Air Quality Action Plan for Oslo and Bærum 2020-2025

Executive summary

Oslo

Statens vegvesen

BÆRUM KOMMUNE

VIKEN FYLKESKOMMUNE

Why is an air quality action plan necessary for Oslo?

In recent years, air quality has steadily improved because of implemented measures and technological development. In Oslo and Bærum, however, there is still a risk of exceeding the limit values set by the Pollution Regulations for local air quality, see Table 1. Therefore, there remains a legal obligation to draw up an action plan, assessing and describing the measures necessary to fulfil the requirements in the regulations. The Norwegian Environment Agency has decided that both the City of Oslo and Bærum Municipality must submit new action plans with binding measures by 1 July 2021.

With this in mind, Oslo and Bærum have revised the existing air quality action plan, which applied until 2020, with a new plan for the period 2020-2025. The Norwegian Public Roads Administration, Bærum Municipality, the County of Viken and City of Oslo have collaborated on revising the action plan.

For practical reasons, it is convenient to consider Oslo and Bærum together for modelling purposes. Traffic analyses and air quality calculations were carried out by COWI, which has also written the report for Bærum Municipality. The Agency for Urban Environment has written the report for the City of Oslo.

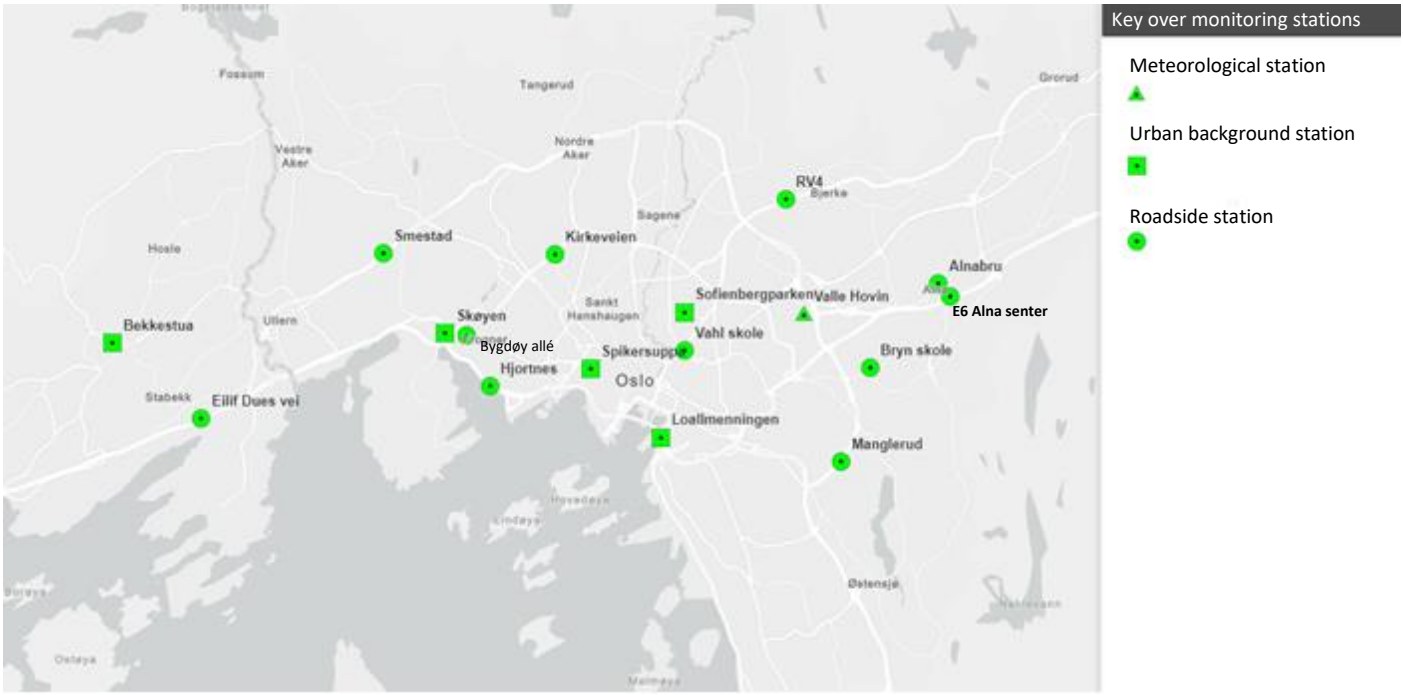

Figure 1: Map showing locations and types of monitoring station in Oslo and Bærum as per 2021

Table 1. Extract from Pollution Regulations[1]. Limit values for selected components.

Component	**Averaging period**	**Limit value**	**Maximum number of permissible exceedances**
Particulate matter (PM_{10})	1 day	50 µg/m^3	30 times per calendar year
	Calendar year	25 µg/m^3	
Particulate matter ($PM_{2.5}$)	Calendar year	15 µg/m^3	
Nitrogen dioxide (NO_2)	1 hour	200 µg/m^3	18 times per calendar year
	Calendar year	40 µg/m^3	

The main report for Oslo and attachments (in Norwegian) may be downloaded from https://www.oslo.kommune.no/gate-transport-og-parkering/luftkvalitet-i-oslo/slik-gjor-vi-luftkvaliteten-bedre/

The main report for Bærum (in Norwegian) may be downloaded from https://www.baerum.kommune.no/innsyn/politikk/wfdocument.ashx?journalpostid=2020329142&dokid=5349751&versjon=1&variant=A&

[1] *Regulations relating to pollution control (Pollution Regulations)*; FOR-2004-06-01-931.

What is the current state of the air quality in Oslo and Bærum?

The main air pollution components in Oslo and Bærum are nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). In Bærum, air pollution is a particular problem along the major trunk roads E18 and E16. In Oslo, air pollution is a particular problem at road-tunnel openings and along the busiest roads.

The main source of NO_2 in the region is exhaust gasses, particularly from diesel vehicles. In addition, there are exhaust contributions from ships and harbours. In the last three years, there have been no exceedances of the limit values for NO_2. This is due to a decrease in emissions from an increasingly cleaner vehicle fleet, combined with relatively favourable weather conditions. However, there is still a risk of exceeding the limit values, e.g., under less favourable meteorological conditions.

The most important source of coarse particulate matter (PM_{10}) measured locally is road dust. This arises from abrasion of the road surface, especially through use of studded tyres on wet roads. When the roads become dry, turbulence from passing vehicles resuspends the dust in the air. The heavier and the more powerful the vehicle, the greater the contribution to production and resuspension of road dust. In addition, wood burning and exhaust emissions contribute to PM_{10}.

Fine particulate matter ($PM_{2.5}$) consists mainly of combustion particles. The most important local sources of $PM_{2.5}$ in the region are wood burning and other more diffuse combustion sources.

Currently there are 14 stations monitoring air quality in Oslo and two in Bærum, see Figure 1 for a location map. Figure 2 shows the number of times the daily mean value for PM_{10} was exceeded at selected monitoring stations over the last 7 years. Figure 3 shows annual mean concentrations of NO_2. There were no exceedances of the current limit value for the annual mean concentration of PM_{10} during this period.

In order to forecast future developments in air pollution, as well as the effectiveness of measures to improve air quality, mathematical modelling is necessary. COWI calculated these models.

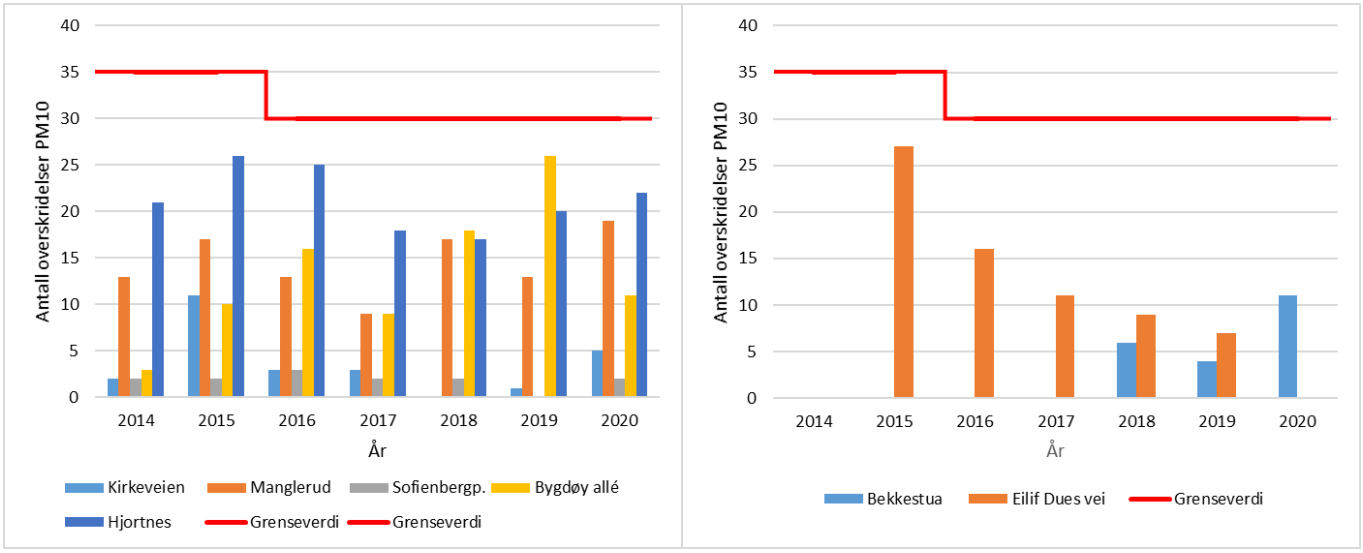

Figure 2: Number of times the daily mean value for PM_{10} was exceeded at selected monitoring stations in Oslo (left) and Bærum (right). Data for 2020 is not quality assured.

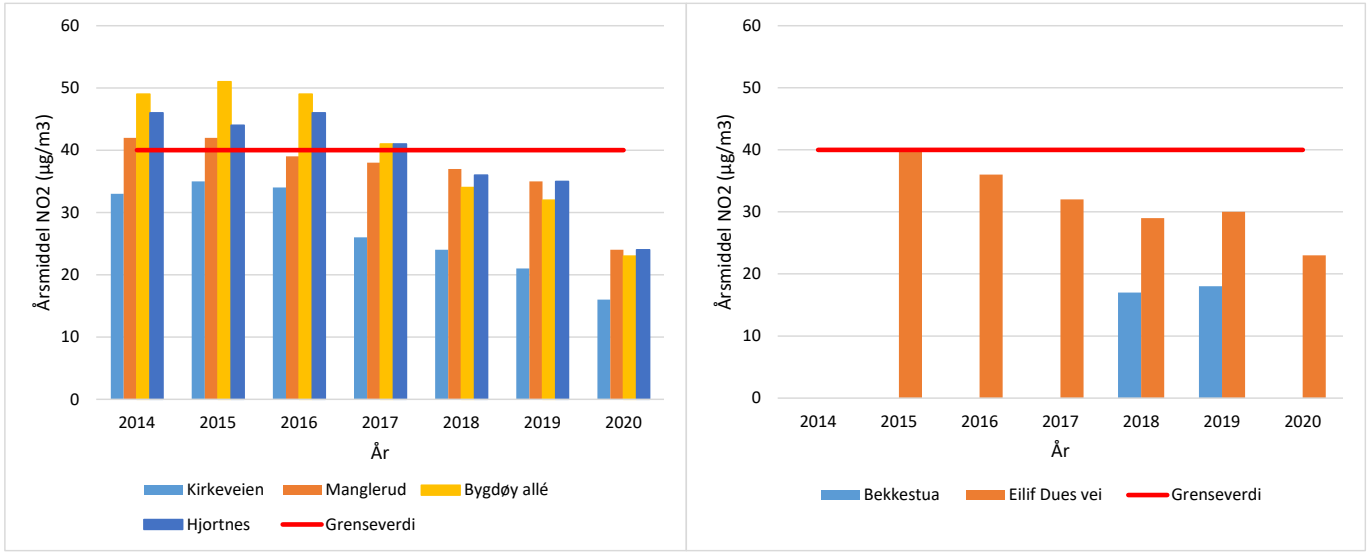

Figure 3: Annual mean concentration of NO_2 at selected monitoring stations in Oslo (left) and Bærum (right). Data for 2020 is not quality assured.

Expected development in air quality

The action plan will apply for a five-year period ending 2025. Expected development during this period, based on existing plans and measures as well as political decisions, in the main shows compliance with the current limit values in 2025. This assumes the continued implementation of measures such as the studded-tyre fee in Oslo, environmental speed limit, as well as road cleaning and dust suppression. For nitrogen dioxide, the transition to zero-emission vehicles is expected to yield a significant reduction. Calculations show exceedance of the annual mean concentration of NO_2 at just two tunnel openings. See Figure 4 for modelling results

No significant change in PM_{10} concentrations is expected. Assuming development as expected, calculations show exceedances at tunnel openings and along the E18 motorway. See Figure 5 for modelling results showing areas with potential exceedances of the limit value for the daily mean concentration. Similar results are expected for the annual mean concentration of PM_{10}. No exceedances of the current limit value for $PM_{2.5}$ were calculated.

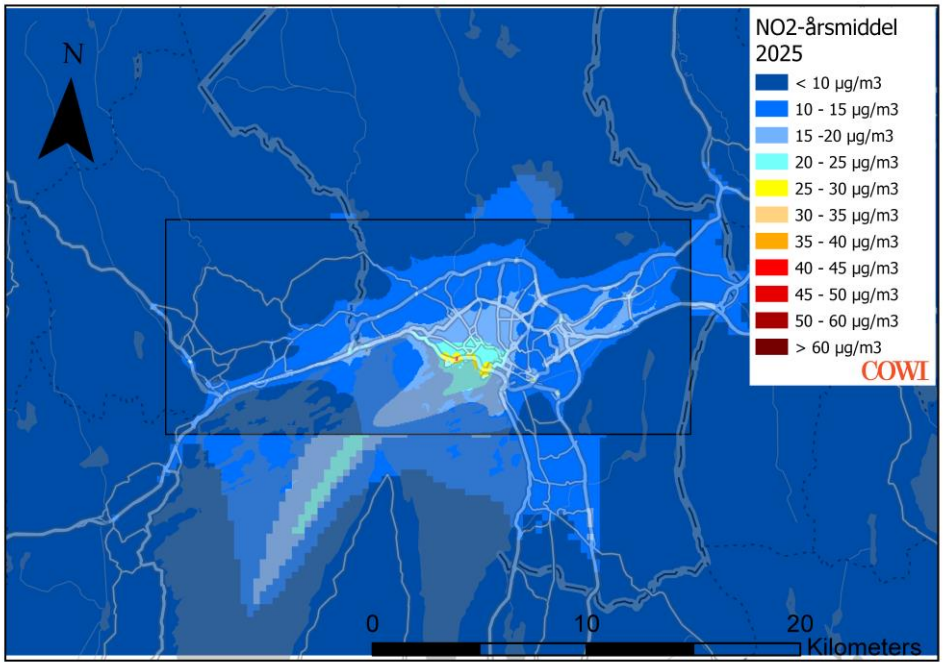

Figure 4 Map showing the extent of NO_2 pollution (annual mean, µg/m^3) in Oslo and Bærum for a reference scenario in 2025. Areas with exceedances of the limit value are red. Concentrations calculated by COWI using the model TAPM. Source: COWI.

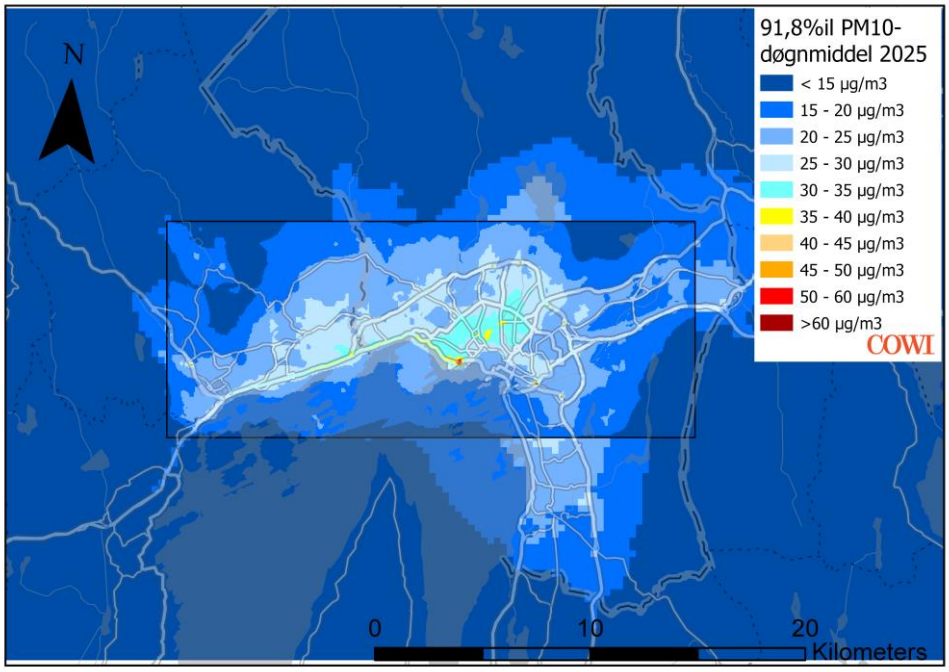

Figure 5 Map showing the extent of PM_{10} pollution (31st highest daily mean concentration, µg/m³) in Oslo and Bærum for a reference scenario in 2025. Areas with exceedances of the limit value are red. Concentrations calculated by COWI using the model TAPM. Source: COWI.

Is it possible to achieve compliance with the regulations?

There are a number of sources of air pollution in Oslo and Bærum, requiring a variety of measures. Modelling calculations, based on expected development, show that exceedances of the current limit values in 2025 will mainly occur at road-tunnel openings. This will require the implementation of enhanced measures directed specifically at tunnel openings in order to ensure compliance. General measures to reduce road traffic emissions will also contribute to reducing emissions at tunnel openings.

A scenario with improved air quality in 2025 was modelled using a package of the following measures:

- Zero growth in all traffic (including heavy vehicles) through the toll ring
- Increase share of winter tyres without studs to 94 %
- Reduce emissions from wood burning stoves by 30 % in the City of Oslo and 25 % in Bærum Municipality
- Reduce emissions by up to 10 % from tunnel openings and culverts for tunnels with ventilation towers
- Reduce emissions from the Port of Oslo
- Expand the environmental speed limit zone on the E18 to Ramstadsletta

- Increase road dust suppression
- Road cleaning measures

Modelling results with this package of measures indicate a high probability of compliance with the current limit values in 2025 for most of Oslo and Bærum. In the case of a small number of areas adjacent to tunnel openings, exceedances of the limit values for PM_{10} have been calculated.

For details of the politically adopted measures in Oslo and Bærum, see the following Appendix: Overview of measures, effect, responsibility, timetable and status.

How many people does non-compliance with the regulations affect?

COWI has calculated the number of people exposed to concentrations above the limit values outside their homes.

For the present day situation in Oslo, calculations show exposure of several thousand people to levels of NO_2 above the limit values. Additionally, more than 100 people are exposed to levels of PM_{10} above the current limit values. In Bærum, calculations show exposure of ca. 2000 people to levels of NO_2 above the limit value. There are no exposures to $PM_{2.5}$ calculated above the current limit value. With future development according to business as usual without enhanced measures in 2025 (i.e., the reference scenario), the number of people exposed to NO_2 above the limit values will decrease somewhat. In Oslo, on the other hand, there will be some increase in the number of people exposed to high levels of PM_{10}. If enhanced measures are implemented, then by 2025 virtually no one in Oslo and Bærum will be exposed to air pollution above the current limit values.

For the present day situation in Bærum, calculations currently show ca. 2000 people exposed to NO_2 above the limit value, but none in 2025 neither with nor without enhanced measures. In addition, calculations show almost no exposures to particulate matter above the current limit values.

Proposed tightening of the limit values

Tightening of the limit values for particulate matter has been proposed from 2022, see Table 2. If this is realised, then it is likely that exceedances will occur in Oslo and parts of Bærum. During the work with the air quality action plan, we have also considered the effect of the proposed limit values. A tightening of the limit value for $PM_{2.5}$, in the case of future development with business as usual, could lead to exceedances in large areas within Ring Road 3 and the south-easternmost parts of Bærum.

Wood burning stoves and other diffuse combustion sources are the most important local contributors to $PM_{2.5}$. Calculations show that even with the package of measures to improve air quality in 2025, an estimated 110 000 people in Oslo will be exposed to $PM_{2.5}$ levels above the proposed limit value. Approximately 200 people will be exposed to levels above the proposed limit values for PM_{10}. In Bærum, it is expected that the package of measures will be sufficient to ensure virtually no exposures to levels of particulate matter above the proposed limit values.

In the event of a tightening of the limit values, a renewed assessment will be necessary to examine further relevant policies and measures. In particular, it will be important to carry out improved studies of $PM_{2.5}$ pollution and the effect of various measures.

Table 2: Proposed limit values for particulate matter from 2022

Component	**Averaging period**	**Limit value**	**Maximum number of permissible exceedances**
Particulate matter (PM_{10})	1 day	50 $\mu g/m^3$	25 times per calendar year
	Calendar year	20 $\mu g/m^3$	
Particulate matter ($PM_{2.5}$)	Calendar year	10 $\mu g/m^3$	

Appendix: Overview of measures, effect, responsibility, timetable and status

Oslo

Responsibility	Measures		Effect	Timetable/status
City of Oslo, Air Quality Action Plan for Oslo 2020-2025 Responsibility: City of Oslo	1. Emergency response to acute air pollution episodes	1.1. Maintain the ban on diesel-powered private cars and goods vehicles older than Euro VI as an emergency measure on the most polluted days.	NO_2 Short term Large	To be implemented during an emergency response.
		1.2. Work for a timely revision of the national "Regulations on temporary increases in toll tariffs in Oslo" to include all toll zones, whilst avoiding increased tariffs on zero and lower emission vehicles. Make use of reserve capacity to enhance public transport services on days with acute air pollution.	NO_2 Short term Large	Assessment of the measure has been carried out. The City of Oslo has sent a number of applications to the Ministry of Transport and Communications. Feedback from the ministry in 2019 was that they believe that any changes to the regulations ought to be made after a new central system for toll collection is in place. This will enable automatic exemption of zero-emission vehicles. If necessary, a manual reimbursement scheme can be used until further notice. Oslo is continuing to work on the issue.
		1.3. Issue free single tickets on the public transport during periods when diesel bans or emergency tariffs are in force.	Small	Work in progress.
		1.4. Increased communication encouraging use of public transport and home offices instead of cars when diesel bans or emergency tariffs are in force.	Small	To be implemented during an emergency response.
	2. Reduction of road dust	2.1. Continue current practices of cleaning and dust suppression	NO_2 none	This is part of the City of Oslo's routine operations.

Responsibility	Measures		Effect	Timetable/status
		along roads and streets. Intensify efforts in periods where a lot of resuspended road dust is expected.	PM_{10} large, but short term $PM_{2.5}$ small	Dust suppression is carried out as needed.
		2.2. Follow up the Norwegian Public Roads Administration (NPRA) to ensure continuation of environmental speed limits on trunk roads and its extension to other locations. Assess increased use of variable warning signs or other measures in collaboration with NPRA, to increase respect for environmental speed limits.	NO_2 small PM_{10} large $PM_{2.5}$ small	Currently, E18 West, Ring Road 3, Østre Aker vei and National Road 4 have environmental speed limits. In recent years, NPRA has worked on pilot projects with a more targeted use of environmental speed limits to increase compliance among motorists.
		2.3. Work with national authorities to develop appropriate, effective measures that can contribute to decreasing the share of studded tyres in Oslo, through adjusting legislation, increased fee rates, new technology or other measures.	NO_2 small PM_{10} large $PM_{2.5}$ small	In 2019, the share of tyres without studs in Oslo was 91 %. A revision of current regulations is in progress. NPRA and the Ministry of Transport and Communications have clarified the framework for the revision. It is important to ensure a proper balance between the environment, traffic safety and accessibility. The City of Oslo has previously provided input to this work, focusing on the size of the studded-tyre fee, length of the studded-tyre season, and the need for a better technical basis for assessing the need for studded tyres and studded tyre share, including cost-benefit assessments.

Responsibility	Measures		Effect	Timetable/status
	3. Reduction of emissions from the Port of Oslo	3.1. Continue the transition to zero-emissions in the Port of Oslo in line with the action plan, “Port of Oslo: A zero-emission port.”	NO_2 medium PM_{10} small $PM_{2.5}$ small	The action plan was adopted by the City Council 14.11.2018. A number of shore power plants have been, and will be, established for different types of ships. Ruter has entered into a contract for a new, all-electric, island boat-service. Start-up 2021 with the first boat from Boreal Sjø.
	4. Reduction of emissions from fuelwood burning	4.1. Carry out campaigns to improve wood burning technique and promote inspection and maintenance of fireplaces.	NO_2 none PM_{10} small $PM_{2.5}$ medium/large	Implemented. May be intensified.
		4.2. Assess effective, targeted measures that significantly reduce emissions from wood burning in fireplaces.		Assessments to be initiated during 2021. Collaboration between agencies for Urban Environment and Fire and Rescue Services.
		4.3. Consider possible incentives for rapid replacement of wood burning stoves.		
	5. General measures to improve Oslo's air quality	5.1. The City of Oslo will work to develop knowledge and research on emissions and pollution from vehicles, wood stoves, ships and other sources with the aim of implementing as targeted measures as possible.	No direct effect. Important for improving the knowledge base.	Ongoing. Participation in European fora where real world emissions from traffic are studied.
		5.2 Ensure daily monitoring of air quality throughout the year as well as further deployment of monitoring stations near residential areas and in areas where children and vulnerable groups reside. In addition,		Implemented. Two monitoring stations have been moved to schools, one to Bryn school and one to Vahl school. In addition, the City of Oslo is involved in projects on measurement by microsensors (iFLINK and URBANITY). The projects last until 2024 and

Responsibility	Measures		Effect	Timetable/status
		evaluate and assess the need for, and placement of, new monitoring stations and use of new technology for air quality measurement.		aim to test whether smart sensors can provide relevant information about air quality in urban areas, supplementing more advanced, established monitoring stations.
	6. Measures relating to road building and other construction projects	6.1. Say no to all capacity increasing motorways, and work to ensure road projects minimise noise and particulate pollution in local environments and residential areas.	Small	Political processes.
		6.2. Ensure zero-emission development in the municipality's own construction projects, and set requirements in zoning plans and building applications that private and state construction sites must be fossil-free and have measures for dust reduction.	NO_2 small, larger in the long term PM_{10} medium-large locally $PM_{2.5}$ small	Ongoing and in dialogue with the Agency for Planning and Building Services. According to the City of Oslo's climate strategy, by 2025, all building and construction work undertaken on behalf of the municipality will be either zero-emission or utilise biogas. The Agency for Planning and Building Services is looking for ways to incorporate environmental requirements and conditions in zoning plans and building applications.
		6.3. Inform and guide developers during the processing of building applications about possibilities to cut emissions and reduce dust during construction work. Work to ensure that all building and construction activities within the municipal boundaries are zero-emission by 2030.		Ongoing. The Agency for Planning and Building Services is looking for ways to incorporate environmental requirements and conditions in zoning plans and building applications.

Responsibility	Measures		Effect	Timetable/status
	7. Traffic reduction	7.1. Reduce car traffic by working to increase toll ring tariffs and implement tariffs differentiated by environmental criteria and time of day.	NO_2 medium-large PM_{10} medium-large $PM_{2.5}$ small-medium	Political processes. Linked to Oslo Package 3.
		7.2. Continue work with the urban logistics plan to ensure efficient, traffic safe and environmentally friendly urban logistics, and consider the possibility of integrating this into the municipal masterplan.		The Agency for Urban Environment is working on a preliminary project for such a plan with a deadline in the summer of 2021.
		7.3. Work for densification around public transport nodes with the aim of reducing transport needs and making it easier to choose walking, cycling and public transport. Facilitate environmentally friendly travel through use of spatial and transport planning.		Political/urban planning. Revision of the municipal masterplan will be an important tool for ensuring environmentally friendly land-use and transport in Oslo in the future.
		7.4 Continue work on measures that encourage people to be less dependent on private cars, e.g., promotion of car sharing, a high roll out of improvements for cycling, increased establishment of bicycle parking and implementation of measures to make winter cycling more attractive.		Ongoing. The Agency for Urban Environment is working to provide up to 600 car-sharing spaces in public parking lots in Oslo.
	8. Measures relating to	8.1. Follow up the results of the NPRA's pilot project on the	NO_2 medium PM_{10} medium $PM_{2.5}$ small	In 2020 and 2021, the NPRA will carry out a project for measuring air

Responsibility	Measures		Effect	Timetable/status
	tunnel openings	potential for reducing emissions from tunnels.		pollution both inside and outside the E18 Opera Tunnel.
		8.2. Ensure that the NPRA maintains current levels of cleaning and dust suppression in tunnels, and work to increase these efforts whilst avoiding tunnel closures that divert traffic to local roads.		Ongoing.
		8.3. Avoid air pollution sensitive land-use near tunnel openings and take this issue in to consideration in building application processes.		Political/urban planning.
	9. Further electrification of the vehicle fleet	9.1. Continue requirements for zero emission deliveries of goods and services to the municipality.	NO_2 small, larger in the long term	Ongoing. Grounded in the City of Oslo's procurement strategy.
		9.2. Continue the work of prioritizing zero-emission vans through establishing charging points, reserving parking spaces and considering additional financial incentives.		Currently, the main incentives are free parking and free passage in the toll ring for zero-emission goods transport/ tradesmen. The Agency for Climate is considering new schemes to subsidise charging infrastructure for goods transport.
		9.3. Continue the scheme to subsidise charging points in housing associations and co-ownerships. Increase the number of municipal charging points, including charging points reserved for taxis, and continue to support the establishment of home charging for taxi owners.		Project to reserve taxi ranks for zero-emission taxis with charging infrastructure in Olav Vs gate. Collaboration with Ruter, Nydalen, Oslo S/ Bane Nor. Establishment of exclusive rapid-chargers at taxi bases. The Agency for Climate has a scheme to support the establishment of home charging for van/taxi owners.

Responsibility	Measures		Effect	Timetable/status
				The Agency for Urban Environment has prepared a new strategy and action plan for charging infrastructure.
	10. Other measures	10.1. Continue to facilitate the use of bicycles and electric bicycles by municipal employees.	Small	Ongoing. Oslo's municipal bodies have electric bicycles and bicycles available for use by employees. Kilometre allowance for in-service use of bicycles.
		10.2. Continue the transition of goods transport over to cargo bikes and other zero-emission vehicles.	Small	Ongoing. Grant schemes for cargo bikes, pilot project with DHL in Tjuvholmen (micro-terminal), Schenker and Bring have started electric bike distribution from spring 2019 in two projects (Beloved City, Oslo City Hub). The projects are being expanded.
		10.3 Continue work to make streets and roads completely car-free, both inside and outside the city centre.	Dependant on the number of streets/ total area.	Political/urban planning.
		10.4. Continue to cooperate with the NPRA on measures to improve air quality, and follow up the NPRA via its role as national road administrator.	NO_2 large PM_{10} large $PM_{2.5}$ small	NPRA has drawn up action plans for the periods 2020-2022 and 2022-2025.
		10.5 Stimulate increased fossil-free heavy transport on national roads through Oslo, e.g., through increased price differentiation.	NO_2 small, larger in the long term	Political processes. Linked to Oslo Package 3.
	Addendum	Make provisions for municipal employees to work from home and have flexible core time to reduce work related travel, especially during the rush hour.	Small	New measure.

Responsibility	Measures	Effect	Timetable/status
Norwegian Public Roads Administration (NPRA), Air Quality Action Plan for National Roads in Oslo 2022-2025 Responsibility: NPRA	1. Monitoring of local air quality Necessary to verify compliance with regulatory requirements and robustness of model calculations.	Verification of PM_{10} and NO_2	Ongoing Continuous
	2. Road network cleaning Continue routine cleaning of road surfaces towards the sides and side areas, gutters to be flushed/swept/vacuumed every 14 days. Undertake comprehensive spring clean with closures on individual road stretches, each night over a 6-week period from 15 March to the beginning of May. Starts when weather conditions allow.	Medium-large PM_{10}	Ongoing All year Systematic, own plans
	3. Dust suppression on road network Continue existing regime for dust suppression on the road network on days with predicted high levels of resuspended dust.	Medium-large PM_{10}	Ongoing Winter season if needed
	4. Environmental speed limit Introduce reduced speed limits (60 km/h) on selected national roads in Oslo. Consider extensions and introduction of variable environmental speed limits.	Large PM_{10}	Ongoing Winter season
	5. Ban on diesel vehicles Emergency measure for the most polluted days. Includes municipal roads and parts of Ring Road 1 (national road).	Medium-large NO_2 short term	To be implemented during emergency response collaboration.
	6. Establish an environmentally based regime for the management of ventilation towers Relevant measure at the openings of tunnels with ventilation towers. Based as far as possible on existing monitoring instruments.	Medium-large PM_{10} (NO_2)	Start 2020 Will be implemented if a management regime is found that is shown to reduce emissions on days with high air pollution