plan, their effect on air quality can be calculated. The effects of every measure relating to cleaner road traffic have been calculated. The results reveal the following situation.

The nitrogen concentration is expected to decline to 14.4 µg/m^3 in 2030 (as a result of lower emissions from every source). This is well below the EU's limit value of 40 µg/m^3. The WHO's guideline value for the concentration of particulate matter will also be met solely by implementing the measures for road traffic, since it will decline to 9.6 µg/m^3 in 2030. Furthermore, an even greater decrease is anticipated through the measures in the other mobility programmes and the policy on mobile machinery, passenger vessels and pleasure craft and wood burning.

4.2 Finance

The measures in this Action Plan will help Amsterdam to come closer to achieving emission-free transport, and hence cleaner air.

- A large part of the financial resources will be devoted to creating new environmental zones or tightening up existing ones. The majority of the costs will be incurred in preparing the measures and in the year of their introduction, 2019 and 2020, and are connected to hardware and legal affairs. The post-introduction costs relate mainly to monitoring and the handling of exemptions. Altogether, roughly a quarter of the budget will be spent on environmental zones (regulation).
- The environmental zones will be backed up with incentives. The expenditure will coincide with the introduction of the environmental zones and will be incurred mainly in the period from 2020 until the end of 2022. Existing subsidies will also continue in 2019. Incentives are expected to account for a third of the budget. This amount will be used to stimulate demand to best effect, while lower market prices will lead to lower subsidies.
- The costs of facilitating measures will be devoted mainly to scaling up the charging infrastructure. The public charging network will be put out to tender again in 2020 and there will be investment in charging infrastructure in the public space. The investments will be made in flexible charging, high-speed chargers and the first hydrogen filling stations.
- A fourth cost item is communication. A major campaign will be organised in the coming years to raise awareness and to promote behaviour change.

There will also be expenses relating to specific measures to improve the air quality at worst-affected locations, such as taxi ranks and building sites (mobile machinery).

In light of the municipality's ambitious target for emission-free buses, we will make a financial contribution to the management of the process and to pushing forward this transformation.

At a later stage, the measures will be fleshed out in detail and the costs will be allocated more specifically.

4.3 Monitoring

Every year the city council is informed about the air quality in Amsterdam in the national report produced by the RIVM. In that report, the annual average concentrations of nitrogen dioxide and particulate matter in cities, including Amsterdam, are published on the basis of calculations by the RIVM. The report focuses on the extent to which the EU's limit value for air quality is being met. We will also use the annual average for Amsterdam to review the progress being made in complying with the WHO's guideline values and the specified target for reduction of CO_2 emissions.

In addition to the reporting on the air quality in Amsterdam, the progress of the Action Plan will be monitored by means of an annual survey of the number of clean vehicles driving around in Amsterdam. This will show the progress being made in increasing the proportion of clean cars

Resident, visitor or company: there is always an emission-free alternative

in Amsterdam on the way to an emission-free city in 2025.

4.4 Planning and consultation

The Clean Air Action Plan calls for a behaviour change by the people of Amsterdam. Sometimes voluntary, sometimes compulsory; it is not something that everyone is looking forward to. An advantage is that many of the types of policy measures in the Action Plan are not new. There are already subsidies, there are already requirements that old vehicles have to meet and there are already charging points. But the combination of measures, their greater impact and the gradual realisation that the measures are inevitable and will affect everyone will take getting used to and will need to sink in before there is any prospect of public acceptance. The municipality therefore wants to (and has to) engage in a dialogue. To build understanding, acceptance and public support through participation. The greater the public support now, the sooner the policy will be accepted (short term) and the easier it will be to ultimately achieve the policy objectives (long term).

Participation comes in all shapes and sizes. From the statutory consultation procedure to joint policymaking. The impact of the measures tends to favour the latter course. Joint policymaking, or 'fine tuning' policy, calls for deepening and commitment from sparring partners. That is not the same thing as attending a single information evening to voice arbitrary objections. It calls for absolute clarity about what is being discussed and what has already been determined. The drawback of this type of discussion is that there is always only a section of the community that takes part. Even though the plans for air quality affect everyone in Amsterdam, not to mention commuters, businesses and visitors. Ideally, a wider group of residents will provide their input to the discussion.

The Action Plan will be fleshed out with the city districts, the residents and interested parties in three stages:.

- a survey of public opinion in Amsterdam
- a deeper discussion of specific subjects, and
- formal consultation.

The action plan is an elaboration of the ambitions set out in the coalition agreement, which was in turn indirectly the result of the outcome of the municipal elections in 2018. Air quality was evidently an issue during the elections. To zoom in further on the wishes and expectations on this subject, an opinion poll was conducted among the people of Amsterdam in February 2019. The poll asked respondents for their views on a number of dilemmas arising from the action plan. The findings provided insight into public support for particular decisions and will help the city executive (and the digital platform) in the conversation with the city. The results have been incorporated in drafting the plans and form the basis for the measures presented here.

The deeper debate will be conducted in a six-week period from the beginning of June until the middle of July on an (external) digital platform. Residents, companies and anyone who feels so inclined is welcome to join the conversation. The central question is: given the challenge and the objective of improving the air quality, how should the municipality design these measures? The choice of this question reflects the experiences with earlier environmental zones, where the discussion focused mainly on their implementation. Three online discussions are planned: one on environmental zones (including exemptions and subsidies); another on emission-free zones; and another on the charging infrastructure. Participation in any of the discussions brings obligations with it: participants must give their name and declare the nature of their involvement. The purpose is to use the discussion to fine-tune the policy even as officials are fleshing out the action plan. The platform will be hosted by practical experts. The municipal policymakers will be regularly involved to keep abreast of the discussion and to join in if necessary, for example by providing background information. The findings from this process will be used to draw up a specific package of measures after the summer.

The third step in the process will be the formal consultation procedure on the adoption of the measures. The measures all have their own timetable. The consultation period will conclude with an emission-free traffic festival.

Emission-free Amsterdam

5 Approach per source

This action plan focuses on traffic, shipping, (mobile) machinery and wood burning.

There are many categories of vehicles. Each category has a different context, state of technology and socio-economic impact and deserves its own distinct approach. The general strategy of communication, stimulation, facilitation and regulation will be used for all of the above traffic modalities, sailing, (mobile) machinery and wood burning. The result will be a tailored approach leading to each category becoming emission-free.

Traffic

1. Passenger cars
2. Taxis
3. Vans
4. Trucks
5. Buses and coaches
6. Motorbikes
7. Scooters and mopeds

Boats and ferries

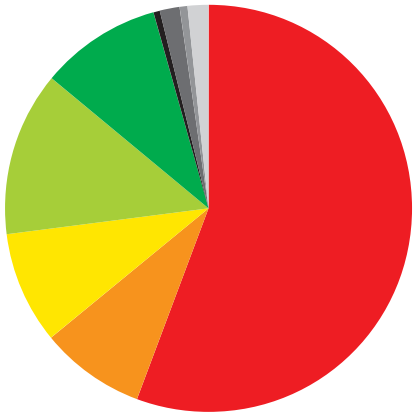
8. Municipal ferries
9. Ships (passenger and pleasure craft)

Other sources

10. Mobile machinery and generators
11. Biomass and wood burning

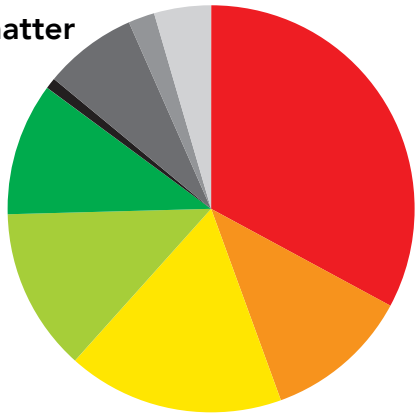
Emission by category (source: RIVM)

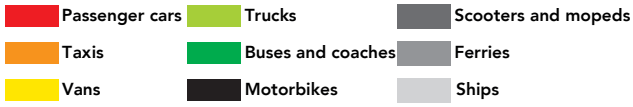
CO_2



Nitrogen

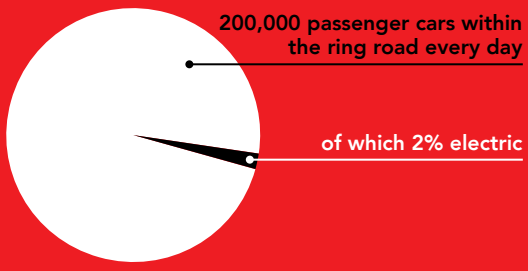
Particulate matter





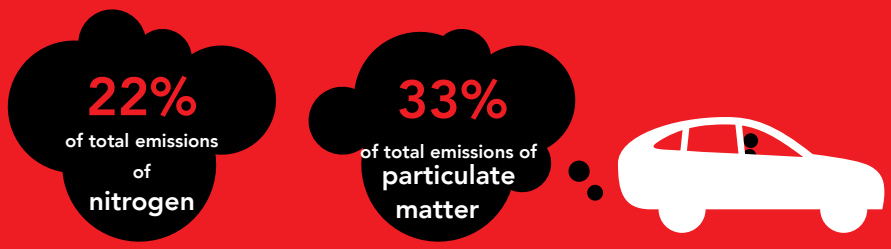
Passenger cards emission-free in 2030

Volume



Why do we want to achieve this?
Passenger cars cause 22% of total nitrogen emissions and 33% of total emissions of particulate matter in Amsterdam. There is every reason to take action. But measures affecting the car also have a substantial social impact. From 2030 the government will only permit the sale of new cars that are emission-free. From that time, Amsterdam will only allow emission-free passenger cars to enter the city.

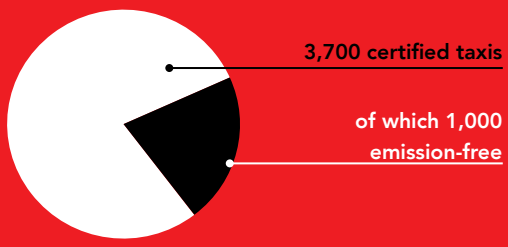
The measures in the coming period are designed mainly to raise awareness of the pollution caused by cars and of the possible alternatives in anticipation of further measures in 2030.



	Effort	Current situation	Future situation
	++	Passive communication via website about admission to the city; active communication about subsidies	Active and direct targeting of owners of old diesel cars in 2019
	+	Subsidy for frequent business travellers (max. € 5,000). Scheme ends in October 2019	Investigation of possibilities for new subsidies; decision at end of 2019
	++		▪ Drafting of strategy for charging infrastructure ▪ Demand driven and strategic roll-out of charging points
	+		▪ Investigation with national government of possibilities for differentiated parking rates for metred and permit parking (submission to House of Representatives in spring of 2019) ▪ Environmental zone for diesel cars Euro4 and higher within A10 ring road in 2020 ▪ Creation of emission-free zone within the built-up area in 2030 ▪ Ban on sale of fossil vehicles (2030)

Taxis emission-free in 2025

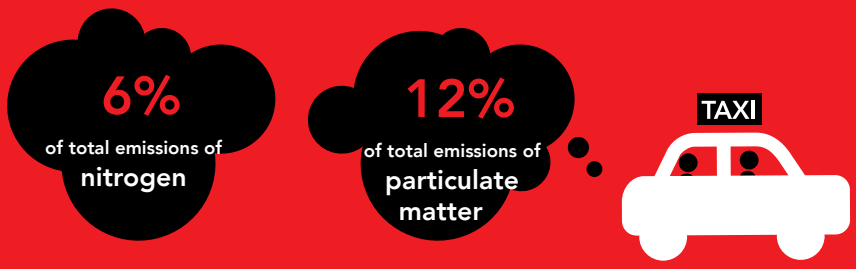
Volume



Why do we want to achieve this?
Taxis account for a substantial share of the kilometres driven in cars. This modality causes 6% of the total emissions of nitrogen and 12% of the total emissions of particulate matter in Amsterdam.
Only drivers of taxis operated by the taxi organisations certified by the municipality are allowed to use the taxi ranks.

There are 3,700 certified taxis and 30% of the current fleet of certified taxis are emission-free vehicles. They are the biggest group of users of electric cars in Amsterdam. This is partly due to the agreements reached between the municipality and the taxi organisations in the Voluntary Agreement on Clean Taxis for Amsterdam. That agreement will be updated with new measures in 2019.

There are also several thousand non-certified taxis (suppliers of transport on demand such as Uber). To provide a boost for the transition to emission-free transport on demand, the municipality wants to make agreements with parties that order transport for their customers, such as hotels (for example, when ordering taxis and coaches).



	Effort	Current situation	Future situation
	+	Voluntary Agreement on Clean Taxis for Amsterdam	▪ New agreement with taxi sector ▪ Agreements (in a voluntary agreement or statement of intent) with companies and institutions that receive guests (hotels, tourist attractions, hospitality sector, etc.) to order only emission-free vehicles
€	+	Subsidy scheme (€ 5,000 for the purchase of a new electric taxi, max. 5 taxis)	Research into the possiblities of further promoting the purchase of electric taxis; decision at end of 2019
	++	Network of public charging infrastructure and high-speed chargers	▪ Scaling up of public high-speed charging infrastructure (from 13 to possibly 62 in 2026) ▪ Roll-out of hydrogen filling stations from 2019
	++	▪ Diesel environmental zone within A10 ring road since 2018 (Initial admission 2009 or younger) ▪ Clean taxi ranks (Central Station, Leidseplein)	▪ Increase in number of clean taxi ranks ▪ Ban on taxis using green gas at clean taxi ranks from 2021 ▪ Investigation of the extent to which access roads to busy ranks can be made clean/emission-free) ▪ Emission-free zone within A10 ring road in 2025

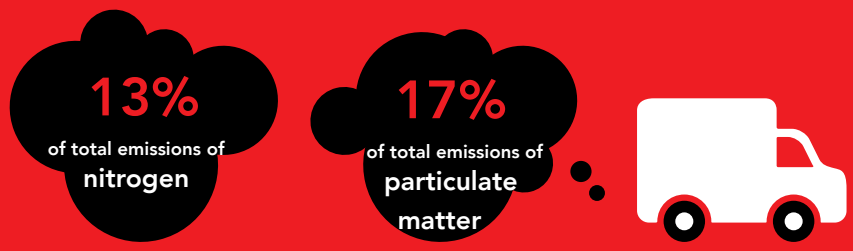
Vans emission-free in 2025

Why do we want to achieve this?
Around 25,000 vans drive into the city from the A10 ring road every day. This 'light transport' (up to 3.5 tons) accounts for approximately 12% of the total road traffic and that figure is still rising. Vans currently account for 13% of the total emissions of nitrogen and 17% of the total emissions of particulate matter in Amsterdam.

Every day
25,000
vans enter the city

Urban logistics refers to the transport of goods within the city and encompasses the primary transport of goods and/or services. It includes parcel delivery services, retail and wholesale, hospitality, building, purchase of facilities services and waste. Cargo bikes, light electric vehicles, vans and trucks are used to transport the goods.

Amsterdam is a co-signatory of the Green Deal Zero Emissions Urban Logistics 2025. With its partners, the city is endeavouring to create an emission-free logistics system for light vans in Amsterdam by 2025. Only a small number of models of e-vans are currently produced on a large scale, but that situation is changing rapidly.



	Effort	Current situation	Future situation
	++	▪ Passive information about environmental zone, active communication about enforcement ▪ Voluntary agreement 'Smart and clean through the city' (2015)	▪ Communication about the Green Deal and logistics hubs ▪ Information about changes to the environmental zone ▪ Voluntary agreement on clean logistics 2019
€	+	▪ Subsidies for frequent business travellers (max. € 5,000) ▪ Subsidy for purchase of e-van for use in Amsterdam (max. € 10,500). ▪ Exemption for loading and unloading with electric vehicles and discount on charges	Investigation of possibilities for new subsidies
	++	E-transport from 5 logistics hubs	Drafting of strategy for charging infrastructure, including upscaling of logistics hubs and high-speed charging infrastructure
—	+	Diesel environmental zone within A10 (DET 2000 or later permitted)	▪ Environmental zone will remain in force until 2025 ▪ Emission-free zone within A10 ring road in 2025 ▪ Enforcement expanded to European licence plates

Trucks emission-free in 2025

Every day

6,000

trucks

Why do we want to achieve this?

Trucks (above 3.5 tons) account for roughly 3% of the traffic and are important for the distribution of goods and services in the city. Every day around 6,000 trucks enter the city from the A10 and the number is steadily rising. This modality causes 29% of the total emissions of nitrogen and 13% of the emissions of particulate matter in Amsterdam.

Although there is no large-scale production of emission-free vehicles yet, there are already large electric vans available and the first heavier, customised emission-free trucks are being used. Developments in relation to hydrogen could certainly also be relevant for trucks.

	Effort	Current situation	Future situation
	+	▪ Communication about environmental zones and exemptions ▪ Voluntary agreement 'Smart and clean through the city' (2015)	▪ Communication about hubs ▪ Voluntary agreement on clean logistics
€	+	▪ SSubsidy scheme for electric vehicles for businesses (max. € 40,000 per truck, max. € 10,500 per light vehicle). Scheme ends in October 2019 ▪ Exemption for loading and unloading by electric vehicles and a discount on charges	Investigation of possibilities for new subsidies
	++		▪ Drafting of strategy for charging infrastructure, including upscaling of logistics hubs plus high-speed charging infrastructure ▪ Facilities for filling up with hydrogen
	+	Environmental zone within ring for Euro4 and higher trucks	▪ Environmental zone intensified to Euro6 in 2022 ▪ Emission-free zone within A10 ring road in 2025 ▪ Enforcement for all European licence plates

Buses and coaches emission-free in 2025

Volume

8,000
coaches per day within the ring, of which

1%
electric

2,000
GVB-buses, of which

1%
electric

7%
electric in 2020

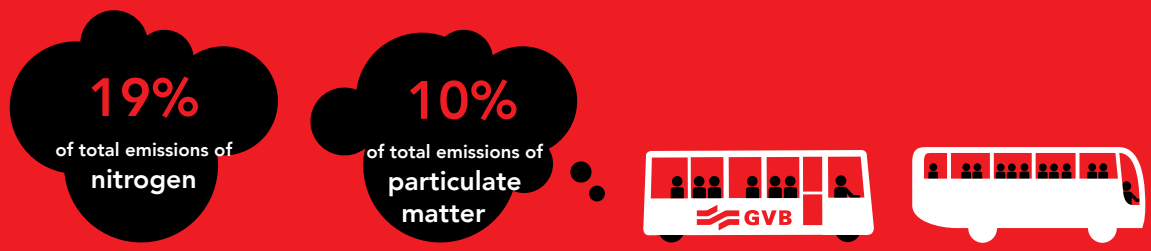
50%
Connexion buses electric

Why do we want to achieve this?
Emissions from buses (coaches and buses operated by the public transport companies GVB and Connexxion) are relatively high. Together they account for 19% of nitrogen emissions and 10% of particulate matter emissions.

Hydrogen is a highly relevant option as a fuel for coaches. Amsterdam is specifically considering its use for this target group.

For the time being, the Amsterdam Transport Region expects e-buses will be the most promising option (as opposed to hydrogen-powered buses).

There are currently three possible charging techniques: Opportunity Charging (OC), In-Motion Charging (IMC) and plug-in technology. In addition to lengthy charging at night, the OC bus uses high-speed charging during the day. The MC bus charges as it is moving via an overhead cable, and the plug-in bus charges only at night. OC technology is the most proven technology at the moment.



	Effort	Current situation	Future situation
	++	Regular communication by public transport company GVB	Coaches: building an "emission-free coalition" of parties in the city that receive groups (hotels, museums, etc.)
	+	Subsidy scheme for electric vehicles for businesses (max. € 40,000/bus). Scheme ends in October 2019	
	++	Agreement in 2019 on cooperation between the Amsterdam Transport Region, the GVB and the municipality	Exploration of possibilities for hubs for coaches (including high-speed charging facility)
	+	Environmental zone diesel Euro6	▪ Emission free zone within S100 in 2022 ▪ Emission-free zone within A10 ring road in 2025

Motorbikes emission-free in 2030

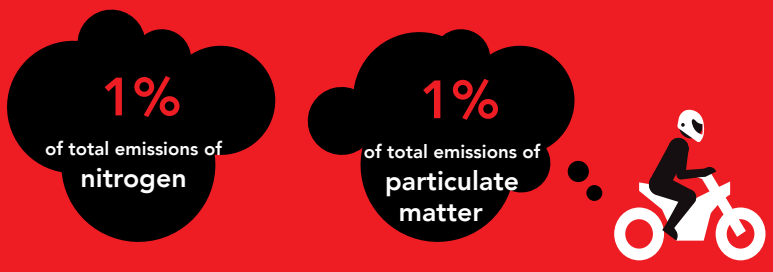
Volume

20,000
registered motorbikes in Amsterdam

5.8%
of new sales are electric

Why do we want to achieve this?
There are relatively few motorbikes and they travel relatively few kilometres. Motorbikes account for less than 1% of nitrogen emissions and 1% of particulate matter emissions. There are 730,000 motorbikes and 1.4 million people with a motorbike licence in the Netherlands. In the province of Noord-Holland, 5% of the inhabitants own a motorbike. The number of kilometres driven is estimated at beween 1,200 and 3,500 a year. The age of the motorbikes varies: 25% are more than 25 years old. The emission standard for new motorbikes is currently Euro4 and will be Euro5 from 2020, which is relatively similar to the standard for modern petrol-driven cars. From the perspective of air quality, there is little urgency to adopt regulatory measures in the short term. Nevertheless, it is also reasonable to ask motorbike riders to help make the city's air cleaner. It would also prevent a large-scale shift to this modality.

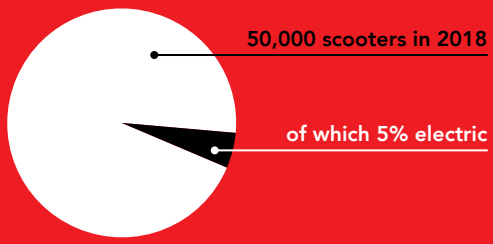
The electric engine has been under development for ten years. There are a few models on the market, for example from Dutch/Belgian manufacturers and from prestigious brands like Harley Davidson. At the end of last year, there were around 600 e-motorbikes registered in the Netherlands.



	Effort	Current situation	Future situation
	++		Active communication about environmental zone well before 2030
€	0		Investigate possibilities for new subsidies; decision in 2022
	0		Study into the need for and required locations of public charging infrastructure
	0		Built-up environment will be an emission-free zone for motorbikes in 2030

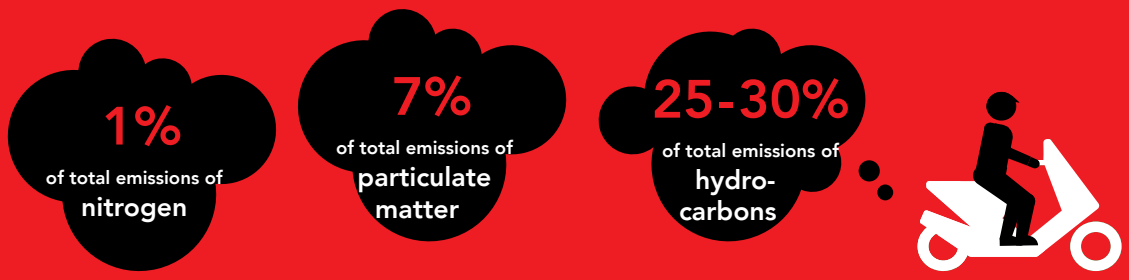
Scooters and mopeds emission-free in 2025

Volume



Why do we want to achieve this?
Scooters and mopeds account for less than 1% of nitrogen emissions and 7% of particulate matter emissions. They also emit relatively large quantities of hydrocarbons (including benzene) and soot, direct exposure to which is very harmful to human health. This is a reason to make this type of vehicle emission-free as soon as possible.

Until 2016, very few e-scooters were sold. 'Too expensive' and 'poor quality' were the usual reasons. With the emergence of a growing number of new parties in the market, the supply has risen in recent years and e-scooters are now available in the same price range as fossil scooters. However, autonomous developments will not be sufficient to meet the target for 2025.



	Effort	Current situation	Future situation
	++		Acceleration of knowledge sharing and awareness through cooperation with market actors
	++	To compensate for the environmental zone for scooters and mopeds, there used to be a subsidy for green city pass holders	Investigate the possibilities for new subsidies
	++	Charging infrastructure is not facilitated	Charging infrastructure will not be facilitated
	+	The environmental zone for scooters and mopeds was introduced in 2018.	▪ Investigate the possibilities for stricter enforcement ▪ From 2025, the environmental zone will be raised to an emission-free zone

Municipal ferries emission-free in 2025

Volume

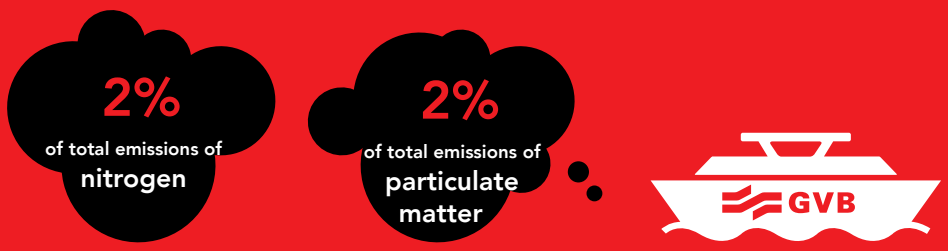
16
GVB ferries

12 Diesel **4** hybride

Why do we want to achieve this?

The number of passengers on the GVB ferries is growing by an average of 6% annually. The fleet is expanding to absorb this growth. The ferries currently account for around 25% of the entire consumption of diesel by the GVB fleet (ferries and buses). Making these vessels emission-free will yield substantial environmental benefits. The ferries currently account for 2% of the total nitrogen emissions and 2% of particulate matter emissions in Amsterdam. In 2015, the municipality of Amsterdam and the GVB signed a voluntary agreement on sustainability with the aim of making the ferries emission-free. The sustainability strategy was updated in 2018.

The focus is on electric propulsion. The GVB ferries will be charged at or close to the ferry terminals. The strategy will be fleshed out in 2019 so that the first emission-free vessels can enter service in 2022. The four newest vessels are already much cleaner and more efficient.



	Effort	Current situation	Future situation
	+	Sustainability strategy for GVB ferries	Specific projects to implement sustainability strategy (expected at end of 2019)
€	++		Funding for investments in sustainability of vessels and infrastructure (including charging facilities)
	++		Identification of best charging locations in consultation with the network manager and market actors
	+		Emission-free in 2025

Sailing emission-free in 2025

Less than

76%

of passenger vessels are emission-free

5%

of pleasure craft are emission-free

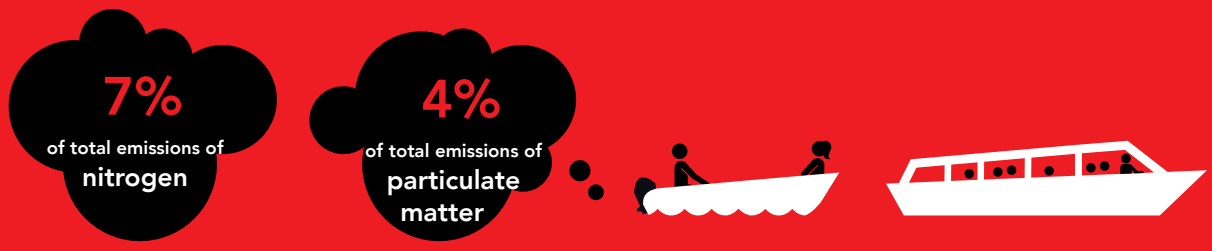
Why do we want to achieve this?

Passenger vessels and pleasure craft account for 7% of nitrogen emissions and 4% of particulate matter emissions. Technological developments in the area of emission-free sailing are advancing at an explosive pace and that creates opportunities for smarter, cleaner and quieter travel by water in Amsterdam.

76% of the tour boats in Amsterdam are already emission-free and all of them will be by 2025.

Fewer than 5% of the pleasure craft are emission-free. From 2025, all pleasure craft on Amsterdam's canals will have to be emission-free. Improving the sustainability of the fleet of pleasure craft and so reducing the emissions and the nuisance they cause on the water will be a major challenge.

To facilitate the transition to emission-free sailing, the municipality is subsidising the creation of a charging infrastructure for the tour companies. The municipality will provide charging infrastructure for new marinas at a number of specific locations. It will also investigate whether public charging points can be established for pleasure craft. The points of departure and the details of the charging infrastructure will be fleshed out in the Nota Varen deel II, the successor to Nota Varen deel I, which laid down the points of departure for emission-free sailing. This policy document will be submitted to the city council in 2019.



	Effort	Current situation	Future situation
	++	*Nota Varen deel I* laying down the points of departure for policy on emission-free sailing	*Nota Varen deel II* containing policy measures for vessels for an emission-free zone (end of 2019)
	+	Harbour fees for emission-free vessels are lower than for vessels with combustion engines	Financial measures will be investigated and if possible included in *Nota Varen deel II*
	++	Charging point locations for cruise boats at terminals	▪ Tender for a public charging infrastructure for pleasure craft and cruise boats in 2019 ▪ Pilot projects with charging infrastructure ▪ Standard charging policy for vessels
	++		▪ Emission-free cruise boats in 2020 ▪ All vessels (including pleasure craft) emission-free in 2025

Mobile machinery and generators emission-free

Why do we want to achieve this?

Mobile machinery is a collective name for machines that are used in building and construction projects. Examples are diggers, cranes, excavators and generators. All of these machines cause air pollution, although precisely how much is not known. Research is underway into the volume of emissions and how to make these machines emission-free by 2025 insofar as the state of the technology and enforceability allow.

Like vehicles, mobile machinery is subject to EU emission standards. The earliest standards date from 1999 and they have been regularly tightened up over the years.The most recent update (phase V) applies from 2019. The higher the phase of the standard, the fewer pollutants the machine emits. There are also emission-free alternatives available or in development for a growing number of mobile machines. Some of these are electric alternatives, but they also include hydrogen-driven mobile machines. The municipality can dictate the emission standard for some of the machines that are used in the city, but does not have direct influence over all building projects. The municipality of Amsterdam can exercise most influence over projects it commissions itself through the criteria it adopts for awarding a contract or by specifying requirements in tenders. It has far less influence over private building projects such as renovations.

	Effort	Current situation	Future situation
	++	Signing of the Green Deal Het Nieuwe Draaien [the New Way of Operating], in which the municipality commits itself to reducing emissions from mobile machinery	Sharing knowledge, creating awareness and suggesting actions to reduce emissions from mobile machinery
	+		Study into the usefulness of subsidies for emission-free mobile machinery
	0	Generators are banned at festivals and large events and fixed electricity points are established	
	+	The first pilot projects in which criteria for the use of green machinery were included in tenders for civil engineering projects	▪ Inclusion of criteria and requirements for clean machinery in tenders for civil engineering projects ▪ Investigation of ways to encourage the use of clean machines in other building projects. ▪ Investigation of ban on diesel generators in particular areas ▪ Investigation of city-wide (within the ring) rules for the cleanest possible/emission-free mobile machinery in 2025

Biomass and wood burning

Why do we want to address this source?
Emissions from open fires, wood-burning or pellet stoves, barbecues, outdoor heaters, fire baskets and fireworks are one of the larger sources of pollution in the city. Incineration leads to emissions of harmful, and sometimes carcinogenic substances. The number of health complaints arising from pollution from wood smoke has increased greatly in recent years.

The quantity of particulate matter released in burning 1 kg of wood in a modern stove is equivalent to driving 350 km in a truck. A neighbour who burns a lot of wood is as bad for a person's health as a busy road outside the front door.

From the perspective of sustainability, however, the incineration of biomass and wood are regarded as a CO2-neutral form of energy generation. Both are accompanied by emissions of CO2 from short-cycle carbon[1]. Amsterdam has not yet formally adopted a uniform policy on this issue. At the end of 2019, Amsterdam will publish a Policy Framework for Biomass and Wood Smoke in which the city executive will carefully weigh up the pros and cons of burning biomass and wood. The report will establish the points of departure for its policy. It will also cover the subject of fireworks. The policy framework will take account of the Roadmap for a Climate-Neutral Amsterdam 2050.

	Effort	Current situation	Future situation
	++	Passive communication on GGD website	The national government is producing publicity material to draw attention to the method of burning and burning during particular weather conditions. Amsterdam will make appropriate use of this material. Amsterdam's publicity campaign will commence at the end of 2019
	++		
	++		
	++		Drafting of policy framework for biomass and wood burning (end of 2019)

[1] If sufficient attention is devoted to aspects of sustainability in the entire chain (growing and cutting down trees, transport, processing and incineration of biomass and wood), the incineration of biomass and wood for energy helps to reduce greenhouse gas emissions.

Emission-free Amsterdam

Appendix 1
Measuring and monitoring air quality

The municipality of Amsterdam's air quality monitoring network, which is managed by the GGD, and the monitoring networks of the Rijnmond Environmental Service and the RIVM are part of the National Air Quality Monitoring Network. Amsterdam has the densest monitoring network in the Netherlands and complies will all of the requirements specified by the European Union.

Amsterdam's air quality monitoring network is managed by the GGD and consists of:

- 11 automatic monitoring stations: at these stations the concentrations of particulate matter (PM_{10}, $PM_{2.5}$ and Black Carbon (soot)), gaseous components (NOx, CO, O and SO ,) and volatile hydrocarbons (benzene, toluene, xylene) are measured around the clock on the basis of hourly averages. Six of these automatic monitoring stations are in background locations, five are street stations.
- 124 locations (70 on streets, 4 on motorways, 3 on the IJ and 47 in background locations) where nitrogen dioxide (NO_2) levels are monitored with a simple, passive monitoring method using Palmes diffusion tubes. These tubes monitor the annual average NO_2 concentration.
- 2 automatic monitoring stations to measure the contribution of industrial activities and the Westelijke Havengebied (Western Harbour Area).

The monitoring network is mainly intended to measure PM_{10}, $PM_{2.5}$, Soot and NO because these are the most important components from the perspective of human health. At one measuring station (Osdorp), ultrafine particulate matter (< 0.1 micrometer) is measured. This component is important in relation to air traffic.

The automatic monitoring stations make it possible to see the actual air quality at any given moment (hourly average) (www.luchtmeetnet.nl). Because the air quality is heavily affected by factors such as the weather (wind direction and speed, precipitation), concentrations of substances can change from hour to hour and from day to day. It is therefore important to measure concentrations over a longer period (annual average).

Because monitoring air quality is expensive (due to the space and material required), air quality can only be measured at a limited number of locations in the city. It is also impossible to make a distinction between the contributions of the various sources to the air quality.

Statutory assessment of air quality in the Netherlands, and therefore also in Amsterdam, is based on models. The legislation provides that air quality must be monitored at specific monitoring points, which are in practice on the facades of dwellings or other buildings where people spend long periods of time. Calculations and monitoring are carried out under the auspices of the National Air Quality Cooperation Programme.

Air quality is calculated annually by the RIVM using the monitoring tool on the basis of input provided by various public authorities. The municipality of Amsterdam provides traffic data, characteristics of the road and measures that have been taken. On the basis of the data and the information provided about emissions from road traffic (emission factors), calculations are made of the air quality and published in the annual monitoring report. Because there are discrepancies between the monitoring data and the calculations of air quality, the municipality of Amsterdam bases the measures it takes on the results of both the monitoring and the calculations.

Monitoring and calculation of the emissions from vehicles
Every year TNO formulates emission factors for road traffic. These emission factors are produced from various measurements of vehicles during 'normal' use on the road. Emission factors derived from these measurements are therefore representative of the actual vehicle emissions. By measuring emissions from different vehicles, emission factors are available for vehicles in different categories and with different features (category, type of fuel, etc.). The emission factors are used to calculate the impact of traffic on air quality.

The following steps are taken to determine the impact of measures on air quality:
- Determination of the composition of the traffic in urban areas of the municipality of Amsterdam for the purpose of adopting measures in terms of type of vehicle, type of fuel, year of construction and after-treatment technology;
- Correction for the autonomous rejuvenation of the vehicle fleet that would have occurred in future years but for the measures that were taken;
- Determination of the average emission factors for the different categories of vehicle;
- Establishment of traffic intensities on Amsterdam's road network on the basis of the Amsterdam traffic model;
- Determination of the change in the composition of the average traffic on roads in the urban area as a result of the measures. The assumption is made that there are still exemptions and violations; Processing of intensities per street and emission factors per category of vehicle;
- Calculation of the emissions and the air quality before (with correction for the autonomous increase in the number of clean vehicles) and after introduction of the measures

Because the traffic composition differs from one location to another, the effect of measures is not the same at every location. The effect is reinforced by other parameters at each location, such as the type of building, the level of congestion, wind speed and direction, etc. Locations with different traffic volumes are therefore selected to determine the average effect.

Although the method of calculation takes a great many parameters into account, it is a simplification of the reality. Furthermore, the method is based on a number of assumptions that could in reality differ from the values in the model.

Emission-free Amsterdam

Appendix 2 Further calculation of effect of the measures

For each of the measures in this action plan, TNO has calculated its effect on the decline in the annual average concentration of NO_2, soot, PM_{10} and $PM_{2.5}$ in busy streets in Amsterdam (eight streets with the highest concentrations, with a total of 39 road sections). The calculation is made in relation to the reference concentration, in other words the situation if Amsterdam were not to adopt any additional measures. The reason for this is that the air quality throughout the Netherlands is expected to improve gradually as a result of EU and national policy.

Table 1. Timetable for the introduction of measures

Measures	Year
Environmental zone for passenger cars (Euro4 or higher)	2020
Intensification of environmental zone for trucks to Euro6	2022
Emission-free zone for taxis	2022
Emission-free zone for buses and coaches	2025
Emission-free zone for vans	2025
Emission-free zone for trucks	2025
Emission-free zone for all vehicles	2030

In association with the University of Utrecht and the RIVM, the GGD Amsterdam has developed a method to com-pare the harm to human health from air pollution with the harm caused by passive smoking. The latter is expressed in terms of the second-hand smoke from a particular number of cigarettes per day. Accordingly, the health benefits from a local improvement of the air quality can be expressed in terms of passive smoking. The concentrations of NO_2 and soot are the most suitable for judging the effects of local traffic-related measures. The PM_{10} and $PM_{2.5}$ con-centrations are affected less by local road traffic. Most of the (soot) particles emitted by traffic are in the ultrafine fraction (<0.1 µm) of particulate matter. These particles have scarcely any mass and therefore contribute little to the mass concentration of PM_{10} and $PM_{2.5}$.

Autonomous development

In the absence of measures, in 2020 the air quality in the busiest streets would be equivalent to passively smoking an average of six cigarettes a day. Autonomous developments are expected to reduce that number to four cigarettes in 2030. That decrease is linked to a significant extent to a decline in the volume of substances 'blown in' from more remote sources in Amsterdam, the rest of the Netherlands and other countries. The harm to human health caused by this background concentration is the equivalent of passively smoking 4.2 (2020), 3.9 (2022), 3.6 (2025) and 3.0 (2030) cigarettes a day, respectively.

Table 2. Average and maximum expected NO_2, soot, PM_{10} and $PM_{2.5}$ concentrations (µg/m³) in Amsterdam's most polluted streets on the basis of the autonomous situation. The columns highlighted in yellow show the number of passively smoked cigarettes to which the air quality equates (calculations based on entirely clean air, in other words a concentration of 0 µg/m³)

	NO_2	Soot	PM_{10}	$PM_{2.5}$	Cigarettes/day
2020					
Average	33.8	0.85	23.3	13.3	6.0
Max	40.3	0.97	24.8	14.0	7.1
2022					
Average	31.5	0.79	22.8	12.8	5.6
Max	37.5	0.89	24.3	13.5	6.6
2025					
Average	28.0	0.69	22.0	12.2	4.9
Max	33.1	0.78	23.5	12.8	5.8
2030					
Average	21.4	0.51	20.7	11	3.7
Max	24.5	0.56	22.1	11.6	4.2

Effect of measures

Measures 2020

The introduction of the environmental zone for Euro4 passenger cars has only a modest effect on the concentrations of NO_2 and soot. The same applies for the number of cigarettes passively smoked per day. In the street that benefits most from this measure (Weesperstraat), the maximum decline is equal to the second-hand smoke from 0.09 fewer cigarettes per day, or 33 cigarettes a year.

Table 3. The impact of the introduction of the environmental zone for passenger cars (Euro4 or higher) in 2020 expressed in terms of a decline in the number of cigarettes passively smoked per day. The figures show the average for all road sections per street and the maximum effect per street in terms of a decrease in NO_2 and soot concentrations and the number of passively smoked cigarettes.

		Δ NO_2	Δ soot	Δ Cig/day
Amsteldijk (n=8)	Average	0.25	0.01	0.05
	Max	0.28	0.01	0.06
Haarlemmerweg (n=7)	Average	0.24	0.01	0.06
	Max	0.26	0.01	0.06
Jonas Daniel Meijerplein (n=1)		0.30	0.01	0.07
Nassaukade (n=1)		0.19	0.01	0.05
Stadhouderskade (n=14)	Average	0.25	0.01	0.06
	Max	0.33	0.02	0.08
Valkenburgerstraat (n=1)		0.23	0.01	0.05
Weesperstraat (n=5)	Average	0.29	0.01	0.07
	Max	0.38	0.02	0.09
Wibaustraat (n=2)	Average	0.18	0.01	0.04
	Max	0.18	0.01	0.04

Measures 2022

The effect of the intensification and expansion of the environmental zone for trucks (Euro6 and higher) and the introduction of an emission-free zone for coaches and buses is a reduction of 2.9 µg/m^3 in the concentration of NO_2 and 0.03 µg/m^3 in the concentration of soot (Stadhouderskade). This corresponds with passively smoking 0.4 fewer cigarettes per day, or three cigarettes per week. The explanatory notes at the end of this appendix show the effect of both measures separately in terms of the concentrations and passively smoked cigarettes.

Table 4. Influence of intensification of the environmental zone for trucks (Euro6 or higher) and the emission-free zone for coaches and buses in 2022 expressed in terms of a decline in the number of passively smoked cigarettes per day (for both measures together). The figures shown are the average for all road sections in each street and the maximum effect per street in terms of a decline in NO_2 and soot concentrations and the number of passively smoked cigarettes.

		ΔNO$_2$	Δ soot	Δ cig/day
Amsteldijk (n=8)	Average	1.0	0.01	0.14
	Max	1.3	0.01	0.19
Haarlemmerweg (n=7)	Average	1.6	0.01	0.23
	Max	1,7	0,02	0.24
Jonas D. Meijerplein (n=1)		1.6	0.02	0.16
Nassaukade (n=1)		1.1	0.01	0.11
Stadhouderskade (n=14)	Average	1.9	0.02	0.28
	Max	2.9	0.03	0.42
Valkenburgerstraat (n=1)		1.3	0.01	0.13
Weesperstraat (n=5)	Average	1.8	0.02	0.27
	Max	2.5	0.03	0.36
Wibautstraat (n=2)	Average	1.5	0.01	0.22
	Max	1.5	0.01	0.22

Table 4a: Explanation of the effect of the intensification of the environmental zone for trucks (Euro6 or higher), expressed in terms of a decline in NO_2 and soot concentrations and fewer passively smoked cigarettes.

		>=Euro6 truck		
		Δ NO$_2$	Δ soot	Δ cig/day
Amsteldijk (n=8)	Gem	0,59	0,00	0,09
	Max	0,83	0,01	0,12
Haarlemmerweg (n=7)	Gem	1,06	0,01	0,15
	Max	1,11	0,01	0,16
Jonas D. Meijerplein (n=1)		0,94	0,01	0,07
Nassaukade (n=1)		0,71	0,01	0,05
Stadhouderskade (n=14)	Gem	1,16	0,01	0,17
	Max	1,84	0,02	0,27
Valkenburgerstraat (n=1)		0,79	0,01	0,05
Weesperstraat (n=5)	Gem	1,14	0,01	0,16
	Max	1,57	0,01	0,23
Wibautstraat (n=2)	Gem	0,96	0,01	0,14
	Max	0,97	0,01	0,14

Table 4b: Explanation of the effect of the emission-free zone for coaches and buses, expressed in terms of a decline in NO_2 and soot concentrations and fewer passively smoked cigarettes.

		Emission-free coach		
		ΔNO_2	Δ soot	Δ cig/day
Amsteldijk (n=8)	Average	0.4	0.00	0.06
	Max	0.5	0.01	0.07
Haarlemmerweg (n=7)	Average	0.5	0.01	0.08
	Max	0.6	0.01	0.09
Jonas D. Meijerplein (n=1)		0.6	0.01	0.10
Nassaukade (n=1)		0.4	0.00	0.06
Stadhouderskade (n=14)	Average	0.7	0.01	0.11
	Max	1.0	0.01	0.16
Valkenburgerstraat (n=1)		0.5	0.01	0.08
Weesperstraat (n=5)	Average	0.7	0.01	0.10
	Max	0.9	0.01	0.14
Wibautstraat (n=2)	Average	0.5	0.01	0.08
	Max	0.5	0.01	0.08

Measures 2025

The improvement in the air quality as a result of the measures that will be taken in 2025 is equivalent to passively smoking between 0.7 and 1.5 fewer cigarettes a day.

The effect of the introduction of an emission-free zone for vans, taxis and trucks will reduce the concentration of NO_2 by as much as 9.3 µg/m^3 and the concentration of soot by 0.13 µg/m^3 in parts of the Stadhouderskade and Weesperstraat. This is the equivalent of passively smoking 1.5 cigarettes per day.

The explanatory notes at the end of this appendix show the effect for each of the three separate measures in terms of concentrations and passively smoked cigarettes.

Table 5. Influence of the introduction of the emission-free zone for vans, taxis and trucks in 2025 expressed in terms of a decline in the number of passively smoked cigarettes per day. The table shows the average for all road sections per street and the maximum effect per street in terms of lower NO_2 and soot concentrations and the number of passively smoked cigarettes.

		Total measures		
		Δ NO_2	Δ soot	cig/day
Amsteldijk (n=8)	Average	5.2	0.07	0.06
	Max	6.2	0.08	0.07
Haarlemmerweg (n=7)	Average	6.3	0.08	0.08
	Max	6.8	0.09	0.09
Jonas D. Meijerplein (n=1)		6.3	0.08	0.10
Nassaukade (n=1)		4.8	0.06	0.06
Stadhouderskade (n=14)	Average	6.1	0.08	0.11
	Max	9.3	0.13	0.16
Valkenburgerstraat (n=1)		4.9	0.07	0.08
Weesperstraat (n=5)	Average	7.0	0.10	0.10
	Max	9.3	0.13	0.14
Wibautstraat (n=2)	Average	5.0	0.06	0.08
	Max	5.1	0.06	0.08

Table 5a: Explanation of the effect of the emission-free zone for vans, expressed in terms of a decline in NO_2 and soot concentrations and fewer passively smoked cigarettes.

		Emission-free vas		
		Δ NO_2	Δ soot	Δ cig/day
Amsteldijk (n=8)	Average	2.1	0.03	0.3
	Max	2.5	0.04	0.4
Haarlemmerweg (n=7)	Average	2.4	0.04	0.4
	Max	2.5	0.04	0.4
Jonas D. Meijerplein (n=1)		2.3	0.04	0.4
Nassaukade (n=1)		1.8	0.03	0.3
Stadhouderskade (n=14)	Average	2.1	0.03	0.3
	Max	3.2	0.05	0.5
Valkenburgerstraat (n=1)		1.7	0.03	0.3
Weesperstraat (n=5)	Average	2.6	0.04	0.4
	Max	3.4	0.05	0.5
Wibautstraat (n=2)	Average	1.8	0.03	0.3
	Max	1.8	0.03	0.3

Table 5b. Explanation of the effect of emission-free zone for taxis, expressed in terms of a decline in NO_2 and soot concentrations and fewer passively smoked cigarettes.

		Emission-free taxi		
		Δ NO_2	Δ soot	Δ cig/day
Amsteldijk (n=8)	Average	2.2	0.03	0.34
	Max	2.6	0.03	0.39
Haarlemmerweg (n=7)	Average	2.5	0.03	0.37
	Max	2.6	0.03	0.40
Jonas D. Meijerplein (n=1)		2.4	0.03	0.36
Nassaukade (n=1)		1.9	0.02	0.29
Stadhouderskade (n=14)	Average	2.2	0.03	0.34
	Max	3.3	0.04	0.50
Valkenburgerstraat (n=1)		1.8	0.03	0.29
Weesperstraat (n=5)	Average	2.7	0.04	0.42
	Max	3.5	0.05	0.55
Wibautstraat (n=2)	Average	1.9	0.02	0.28
	Max	1.9	0.02	0.28

Table 5c. Explanation of the effect of the emission-free zone for trucks expressed in terms of a decline in NO_2 and soot concentrations and fewer passively smoked cigarettes.

		Emission-free trucks		
		Δ NO_2	Δ soot	Δ cig/day
Amsteldijk (n=8)	Average	0.9	0.01	0.1
	Max	1.2	0.01	0.2
Haarlemmerweg (n=7)	Average	1.5	0.02	0.2
	Max	1.6	0.02	0.2
Jonas D. Meijerplein (n=1)		1.6	0.02	0.2
Nassaukade (n=1)		1.0	0.01	0.2
Stadhouderskade (n=14)	Average	1.8	0.02	0.3
	Max	2.8	0.03	0.4
Valkenburgerstraat (n=1)		1.3	0.01	0.2
Weesperstraat (n=5)	Average	1.8	0.02	0.3
	Max	2.4	0.03	0.4
Wibautstraat (n=2)	Average	1.4	0.02	0.2
	Max	1.4	0.02	0.2

Measures 2030

The health benefits from the introduction of the emission-free zone for passenger cars and for all traffic in 2030 expressed in terms of fewer passively smoked cigarettes is a maximum of 1.0 cigarettes per day on Stadhouderskade and in Weesperstraat.

Table 6. Influence of the introduction of the emission-free zone for passenger cars and emission-free zone for all traffic in 2030 expressed in terms of a decline in the number of passively smoked cigarettes per day. The table shows the average for all road sections per street and the maximum effect per street in terms of a decline in NO_2 and soot concentrations and the number of passively smoked cigarettes.

		Passenger cars emission-free			Everything emission-free		
		Δ NO_2	Δ soot	cig/day	ΔNO_2	Δ soot	cig/day
Amsteldijk (n=8)	Avg.	1.9	0.03	0.3	3.7	0.05	0.6
	Max	2.1	0.03	0.3	4.2	0.05	0.6
Haarlemmerweg (n=7)	Avg.	2.1	0.03	0.3	4.4	0.05	0.7
	Max	2.2	0.03	0.4	4.8	0.06	0.7
Jonas D.Meijerplein (n=1)		2.1	0.04	0.3	4.5	0.06	0.7
Nassaukade (n=1)		1.8	0.02	0.3	3.5	0.04	0.5
Stadhouderskade (n=14)	Avg.	1.9	0.03	0.3	4.4	0.06	0.7
	Max	2.8	0.04	0.4	6.6	0.08	1.0
Valkenburgerstraat (n=1)		1.6	0.03	0.3	3.5	0.05	0.5
Weesperstraat (n=5)	Avg.	2.3	0.04	0.4	5.0	0.06	0.8
	Max	3.0	0.05	0.5	6.7	0.08	1.0
Wibautstraat (n=2)	Avg.	1.5	0.02	0.2	3.4	0.04	0.5
	Max	1.6	0.02	0.2	3.5	0.04	0.5

Colophon

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