SIEMENS
Ingenuity for life

Nuremberg sustainable mobility

City Performance Tool - Air, May 2017

Nuremberg offers its citizens and visitors a quality of life of international standing and is listed among the top 25 cities in the Mercer Quality of Life Ranking. This is not least due to its progressive environmental policy. Nuremberg is a pilot city for many measures aimed at reducing air pollutants and greenhouse gases and is taking a lead role in the region.

As not all air quality measuring stations in the city comply with the threshold values for air pollutants, the city is working on a set of measures to improve air quality.

Against this backdrop, Siemens has piloted its new City Performance Tool-Air Transport with the City of Nuremberg and developed a bundle of measures in a holistic, multi-layered indicator approach, providing medium to long-term increases in air quality to a significant extent without compromising greenhouse gas or convenience targets.

The measures include pull and push effects, modal shifts, the electrification of fleets, and efficiency improvements via traffic control and traffic management systems.

Executive Summary

Nuremberg complies with the EU's particulate matter limit for PM10, although the WHO's recommendation for good air quality (20 µg/m^3 annual mean) has not been achieved everywhere. The mean annual NO_2 limit value is currently not yet complied with at the urban traffic air quality measuring point of the Bavarian state monitoring programme. The primary cause for exceedances of NO_2 is local traffic.

As part of the city's air pollution plan update, Siemens piloted its new City Performance Tool - Air for transport with Nuremberg. After a comprehensive collection of data, with help from several departments, agencies and local companies, the traffic system and its emissions of airborne and CO_2eq emissions were analysed with the subsequent development of a business as usual (BAU) scenario up to 2030. This was followed by an investigation into a large number of potential pollutant reduction measures (levers). The city developed three scenarios for 2020 and 2025 in a subsequent workshop with participants from various departments and local companies based on the results of this analysis.

The first 'Intelligent E-Mobile' scenario aims at a short to medium-term reduction of local NO_2 emissions by 2020. The most effective measures are the low emission zone with a blue badge, limiting access to EURO 6 vehicles, city tolling and a realistic electrification of bus, taxis and car fleets. The scenario achieves a 45% reduction in transport-related NO_2 emissions as compared to the BAU scenario by 2020. This would mean compliance with the limit values, for example at the urban air quality measuring station located near traffic in Von-der-Tann-Strasse.

The second scenario, 'Car-free Fun', has the primary goal of significantly reducing greenhouse gas emissions and particulate matter by 2025. The scenario relies on modal shifts and uses city tolling as a push effect and the significant expansion of public transport, electric car sharing and bicycle highways for a pull effect. Alternative drives are also used for buses and cars. These measures will achieve annual greenhouse gas reductions (CO_2eq) of 20% and a particulate matter emission reduction (PM10) of 35% by 2025.

The third scenario, 'Liveable City 2025', aims to create a modern, intermodal urban transportation system. The scenario encourages behavioural changes through many pull effects, such as the expansion of the rail-based public transport system through new routes and reduced train headways, an annual public transport subscription for 365€ per year and easy e-ticketing. Bicycles and electric car sharing represent an offered alternative to public transport. Despite renouncing undesirable push effects, the measures achieve a 22% reduction in particulate matter and a 16% reduction in greenhouse gas emissions.

Measures selected for all three targets are bicycle highways and a general reduction in car traffic. The actions to reduce emissions significantly all rely on city tolling and electric buses. The most popular long-term measures are the expansion of the metro and tram network, the introduction of an e-ticketing system and the implementation of an eCar sharing system. eines E-Car-Sharing Systems.

The City Performance Tool - Air offers a preview of how a diverse mix of measures can permanently ensure fresh air in Nuremberg

Introduction City Performance Tool - Air for Transport

The City Performance Tool - Air (CyPT-Air) is a parameterized model that examines more than 40 urban traffic measures and technologies, each with different time periods and implementation rates.

It has been designed to reduce the environmental impact of a city through the use of technologies and has a strong focus on local air pollutants.

At the same time, it takes into account the global greenhouse gas emissions and illustrates the potential to create new jobs at local level in connection with the installation, operation and maintenance of urban solutions.

The tool calculates the ecological and economic impact of individual technologies at different implementation levels. In transport, the CyPT assesses how technologies reduce traffic (less traffic from searching for parking places), induce modal shifts (public transport instead of cars) or increase efficiency (automated trains), thereby reducing city emissions.

CyPT-Air is a further development of the CyPT, which already serves as a planning tool for more than 20 cities on four continents. Its strategy reports provide valuable information for strategic planning, marketing and communication as well as project planning.

One city, many target functions, many options for the future and many experts.

One tool helps to find the right data-supported strategy.

Nuremberg's Transport System: Baseline and Business as Usual Development

Measured against the degree of mobility of German urban population, Nuremberg's inhabitants are about average. The city faces only a slight increase in volume of passenger transport mainly due to the expected increase of the freight transport volume within in the city boundary is about 1000 tonne-kilometres per inhabitant per year, of which 92% are road transport (Figure 1 and 2).

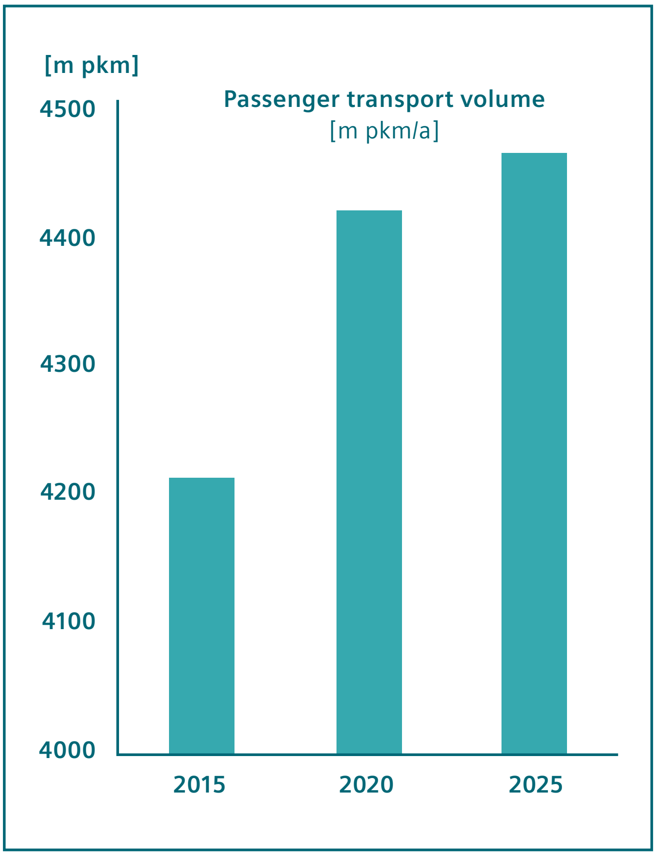


Figure 1: Projected passenger transport volume

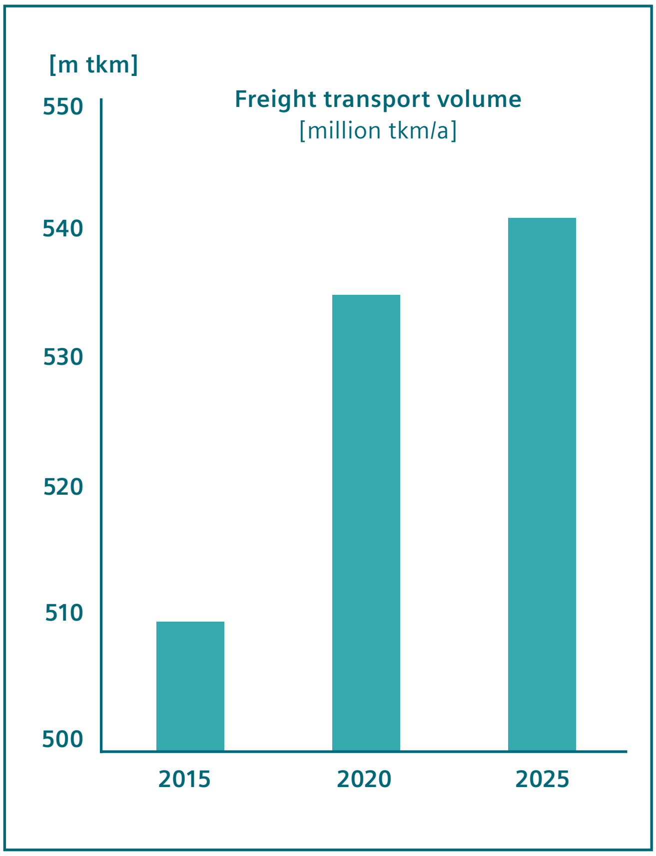


Figure 2: Projected annual freight transport volume

Motorised private transport dominates passenger traffic. With more than 240,000 registered cars, almost half the population owns a car. This also reflects in the modal split. More than 64% of the passenger kilometres are covered by private transport, even if the share of the car trips is just 44%, which is due to the above-average journey distance of car travel. The average capacity utilization of cars is low with 1.3 persons per vehicle, which results in high vehicle mileage and emissions per passenger kilometre [pkm] (Figures 3 and 4).

The city has especially done well in the areas of non-motorised and public transport. Structurally, with the establishment of Europe's longest pedestrian zone, the city has created excellent conditions for a high non-motorised modal share. The proportion of journeys by bicycle is average compared to other German cities. Nuremberg and VAG (Verkehrs-Aktiengesellschaft Nürnberg) have set national standards in the public transport sector. It is the first city in Germany to put a driverless metro line into regular operation. The city's three metro lines form the backbone of its public transport network. With a high proportion of gas-powered buses, VAG has also made advances regarding air pollution control.

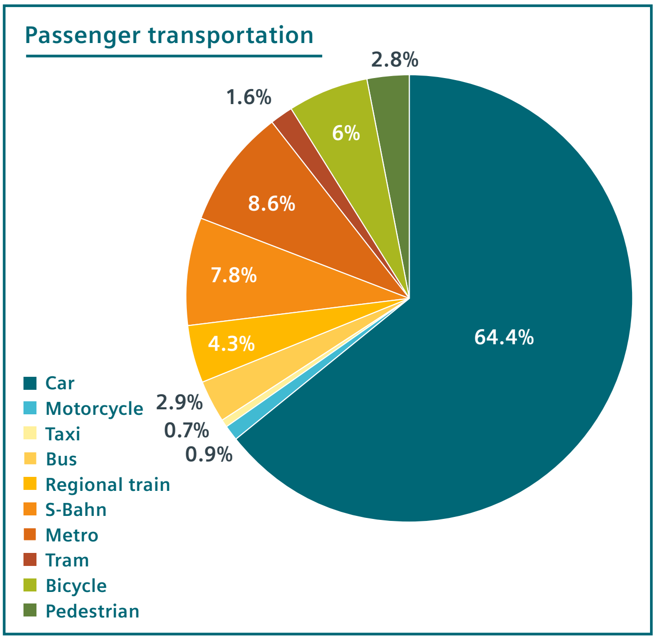


Figure 3: Modal split passenger transportation to pkm

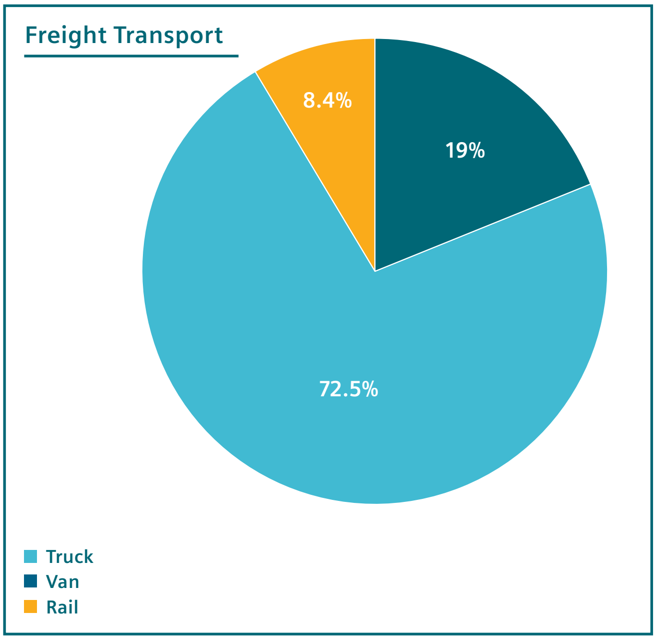
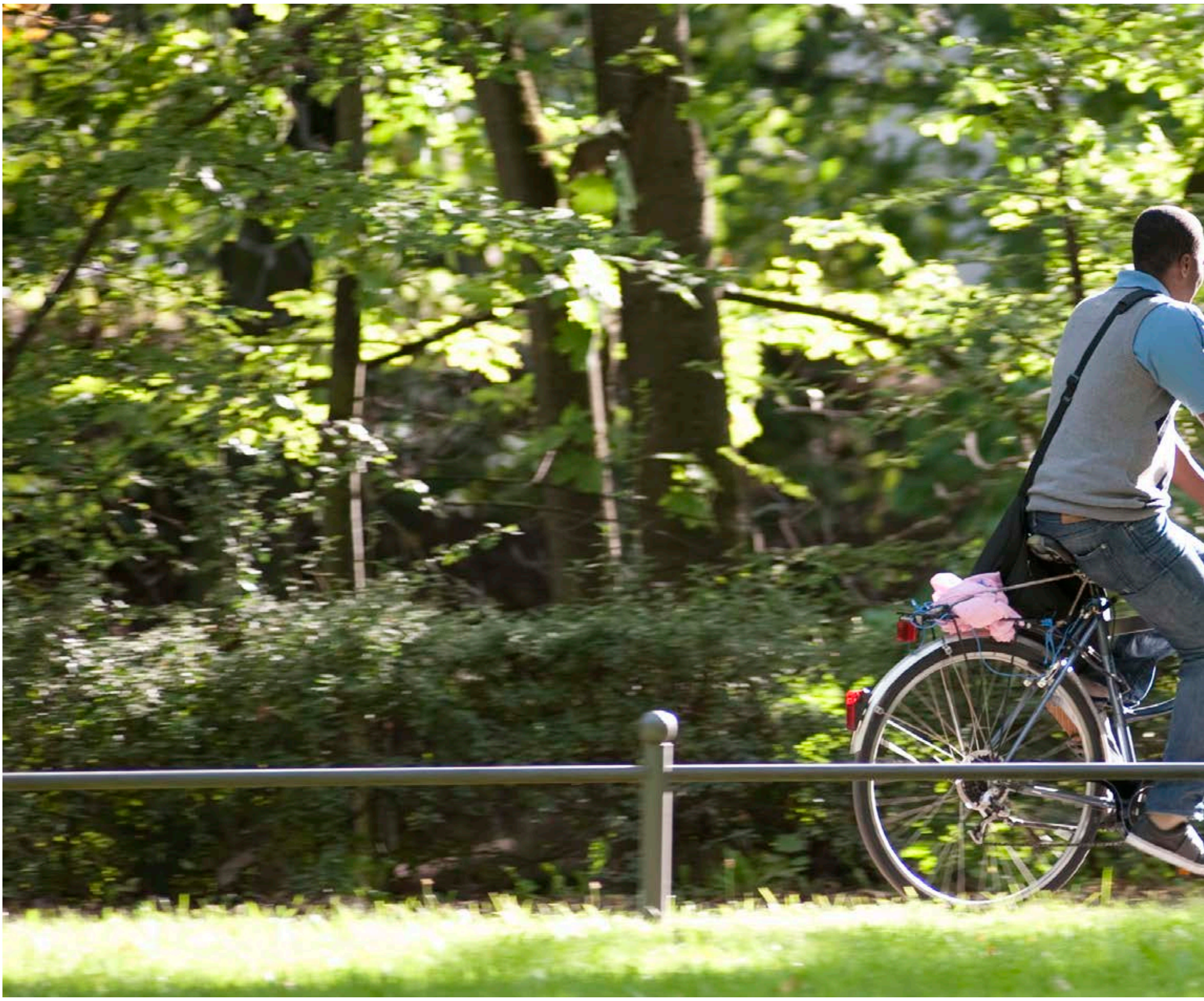


Figure 4: Modal split freight transport to tkm



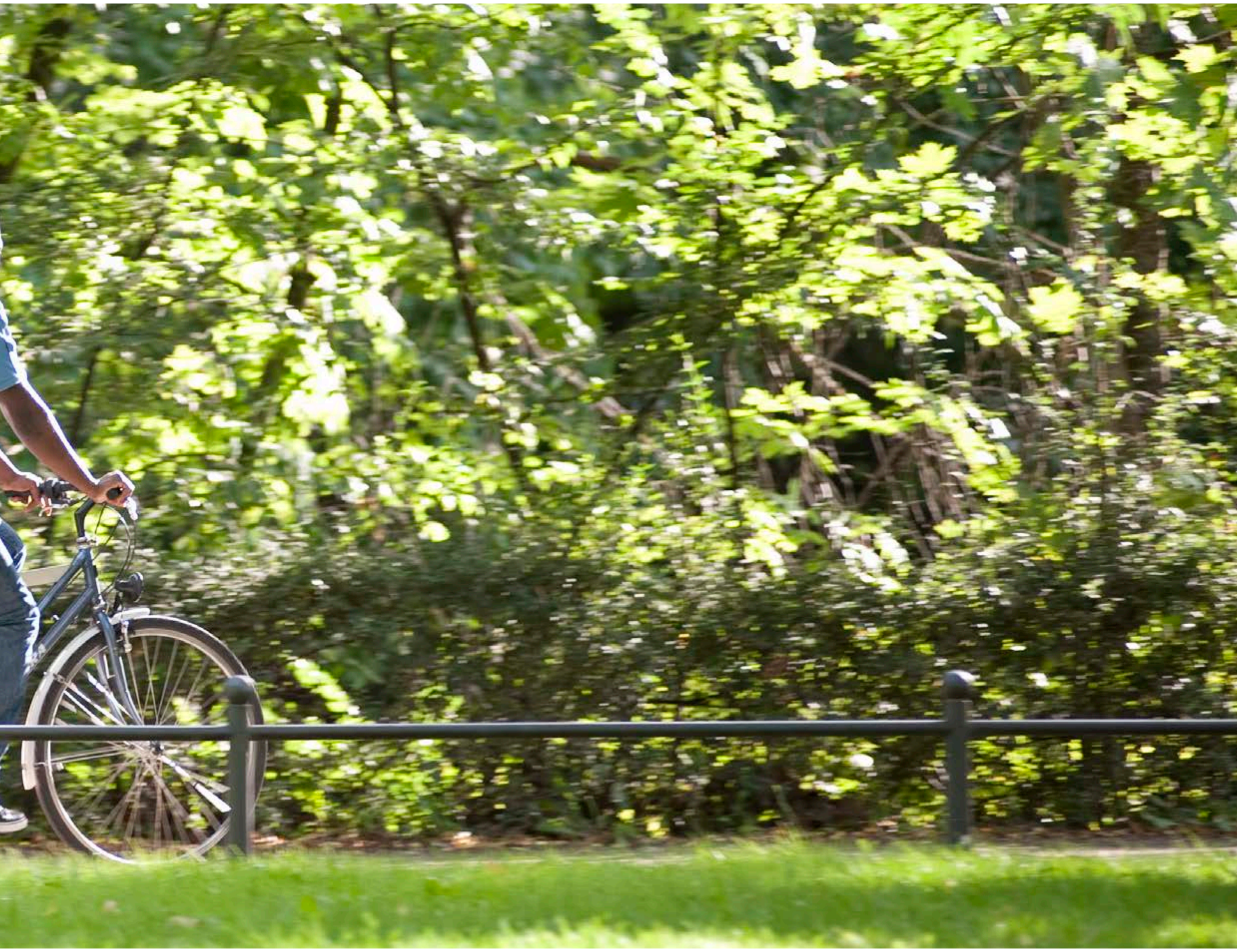
Transport services are shown according to their share of the annual passenger kilometres, which should not to be confused with their share of journeys made.

In the area of goods, the city has the largest and most important multifunctional freight transport and logistics centre in southern Germany, which combines waterway, rail and road connections in an exemplary multimodal manner.

Pilot projects, such as the electrification of taxis or a parcel service provider switching to the use of cargo bicycles in selected districts are an expression of the city's forward-looking attitude and innovativeness in the transport sector and point the way for future developments.

In the BAU scenario, the modal split is kept constant over time.

Nuremberg's vehicle kilometre composition of the different modes of transport according to drive technology/energy carriers is average for a German city of this size, except for the aforementioned gas-powered buses. In larger cities like Berlin, for example, the proportion of private diesel car kilometers is even lower than in Nuremberg. The German average diesel vehicle kilometre share is much higher, since this includes rural areas with cars of much higher vehicle mileage. These are predominantly diesel cars (Figure 5). This distribution is also kept constant over time in the BAU scenario.



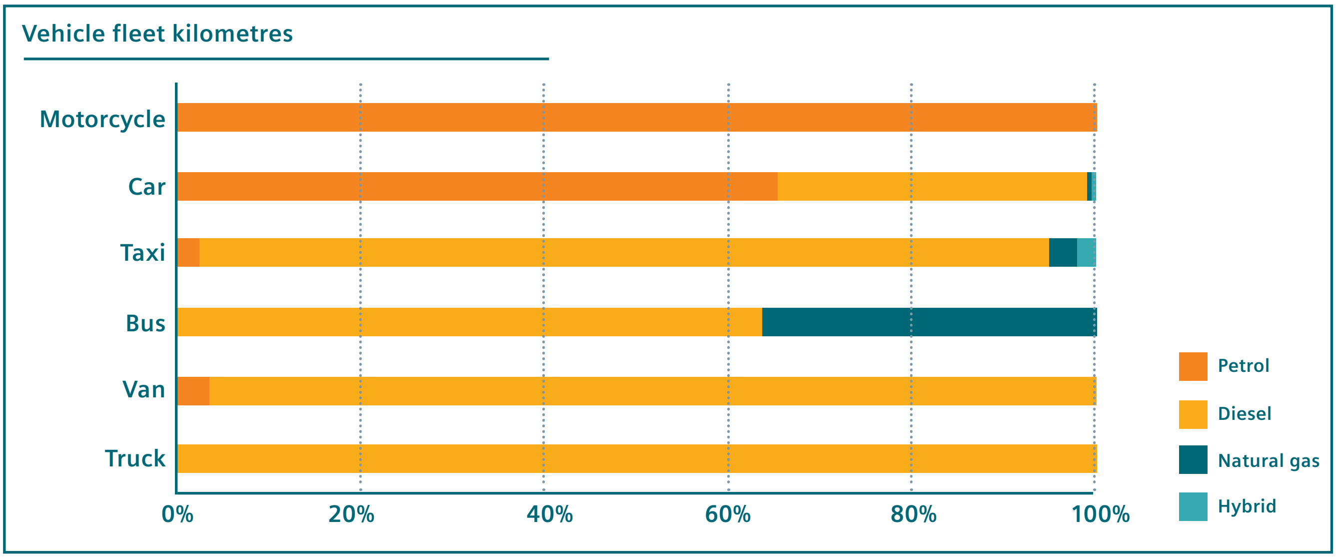


Figure 5: Vehicle kilometre composition according to drive technology

Nuremberg's Air Quality: Baseline and Business as Usual Development

Air quality in Nuremberg is mainly influenced by local traffic emissions at the urban air quality measuring station located near traffic in Von-der-Tann-Strasse (Figure 6 and Figure 7). The relevant traffic emissions are nitrogen oxide, particulate matter, carbon monoxide and benzene. In Nuremberg, for a long time the limit values for the pollutants sulphur dioxide, carbon monoxide, benzene and lead have been kept under check. The particulate air pollution can't be neglected but is not severe if compared with other German cities. The focus is therefore on measures to reduce nitrogen oxide or nitrogen dioxide (NO_2) levels. As in most other German cities, these are most difficult to achieve in Nuremberg. In recent years the EU limit of an annual average of 40 µg/m³ of NO_2 was continuously exceeded in Von-der-Tann-Strasse. For PM10 and PM2.5, however, the limits are already within the norm. Moreover, most stations comply with the WHO recommendations of 20 µg/m³ for PM10 and 10 µg/m³ for PM2.5. An exception is the measuring station in Von-der-Tann-Strasse

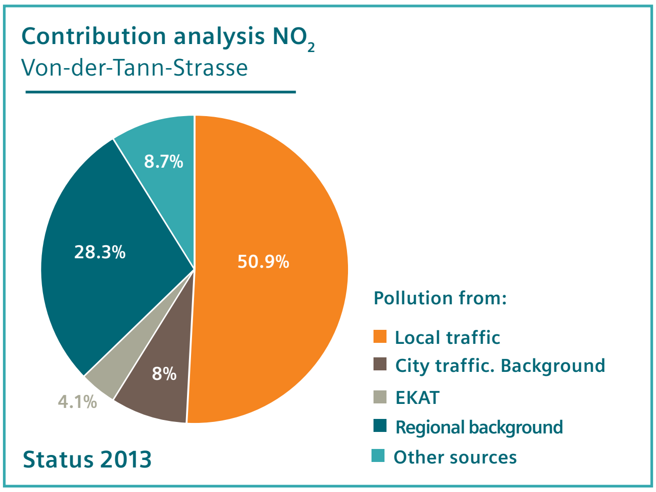


Figure 6: Contributions to nitrogen dioxide pollution from different sources (example 2013, Von-der-Tann-Strasse) [RUS 2015]

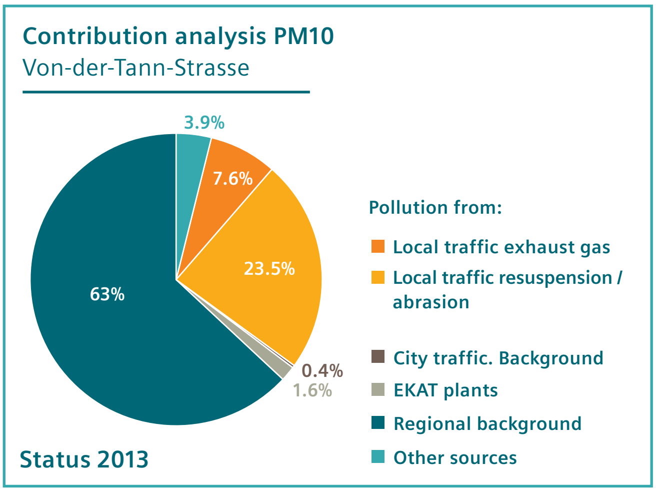


Figure 7: Contributions to particulate matter pollution from different sources (example 2013, Von-der-Tann-Strasse) [RUS 2015]

The contribution analysis shows the clear dominance of motorised individual traffic as the primary source of both emissions. In the case of NO_2, buses carry a disproportionately high share of emissions if measured by their traffic performance. However, PM10 and greenhouse gases are under 2%. Vans also have a relatively small transport capacity but high NO_2 and particulate matter emissions.(Figure 8 - Figure 10)

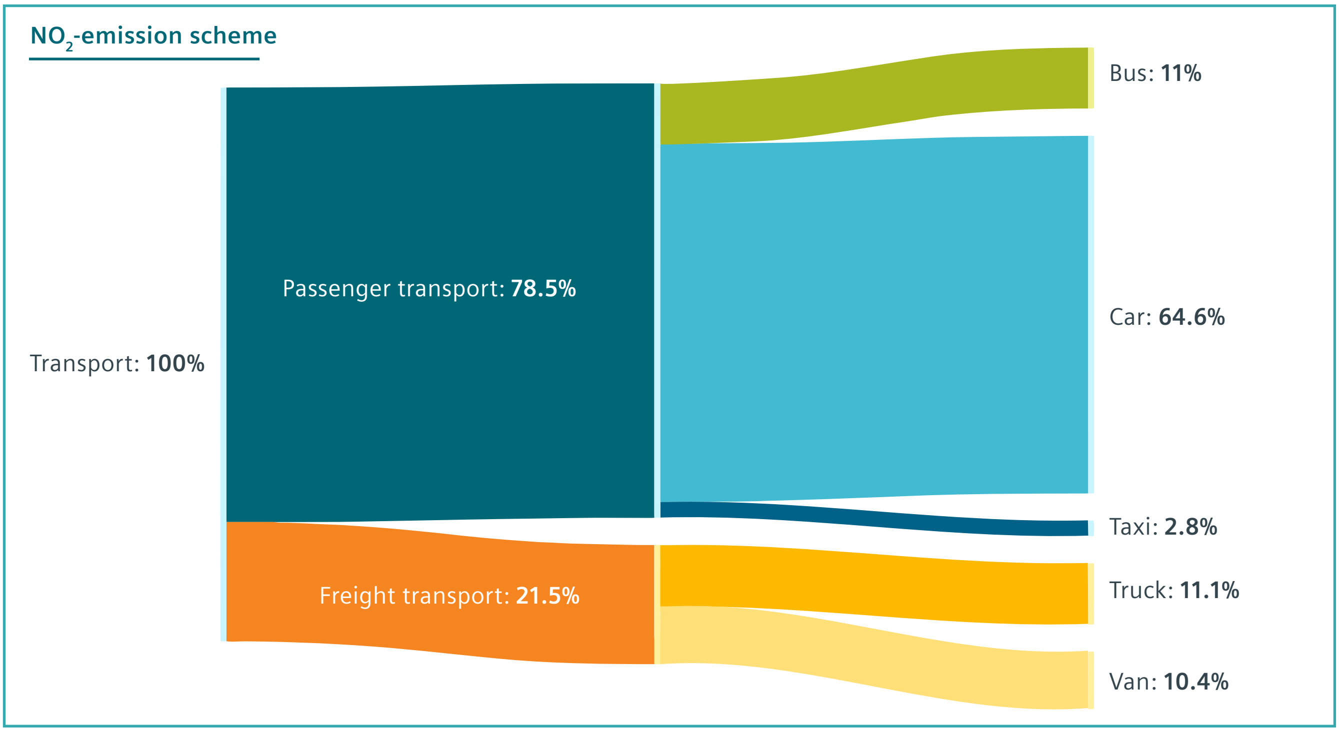


Figure 8: NO_2 emission scheme 2015 (modes with an overall contribution > 2% visible only)

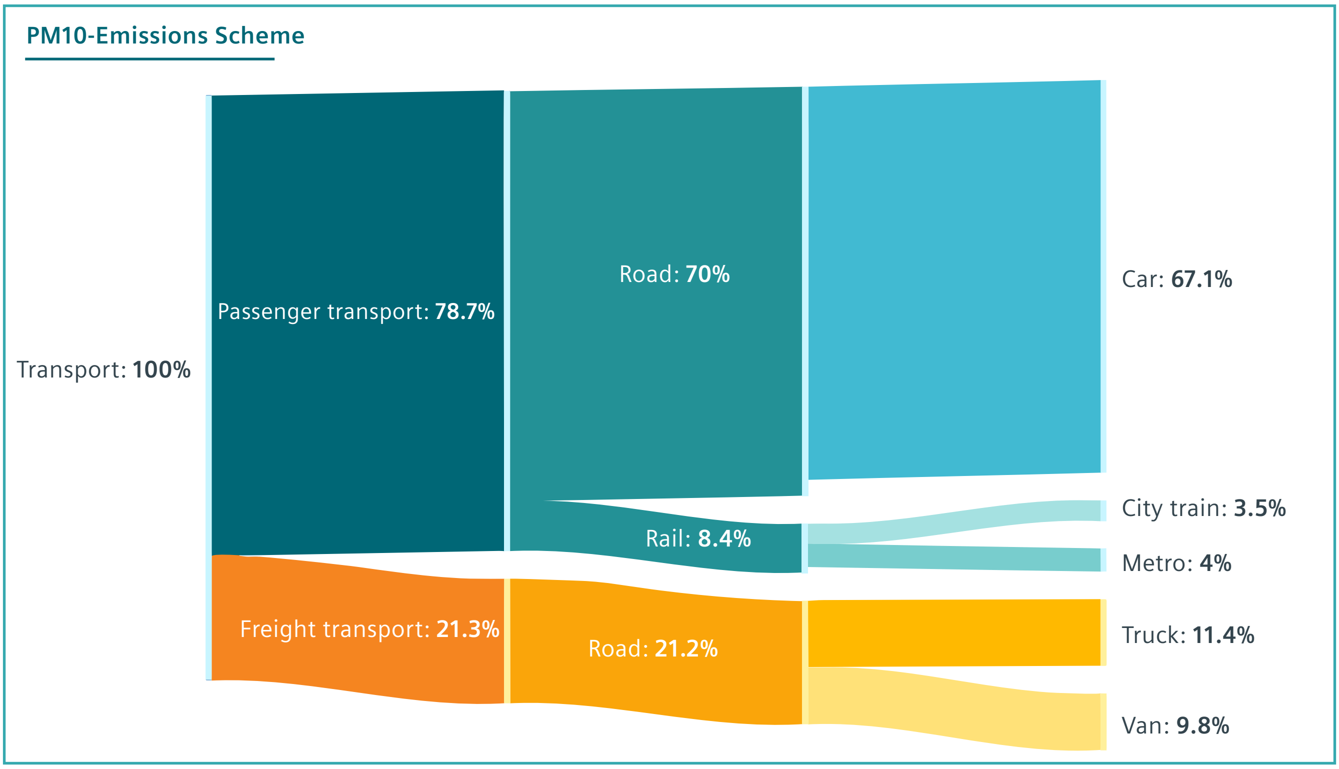


Figure 9: PM10 emission scheme 2015 (modes with an overall contribution > 2% visible only)

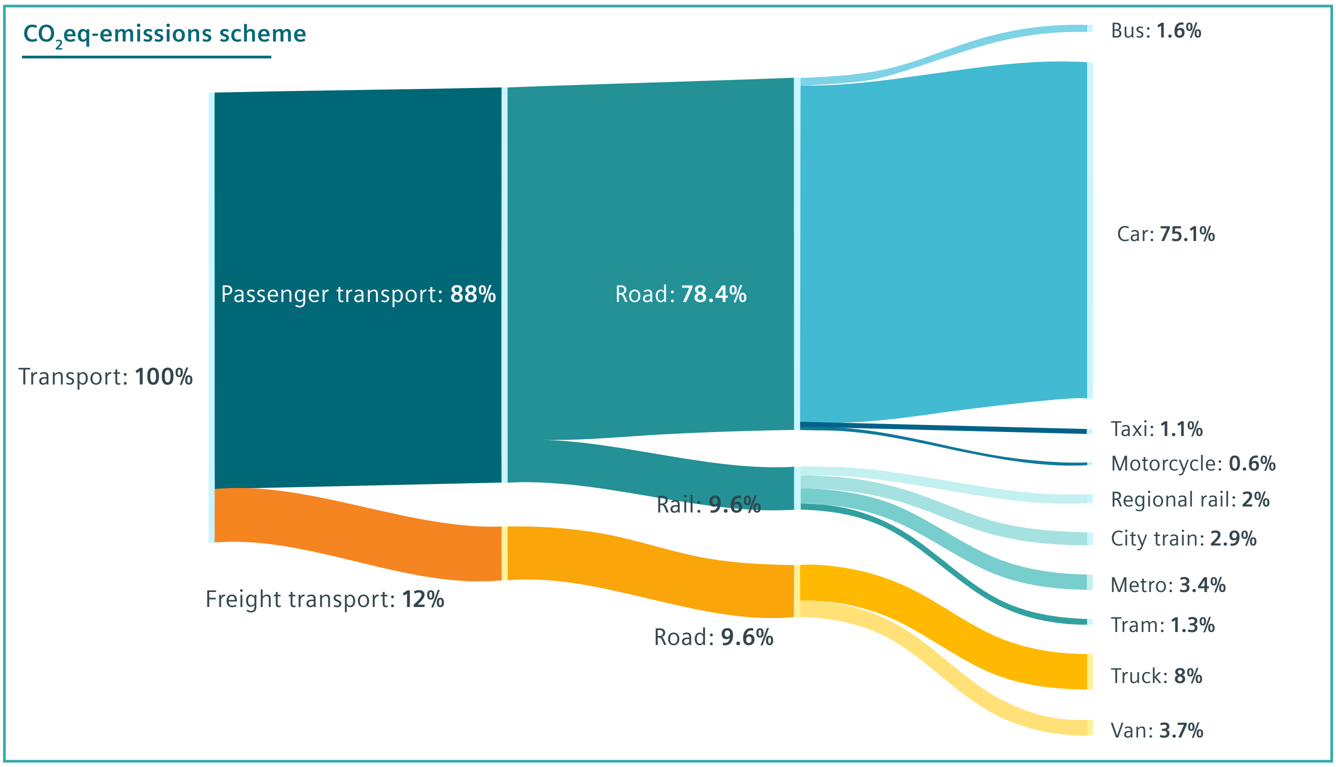


Figure 10: Greenhouse gas emissions scheme 2015 (modes with an overall contribution > 1% visible only)

Air quality in Nuremberg will improve over the next ten years, especially in urban areas suffering from heavy traffic related emissions. Overall concentration reductions of air pollutants are certainly far less pronounced than the transport-related emissions. However, the forecasts for non-lever-related reductions of nitrogen dioxide (NO_2) should be taken with caution. Past experience has shown that even the most conservative models still overestimate the efficiency of exhaust gas treatment in diesel vehicles, and increasing shares of diesel vehicles in fleets. Rising traffic volumes are at the very least slowing down the reduction of NO_2 emissions. In Von-der-Tann-Strasse, the annual mean values for the past five years have been between 46 and 49 µg/m³ without a clear trend.

Unfortunately, a substantial reduction of greenhouse gas emissions in the transport sector cannot be expected before 2025 without significant intervention by the city (Figure 11). Unlike the calculated local air pollutants, greenhouse gas emissions include the upstream processes of the energy supply.

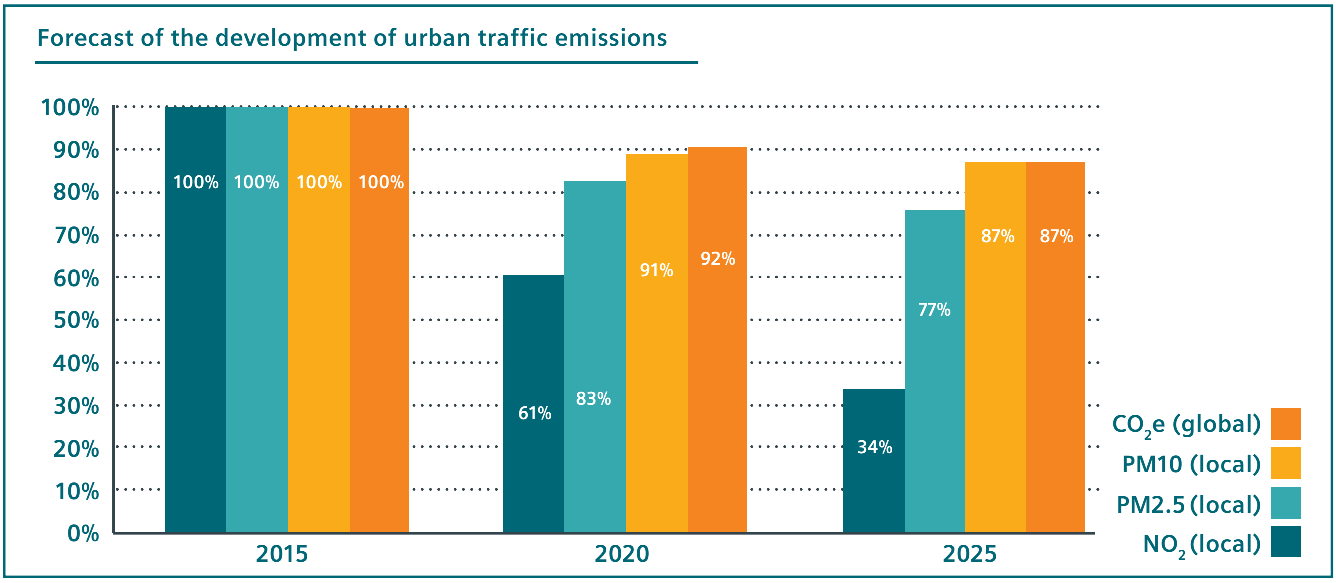


Figure 11: Forecast of the relative reduction of air pollutant emissions from the transport sector in Nuremberg

Three Visions for the Future

The three scenarios developed during a workshop in groups with decision-makers from various municipal services and local infrastructure operators pursue three different primary objectives:

1. **Group: Reduction of NO_2 by 2020**

2. **Group: Reduction of greenhouse gases and particulate matter (PM10) by 2025**

3. **Group: Maximizing intermodal traffic behaviour by 2025**

According to the rating of the workshop participants, all scenarios had to be ambitious, realistic and politically realisable. The three groups had an extensive set of predefined levers available from which they could form scenarios (see appendix). The groups were also asked to design an additional measure that was subsequently quantified. The impact of the measures on greenhouse gases, as well as the most relevant air pollutants, were quantified and printed on cards made available to the workshop participants. As a social indicator, the cards also contained a semi-quantitative assessment of the potential of the lever of creating local jobs. As a basic orientation, the participants were given large-scale printed emission schemes, which provide a clear overview of the main contributors for different air pollutants. Thus, a data-driven decision-making process was established (Figure 12 and 13).

Figure 12: Card example

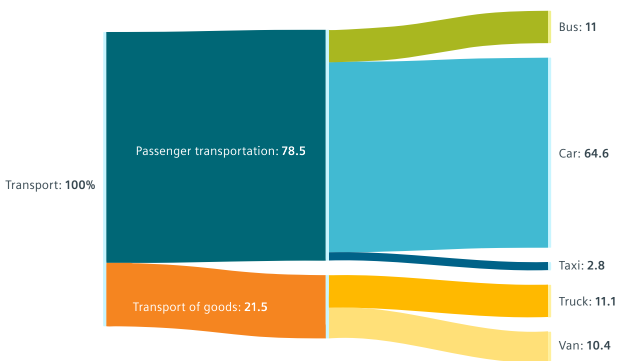


Figure 13: Example of emissions scheme

Intelligent E-Mobile

The first 'Intelligent E-Mobile' scenario is based on short-term and medium-term measures and thus aims to significantly reduce nitrogen dioxide emissions by 2020. To ensure comparability of the three scenarios, both time horizons (2020 and 2025) are visualised in the following (Figures 14 and 15). The 'Intelligent E-Mobile' approaches pursued are based on a significant reduction in private traffic and the extensive electrification and renewal of the car and bus fleets. The key to most successfully shifting to low-emission transport is that in addition to pull effects such as the construction of new bicycle lanes, levers like city tolling are used to create a push effect. In sum, these will ensure a reduction in private traffic of more than 25%. The increases in NO_2 emissions from buses due to the induced modal sift are overcompensated by a partial electrification of the bus fleet. This is a highly efficient combination. The remaining conventional car fleet is forced to upgrade to vehicles with decent exhaust gas treatment by means of a low emission zone that is enforced by a camera-based control system. Exceptions from the low emission zone for individual vehicle groups are not provided for. Also, some of the car fleet is now converting to electric. A smart traffic light control system will be implemented in pollution hotspots. It ensures a decrease in emission levels and improves traffic flow, thereby increasing convenience.

Intelligent E-Mobile (optimisation target air pollutants in 2020)

Lever	2020	2025
Electric buses	20 %	50 %
Intelligent traffic light control	40 %	80 %
Reduction of car traffic	5 %	10 %
Electric car fleet share	10 %	20 %
Electric taxis fleet share	10 %	20 %
Bicycle highways	2 km per 100k inhabitants.	4 km per 100k inhabitants.
City tolling: cars and motorcycles	15 %	15 %
Low emission zone for cars	EURO 6	EURO 6

Table 1: Levers composition 'Intelligent E-Mobile' with implementation rates

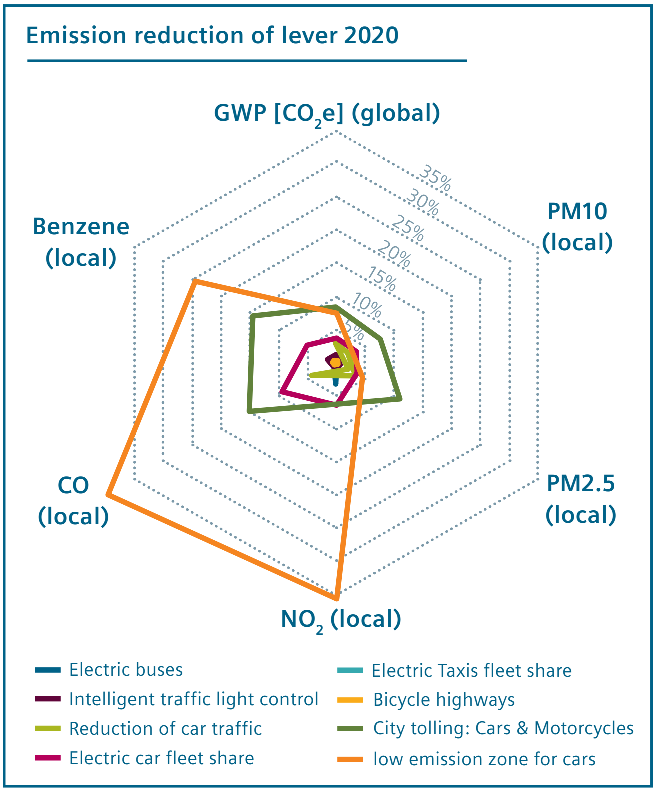


Figure 14: 2020 relative emission reduction potential of the levers of the scenario 'Intelligent E-Mobile' for individual application

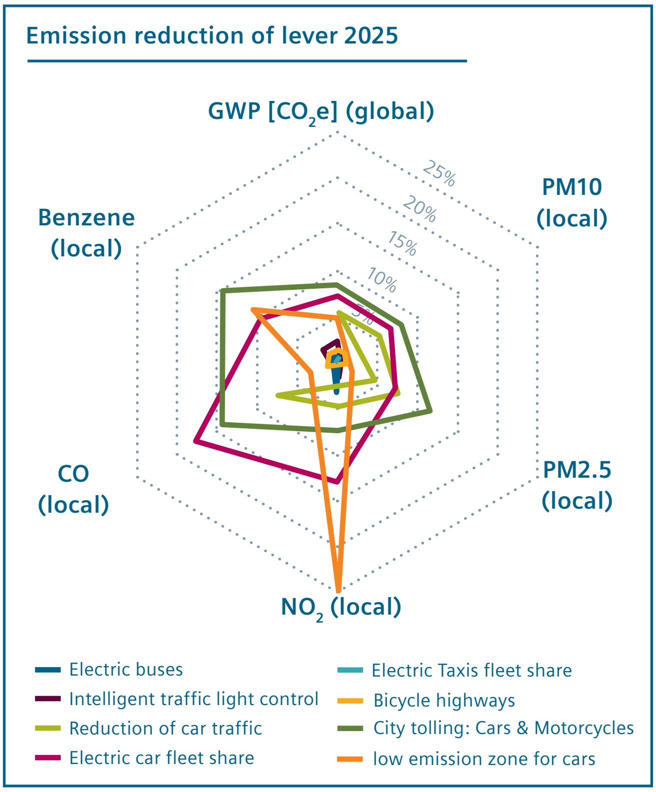


Figure 15: 2025 Relative emission reduction potentials of the Intelligent E-Mobile scenarios for individual applications

The low emission zone for cars is very dominant in air pollutants, except particulate matter. However, the effect quickly decreases over time due to the natural replacement of vehicles. All round positive effects in terms of emission savings are also demonstrated by the introduction of the politically ambitious city tolling for cars and motorcycles, as well as electric cars with the consequent development of a charging infrastructure.

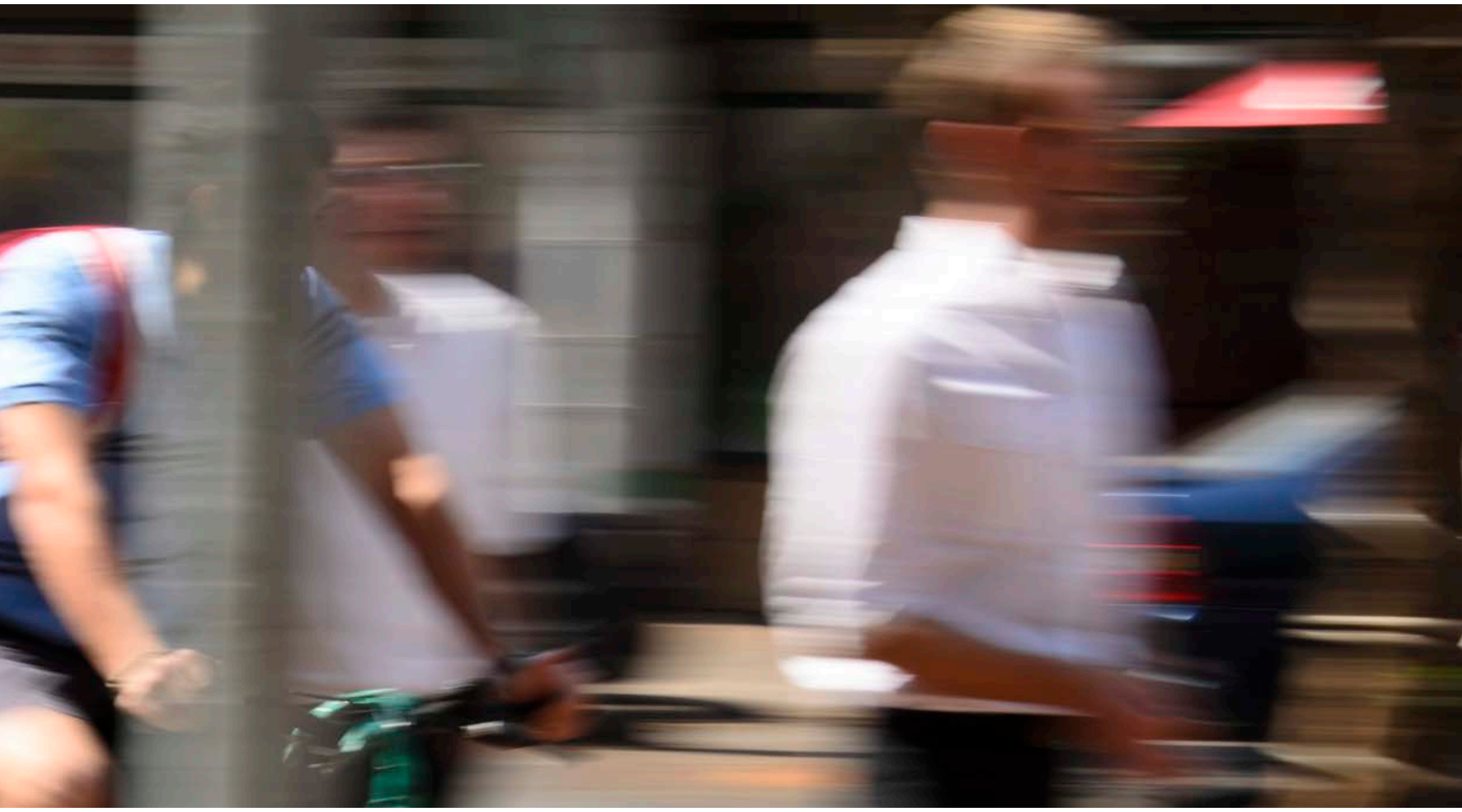
Car-free fun

The second scenario, 'Car-free fun', aims to reduce annual greenhouse gas emissions and particulate matter by 2025 using a broad range of measures to make public transport and cycling more attractive and to shift traffic to rail or bicycle (Fig 16). In 2025, long-term measures such as the expansion of the metro and tram network also will take effect. Here city tolling and the expansion of eCar sharing are a reinforcing factor. Smaller measures, such as the development of bicycle infrastructure or e-ticketing for public transport, make the ownership of a private car as unattractive as possible. The favoured hydrogen cars cannot yet trump greenhouse gases in 2025, but will show their positive effect in subsequent years with a better electricity mix. Also discussed, but not quantified, were speed limits and coventionel car sharing.

Car-free fun (optimisation goal CO_2eq and PM10 in 2025)

Lever	2020	2025
Electric buses	20 %	50 %
Metro: route extension	0	6 new km
Reduction of car traffic	5 %	10 %
Hydrogen car fleet share	10 %	20 %
eCar sharing	3 per 1,000 inhabitants.	6 per 1,000 inhabitants.
Tram: new line	0	2 new lines
Bicycle highways	2 km per 100k inhabitants.	4 km per 100k inhabitants
City tolling: cars and motorcycles	20 %	20 %
E-ticketing public transport	25 %	50 %

Table 2: Lever composition 'Car-free Fun' with implementation rates



Emission reduction of levers 2025

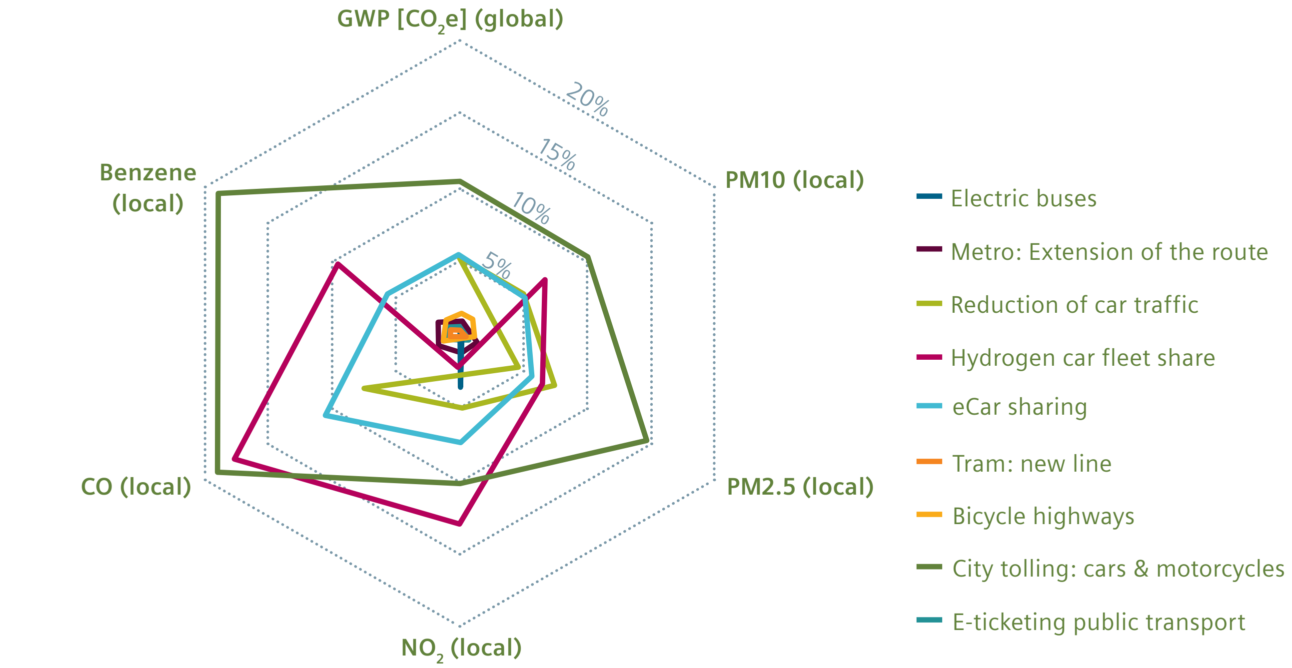


Figure 16: 2025 relative reduction potentials of the 'Car-free Fun' scenario in individual application

In this scenario too, city tolling and the associated modal shift set standards in almost all evaluated extensive categories. Hydrogen cars demonstrate a significant effect, at least on local emissions. Electric car sharing can also demonstrate a high potential with such coverage.

Liveable City 2025

The third scenario, 'Liveable City 2025', aims to reform the transport system using many pull effects and traffic management measures and to create a convenient, efficient transportation system by 2025 (including but not limited to the reduction of air pollutants) (Fig 17). This scenario consciously renounces use of city tolling or a low emission zone and focuses on measures such as the reduction of public transport season ticket prices to 365€ per year. An extended range of sharing concepts, e-ticketing and the establishment of a rapid-transit system make the transition from car to other modes of transport more attractive, but do not force anyone to switch through push effects. In addition to shortening train headways, the expansion of the metro system and the tram will also reduce emissions in 2025. Other concepts that were discussed, but not quantified, were the cross-financing of the expansion of the public transport network by shops and stores on the new routes, which make additional sales (example Strasbourg). A monthly contribution of 2€ from every employee liable to social insurance should raise 30€ million p.a. for the expansion of public transport..

Liveable City 2025 (target: optimal transport system 2025)

Lever	2020	2025
Metro: route extension	0	6 new km
Reduction of car traffic	5 %	10 %
Electro-car sharing	1 per 1,000 inhabitants	2 per 1,000 inhabitants
Intermodal Traffic Management (app)	25 %	50 %
Bike sharing	4 km	8 km
Tram: new line	0	4 new lines
Metro: reduced train headways	15 %	30 %
Bicycle highways	2 km per 100k inhabitants.	4 km per 100k inhabitants.
E-ticketing public transport	40 %	80 %
365€ p.a. public transport subscription	365€	365€

Table 3: Lever composition 'Liveable City 2025' with implementation rates

Emission reduction of levers 2025

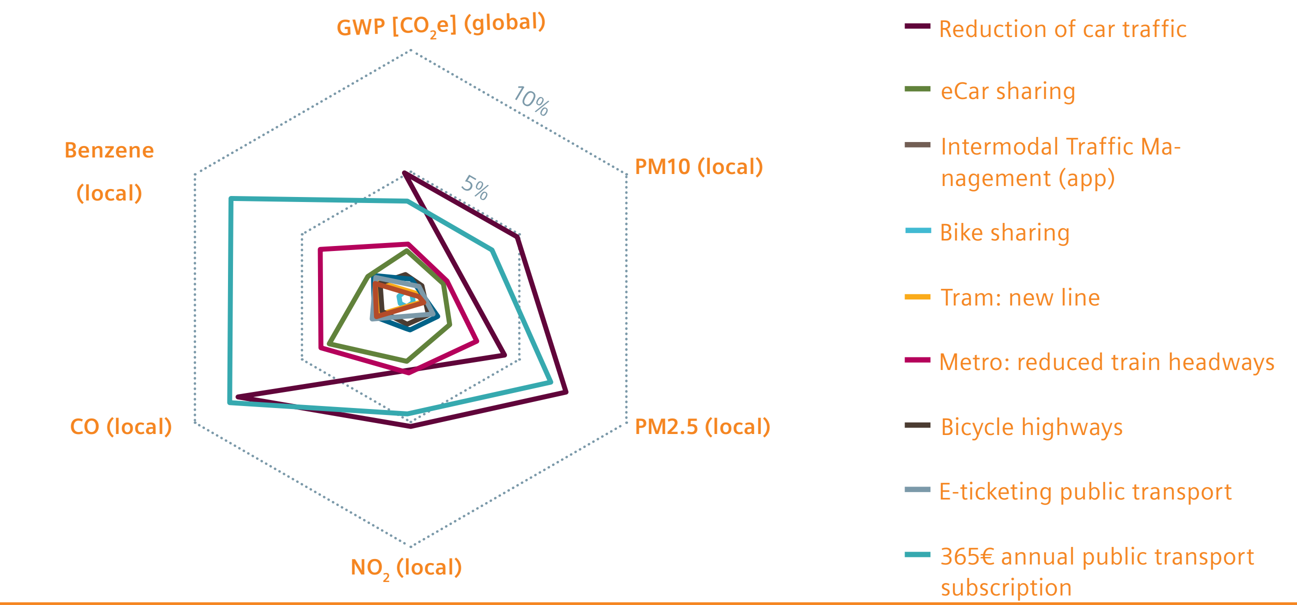


Figure 17: 2025 relative reduction potential of the levers of the 'Liveable City 2025' scenario for individual application

Apart from benzene, which plays a more subordinate role and is mainly caused by scooters and small motorcycles, the measures to improve the traffic system show balanced positive effects in all evaluated areas. These savings, however, are at a lower level, since they only rely on incentives, not on push effects. In this case, the significant reduction of the annual subscription for public transport to one euro per day has to be highlighted. This measure has already been implemented in Vienna. Otherwise, the generic lever of car traffic reduction is dominant, but this is due to the lack of other dominant levers (no push effects).

Scenario comparison

Nitrogen dioxide

Large savings are possible for local nitrogen dioxide (Figure 18). 'Intelligent E-Mobile' achieves approx. 45% for both target years. For example, in Von-der-Tann-Strasse in 2020 this corresponds to a total saving of 7.8 µg/m³ in annual mean and 5.5 µg/m³ in 2025. Comparing the scenarios, the difference in the scenarios in 2020 is quite extreme. The fact is mainly due to the electronically monitored low emission zone, which helps the rapid development of the 'Intelligent E-Mobile' scenario. The 'Car-free Fun' and 'Liveable City 2025' scenarios catch up a little bit by 2025 due to their long-term infrastructure measures. In 'Intelligent E-Mobile' the emission reduction of long-term infrastructure measures are almost offset by the decreasing efficiency of the low emission zone over time.

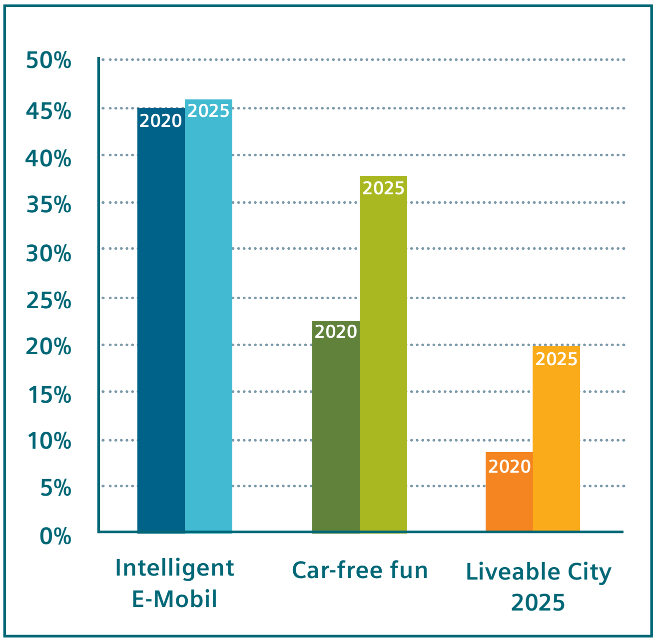


Figure 18: Savings NO_2 [%], tank to wheel (local in the city)

Particulate matter

The 'Car-free Fun' scenario beats the other scenarios, both in the short and long term (Fig 19). However, the relative savings of 23% in 2020 and 35% in 2025 appear high when compared to the absolute figures. In Von-der-Tann-Strasse, for example, these would correspond to total savings of 1.7 µg/m³ in annual mean in 2020 and 2.5 µg/m³ in 2025. The maturity of exhaust gas treatment of particulate matter in vehicles is several years ahead of the treatment of nitrogen oxides and a relatively large proportion of the particulate matter emissions are not caused by the combustion process. Measures for the reduction of vehicles therefore perform better than electrification approaches. This is very beneficial to the 'Car-free Fun' scenario. In this context, however, it should be emphasised that 'Liveable City 2025', without push effects, achieves almost the same particulate matter reduction as 'Intelligent E-Mobile' in 2025.

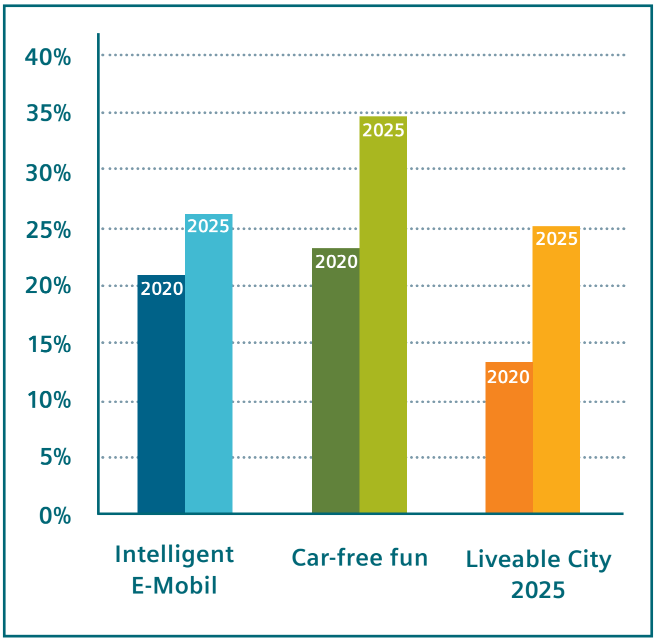


Figure 19: Savings PM10 [%], tank to wheel (local in the city)

Greenhouse gas

For greenhouse gases, the first scenario 'Intelligent E-Mobile' records the biggest reduction potential of 21% in 2020 and almost 24% in 2025, although its primary objective is the reduction of nitrogen oxides. This represents an absolute reduction of 87 kilotons per year in 2020 or 105 kilotons in 2025. However, a 5% difference compared to the 'Car-free Fun' scenario appears less relevant, considering that electric rather than hydrogen cars would have overcompensated for the difference (Figure 20).

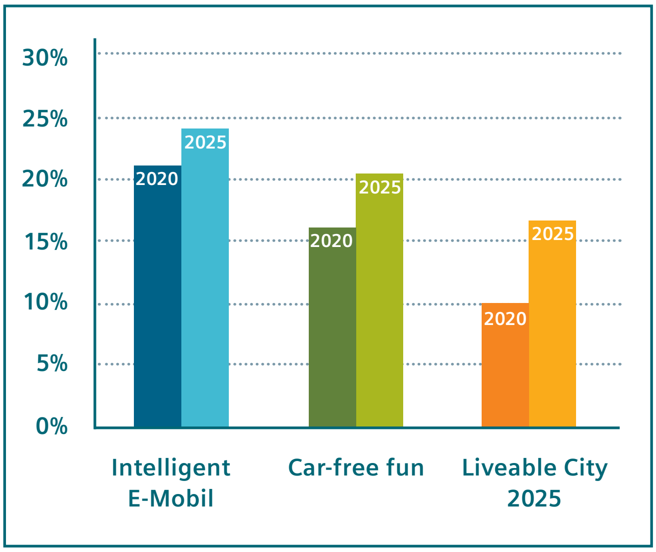


Figure 20: Savings THG [CO_2eq] well to wheel (global with upstream processes of energy supply)

Experts weigh up the options

All three groups decided to reduce car traffic in Nuremberg. Bicycle highways also feature in all three scenarios and are thus a good choice for all three different target functions.

To reduce emissions, all groups with direct emission targets opted for electric buses and the introduction of city tolling. The introduction of city tolling would make Nuremberg a pioneer in Germany.

Among the long-term measures, there is the greatest consistency between the scenarios of different target functions. Both 2025 scenarios call for the extension of the metro system, the tram system, the introduction of an e-ticketing system and the implementation of an eCar sharing system.

Three scenarios, one single vote: Nuremberg's experts opt for non-motorized traffic and public transport

Conclusion

Nitrogen dioxide is the most challenging pollutant in the city of Nuremberg. If the diesel boom is stopped, over the coming years, transport-induced nitrogen oxide emissions will decrease more rapidly than other pollutants. The excellent news is that nitrogen oxides can also actively be reduced more quickly than other air pollutants or greenhouse gases. Short-term as well as long-term reductions of urban traffic NO_2 emissions by 40% seems possible as a result of measures that can be implemented by the city and would push NO_2 concentrations, e.g. on Von-der-Tann-Strasse below the limit of 40 μg/m^3.

The urban traffic related particulate matter and CO_2eq emissions will not significantly decrease over the next ten years, without the city itself taking measures. More persistence and a broad mix of measures that enforce a modal shift to non-motorised and public modes of transport are needed here.

The scenarios show that in the short-term, only push effects such as city tolling or an electronically monitored low emission zone can achieve vast emission reductions, whereby city tolling also provides financial scope for a major expansion of public transport. A real exception here is the measure 365€ annual public transport subscription, which produces a pull effect and provides very noticeable relief for all emissions very quickly. The fact that city tolling was considered to be politically feasible, however, shows how important good air quality is to Nuremberg's experts.

Seen from the perspective of over a decade, there is a clear vote for a significant extension of public transport and the promotion of non-motorised traffic as well as sharing concepts. These measures create outstanding results in the long run without the use of push effects, especially with regards to particulate matter emissions. To achieve significant success in the case of nitrogen oxides, this modal shift towards public transport has to be accompanied by the electrification of the bus fleet.

City tolling and low emission zones ensure the most significant short-term emission reductions. The 365€ annual public transport subscription is popular, but nevertheless efficient in the short term.

Sources

Emissions Analysis & Limits:

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Appendix

Electricity mix in the BAU scenario

Although not directly part of the transport system, the development of the electricity mix must be briefly discussed here, since it has a significant influence on the greenhouse gas emissions from electrification projects in the different vehicle fleets. The analysis draws on the electricity mix of N-ERGIE, which was updated according to the trend of the expected German average.

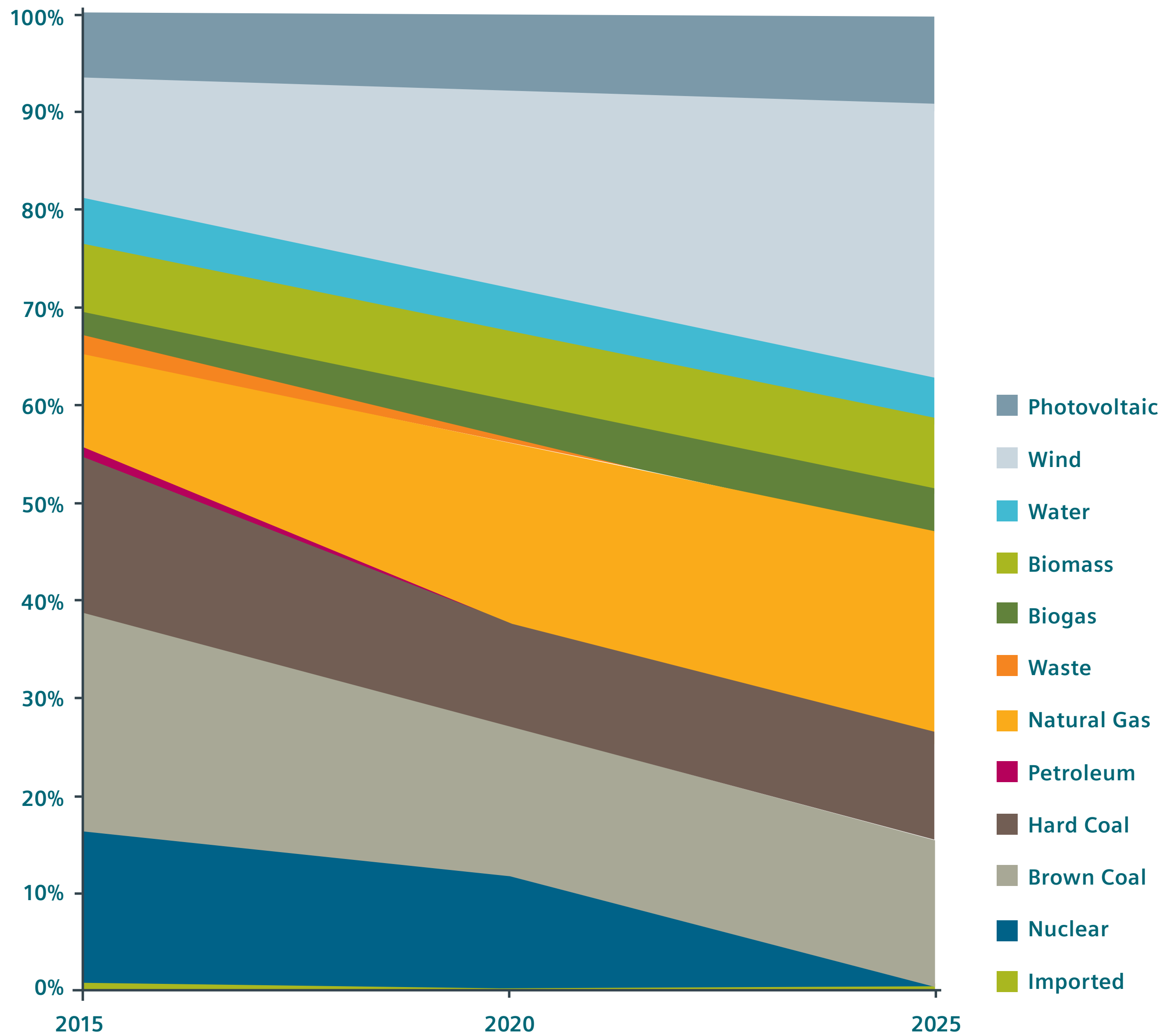

Figure 21: Projected electricity mix of Nuremberg

Emission Schemes for PM2.5, CO and benzene

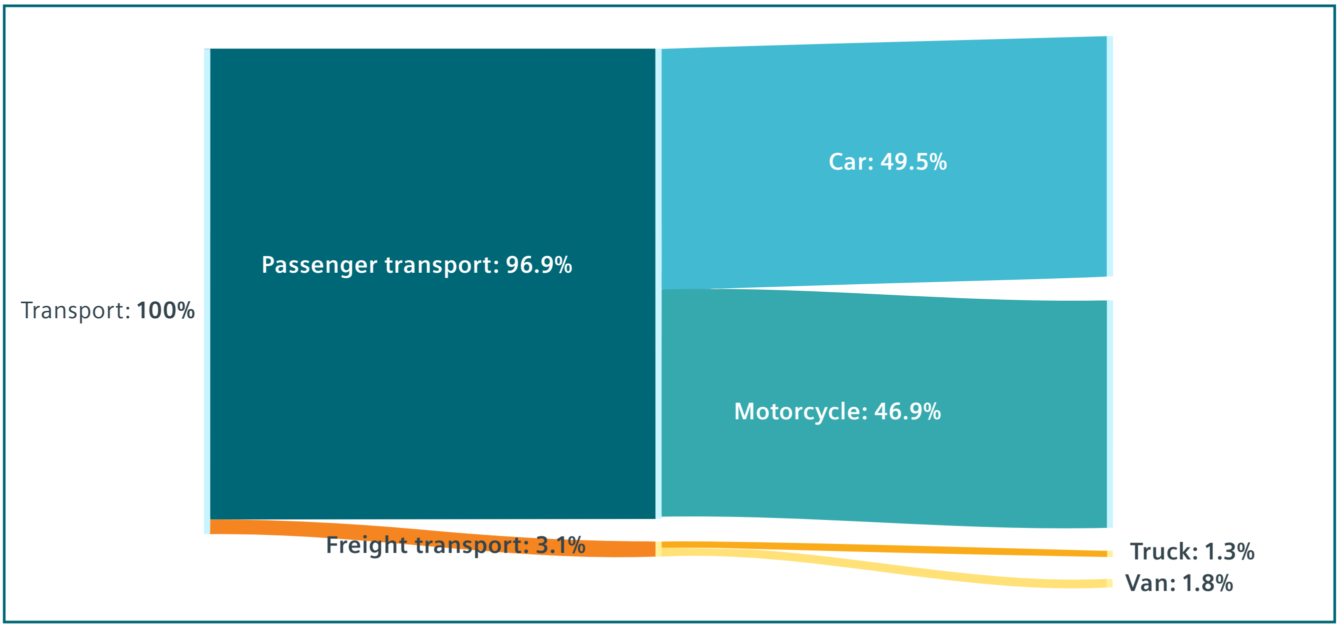

Figure 22: Benzene emission scheme 2015 (modes with an overall contribution > 2% visible only)

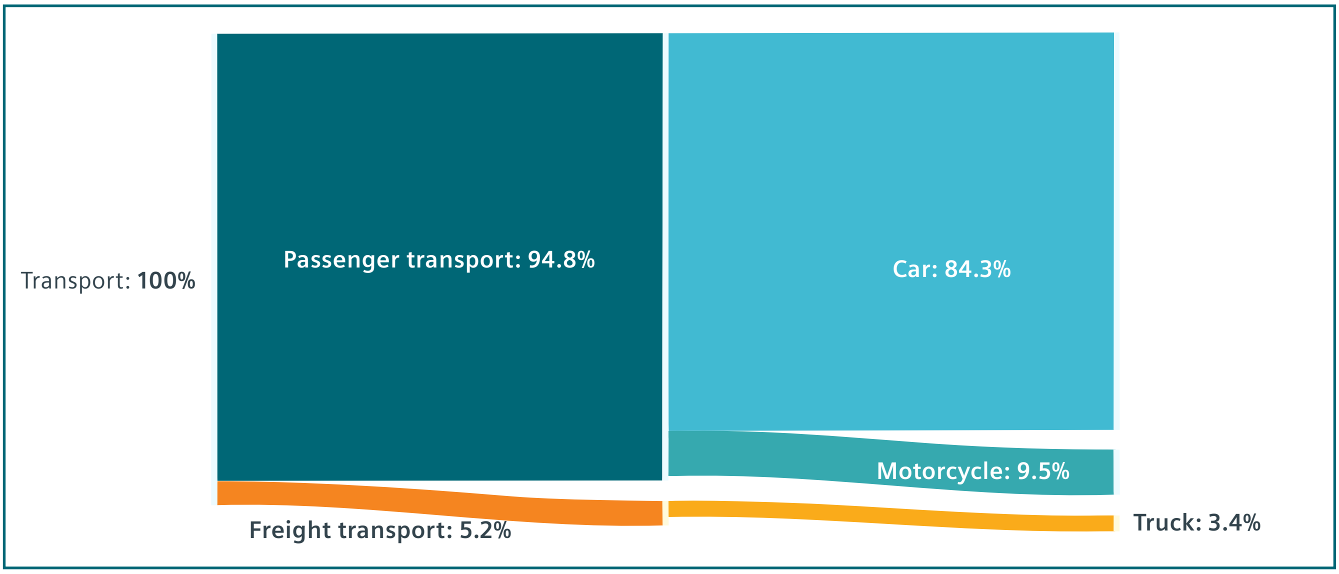

Figure 23: CO emission scheme 2015 (mode with an overall contribution > 2% visible only)

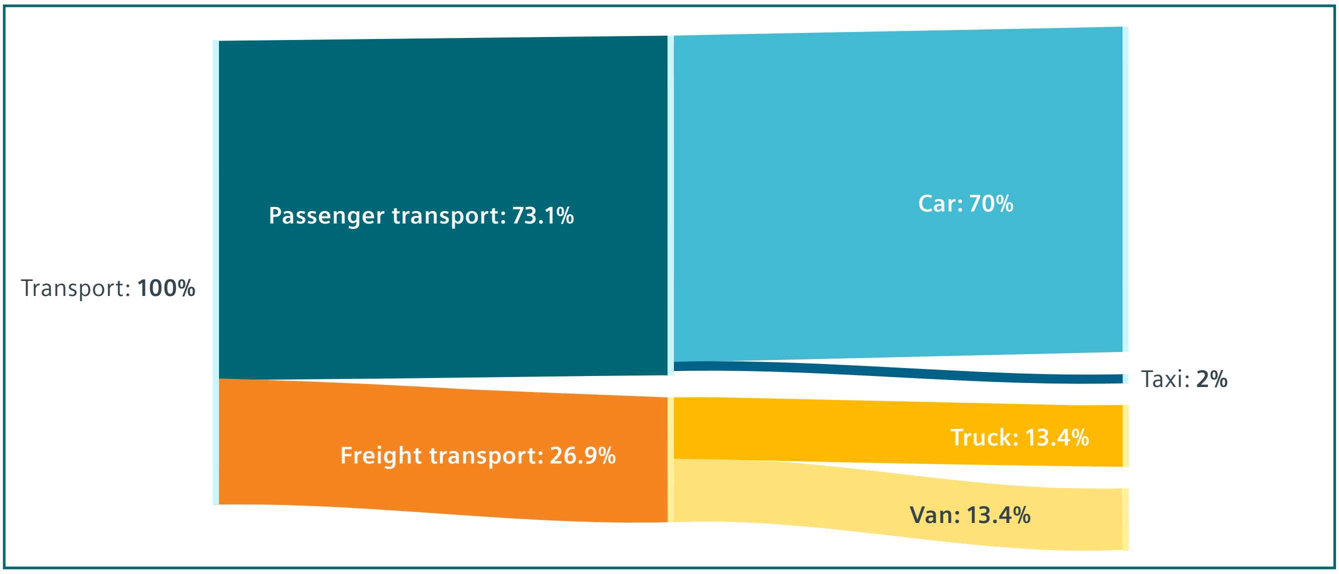

Figure 24: PM2.5-emission scheme 2015 (mode with an overall contribution > 2% visible only)

Lever options in the workshop

Due to the local infrastructure, not all CyPT-Air levers are applicable or useful in Nuremberg. Out of 40 levers implemented in the model, the following 26 levers were available in the workshop.

Lever description	Assumptions about time horizons			
	Political decision made	Start of implementation	Target year (implementation rate achieved)	Further increasing after target year
Metro: Driver Assistance System (ATO)	2018	2020	2020	No
Electric buses	2017	2018	2020	Yes
Metro: route extension	2019	2020	2025	No
Intelligent traffic light controls	2017	2019	2020	No
Car-traffic reduced	2017	2018	2020	No
CNG car fleet share	2017	2018	2020	Yes
Electric car fleet share	2017	2018	2020	Yes
Hydrogen car fleet share	2017	2018	2020	Yes
Hybrid electric car fleet share	2017	2018	2020	Yes
Plug-in hybrid electric car fleet share	2017	2018	2020	Yes
Electric taxi fleet share	2017	2018	2020	Yes
E-Car Sharing, PKW pro 1000 Einwohner	2017	2018	2020	Yes
Intermodal traffic management via mobile app, usershare	2017	2018	2020	No
Bike sharing, bicycles per 1,000 inhabitants	2017	2018	2020	Yes
Tram: new line	2017	2020	2025	No
Electric express bus: new line	2017	2018	2020	Yes
Metro: shortening train headways	2017	2018	2020	No
CNG bus fleet share	2017	2018	2020	Yes
Bicycle highway km per 100,000 inhabitants	2017	2018	2020	Yes
Freight line electrification	2017	2018	2020	No
Low emission zone for vans and trucks according to Euroclass	2017	2018	2019	No
City tolling for cars and motorbikes, dynamic pricing cording to traffic reduction target	2018	2019	2020	No
E-ticketing for public transport	2019	2019	2020	No
Low emission zone Euro6 for all cars	2019	2019	2020	No
Scouter 2S: electrification	2019	2019	2020	No
365€ annual public transport subscription	2017	2018	2018	No

Nuremberg sustainable mobility shows strategies that can reduce air pollutants and greenhouse gases.

The three scenarios that were developed enable a comparison of short-term and long-term measures. Emissions and saving potentials are made transparent for short-term fleet changes in private motorized transport to very efficient long-term measures, combining modal shifts with electrified public transport or sharing schemes.

The results create the foundation for air quality control and climate protection planning.

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