



Oslo

Climate budget 2021

Chapter 2, Oslo City Government's
budget proposal 2021 with appendices

Abbreviations

Agencies	English names
BYM	Department of Urban Environment
EBY	Agency for Real Estate and Urban Renewal
KLI	Agency for Climate
MOS	Department of Environment and Transport
NOE	Department of Business Development and Public Ownership
PBE	Agency for Planning and Building Services
REG	Agency for Waste Management
UKE	Agency for Improvement and Development

Chemical bonds	English names
CO ₂	Carbon dioxide
CH ₄	Methane
N ₂ O	Nitrous oxide

Others	English names
CCS	carbon capture and storage
GHG	greenhouse gases
NTP	national transport plan
pp	percentage points
SLS	the Norwegian Association of Cyclists

Description of Oslo specific terms

Terms	English names
Oslo Package 3	the road toll payment system
Ring 1	the city-centre toll ring
Ruter	the public transport operator
Storting	the Norwegian Parliament

2. Climate budget

2.1 The City Government's initiatives for reducing GHG-emissions

In 2030, emissions of greenhouse gases (GHG) in Oslo shall be reduced by 95% compared with 2009. The emission inventory published by the Norwegian Environment Agency in spring 2020, using a new calculation methodology, shows that emissions in Oslo are significantly higher than previous inventories have indicated. For example, emissions from the building and construction sector, in the Climate budget 2021, the City Government has prioritised tightening the instruments targeted at reducing emissions from these sources.

Building and construction:

- **Climate requirements for developers**

The City Government will introduce requirements for fossil-free building and construction sites and, gradually, requirements for zero-emissions building and construction sites in new zoning plans, in dialogue with the pollution control authorities. The City of Oslo already requires fossil-free/zero-emissions construction in its own projects. However, four out of five building sites are state owned or private sector. Preliminary rough estimates suggest that the City Government's proposed requirements could cover approximately 40–80% of building activity by as early as 2024, and increase further leading up to 2030. Consequently, this instrument will significantly reduce emissions from building and construction sites within just a few years. This is a vigorous response to new data on emissions from this sector; see discussion below.

- **Fossil-free transport and handling of bulk materials**

From 2020, the City of Oslo requires fossil-free transport of bulk materials to and from building sites in its own projects. The share of projects with fossil-free transport of bulk materials where the City of Oslo is the buyer is thus expected to increase from virtually zero to 100% over the economic plan period.

Road transport:

- **More and better charging infrastructure to be built**

This is crucial to electrify the transport sector, and the City Government therefore proposes allocating NOK 37 million to step up the work on charging infrastructure for taxis, passenger cars, heavy vehicles and buses (including tour coaches and express buses). The City Government's ambition is for Oslo to lead the way in zero-emissions heavy vehicles, and NOK 4.275 million has been granted from the Norwegian Environment Agency's Klimasats environmental subsidy scheme for this purpose as well.

- **One or more "zero-emissions zones" to be established**

Zero-emissions zones will cut emissions in the transport sector. Access to these zones will be restricted to vehicles that use zero-emissions solutions (electricity, hydrogen or biogas). Such zones could potentially have a significant impact if they are large enough and cover most types of vehicles. The work to develop zero-emissions zones is to be stepped up in 2021 and 2022 with a view to coming into effect during the City Government's current term.

- **Parking charges shall be increased and more parking spaces reserved for electric vans**

In the absence of agreement on adequate toll charges in Oslo Package 3 (the road toll payment system), the City Government proposes increasing charges for street parking in the yellow zone by 25%. The charge for non-residents to use resident-only parking zones will increase by 25%, and the charge for residents' parking permits will increase by 50% in 2021. Higher parking charges make a slight contribution to reducing traffic and GHG-emissions.

This initiative supports the City Council's resolution on the new Climate Strategy towards 2030 and the associated discussion, which concluded that "the sum of tolls, parking restrictions and tighter rules on vehicle access to the city must reach a level that is sufficient to achieve the targets for cutting GHG-emissions and reducing car traffic".

The City Government has lobbied national authorities to be able to order private parking providers to charge prices at least equivalent to those for municipal parking spaces.

Within Ring 1 (the city-centre toll ring), an additional 25 parking spaces will be reserved for zero-emissions utility vehicles, while visitor parking will remain free for electric vans in resident-only parking zones.

- **Subsidies for public transport to be increased**

The City Government is allocating funding to avoid ticket price increases in excess of the ordinary price adjustment provided for in the Oslo Package 3 agreement. Effective 2021, all fuel used in public transport will be fossil free, and zero-emissions island ferries will be deployed.

- **Road tolls to be increased in the long term**

Norconsult has analysed and reported the effects of a new toll system. They found that, to achieve the necessary emissions reductions for traffic in Oslo, the difference between the tolls for fossil-fuel and zero-emissions cars must gradually be increased to NOK 100 by 2030. This will enable the emissions from passenger cars to be reduced by 95%, assuming no change in other instruments to promote electric cars. Achieving this breakthrough presupposes the agreement of the negotiations committee for Oslo Package 3, and adoption of the appropriate resolutions by the City Council and Viken county council. The Norwegian Parliament (Storting) must endorse the changes in toll charges if the average toll will be higher than it previously approved. Significant emissions reductions can also be achieved in the short term by increasing toll charges within the framework of the current Storting resolution, which permits an average toll of NOK 14 (against just over NOK 10 today). If the tolls for light fossil-fuel vehicles were increased to the maximum this framework allows, CO₂ emissions from light vehicles could be reduced by an estimated 13% in 2024 compared with the reductions being achieved by the current toll system. The City Government wishes to increase the toll charges to the maximum average toll. A change of this nature requires Viken county to agree with Oslo.

Waste incineration:

- **Establish carbon capture facility at Klemetsrud**

If it follows the plan, the Norwegian government shall promote investment decisions on full-scale value chains for carbon capture and storage (CCS) in the central government budget to be submitted in autumn 2020. The City Government is working to ensure a positive outcome for the Klemetsrud facility, something which is crucial in achieving Oslo's climate targets.

- **Zero-emissions waste management**

The City Government is investigating how Oslo can increase its materials recycling rate to minimum 65% (in line with EU requirements), while simultaneously safeguarding the target of waste management generating almost zero GHG-emissions in 2030.

The Climate and Energy Fund:

- The City Government is using subsidies for climate and energy measures to enable residents and businesses in Oslo to take steps that contribute to reduced GHG-emissions and more efficient energy use. The City Government proposes continuing the 2020 commitment quota of NOK 120 million in 2021.



Photo: Tonje Brustuen

Relevant subsidy schemes in 2021 that can reduce GHG-emissions include:

- Subsidies for mapping how a construction site can become a zero-emissions site
- Subsidies for companies relating to charging facilities for electric vans
- Subsidies for housing cooperatives and joint owners relating to charging facilities
- Financial support for pilot projects and development projects for GHG reductions and energy saving
- Subsidies for companies to purchase electric cargo bikes
- Subsidies for charging stations for electric taxis
- Subsidies for climate-smart travel to/from work
- Subsidies for housing cooperatives and joint owners to provide bike parking

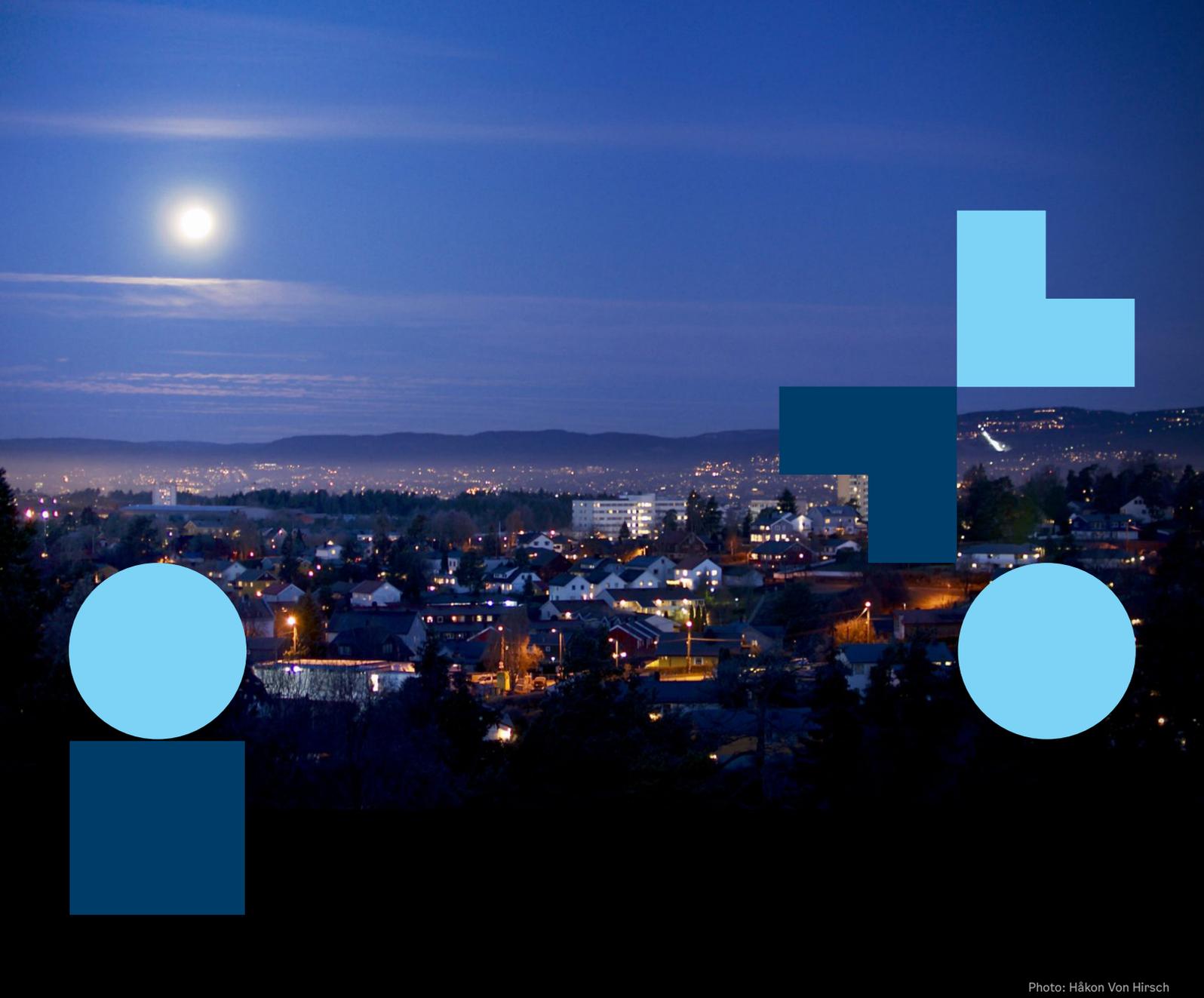


Photo: Håkon Von Hirsch

2.2 About the Climate budget

In 2030, emissions of GHG in Oslo shall be reduced by 95% compared with 2009. The City of Oslo has developed a dedicated Climate budget, which serves as a governance tool for its climate work. The Climate budget presents and calculates the effect of measures that will help us to reach our target. It shows where responsibility lies for implementing the measures in municipal entities, and includes requirements for reporting the status of the climate measures in line with the entities' financial reporting. The Climate budget also clarifies which national and regional measures directly contribute to emissions reductions in Oslo.

88% of Oslo's total GHG-emissions come from road transport, building and construction sites, and waste incineration. Among other things, reducing these emissions requires us to change how we transport people and goods, how

we build our city and how we handle our waste. Measures within these areas are therefore prioritised in the Climate budget.

The Climate budget shows that achieving the emissions reduction target requires efforts from the city's residents and business community, plus active cooperation between local, regional and national authorities and among the City of Oslo's own entities.

The Climate budget for 2021 is the fifth such budget to be prepared. The budgets have developed in line with increased knowledge, experience and improved methodologies for calculating GHG-emissions. We are seeing an ever-increasing number of cities and municipalities being inspired by Oslo to introduce their own climate budgets. Several major international cities have either prepared climate budgets or are in the process of doing so. Many Norwegian municipalities are also introducing climate budgets. In collaboration with Hamar and Trondheim, Oslo is now developing a climate budget manual for other municipalities, in a project part-financed by the Norwegian Environment Agency's Klimasats environmental subsidy scheme. This can help further speed up the development of climate budgets as a governance tool in the years ahead.

The Climate budget is based on the Norwegian Environment Agency's national emission inventory, which is broken down by municipality. In spring 2020, the Norwegian Environment Agency published new, amended calculations, which restated the emissions for every year right back to 2009. The most important change for Oslo was a substantial increase in the estimated emissions from the building and construction sector (sale of construction diesel). Based on the new calculations, emissions in Oslo are significantly higher than previous inventories have indicated. This is a result of changes in the methodology and input data; see chapter 4 for further information. This means Oslo is further off the climate targets than the City Government has previously assumed. The target for 2020 is to reduce emissions by 41% compared with the 2009 level. According to the Climate Agency's calculations, the measures quantified in the Climate budget will help to reduce Oslo's GHG-emissions by 25% in 2020 compared with the 2009 level. There will also be additional effects from measures that have not been possible to quantify. The actual 2020 emissions figures for Oslo are not expected to be available until the spring of 2022, when the Norwegian Environment Agency publishes its emission inventory for all Norway's municipalities.

The Climate budget also shows that achieving the target of a 52% reduction in emissions in 2023 will require greater efforts, both in Oslo and at central government level. The City Government considers the correct response to the new information on Oslo's emissions is not to dilute the climate targets but rather to use the Climate budget as a means to target new measures and strengthen efforts to reduce emissions. At the same time, Oslo is also dependent on central government facilitating emissions reductions in the city, which will in turn also make an important contribution to national climate targets.

The City Government wants to ensure that the climate measures do not contribute to social differences. This is why both climate and distributional effects are to be considered in all relevant decisions. The City Government seeks to make climate and distributional consequences visible in all relevant matters submitted to the City Council.

The Climate budget is prepared for the entire economic plan period. The effects of the measures in the Climate budget have therefore been estimated for the years 2021 and 2024. Supplementary information on the methodology underpinning the Climate budget 2021 can be found in the Appendix to the Climate budget 2021, which also expounds the procedure used to calculate the effects of the measures.

2.3 The City of Oslo's climate targets and the need for coordination of municipal and national instruments

Oslo shall be a zero-emissions city and one that is resilient to climate change. In spring 2020, Oslo City Council adopted a new climate strategy leading up to 2030, which introduces new targets for its climate work and describes how they are to be achieved. The target of reducing direct GHG-emissions by 95% compared with the 2009 level has been carried forward from the Climate and energy strategy of 2016. The City Council also adopted a new target for direct GHG-emissions in Oslo to be reduced by 52% in 2023 compared with 2009. See the figure to the right for the other targets.

The climate strategy states that emissions can be reduced by approximately 75% by 2030 compared with the 2009 level, provided that local and national instruments already adopted are continued, nine central government instructions of actions are implemented, and a carbon capture facility is established at Klemetsrud. This indicates that Oslo can achieve the 2030 target provided further measures are developed. It also shows that the introduction of new, enhanced instruments at national level will be absolutely decisive in Oslo achieving its targets. Removing barriers to the municipalities implementing necessary measures is important in order to achieve the targets. This includes being able to introduce zero-emissions zones for climate reasons or to require private-sector workplaces to charge for parking, as well as an adequate level of road tolls, and the possibility of using the Planning and Building Act to set climate requirements.

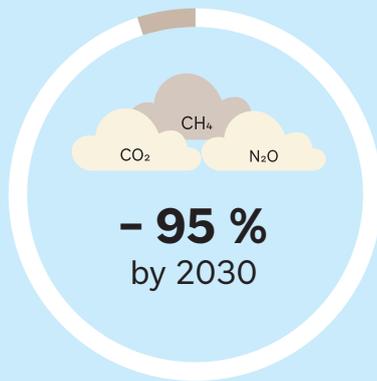
To achieve the climate targets, it is crucial that the Storting passes an investment decision on CO₂ capture and storage that covers the waste incineration plant at Klemetsrud. This facility represents Oslo's single largest source of emissions. In addition, too low a CO₂ tax on GHG-emissions makes it profitable to pollute. Central-government subsidy schemes under Enova should be expanded, and the Klimasats environmental subsidy scheme should be made permanent. Norway has a national target of reducing emissions by 50–55% by 2030. This climate target is to be implemented in collaboration with the EU. For emissions not covered by the EU quota system – the non-ETS sector – the government has set a target of a 45% reduction. The largest non-ETS source of emissions is road transport. The target also covers other transport, waste management and agriculture. The government has notified that it will submit a report to the Storting in 2020, setting out how Norway is to achieve the 2030 target. This report will be highly significant to how Oslo can achieve its climate targets, including by setting the limits for emissions from road transport going forward.

Over the winter, the government will submit a report to the Storting on a new national transport plan (NTP). An NTP that includes funding for projects to reduce GHG-emissions will improve Oslo's chances of achieving the climate target for 2030. On the other hand, if the NTP includes funding for projects that increase emissions, this will make achieving our climate targets more challenging. Oslo has submitted a number of concrete suggestions as part of the process surrounding the new report to the Storting.

The Storting has approved construction of the new E18 Lysaker-Ramstadsletta, against the wishes of the City of Oslo. The project entails a longer motorway than was agreed in the revised Oslo Package 3 in 2016 and will make it more difficult to achieve the City of Oslo's targets to reduce traffic and GHG-emissions. The project also ties up toll revenues at the expense of important public transport projects.

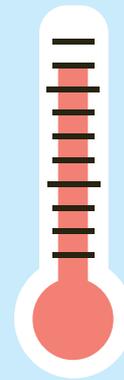
It is not just Oslo's target achievement that would be enhanced by a stronger national climate policy; if Oslo achieves its climate targets, this will make a significant contribution to Norway's climate commitment as a whole.

Climate targets for Oslo



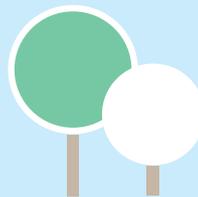
Direct emissions

Oslo's greenhouse gas emissions in 2030 will be reduced by 95 per cent compared with 2009, and by 52 per cent by 2023



Climate resilience

Oslo's capacity to withstand climate change will be strengthened towards 2030, and the city will be developed so that it is prepared for the changes projected by 2100



Forests and land use

Oslo's natural environment will be managed in such a way that natural carbon storage in vegetation and soil are protected and the greenhouse gas removal in forests and other vegetation increase by 2030



Energy

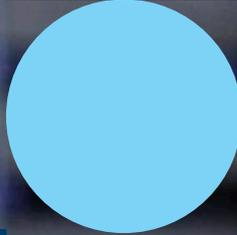
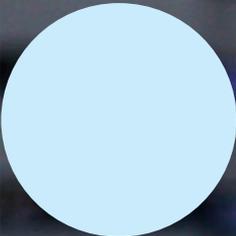
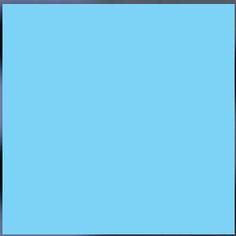
Oslo's total energy consumption in 2030 will be reduced by 10 per cent compared with 2009

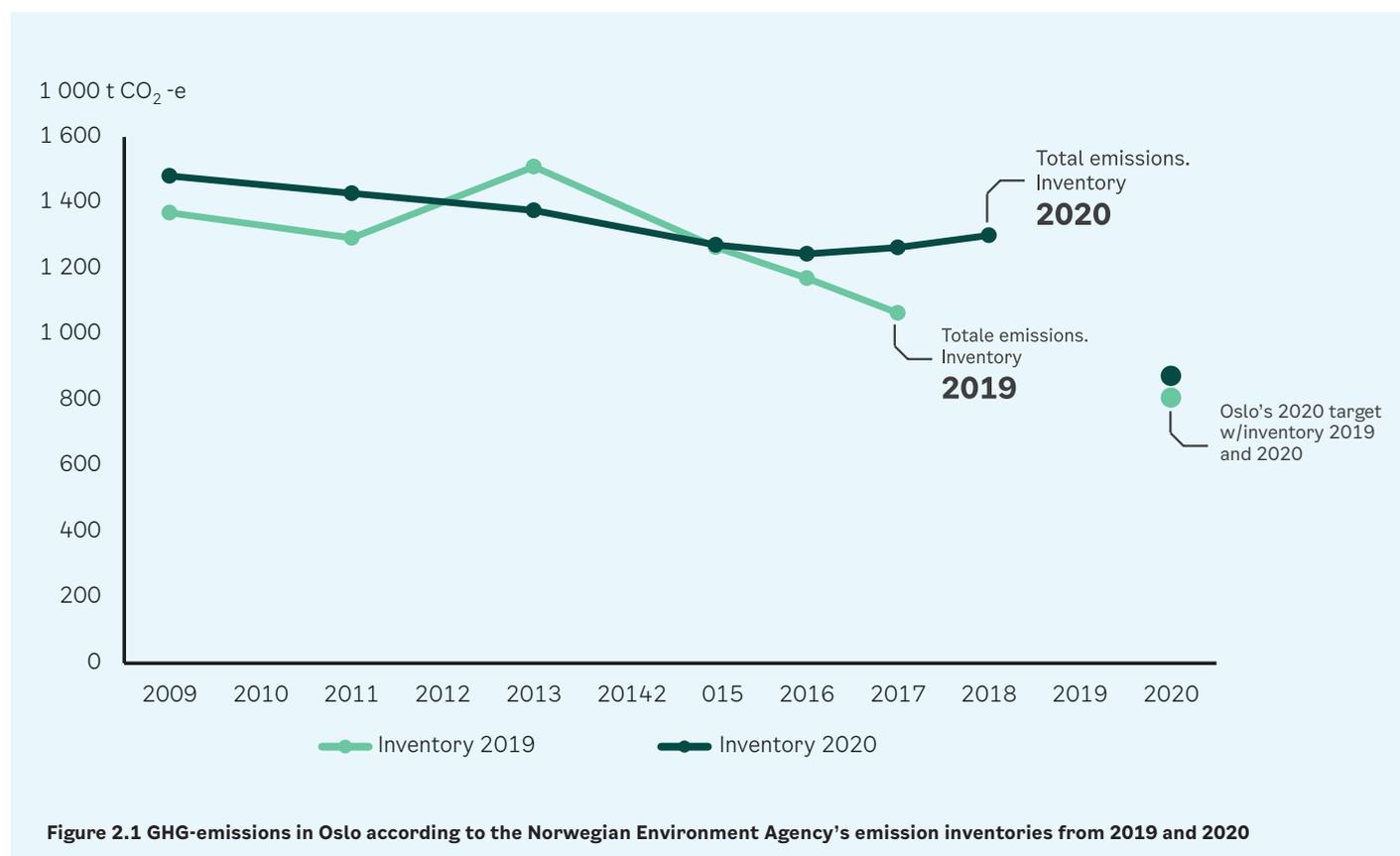


Indirect emissions

Oslo's contribution to greenhouse gas emissions generated outside the municipality will be substantially lower in 2030 than in 2020

Figure 2.0 The City of Oslo's climate targets





2.4 Status of GHG emissions in Oslo

The Norwegian Environment Agency publishes an updated inventory of the municipalities' GHG-emissions each year, and this forms the starting point for Oslo's Climate budget. An emission inventory covering the period 2009–2018¹ at municipal level was published in April 2020. The emissions calculations are based on a new methodological approach for several sectors, especially heating in buildings, diesel-driven motorised equipment (including construction machinery), and industry, oil and gas. In addition, emissions from landfill sites have temporarily been removed from the emission inventory. The changes in methodology have led to an upwards adjustment in the total emissions level for Oslo for every year except 2013, compared with the previous figures. The changes have been implemented for the entire time series, so that year-on-year comparisons are still possible.

The new time series shows that Oslo's total GHG-emissions have been reduced by 12% from 2009 to 2018. The Norwegian Environment Agency's new emission inventory thus shows a significantly smaller reduction than had been presented previously and was used as the basis for the Climate budget 2020; the previous data had shown a 22% reduction in emissions from 2009 to 2017. Where the previous emission inventory showed a downward curve pointing almost directly towards Oslo's 2020 target, the new inventory shows an opposite trend – away from this target (see Figure 2.1 above).

In particular, emissions from the building and construction sector (other mobile combustion) are now estimated to be significantly higher since 2015 than the previous emission inventories have shown. Where the previous emission inventory showed a marked reduction in these emissions from 2013 to 2017, the new emission inventory shows an increase after 2016 (Figure 2.2 below). Around one in five building sites in Oslo are municipal, while the rest are state owned or private sector.

¹ An error in emissions data from road transport (2017) and the emissions factor for wood burning (heating) were corrected in the Norwegian Environment Agency's publication of 29 May 2020, and updated figures for waterborne navigation (2009–2013) were published on 3 July 2020.



Figure 2.2 GHG-emissions from the emissions sector “Other mobile combustion”, according to the Norwegian Environment Agency’s emission inventories from 2019 and 2020

Total GHG-emissions in Oslo in 2018 were around 1.3 million tonnes CO₂e. In the last year covered by the figures, from 2017 to 2018, emissions increased by almost 3%, equivalent to 37,000 tonnes CO₂e. Emissions from other mobile combustion (mainly use of duty-free diesel in construction machinery) increased by 19% from 2017 to 2018. There are significant uncertainties in the Norwegian Environment Agency’s emission inventories, particularly concerning the emissions sector “other mobile combustion”. In 2018, the City of Oslo was well under way with setting requirements for fossil-free building and construction sites in its own projects, but this reduction in emissions will probably not be captured in the emission inventory at present. The Climate Agency is working with the Norwegian Environment Agency to see whether the City of Oslo can help to improve the emission inventory.

Emissions from road transport increased by 2% from 2017 to 2018. This can be attributed to stricter national environmental requirements on biofuel (mainly on the use of palm oil) causing a temporary increase in the use of fossil fuels; the increase was expected. A reduction in traffic, renewal of the vehicle fleet and a higher share of passenger cars that are electric are moderating the increase in emissions from road transport. Overall, road transport had been reduced by just over 4% from 2015 until the new toll stations were introduced in 2019. Since the introduction of toll stations with many new vehicle registration points, old and new traffic figures are no longer directly comparable.

From 2017 to 2018, there was also a small increase in emissions from other sectors, for example waste incineration and energy supply (2%), waterborne navigation (3%), and industry, oil and gas (5%).

Emissions from heating of buildings were reduced by 22% from 2017 to 2018, probably as a result of many people preparing for the ban announced on oil-fired heating, which came into effect on 1 January 2020. The subsidies the City of Oslo has provided for phasing out oil-fired heating have probably also affected emissions, together with the availability of district heating in large parts of the municipality.

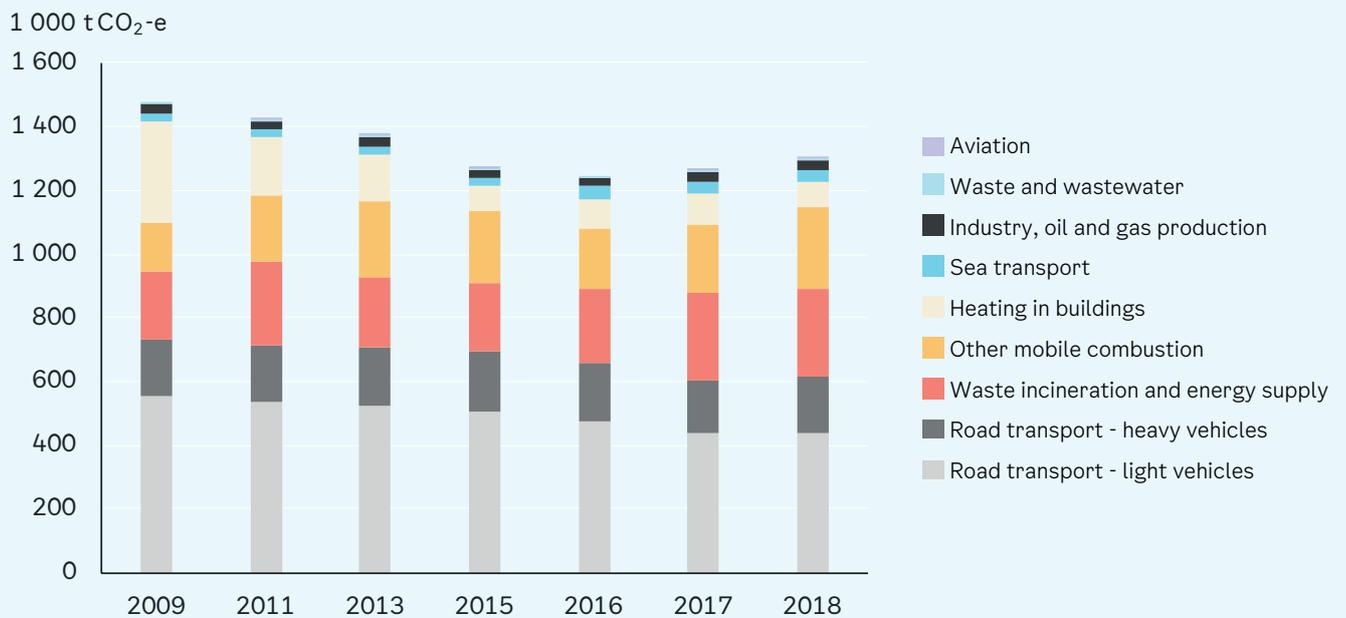
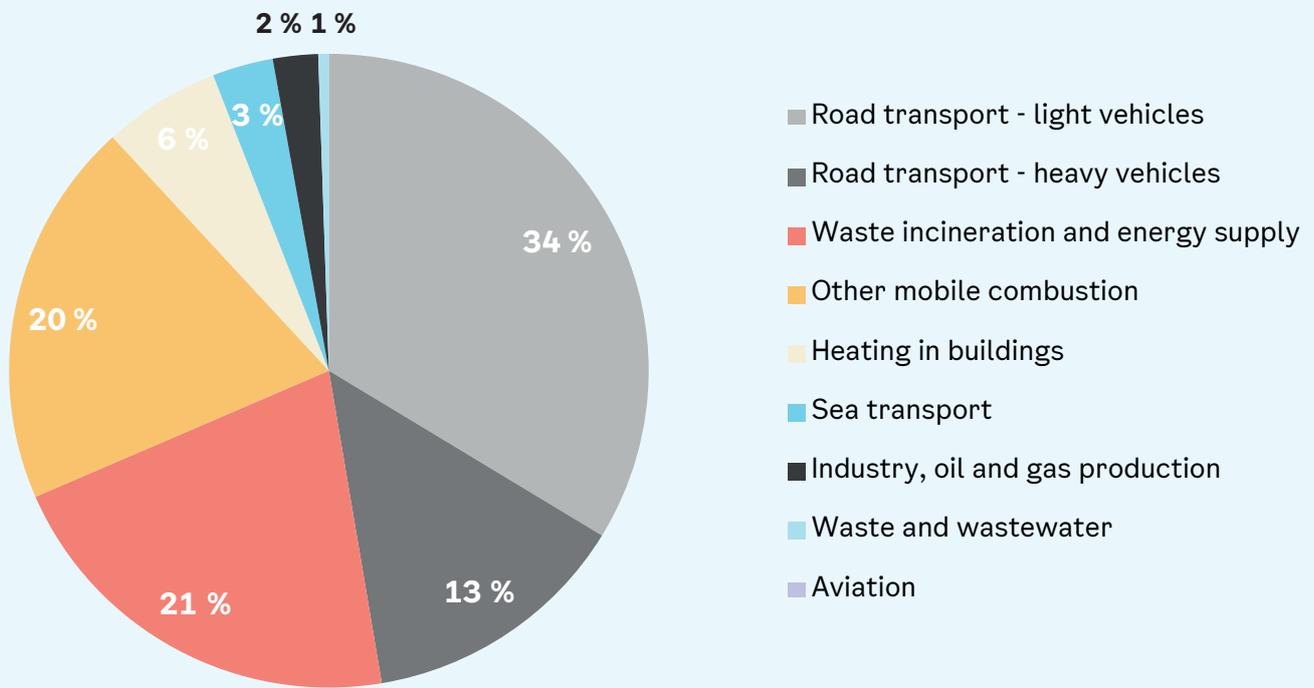


Figure 2.3, Top: GHG-emissions in 2018 by emissions sector

Figure 2.4, Bottom: GHG-emissions in Oslo, 2009–2018. Source: The Norwegian Environment Agency

2.5 Calculating the effect of measures in the Climate budget

The Climate Agency has calculated the effect of measures in the Climate budget (Table 2.2a). The starting point for these calculations is a projection of Oslo's emissions in the period towards 2030 made by CICERO Center for International Climate Research. The basic projection (subsequently called "the projection") is based on continuation of the climate measures and instruments in place in May 2018. It also relies on current data on underlying factors such as population growth, technological development and general economic conditions.²

The projection incorporates the emission-reducing effect of the following national, regional and municipal instruments adopted as of May 2018:

- Revised Oslo Package 3 for 2017–2036 dated 5 June 2016 and the supplementary agreement dated 13 June 2017
- National ban on oil-fired heating of buildings from 1 January 2020
- National requirement for sale of biofuel for road transport in 2020 (the proportion of biofuel is constant at the 2020 level in the period 2020–2030)
- Expansion of charging infrastructure for electric cars, and continuation of national instruments for the transition to zero-emissions vehicles

The analyses underlying this budget proposal show that the estimated measures (national, regional and municipal) in the Climate budget will reduce GHG-emissions by 27% in 2021 and 31% in 2024 compared with the 2009 level (green broken line in the figure below). Thus, there is a discrepancy of 18 percentage points (pp) in 2021 between the quantified effects of measures and the emissions limit (distance between the green and yellow broken lines). The shortfall from the target and emissions limit has been calculated at 22 pp in 2023 and 40 pp in 2024. Note that the reason for the large shortfall in 2024 is that the effect of carbon capture at Klemetsrud has not been included (see more on this below).

It is likely that the effect of measures in the Climate budget will be greater than the green line shows, as there are several measures for which the effects have not been calculated.

The information above shows that the City Council's 2023 targets will be extremely challenging to achieve, and that the use of instruments must be significantly sharpened and reinforced through the economic plan period in order to achieve an emissions trend that is on course for the 2030 targets.

Further new measures will be required, both from municipal and national authorities and from the private sector. There are three particular instruments that can significantly reduce the shortfall: phasing in carbon capture and storage at Klemetsrud, requiring all developers to carry out fossil-free and zero-emissions building and construction, and a charging system for Oslo's toll roads that helps to reduce traffic and promotes faster phasing in of a climate-friendly vehicle fleet. Zero-emissions zones may also become an important instrument in the long term, if the zone is large and covers most types of vehicle. The City Government will work purposefully to bring this about in the economic plan period.

The City Government proposes the following resolution:

Efforts shall be made to reduce emissions in 2021 by 45% compared with the 2009 level. Efforts shall be made to reduce emissions by 71% by the end of the economic plan period (2024), provided the Storting votes to introduce carbon capture at the Klemetsrud plant and full-year operation of the facility is achieved in 2024. Based on the most recent emission inventory at 3 July 2020, this corresponds to maximum emissions of 814,800 tonnes CO₂e in 2021 and 429,600 tonnes CO₂e in 2024.

The City Council supports the measures in Tables 2.2a and 2.2b in chapter 2, the Climate budget, in Proposition 1. As part of i presented in Tables 2.2a and 2.2b in chapter 2, the Climate budget, in Proposition 1, and the indicators for GHG-emissions in Oslo, "The Climate Barometer".

² Several different projections of emissions can be made using different assumptions. The basic projection for Oslo depends on current policies being continued. The projection used here has been developed using the same methodology as the national emissions projections (the baseline in the National budget). Projections can also be made that presuppose implementation of specific extra measures, which thus depend on new political resolutions. Table 2.1 shows this for Oslo as "Projection and effect of measures".

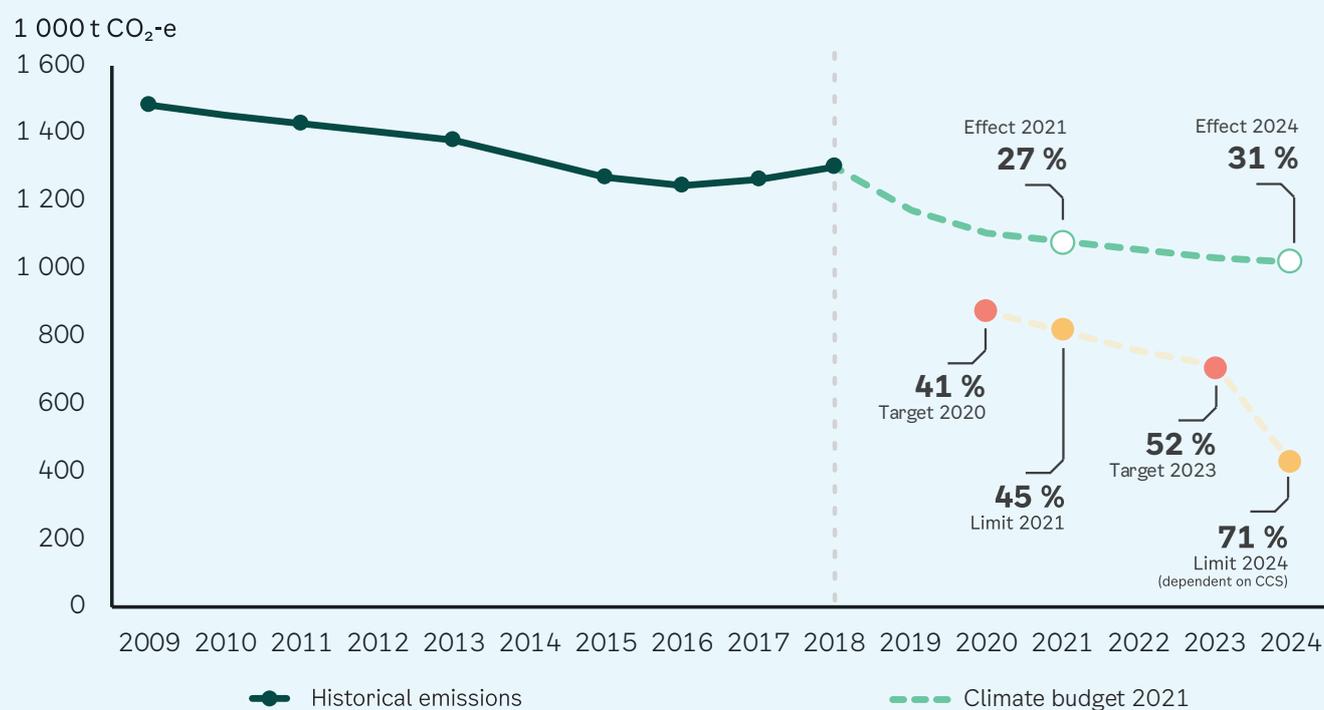


Figure 2.5 GHG-emissions leading up to 2024 given the measures in the Climate budget

Table 2.1 Limits for GHG-emissions in the City of Oslo in 2021 and 2024

	2009 (reference year)	2018 (statistics)	2021	2024
Historical emissions¹	100%	-12%	-	-
Level of emissions	1,481,400	1,301,400	-	-
Projection and effect of measures in Climate budget 2021	-	-	-27%	-31%
Emissions level	-	-	1,074,900	1,018,400
Additional need for emissions reductions²	-	-	18 pp	40 pp
	-	-	260,100	588,800
Emissions limit³	-	-	-45%	-72%
Emissions level	-	-	814,800	429,600

1) All percentage figures are relative to 2009, which is the reference year. All absolute figures are stated as tonnes CO₂e. The figures have been based on the most recent emission inventory available from the Norwegian Environment Agency, published 3 July 2020. These figures may change over time as a result of developments in methodology and data access for the Agency.

2) Measures in Table 2.2b and activities in Table 2.3 are expected to generate emissions reductions that have not been quantified. These measures and activities will therefore slightly reduce the need for emissions reductions compared with what is shown in the table.

3) The emissions limits are not standalone targets, but examples of an emissions trajectory towards the targets for 2023 and 2030. The target years are 2020, 2023 and 2030. The emissions trajectory towards 2030 may deviate from the emissions limits as a result of technological developments and dissemination, price developments and other factors, but the targets for 2020, 2023 and 2030 remain unchanged.

2.6 Status of climate work in Oslo

The road toll payment system contributes to reduced car traffic and to electrification

The road toll payment system is one of the most important instruments for reducing GHG-emissions in Oslo. The new registration points introduced in 2019 will help to reduce car traffic, speed up electrification of the vehicle fleet, increase capacity and reduce delays in public transport, improve the urban environment and level out the road toll burden as a result of more people paying. Changes in the road toll payment system have been introduced in several phases, and the next stage, Phase 3, should have been implemented in June 2020. This has been postponed and will now be implemented no later than 1 January 2021. Phase 3 sees an exemption for light electric vans and a higher charge for electric passenger cars. The City of Oslo is working for – and expects to have – a reduced toll charge for biogas-driven vehicles in the course of 2021. The actual toll charge has not been decided, and the final decision rests with the Storting. The road toll payment system finances road building and the development and operation of public transport. In Oslo, 99% of the revenue is used to improve public transport and facilitate cycling. The total revenues from the road toll payment system are lower than was assumed in the Oslo Package 3 agreement of 2016. One of the reasons for this is the “hour rule”, which means that AutoPASS users pay only one toll per hour in the Inner ring and Oslo ring area, and one toll per hour within the city limits. Another reason is that the growth in the number of vehicles that are exempt or pay a reduced toll is not fully compensated by higher tolls for other vehicle groups.

More people used public transport in 2019

Transport statistics for Oslo from the public transport operator Ruter show that the number of journeys by public transport increased by 2.8% in 2019. The public transport offer was strengthened in 2019. The discount scheme for child tickets was expanded by raising the age limit for free public transport from four to six years and the age limit for child tickets from 16 to 18 years.

Effective 2021, all fuel used in Ruter’s buses will be fossil free. In 2019, Ruter had 115 battery electric buses in operation, 109 of which were phased in during 2019. Of these, 76 operate in Oslo and 39 in the Romerike district, north-east of Oslo.

Electrification of Ruter’s ferry services also started in 2019. The Oslo–Nesodden route was first, and is now fully electric. The island ferries will be electric from November 2021.

To promote public transport in new target groups, the City Government is now trialling elderly-friendly transport using so-called “pink buses” in the districts of Nordre Aker, Vestre Aker, Ullern and Sagene. Transport to leisure activities is being trialled in collaboration with organisations such as Vålerenga football club.

As Oslo is to have 87 new trams from 2021, work is also under way to upgrade streets and rails. The new trams will significantly increase capacity. Testing of self-driving vehicles started in May 2019 along Akershusstranda between Vippetangen and Rådhusplassen. Trials are now under way in Kongens gate and on Ormøya/Malmøya.

Public transport, which is the backbone of Oslo’s transport system, is experiencing severe challenges in connection with the coronavirus pandemic. The national infection control guidelines for public transport entail significantly reduced capacity, and thus a large decline in the number of passengers in 2020.

Zero-emissions goods and utility transport

More parking spaces have been reserved for zero-emissions vans within Ring 1. Two pilot areas with loading and unloading bays reserved for zero-emissions vans were also established in 2019. Zero-emissions vans can park free of charge in resident-only parking zones. Enova’s subsidy scheme for electric vans has also helped to increase sales of these vehicles. Sales statistics show that Oslo is far ahead of the rest of Norway when it comes to the share of electric vans. Various actors are working to reduce goods transport and make it more efficient, including by means of freight consolidation centres. At present, there are two such centres in operation in Oslo city centre, from both of which goods are transported on to recipients using zero-emissions vehicles.

Zero-emissions taxis

In May 2020, there were 88 zero-emissions taxis in Oslo out of a total fleet of 1780. The City Council passed a regulation on zero-emissions taxis in 2018. The regulation cannot enter into force earlier than four years after the joint licensing district with Akershus is abolished, which will happen when the new national regulations for taxis enter into force, scheduled for 1 November 2020. This means that taxi owners will then have the period until November 2024 to switch to zero-emissions taxis. According to the schedule, 2020 will see Oslo's first taxi stands reserved for zero-emissions taxis. Olav V street will have the world's first wireless fast-charging stations for electric taxis. More taxi stands with charging facilities are planned, so that Oslo is ready for a zero-emissions taxi industry in 2024.

Parking

Several thousand parking spaces have been removed in Oslo in recent years to provide better space for urban life, bicycles and public transport. Resident-only parking provides residents with more predictable parking where they live and reduces the number of people parking in residential areas to travel into the city. At the end of 2019, five of the city's districts had introduced district-wide resident-only parking and six had introduced the scheme in some areas. In this budget, the City Government proposes enhanced instruments in the parking area to reduce GHG-emissions (described in chapter 6 of the budget).

Oslo's cycling initiative is producing results

The cycle counters are showing an upward trend: In the period March to May 2020, there were 17% more bikes passing the counters compared with the same period in 2019. Good care and maintenance of the cycling paths and mild weather contributed to a 43% increase in bikes passing the counters in the period December 2019 to February 2020 compared with the previous year.

According to a survey conducted by Opinion in the spring of 2020, 43% of respondents consider Oslo to be a good city to cycle in, compared with only 16% in 2014. The same survey also shows that 28% of respondents consider Oslo to be a safe city to cycle in.

Oslo's cycling infrastructure has undergone extensive development in recent years, with 14 kilometres of new cycling paths added in 2019. It may be difficult to maintain this pace of expansion in 2020, partly due to reduced work capacity as a result of infection control measures to stop the spread of coronavirus. At the same time, it is important to expand and increase the capacity of the network of cycling paths, because cycling reduces the pressure on public transport and helps to keep the infection risk down.

Cleaner vehicle fleet and machinery in municipal entities

At the end of Q1 2020, 69% of the City of Oslo's light vehicles (municipal vehicles) were zero emissions, up 7 percentage points on the same period in 2019. If we add in the share of vehicles using sustainable biodiesel, 77% of the light vehicle fleet is zero emissions/fossil free, based on reporting for 2019.

At the end of Q1 2020, 33% of the City of Oslo's heavy vehicles were electric or ran on hydrogen or biogas, up 4 percentage points on the same period in 2019. If we add in the share of vehicles using sustainable biodiesel (HVO), the figure is 57%, based on reporting for 2019.

Carbon capture at Klemetsrud

Fortum Oslo Varme AS's waste-to-energy plant at Klemetsrud is one of two industrial facilities in Norway carrying out preprojecting for CO₂ capture. Preliminary results show stable CO₂ capture, with the potential to capture 90% of CO₂ emissions from the effluent gas at the plant. A carbon capture facility at Klemetsrud could provide emissions reductions of approximately 200,000 tonnes CO₂e in 2024. When the carbon capture facility can go into operation depends on the timing of investment decisions at central-government level. The government has indicated that it aims to take a decision in 2020. A positive investment decision in 2020 will make it possible to start a carbon capture facility at Klemetsrud in the timeframe 2023/24. The government has indicated that it is encouraging the two capture facilities in question to apply for EU funding in parallel. A requirement for EU funding could delay establishment of a carbon capture facility.

Climate and environmental requirements are reducing emissions

The City of Oslo's municipal building and construction projects are largely fossil free. Over the next few years, Oslo will step up efforts by moving from fossil-fuel to zero-emissions/biogas-driven building and construction sites and requiring fossil-free transport of bulk materials to and from building sites.

This will follow up on new standard climate and environmental requirements at municipal building and construction sites. The City Government will also continue working on this issue in collaboration with other cities.

A sum of NOK 40 million was allocated to the "Subsidy scheme for innovative procurements of fossil-free heavy vehicles, machinery, and building and construction work in municipal entities" in 2020. These entities can use the money both to purchase their own zero-emissions machinery and to cover the additional costs of zero-emissions solutions when the City of Oslo contracts private companies.

The City of Oslo also requires zero emissions or use of sustainable biofuel when purchasing transport services, and goods and services that involve transport. When the municipality purchases locksmith services, for example, the services must be provided using zero-emissions transport. Another example is requiring good environmental solutions in tenders for school transport. This has led to Scandinavia's first three fully electric tour coaches being deployed in Oslo.

As part of its work to revise the "high-rise strategy", the City Government shall consider the possibility of setting climate requirements for new high-rise buildings in the City of Oslo.

Climate criteria in planning matters

In August 2019, the Agency for Planning and Building Services introduced a set of climate criteria for assessing climate consequences in planning matters. The aim is to contribute to development projects having as low GHG-emissions as possible, being resilient to climate change and not increasing climate vulnerability in the area. The Agency is also in the process of incorporating the criteria for area plans.

Climate transformation at the Port of Oslo

The Port of Oslo is working to establish shore power at Vippetangen and in Sydhavna port. All international ferries in Oslo have been using shore power since Q1 2020. Shore power facilities are planned for container ships, tankers, bulk carriers, vehicle carriers etc. calling at Sydhavna port. These systems make it possible to supply the power required by these ships when docked.

Since the autumn of 2019, the Port of Oslo has been working on a concept report for electrification of Sydhavna showing which measures will be most effective and what they will cost. Among other things, the report shows that the port has good access to grid capacity and there is potential to carry out profitable electrification measures, beyond establishing shore power. The work must be seen in the context of the planned review of the port's climate action plan in 2021.

Working with the business community in the "Business for climate network"

The "Business for climate network" has more than 100 member companies, which have committed to helping Oslo achieve its climate targets. From 2020, the network is focusing in particular on developing measures for goods transport, building and construction, and waste. Through the year, the network has established digital meeting places where the member companies share experiences and good practice, and discuss opportunities for and barriers to emissions reductions within these sectors. The network shall serve as a platform for collaboration between the business community and the municipality as a whole.

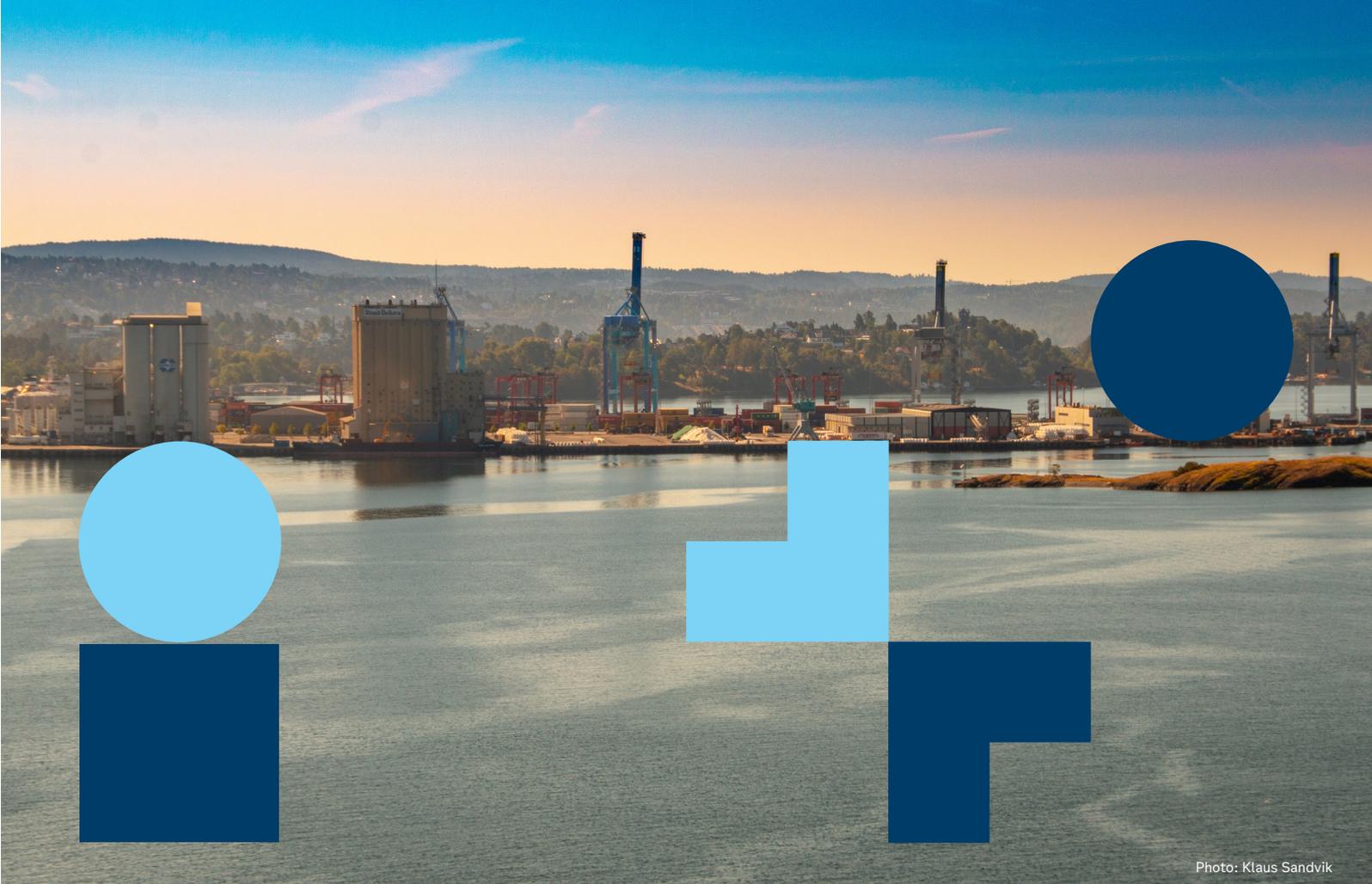


Photo: Klaus Sandvik

Climate survey continues to show broad support for Oslo's climate work

The 2020 climate survey shows there is broad support in the population for the city's climate strategy and targets. 77% of Oslo's residents support the principal target of a 95% reduction in direct GHG-emissions by 2030, on a par with previous years. 64% feel that the work to achieve the climate targets is making the city a better place to live.

Changes in national framework conditions affect Oslo

From 1 July 2020, road tax will be payable on all liquid biofuel. From this date, road tax covers petrol, mineral oil, natural gas, LPG, bioethanol and biodiesel; the rates vary. The national government is simultaneously increasing the national biofuel sales requirement. It is assumed that sales of biofuel nationally will remain at the same level despite the higher tax. However, the introduction of road tax could mean significantly higher costs for transport operators using 100% biofuel, such as Ruter and Asko. The road tax on biofuel could cause the national biofuel sales requirement to act as a ceiling on biofuel sales in Norway, thus preventing additional biofuel sales above the national requirement. A further strengthening of the sales regulation has been proposed from 1 January 2021.

Oslo's climate solutions are making a contribution internationally

Rapid and ambitious climate transformation in cities is decisive if the world is to achieve the targets set in the Paris Agreement. Through international cooperation at city level, Oslo is helping to create bigger markets for new climate solutions, and push for better national and international framework conditions for implementing climate measures. Oslo's experiences and results are in demand internationally, particularly its work on climate budgets, and low-emissions transport, building and construction. Within the C40 climate network, Oslo spearheaded the zero-emissions building and construction initiative, work that will be continued by opening a dedicated C40 office in Oslo. Climate leadership and climate budgets will be another priority area for the C40 office. Oslo is also active in the Eurocities Environment Forum, which coordinates European cities' efforts to implement the EU's Green Deal. The Climate Agency and the Department of Urban Environment contribute to the work in these and other international fora.

2.7 Measures in the climate budget 2021–2024

The Climate Agency has assessed the emissions reductions effects that may result from the measures in the Climate budget. The appendix sets out the methodology used and assumptions made in calculating the effect of the measures. All measures and activities have been allocated to Table 2.2a, 2.2b or 2.3, based on categorisation and whether they are quantifiable. Brief descriptions of the measures are provided below Tables 2.2a and 2.2b.

Measures with quantified emissions reduction

Table 2.2a shows the measures where it has been possible to estimate a quantified emissions reduction. There are several important measures in the Climate budget where the effect has already been included in the projection; cf. the discussion in chapter 4. For the other measures, the table shows the expected GHG emissions reduction that may result from the measure in 2021 and 2024 respectively, compared with the projection for the same years. The effect has been rounded to the nearest 100 tonnes CO₂e. “Emissions sector and source” in the table refers to the classification used in the Norwegian Environment Agency’s emission inventory.

Table 2.2a – Measures with quantified emissions reduction

Emissions sector and source	No.	Measures and instruments	Responsibility ²	Effect 2021 (t CO ₂ e)	Effect 2024 (t CO ₂ e)
Heating					
Fossil fuel heating	1	Phasing out of oil-fired heating in buildings - Governmental ban from 1 January 2020 - Phasing out of oil-fired heating in municipal buildings	BYM*	<i>Included in projection</i>	
Waste incineration and energy supply					
District heating excluding waste incineration	2	Phasing out of fossil oil and gas in district heating (peak load) in 2020 - Objective Fortum Oslo Varme AS	NOE*	2,700	2,500
Road transport					
Light and heavy vehicles	3	National requirement for sale of 20% biofuel		<i>Included in projection</i>	
	4	Introduction of new road toll payment system - Establish sufficient charging infrastructure for passenger cars - Continuation of local and regional instruments to promote zero-emissions cars - Exemption from road toll payment for electric vans	BYM* MOS MOS	<i>Included in projection</i>	
	5	Zero emissions/sustainable biofuel in municipal vehicles	All*, UKE*	1,700	1,700
Private cars	6	Better facilities for cycling - Follow up the cycling strategy	MOS, BYM*	1,700	2,700
	7	Legislation for taxis: zero emissions by 2025 - Contribute to establishing sufficient charging infrastructure for taxis - Subsidy scheme for charging infrastructure for taxis - Reserve some taxi stands for zero-emissions taxis	BYM* KLI* BYM*	1,000	12,700

Vans	8	Zero-emissions goods and utility transport - Parking spaces reserved for zero-emissions vans - Loading and unloading bays reserved for zero-emissions vans - Contribute to freight consolidation - Procurement requirements in the City of Oslo - Municipal subsidy scheme for charging infrastructure for electric vans - National subsidy schemes for electric vans - Provide information on exemption from parking fee for zero-emissions vans in resident-only parking zones	BYM* BYM* BYM* UKE KLI* BYM*	3,000	11,300
Busses	9	Fossil-free public transport – buses	Ruter*, MOS	14,700	14,700
Heavy vehicles	10	Zero emissions/sustainable biofuel in transport of bulk material and waste from building and construction sites - Procurement requirements in the City of Oslo - Dialogue with developers on measures for climate-friendly transport and handling of bulk material in planning matters - Municipal cooperation to reduce emissions from transport of bulk material - Pilot projects in Hovinbyen	All*, UKE PBE* KLI*, PBE, EBY etc. KLI*, PBE, EBY etc.	1,000	2,000
	11	Pilot city for zero-emissions heavy transport - Study to analyse zero-emissions heavy transport options - Facilitate investments in biogas, hydrogen and fast charging by means of declarations of intent, allocating areas for energy stations and financing solutions - Zero-emissions route - Provide areas for municipal climate measures (energy stations, bulk material handling and freight consolidation centre)	KLI*	-	500
Other mobile combustion					
Diesel-driven motorised equipment	12	Zero emissions/sustainable biofuel in municipal machinery	All*, UKE*	1,6000	1,6000
Waterborne navigation					
	13	Fossil-free public transport – ferries	Ruter*, MOS	6,200	6,700
	14	Establishment of shore power - Shore power, international ferries - Shore power, Sydhavna port	HAV*, NOE	3,000	3,900
Total effect of measures in the Climate budget¹				36,600	60,300
Historical emissions reduction and emissions reduction in the projection ¹				369,900	402,700
Total effect of historical emissions reduction, emissions reduction in the projection and measures in Climate budget 2021¹				406,500	463,000

1) The effect of the projection is assessed in relation to the 2009 emissions level. The effects of measures have been calculated using the projection in the same year. This means that the overall effect of the measures cannot be assessed by totalising columns 2021 and 2024, as they state the effect in the year in question compared with 2009. The effects have been calculated based on assumptions of when the measures will be implemented.

2) Asterisk indicates reporting responsibility



Photo: Pål Huse Ski

Description of measures in Table 2.2a

- 1. Phasing out of oil-fired heating in buildings.** The use of heating oil and paraffin to heat buildings was banned as of 1 January 2020. The Department of Urban Environment follows up compliance with the ban in private and commercial buildings, and has the authority to grant dispensations. The Department of Urban Environment follows the intentions behind the regulation and the associated guidance, and is restrictive in granting dispensations from the ban.
- 2. Phasing out of fossil oil and gas in district heating (peak load) in 2020.** Fortum Oslo Varme AS has phased out use of fossil heating oil at peak load in the production of district heating, and has set the goal of phasing out its remaining use of LNG in normal operating conditions. The company is working actively to find satisfactory alternatives such as electricity, various bio-oils, pellets and liquid biogas. The average share of LNG over the last three years has been 1.7%.
- 3. National requirement for sale of 20% biofuel in 2020.** The Norwegian Product Regulations set requirements for biofuel blends in petrol and diesel sold for road transport in Norway (Requirement for sale of biofuel for road transport). A change to the national biofuel sales requirement was adopted from 1 July 2020 in line with the change in road tax for biofuel that came into force at the same time. From 1 July, biofuel is required to make up 22.3% of liquid fuel sold for road transport (advanced biofuels that offer a high climate benefit count double in the sales requirement, so the new requirement is expected to be equivalent to at least 16% by volume). The government has notified a further increase in the sales requirement in 2021; this will be announced in the central government budget. In 2017, 2018 and 2019, sales of biofuel were 16%, 12% and 16% respectively by volume.
- 4. Introduction of new road toll payment system.** Phase 3 of the road toll payment system will be implemented no later than 1 January 2021. This will see an exemption for light electric vans and a 50% discount for electric passenger cars. The City of Oslo is working for – and expects to have – a reduced toll charge for biogas-driven vehicles in the course of 2021. The actual toll charge has not been decided, and the final decision rests with the Storting. The toll charges must be further increased, with clear differentiation between fossil fuel and electric vehicles, in order to achieve additional emissions reductions.
- 5. Zero emissions/sustainable biofuel in municipal vehicles.** By the end of 2020, all vehicles in the City of Oslo's municipal fleet (passenger cars, vans and heavy vehicles) shall be zero emissions or run on sustainable biofuel. For vehicles where zero emissions are not feasible, sustainable biofuel (preferably biogas) shall be used. As of Q1 2020, 69% of light vehicles and 33% of heavy vehicles were zero emissions or running on biogas. In addition, municipal entities largely use biodiesel/HVO for the remaining vehicles.

- 6. Better facilities for cyclists.** One of the most important instruments for making Oslo a cycling city for all is a cohesive network of cycling paths. In addition to new builds and upgrades, the municipality shall prioritise communication and campaigns, care and maintenance, as well as research and development in the field.
- 7. Fossil-free taxis by 2025.** This measure is based on the new regulations for taxis in Oslo, which require the taxi industry to use zero-emissions vehicles (City Council Proposition 386/18). The City of Oslo will facilitate this transition by establishing ordinary charging infrastructure, various pilots for fast charging, prioritised and dedicated charging infrastructure for zero-emissions taxis at taxi stands, and subsidies via the Climate and Energy Fund to enable taxi drivers to charge their taxis at home. At the same time, the Storting has voted to deregulate taxis from 2020 (new national regulations on professional transport). There is some uncertainty as to the effect deregulation will have on the volume of taxi transport and hence emissions. Akershus county municipality and the City of Oslo currently operate a joint licensing district, which will cease when the new national regulations come into force on 1 November 2020. The environmental requirement cannot enter into force earlier than four years after the joint licensing district with Akershus has been abolished, i.e. 1 November 2024. New instruments to speed up the phasing in of zero-emissions taxis will be considered in 2021. Measures under consideration include prioritising or reserving spaces for zero-emissions taxis at taxi stands.
- 8. Zero-emissions goods and utility transport** The Department of Urban Environment is continuing efforts to establish charging points and consolidation centres for electric lorries and vans. Consolidation centres are terminals where logistics operators transfer goods to smaller vehicles suitable for urban distribution. In 2021, a further 25 commercial parking spaces will be reserved for electric goods and utility vehicles. This will mean 84 out of 123 commercial parking spaces within Ring 1 will be reserved for zero-emissions goods and utility vehicles. The transition to zero-emissions goods transport involves gradually introducing restrictions whereby loading and unloading bays can only be used by zero-emissions goods vehicles and encouraging freight consolidation. Zero-emissions vans can park free of charge in resident-only parking zones. The national government has earmarked NOK 500 million in 2020 to support the transition to zero-emissions commercial transport through the Enova subsidy scheme, and it is expected that all purchases of electric vans will take advantage of this support, exemption from tolls for zero-emissions vans, subsidy schemes from the Climate and Energy Fund, and procurement requirements for zero-emissions transport in the municipality.
- 9. Fossil-free public transport by 2020 – buses.** The public transport operator Ruter's buses shall be fossil free by the end of 2020. In 2021, Ruter will continue to require 100% renewable energy sources in new contracts and gradually phase in electric buses. Ruter also aims to achieve zero-emissions operations by the end of 2028. As Oslo Metro trains and trams are already electric, replacement of buses is material to the measure's effectiveness.
- 10. Zero emissions/sustainable biofuel in transport of bulk materials and waste.** From 2020, the City of Oslo requires fossil-free transport of bulk materials to and from building sites in its own projects. The share of projects with fossil-free transport of bulk materials where the City of Oslo is the buyer is thus expected to increase from virtually zero to 100% over the economic plan period.

The City Government will also work to bring about more climate-friendly handling of bulk materials. Among other things, this will involve criteria for assessing climate consequences in all planning and building matters. In all new planning matters where it is relevant, the Agency for Planning and Building Services asks proposers to account for:

- measures to reduce transport to and from the construction site, for example handling or reusing bulk materials locally, reusing materials from nearby properties, etc.
- whether there is a plan for local, climate-friendly handling of bulk materials
- whether the possibility of joint planning with nearby properties has been explored, for example whether anyone requires bulk materials while others need to dispose of them
- resource handling at the building site in order to limit waste volumes and utilise opportunities to sort, reuse and recycle waste locally

Several pilot projects involving collaborations between private- and public-sector actors are also under way in Hovinbyen to develop, test and demonstrate solutions within circular bulk materials handling. Among other things, a project was started in 2020 to collate and make accessible data on bulk material handling. Prioritisation of the collaborative projects in Hovinbyen will continue in 2021.

A municipal working group has been appointed to draw up a proposal for how the City Government can contribute further to reducing emissions from transport of bulk materials in 2021.

- 11. Pilot city for zero-emissions heavy transport.** The Climate Agency has included existing work on energy stations and zero-emissions routes in the new project “Pilot city for zero-emissions heavy transport”. The project has NOK 4.275 million in funding from the Norwegian Environment Agency’s Klimasats environmental subsidy scheme and, as well as continuing existing work, shall identify effective measures and instruments for the transition to zero-emissions heavy vehicles. Dialogue and cooperation with the transport sector and other relevant actors is an important part of this work. The Climate Agency has signed a contract with Gasum (formerly Linde) to establish an energy station offering biogas and fast charging in Ryen. Work will continue to establish more energy stations, declarations of intent for biogas and zero-emissions routes with fast-charging solutions.
- 12. Zero emissions/sustainable biofuel in municipal machinery.** All of the City of Oslo’s own construction machinery shall be converted to fossil-free fuel. The revised 2020 budget included a sum of NOK 40 million, partly to contribute to this change.
- 13. Fossil-free public transport – ferries .** The public transport operator Ruter’s ferries shall be fossil free by the end of 2020. The island ferries are to be electrified in 2021. The Nesodden ferries have already been converted to electric operation, while the others currently run on biofuel. The Oslo-Vollen-Slemmestad express boat route is neither fossil free nor zero emissions. Ruter is participating in Norway’s Green Shipping Programme and developing the expertise to know which zero-emissions solutions may be relevant when a new contract comes into place in 2024.
- 14. Establishment of shore power.** The Port of Oslo has established shore power at Vippetangen, and shore power systems are also planned for container ships, tankers, bulk carriers, vehicle carriers etc. calling at Sydhavna port. All the shore power measures analysed in the concept report for Sydhavna are profitable from a socioeconomic perspective, but not in a commercial sense. Full financing of shore power at Sydhavna needs to be clarified in more detail. All international ferries in Oslo have been using shore power since Q1 2020. The shore power systems provide the option of supplying the power required by these ships when docked, using zero-emissions solutions.

Non-quantified measures expected to provide emissions reductions

Table 2.2b shows measures that are assumed to have an emission-reducing effect but where the level of uncertainty is considered too high to quantify the effect. The uncertainty may, for example, be linked to the scope of the measure and the timing of the expected effect. “Emissions sector and source” in the table refers to the classification used in the Norwegian Environment Agency’s emission inventory.

Although the emissions reduction provided by the measures has not been quantified, this does not mean they necessarily have a lesser impact on GHG-emissions in Oslo than the quantified measures. For example, the requirements made of private- and public-sector developers regarding fossil-free building and construction have a significant effect, but the basis for calculating this needs to be further developed before it can be included in Table 2.2a.

Table 2.2b – Non-quantified measures expected to provide emissions reductions in 2021 and 2024

Emissions sector and source	No.	Measures and policy instruments	Responsibility ¹
Waste and wastewater			
Landfill gas	15	Extraction of landfill gas - Rommen landfill site – increased extraction of landfill gas - Grønmo – minimise downtime at the gas facility	EBY* EBY*
Waste incineration and energy supply			
Waste incineration	16	Increased materials recycling and reduced quantity of plastic waste for incineration - Information campaigns to increase household sorting of recyclable waste - Facilitate sorting of recyclable commercial waste with gradual roll-out to REG's business customers	REG*
Road transport			
Light and heavy vehicles	17	Increased investment in public transport - Increased capacity in public transport - Vigorous measures to reduce delays	MOS* BYM*
	18	Zero emissions/sustainable biofuel in transport when purchasing goods and services - Procurement requirements in the City of Oslo: common environmental criteria for vehicles and machinery used in transport	All*, UKE
Private cars	19	Climate-friendly travel to/from work - Support scheme and certification in the City of Oslo - Subsidy scheme targeting private individuals	All, KLI*
	20	Street and parking measures - Resident-only parking and higher charges - Re-prioritisation of street use	BYM*
Busses	21	Zero emissions/sustainable biofuel in buses other than those operated by Ruter - Charging infrastructure - Information campaigns - Collaboration with the industry on additional measures	KLI*
Other mobile combustion			
Diesel-driven motorised tools	22	Zero emissions/sustainable biofuel in machinery for building and construction under contract for private- and public-sector developers - Requirements for private- and public-sector developers via zoning plans - Subsidy scheme	PBE* KLI*
	23	Zero emissions/sustainable biofuel in machinery for building and construction under contract for the City of Oslo - Procurement requirements in the City of Oslo	All*, UKE
	24	Zero-emissions motorised equipment - National subsidy scheme for zero-emissions motorised equipment - Subsidy scheme: electric motorised equipment - Zero-emissions power at events	KLI* BYM*

1) Asterisk indicates reporting responsibility



Description of measures in Table 2.2b

- 15. Extraction of landfill gas.** The aim of this measure is to increase extraction of landfill gas (methane) from the landfill sites at Grønmo and Rommen. Both the Agency for Real Estate and Urban Renewal (EBY) and the Agency for Waste Management (REG) are responsible for implementing measures at Grønmo. REG is responsible for upgrading the gas-pumping station and energy recovery solution, while since summer 2019 EBY has been responsible for post-operation of the gas wells at the landfill site, which supply gas to REG's plant. Additional measures to improve extraction were considered in 2020, including a pilot project at Rommen and remedial work at the gas facility at Grønmo.
- 16. Increased materials recycling and reduced quantity of plastic waste for incineration.** REG is working to improve sorting of waste at Oslo's sorting plants and to raise awareness of the need for increased sorting of plastic packaging from households. Sorting of recyclable commercial waste with gradual roll-out to REG's business customers will also be facilitated.
- 17. Increased efforts in public transport.** The coronavirus situation has led to public transport facing completely new framework conditions in 2020. Oslo's public transport offer is continually being improved: New trams will go into service in the period 2021–2024, and a study of future needs for new Metro carriages is in progress. At the same time, the project entitled "Vigorous measures to improve negotiability" is continuing, working to improve negotiability for public transport. A number of major public transport measures are under way or in the planning stage: the Fornebu line, a new Metro tunnel through the city centre with a new station at Majorstua,

the tram programme, and a new signalling and interlocking system for the Oslo Metro. These measures help to make public transport more attractive than travelling by car. The measures are funded by road tolls, central-government contributions (urban environment/urban growth agreement), contributions from landowners, ticket revenues and subsidies from Oslo and Akershus. However, managing the coronavirus situation in the longer term requires increased capacity on public transport.

- 18. Zero emissions/sustainable biofuel for transport in connection with municipal procurement of goods and services.** Common procurement requirements shall help to ensure that all vehicles and machinery used for transport in connection with delivery of goods or services to the City of Oslo use climate-friendly fuel technologies. Procurement requirements also apply to operational contracts. The share of the suppliers' vehicles that is zero emissions (electricity/hydrogen) and/or runs on biofuel (preferably biogas) is important in the procurement process. Requirements for vehicles and fuel shall either be set as minimum requirements or used as criteria when awarding contracts.
- 19. Climate-friendly travel to/from work.** The subsidy scheme for climate-smart travel to/from work targeted at private-sector companies has been updated and expanded. More types of measures have been established. Companies can now receive support to convert parking spaces for other uses ("scrap deposit for parking space"), providing changing facilities at the workplace ("getting to work under your own steam"), secure bike parking, and smart and innovative solutions ("Oslo's smartest travel to/from work"). There is also a separate support scheme for climate-friendly travel to/from work targeted at municipal entities, called the "Green travel to/from work scheme". Municipal workplaces may apply for support for measures that promote climate-friendly travel to/from work, both physical and other measures. Moreover, the Climate Agency and the Norwegian Association of Cyclists (SLF) are continuing to roll out the "cycle-friendly workplace" certification scheme at municipal workplaces.
- 20. Street and parking measures.** Oslo prioritises improved accessibility for e.g. cyclists and public transport over parking for cars, and is reallocating street areas from parking to other purposes where necessary. The City Government proposes increasing charges for street parking in the yellow zone by 25%. The charge for non-residents to use resident-only parking zones will increase by 25% and the charge for residents' parking permits will increase by 50% in 2021.
- 21. Zero emissions/sustainable biofuel in buses other than those operated by Ruter.** The Department of Urban Environment, in collaboration with the Climate Agency, shall assess current measures to help reduce emissions from buses in Oslo not operated by Ruter, for example express buses, airport buses and tour coaches.
- 22. Zero emissions/sustainable biofuel in machinery for building and construction under contract for private- and public-sector developers.** The City Government has decided that the City of Oslo shall introduce requirements for fossil-free construction sites in new zoning plans, in dialogue with the pollution control authorities. See also the description in Chapter 2.1. The City of Oslo will continue to facilitate renewable energy supply for building and construction sites, for example by establishing a new subsidy scheme under the Climate and Energy Fund.
- 23. Zero emissions/sustainable biofuel in machinery for building and construction under contract for the City of Oslo.** Common procurement requirements shall help ensure that all machinery used on municipal building/construction sites in Oslo runs on fossil-free fuel from 2020. In the procurement process, suppliers will be rewarded for using machinery that is zero emissions or uses biogas technology.
- 24. Zero-emissions motorised equipment.** The Climate and Energy Fund provides subsidies to companies for the purchase of electric motorised equipment, irrespective of size. The scheme will complement Enova's nationwide scheme Energy and climate measures in land transport. The Department of Urban Environment has received support from the Klimasats environmental subsidy scheme to facilitate electric power at events in Oslo city centre, in order to avoid using generators.

Activities that lay the foundations for future emissions reductions

Table 2.3 shows activities that reinforce climate work in the City of Oslo and that may lay the foundations for further emissions reductions after 2021. These activities are included in the Climate budget to make visible the breadth of instruments being utilised to promote emissions reductions in Oslo, and to denote responsibility for the different activities. These activities have been categorised as follows: “communication and mobilisation”, “facilitating measures”, “studies for future measures” and “measures leading up to 2030”.

Table 2.3 – Activities that lay the foundations for further emissions reductions

No.	Activity	Responsibility ¹⁾
Communication and mobilisation		
A	Market the Climate and Energy Fund's subsidy schemes in Oslo, as well as central-government subsidy schemes (incl. Enova) - Contribute to increased knowledge of support and subsidy schemes, and faster implementation of climate measures. Priority shall be given to Outer Oslo.	KLI
B	Communication on climate solutions to change behaviour - Disseminate information on practical climate measures/solutions to people and businesses, encourage a change in behaviour and provide information on the City of Oslo's climate work - Further develop the KlimaOslo.no communications platform and communication in social media	KLI
C	“Business for climate network” - Continue and further develop cooperation on climate measures between businesses and public authorities in the City of Oslo	KLI
D	Climate communication targeting children and adolescents - The “Climate school” teaching portal for teachers and pupils in Oslo schools - Lecture tour of Oslo schools by “climate pilots”. - Cooperation with the “Climate House” at Oslo's Natural History Museum on communicating the role of cities in climate work	KLI
E	ByKuben – Oslo centre for urban ecology - Further develop offers for all those who want to learn about and participate in the work on urban ecology - Help the people of Oslo gain a sense of ownership of and recognise the opportunities on the way to a zero-emissions society - Guide Oslo's districts in developing and promoting local environmental and climate measures	PBE
Facilitating measures		
F	Measures to increase city life and improve the urban environment in Oslo city centre, Grønland and Tøyen	BYM

G	Better facilities for pedestrians - Finalise the pedestrian strategy - The shortcut project	BYM
H	Climate-friendly urban development with densification around transport hubs - Use of climate criteria to assess climate consequences in planning matters. - Climate evaluations in work on the new land-use element of the municipal master plan.	PBE, BYM, EBY
I	Reduced use of unnecessary plastic and single-use plastic articles in municipal entities and in the city, cf. Action plan to combat plastic pollution in the Oslofjord 2021–2024	BYM
J	Provide areas for the City of Oslo's climate measures (including energy stations) - Obtain an overview of the City of Oslo's area requirement for various climate measures, contribute to localisation and provide necessary areas of land on request. - This measure specifically targets areas for energy stations and related infrastructure, but may also be used in other contexts, such as areas for freight consolidation centres and handling bulk material.	MOS, EBY
K	Production of biogas for fuel - Production of liquid biogas from food waste at Romerike biogas plant - Production of compressed biogas from wastewater sludge at Bekkelaget purification plant - Production of liquid biogas from wastewater sludge at VEAS	REG
L	Facilitating smarter and more climate-friendly travel - Pilot project: Smarter transport in the Oslo region (safer, more efficient and more eco-friendly driving) - Establishing new priority system for public transport	BYM, Ruter
M	Facilitate more efficient and climate-friendly goods and utility transport - Pilot for electric system in Filipstad	BYM
N	Pilot project for electrification of an entire housing cooperative (EU – Green Charge)	BYM
Studies for future measures		
O	Assess possible scope and climate effect of zero-emissions zones	BYM, KLI
P	Study of zero-emissions waste system and 65% materials recycling in Oslo	REG, KLI, BYM
Measures leading up to 2030		
Q	Carbon capture at the Klemetsrud plant (Fortum Varme AS)	NOE
R	The Fornebu Line - Reduce transport of bulk material, more zero-emissions transport - Zero-emissions and fossil-free construction - Material optimisation – innovative low-carbon solutions - Reduction of plastic outside the plastic cycle	MOS, FOB
S	New city-centre tunnel for the Oslo Metro	MOS
T	The tram programme	MOS
U	New signalling and interlocking system for the Oslo Metro	MOS

2.8 Uncertainties

Oslo's Climate budget remains ground-breaking work, and presents several challenges relating to uncertainties. These include uncertainty linked to changes in the Norwegian Environment Agency's emission inventory for Norwegian municipalities, projections of GHG-emissions, and assessments of the emissions-reducing effects of planned or implemented measures.

The City Government's approach to these challenges is to use the best available information and be transparent about the data and methodologies used in the analyses. The Norwegian Environment Agency's inventory has steadily improved in recent years, but uncertainties remain, and further improvements are needed. The City of Oslo, represented by the Climate Agency, is working with the Norwegian Environment Agency to improve the inventory.

The effect of the various measures in the Climate budget has been estimated conservatively. More information on the technical assessment of uncertainties can be found in the Appendix.

The coronavirus situation has had major consequences for Oslo. The measures implemented to reduce infection risk are impacting the City of Oslo's emissions level and the economy. The effects of the coronavirus situation could impact emissions levels in both the short and long term. However, it is too early, and too little information is available, to include these effects in the Climate budget's analyses this year. The trend in transport patterns, GHG-emissions and local air pollution must be monitored carefully going forward. The coronavirus pandemic may require long-term management, with targeted policies at both municipal and central-government level to ensure that we can manage the crisis at the same time as undertaking a climate transformation.

2.9 New grants for climate measures 2021–2024

The table below provides an overview of proposed additional grants for previous and new measures in the Climate budget 2021. All the grants can be found in other chapters/under the respective entities.

Table 2.4 Investments

Amounts in NOK 1,000

Chapter		2021	2022	2023	2024
542	New charging point for taxis Ordinary municipal charging point New fast-charging point, municipal street area	35,000	35,500		
712	Additional cost of biodiesel	1,340			
Total		36,340	35,500		

Table 2.5 Operations

Chapter		2021	2022	2023	2024
542	Study and planning of zero-emissions zones	4,000	4,000		
542	Study and planning of fast chargers for heavy vehicles and buses	2,000			
Total		6,000	4,000		



Oslo



Appendix

to the climate budget

Methodology, emissions limit,
calculation of effect of measures
and references

Appendix to proposition 1/2021

1 Introduction

Climate budget 2021 is the fifth to be prepared. The methodology used for the technical assessments in the Climate budget remains pioneering, and it is therefore necessary to further develop, update and improve the underlying knowledge base on an ongoing basis.

This Appendix provides more detailed information on Climate budget 2021, as described in Proposition 1/2021, Oslo City Government's budget proposal 2021 and economic plan 2021–2024, Chapter 2. These documents should therefore be read in conjunction with one another. The Appendix sets out the technical basis for the emissions reduction targets, annual emissions limits, choice of methodology and analysis. Calculation of the emissions reductions for all the quantified measures (in Table 2.2a in Proposition 1/2021) is described in Section 4 of the Appendix.

The background documentation and technical reports used to prepare Climate budget 2021 are available at: www.klimaoslo.no/category/klimabudsjettet/

2 Methodology and basic data

The methodology and basic data in Climate budget 2021 have been further developed and updated from previous climate budgets.

2.1 Historical emissions and projection

Oslo's Climate budget is based on the most recent emission inventory available at the municipal level¹, which covers the years 2009–2018 (Norwegian Environment Agency, 2020a). Table 2.1 shows total emissions of greenhouse gases (GHG), categorised by different emissions sectors. An account of the emissions development and the major methodological changes since the Norwegian Environment Agency's previous publication is included in Proposition 1/2021, Section 2.3.

Table 2.1 GHG-emissions in total and by sector in tonnes CO₂e, 2009–2018

Emissions sector ¹	2009	2011	2013	2015	2016	2017	2018
Other mobile combustion	149,211	211,161	242,047	225,737	188,560	214,842	256,242
Waste and wastewater	4,891	5,543	5,493	5,436	7,998	7,300	6,904
Waste incineration and energy supply	217,008	258,703	218,404	209,852	233,720	270,655	274,846
Industry, oil and gas	27,698	28,065	28,362	23,787	23,935	28,347	29,684
Aviation	0.2	0.9	0.8	0.7	0.5	0.4	0.2
Heating	322,678	181,722	147,669	80,785	95,475	99,212	77,754
Waterborne navigation	29,486	29,486	29,486	29,486	38,807	38,715	40,028
Road transport	730,414	714,286	705,839	696,522	656,411	605,261	615,924
Total	1,481,387	1,428,967	1,377,301	1,271,606	1,244,906	1,264,333	1,301,381

¹ Climate budget 2021 is based on the updated emission inventory as of April 2020. An error in emissions data for road transport (2017) and the emission factor for wood burning (heating) were corrected in May 2020, and emissions data for waterborne navigation (2009–2013) were corrected in July 2020.

The analysis of the implemented measures uses a projection of GHG-emissions in Oslo for the period 2018–2030 (CICERO, 2019). This projection is often referred to as a baseline and forecasts how emissions may develop in the years leading up to 2030 if no new measures are taken. The projection is based on the best available knowledge of the factors that will impact GHG-emissions in the period to 2030, such as population growth, economic growth and efficiency gains as a result of technological developments.

The projection includes the emissions-reducing effects of national, regional and municipal policies that had been adopted as of May 2018. The development in emissions in the projection depends on these policies being implemented and realised as planned, i.e. triggering effective measures without delay.

The projection incorporates the following measures and instruments:

- Revised agreement Oslo Package 3 for 2017-2036 dated 5 June 2016 and the supplementary agreement dated 13 June 2017
- National ban on oil-fired heating of buildings from 1 January 2020
- National requirement for sales of biofuel in 2020
- Development of charging infrastructure for electric cars and continuation of national policy instruments for transition to zero-emissions vehicles

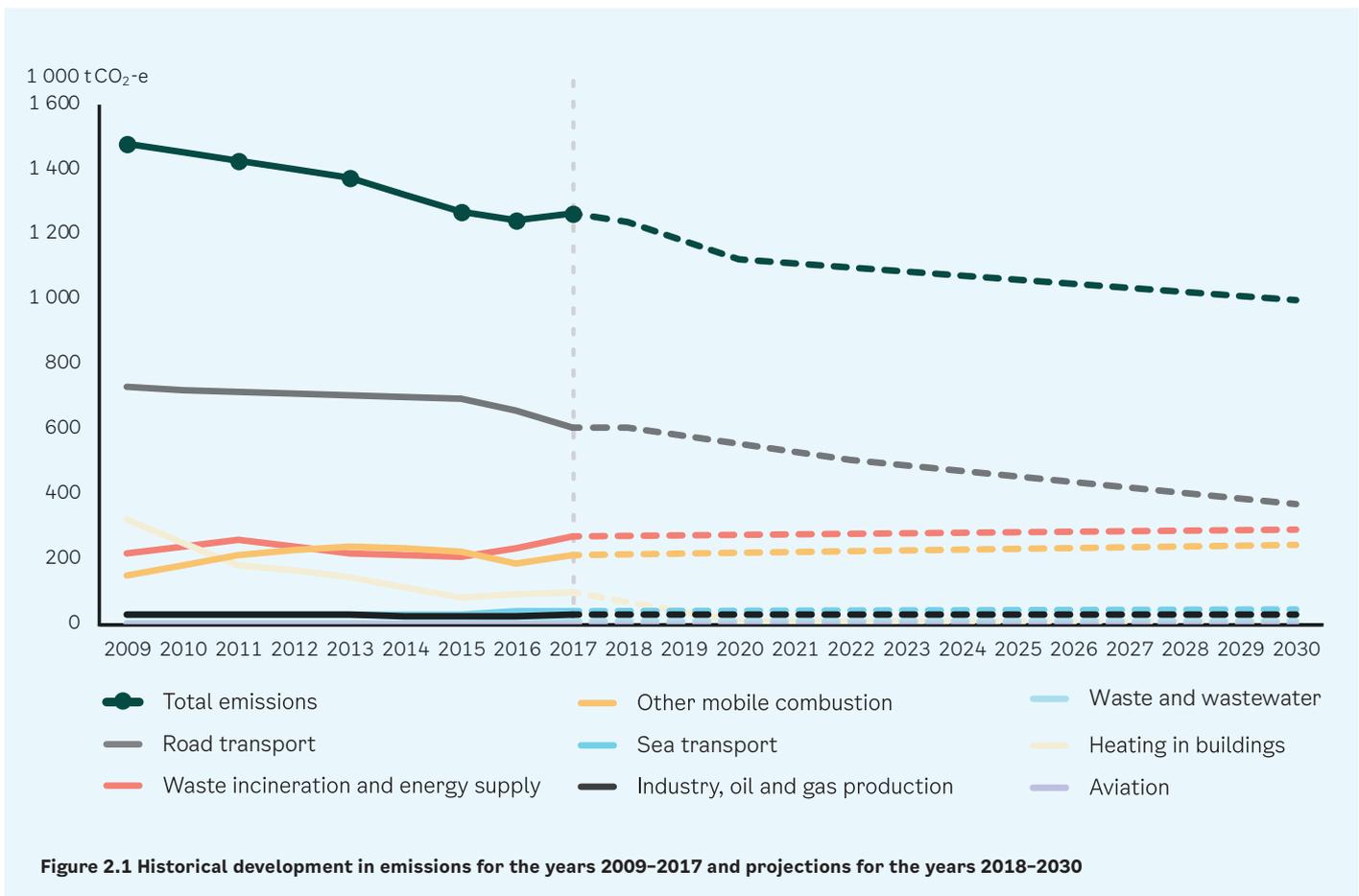
The projection has been updated with historical emissions (2009–2017) from the Norwegian Environment Agency, published in spring 2020 (CICERO, 2020). The starting year for the projection is still 2017, meaning it does not incorporate the effect of the municipal climate measures adopted since 2018. The climate budget analysis uses the emissions figures for 2018 as a starting point and shows the emissions after deducting the effect of the measures included in the Climate budget from that year's figures.

The projection shows a decline in total GHG-emissions from 1.26 million tonnes CO₂e in 2017 to approximately 1.13 million tonnes in 2020, falling further to approximately 1.0 million tonnes in 2030. This is equivalent to a reduction of 25% in 2020 and 33% in 2030 compared with 2009 (the reference year). Historical emissions and the projection of emissions leading up to 2030 are represented in Figure 2.1.

The decline from 2009 is mainly linked to road transport, with GHG-emissions from passenger cars estimated to fall significantly. This is primarily attributed to the transition from fossil-fuel cars to electric cars, but also to a higher proportion of biofuel being used and a reduction in the total number of kilometres driven per person. Implementation of the revised agreement for Oslo Package 3 (also referred to as the road toll payment system) is decisive in realising this emissions reduction. Although there is a decline in emissions from road transport overall, the projection includes an increase in emissions from heavy vehicles in the period to 2030 unless new measures are brought in. In addition, total emissions will be significantly reduced as a result of the decline in emissions from heating, which is mainly due to the ban on oil-fired heating from 2020.

The remaining sectors show a weak upward trend in emissions in the period towards 2030 as a result of population growth and economic growth. For example, waste incineration and energy supply represented approximately 21% of emissions in 2017, but will increase their share of Oslo's GHG-emissions in the period towards 2030. Other mobile combustion is dominated by emissions from diesel-driven motorised equipment (incl. construction machinery) in the building and construction sector, and it is estimated that these emissions may increase by approximately 14% in the period to 2030. This assumes that the growth is proportional to Oslo's population growth.

Road transport is assumed to remain the most significant emissions sector in 2030, but waste incineration and energy supply and other mobile combustion (incl. construction machinery) are well on the way to taking over as the predominant emissions sectors.



The projection for Oslo has been developed by CICERO Center for International Climate Research, with the Institute of Transport Economics (TØI) as subcontractor (CICERO, 2019). The figures in the projection have been adjusted in line with the updated emission inventory as of May 2020 (CICERO, 2020).

2.2 Calculating the effect of measures and instruments

Assessing and calculating the effect of different measures is a complex exercise, which requires a number of premises and assumptions. The Climate Agency has led the work to assess the effect of the measures in the Climate budget. Several calculations of measures are based on external analyses. The Climate Agency works with other municipal entities to assess the rate at which measures are phased in and the emissions-reducing effects they achieve. Among other things, this involves technical assessments of practical feasibility and technological maturity. Assessments of the emissions-reducing effects of measures in the Climate budget shall be based on transparency and descriptions of methodology and all the assessments shall be verifiable.

In line with the demarcation used in the Climate budget and the emission inventory at municipal level, only direct emissions of GHG within municipal borders are quantified when assessing the effects of measures. GHG include carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). The methodology for converting GHG to CO₂e follows the guidelines issued by the UN Intergovernmental Panel on Climate Change (IPCC, 2007).

Bottom-up and top-down approaches

The methodology for calculating the effects of measures can be either top-down or bottom-up. Top-down calculations are often more general, as they are based on total emissions and assess what share of the emissions the measure can eliminate. In this context, bottom-up implies that the effect of the measure is calculated as a change in activity (activity data) or emissions per unit of the activity (emission factor).

$$\text{Change in emissions per year} = \sum \text{change in emissions (activity data} \times \text{emission factor)}$$

Bottom-up calculations require good data on the change in activity or the emission factor to which the measure will lead, and can often provide more detailed information on both premises for and the effect of the measure. For example, activity data may be the number of kilometres driven, while the emission factor states the emissions intensity of a petrol car. The change resulting from the measure may be fewer kilometres driven or a transition to electric cars with zero emissions; the emissions reduction is presented as the total of this change.

Calculations using bottom-up methodology provide more precise estimates of the effect of individual measures than a top-down approach. Efforts have therefore been made to increase the proportion of bottom-up assessments used to analyse measures.

Examples of bottom-up calculations are measures no. 5 (transition to zero emissions or sustainable biofuel in municipal vehicles) and no. 7 (transition to zero-emissions taxis), where the number of vehicles, mileage, expected rate of change and emission factors are used to calculate the effect. An example of a top-down calculation is measure no. 10 (transition to zero emissions or sustainable biofuel in transport of bulk materials and waste from building and construction sites under contract for the City of Oslo), where the emissions reduction is estimated as a percentage of total emissions. Measures no. 2 (phasing out of fossil oil and gas in district heating) and no. 8 (transition to zero-emissions goods and utility transport) use a combination of the two methodologies. For more details, please refer to the description of calculations of measures in Section 4.

Comparison with emissions projection

The effect of measures shall be calculated as the reduction in GHG-emissions, compared with a zero alternative or baseline scenario where no new measures are implemented. The baseline scenario/zero alternative may show increased or reduced emissions in the absence of measures. What the zero alternative shows will affect the level of emissions reduction the measure can achieve. The reference scenario has been sourced from the central estimate in CICERO's projection of GHG-emissions in Oslo for the period 2018–2030 (CICERO, 2019).

The effect of measures is calculated using the following formula:

$$\text{Effect per year} = (\text{emissions in reference scenario without measure}) - (\text{emissions after measure})$$

The assessment of the measures in Table 2.2a in Proposition 1/2021, chapter 2, estimates when and/or at what rate the measure will be implemented. An annual effect has been calculated for the economic plan period (2021–2024), even though the effect may extend over a longer period. Table 2.2a specifies the effect of each quantified measure in 2021 and in 2024, compared with the emissions in the projection for the same year.

Correction for double counting

Some measures will impact the same source of emissions, and there is a risk of the effects being counted twice and overestimated. Double counting is a particular issue within road transport, because the measures may simultaneously

impact the activity level (mileage), technological change (e.g. transition from fossil-fuel to electric car) and the fuel used (e.g. transition to biofuel). By way of example, it is not possible to calculate the effect of increasing the use of biofuel if another measure has resulted in these cars not being on the road.

In addition, the projection may already incorporate the effect of new measures. Among other things, the projection includes the emissions reduction from electrification of vehicles as a result of the revised Oslo Package 3 (also referred to as the road toll payment system) and other benefits for electric cars, as well as biofuel blends resulting from the national requirement for sale of biofuels for road transport. If the measure is assumed to have an emissions-reducing effect larger than what is already in the projection, this can be added as an effect of the Climate budget. The calculations of the effects of road transport measures use an emission factor that is adjusted to take account of biofuel blends. This avoids double counting emissions reductions that are already included in the projection because of the national biofuel sales requirement (measure no.2).

The distinction between measures and instruments

In preparing the Climate budget, efforts have been made to clarify the distinction between measures and instruments. The Climate Cure 2030 report (Norwegian Environment Agency, 2020b) describes the distinction between measures and instruments as follows:

“Measures’ refers to the physical actions that various actors (such as businesses, households and different types of central-government and municipal entities) can take to reduce emissions of greenhouse gases. This may include investments in new technological solutions, transitioning to less energy-intensive energy carriers, or energy efficiency measures.

‘Instruments’ refers to the governance tools that public authorities have at their disposal to actuate concrete measures. Taxes, subsidies, orders, bans, agreements, information activities etc. are examples of instruments that can be used to actuate climate measures.”

The assessments of measures in the Climate budget comprise, to a limited extent, an analysis of instruments. However, efforts have been made to show the emissions-reducing effect that can be achieved per measure by providing an overall assessment of instruments that impact the emissions source in question.

Measures where the emissions reduction has not been quantified (Table 2.2b)

Table 2.2b describes measures that are expected to produce emissions reductions, but where it has not been possible to determine the emissions-reducing effect with sufficient accuracy. There are various reasons for this, such as the measures being at an early stage of development and implementation, or the knowledge base being inadequate or non-existent.

In the long term, it may be possible to move several of the measures from Table 2.2b to Table 2.2a, with a quantified effect, but this will require further development of the measures and closer evaluation of their effect on emissions, among other things. Particular efforts will be made in Climate budget 2022 to map emissions from diesel-driven motorised equipment, which is an important source of emissions. The aim is to be better able to calculate the emissions-reducing effect of key measures within the building and construction sector.

Other cost and benefit effects

The calculation methodology for the measures in Table 2.2a is described in Section 4. Several of the measures also have other costs or benefits. One example of a benefit is lower air pollution and thus improved air quality and health as a result of measures to reduce car usage. The measures may have economic consequences not covered by the city treasury. Electrification of vehicles is one example of a measure that may entail increased costs for industry and residents in the short term, but where lower operating costs mean costs are not necessarily higher over the vehicle's lifetime. Several measures lead to increased sale of biofuels, which may potentially have negative effects for GHG-emissions or biodiversity in other parts of the world. The City of Oslo sets requirements for sustainable biofuel in its procurements.

Correlations between several of the measures are complex. Carrying out a comprehensive assessment of additional effects is therefore challenging and requires additional data. The Climate budget thus shows only the effect the measures are expected to have on direct GHG-emissions in the City of Oslo.

2.3 Uncertainty in the analyses

The Climate budget has been prepared using the best available knowledge, but there is still uncertainty associated with all stages of the climate budget analysis.

Historical GHG-emissions

The inventory of Norwegian municipalities' GHG-emissions is subject to ongoing development, partly because Oslo and other municipalities have demanded greater accuracy and more frequent updates. Each time the emission inventory is published, the entire time series is recalculated if a new methodology or new basic data has been applied. This means that target figures and analyses (shown as absolute tonnes) in Climate budget 2021 have to be updated if the emission inventory is recalculated. This explains why the figures in the Climate budget may change from one year to another.

There has been significant uncertainty linked to the historical emissions figures for fossil-fuel heating and diesel-driven motorised equipment. Emissions from diesel-driven motorised equipment are calculated based on sale of construction diesel. The most recent emission inventory used a new and improved methodology for calculating emissions for all the years in the time series. The emissions are allocated to municipalities according to where sale of construction diesel is registered (delivery addresses) and using distribution formulas based on information from resellers' sales areas. The change in methodology produced higher emissions figures over the entire time series (with the exception of 2013).

The methodology for calculating emissions from industry, oil and gas has also been improved by allocating more facilities'/businesses' consumption of fossil fuels to the municipalities. This has resulted in higher emissions from this sector over the entire time series in Oslo. At the same time, emissions from landfill gas have temporarily been omitted from the inventory due to inadequate basic data.

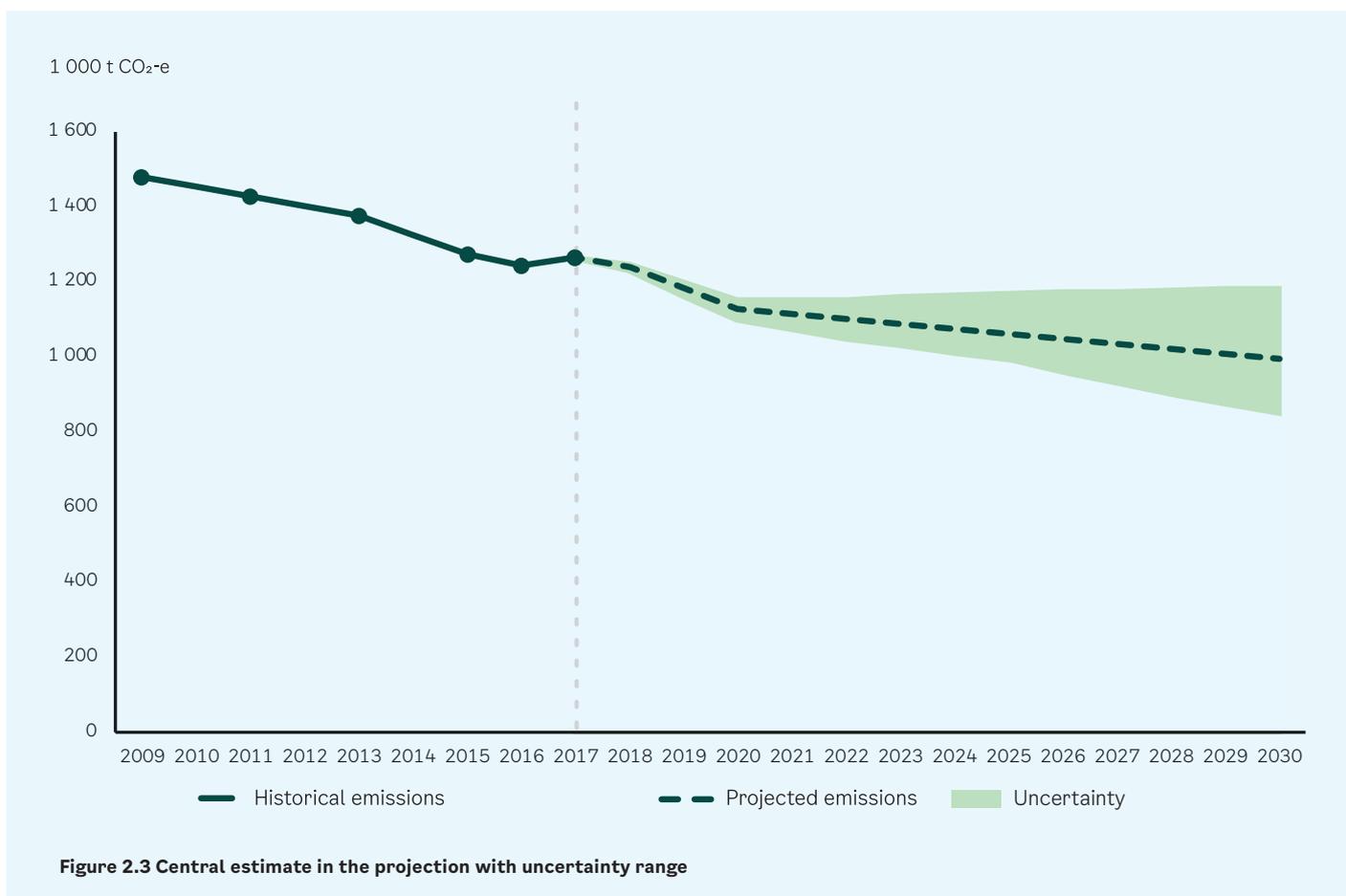
Continuous improvement of the emission inventory makes the analyses in the Climate budget more accurate, but there is still significant uncertainty concerning some sources. One area where there is significant potential for improvement is that the emission inventory needs to capture the effect of measures being implemented in Oslo. In light of the ongoing development work, it must be expected that the methodology used in the emission inventory will be updated in the years ahead and that the figures will have to be recalculated for the entire time series as a result.

Projection of emissions

Projection of emissions was used to analyse effects of measures for the first time in Climate budget 2020. This represented a methodological improvement, compared with how the calculations had been carried out in previous climate budgets, and is used again in this year's budget. At the same time, the projection is a model calculation developed to provide indications of future developments in emissions, and this will always be associated with significant uncertainty.

The Climate budget uses the central estimate in the projection to model the future emissions level, given the measures and instruments included, as shown in Figure 2.3. The projection has an uncertainty range with an upper and lower limit, based on quantifying the uncertainty in the basic figures for factors that affect the development in emissions. In addition, there will be uncertainty regarding implementation of measures in the projection and uncertainty relating to emissions levels in historical basic figures from the Norwegian Environment Agency. This uncertainty has not been quantified.

The projection has to be recalculated whenever the emission inventory at municipal level is updated, and thus the figures in the climate budget will change from one year to another. The projection has been updated with historical emissions (2009–2017) from the Norwegian Environment Agency (Norwegian Environment Agency, 2020a) in 2020. The starting year for the projection is still 2017, to allow calculation of the effect of measures in the Climate budget



that are not already incorporated in the projection. This means that the updated projection will contain the same measures as the projection from Climate budget 2020.

The emissions may both increase and decrease in the period to 2030, and the projection is used in the climate budget analysis to reduce the risk of underestimating the need for emissions reductions. The most recently published emission inventory showed a 3% increase in total GHG-emissions from 2017 to 2018. This increase means that the 2018 emissions are higher than assumed in the projection. The main reason for this is that emissions from diesel-driven motorised equipment increased significantly more than had been estimated. The projection provided for a 14% increase in emissions from 2017 to 2030, while the emission inventory showed an increase of as much as 19% from 2017 to 2018. This shows the uncertainty in the model calculation and that the climate budget analysis needs to be supplemented with information from other data sources and indicators, for example from the Climate barometer (Climate Agency, 2020a).

The coronavirus situation has had major consequences for Oslo. Infection control measures to prevent the spread of the coronavirus are changing travel habits and business activity, and this will probably affect the level of GHG-emissions in both the short and long term. The knowledge base is inadequate to correct for this uncertainty in the projection or in the climate budget analysis. Consideration will be given to updating the projection in work on the Climate budget for 2022.

Analysis of measures

The measures in Climate budget 2021 remain outside the projection, making it possible to calculate the effect of the measures for which there is adequate knowledge and basic data. These measures appear in Table 2.2a.

All the quantified measures in the Climate budget are calculated based on the best available knowledge and methodology, but both the size of the emissions reductions and the timing of implementation of the measures are uncertain. The

analysis of measures is based on a number of assumptions about changes in e.g. activity level or technology resulting from implemented measures and instruments. Estimating the efficiency of measures and instruments as a governance tool is technically challenging, which is why the effects must be treated as estimates and not definite figures.

The analysis of measures in Climate budget 2021 is based on updated 2018 emissions figures from the Norwegian Environment Agency. Through the climate budget analysis, assumptions are incorporated as to whether measures or other factors will affect the emissions development in the period 2018–2024. For some measures, activity data from 2019 has been used to calculate future effect. All premises and assumptions are subject to uncertainty, even though they have been prepared using the latest available knowledge.

The emissions-reducing effect of measures in the Climate budget depends on actual implementation. The measures have to be carried out as planned and without delays if the total effect set out in the climate budget is to be achieved. The emissions-reducing effect may be greater or lower than estimated.

Table 2.3 provides an overview of uncertainty associated with the calculated effect of measures in Table 2.2a. The uncertainty is linked to assumptions about implementation of the measure (phasing-in rate) and the potential for over- or underestimating the effect, and is rated as high, medium or low. In cases where the uncertainty is rated as high or medium, an assessment is included of the consequence this has for achieving the emissions reduction targets in the short (2023) and longer (2030) term. The consequence is assessed based on the size of the measure's effect, and categorised as high, medium or low. These are subjective assessments made by the Climate Agency.

The analyses of the measures are based on a projection, which means that they are corrected for expected developments in emissions if no new measures are taken. For several of the measures, the calculated effect will also be impacted by population growth, economic development and other macrotrends incorporated in the projection. If these do not develop as expected, this will impact the calculated effect of the measures. In the same way as the coronavirus situation may impact the emissions projection, how the situation is handled will probably also impact the effect of the measures. Efforts have been made to correct for this by reassessing the phasing-in rate.

Demarcating the Climate budget

GHG-emissions in Oslo are impacted by numerous factors. In addition to emissions caused by the activities of residents, businesses and governmental/municipal entities in the city, Oslo's emissions will also be impacted by activities that occur beyond the city boundaries. Correspondingly, the measures in Oslo's climate budget may lead to both higher and lower emissions beyond its boundaries. This makes it difficult to demarcate the Climate budget, which only includes GHG-emissions in the City of Oslo as a geographical entity. It is important to be aware of effects beyond the city's boundaries, even if they are not directly included in the Climate budget. The climate budget analysis should thus be used as an indication of the direction and rate of the emissions development, rather than providing definite figures.

Table 2.3 – Activities that lay the foundations for further emissions reductions

No.	Measures and instruments	Description of uncertainty ¹⁾
1	Phasing out of oil-fired heating in buildings Uncertainty: Medium Consequence: High	There is potential for overestimating the effect in the short term. Dispensations from the ban in Oslo mean that fossil heating oil may still be used in buildings, and heating oil may be used for purposes other than heating. With adequate follow-up, the ban will achieve full effect in the longer term.
2	Phasing out of fossil oil and gas in district heating (peak load) Uncertainty: Medium Consequence: Low	There is potential for overestimating the effect in the short term if the measure is not implemented as planned. The measure is based on the target set by Fortum Oslo Varme AS and would have been more effective had it been regulated at municipal or national level, for example in the form of a ban. There is also a risk that consumption of fossil energy sources will be higher than assumed because of the duty to supply and access to renewable alternatives in the market.
3	National requirement for sale of 22.3% biofuel Uncertainty: Low Consequence: -	The potential for over-/underestimating the effect depends on how much advanced biofuel is sold. A new update to the sales requirement came into force on 1 July 2020.

4	Introduction of new road toll payment system Uncertainty: Low Consequence: -	There is equal scope for over- and underestimating the emissions reduction. The effect of the measure derives mainly from the phasing in of electric passenger cars. As of the first half of 2020, the development in the share of electric cars is actually slightly higher than the level in the projection.
5	Zero emissions/sustainable biofuel in municipal vehicles Uncertainty: Medium Consequence: Low	There is potential for overestimating the effect in the short term. There is potential for some municipal vehicles to continue running on fossil fuels after 2020. The full effect is expected to be achieved towards 2024.
6	Better facilities for cycling Uncertainty: Medium Consequence: Low	There is potential for overestimating the effect in the short and longer term. There is particular uncertainty linked to the projection of the proportion of people cycling.
7	Legislation for taxis: zero emissions by 2025 Uncertainty: High Consequence: Medium	There is potential for overestimating the effect in the short term. The uncertainty is linked to deregulation of taxi licences in 2020. The deregulation may lead to increased emissions in the period 2020–2024. The full effect will be achieved when the environmental requirement comes into force on 1 Nov. 2024.
8	Zero-emissions goods and utility transport Uncertainty: Medium Consequence: Medium	There is potential for overestimating the effect in the short term. The effect of the measure derives from the phasing in of electric vans and is calculated on the assumption that all the instruments are implemented in full. The proportion of electric vans may be lower than calculated and come closer to the level in the projection if not all the instruments are implemented. As of the first half of 2020, the proportion of electric vans in Oslo is above the national average, but the rate of transition to electric vans as a result of measures in the budget is uncertain.
9	Fossil-free public transport by 2020 – buses Uncertainty: Low Consequence: -	There is potential for overestimating the effect in the short term, but as the public transport operator Ruter is well on the way to achieving the target of fossil-free public transport by the end of 2020, the level of uncertainty is low. Emissions from Ruter's regional buses are not included in the calculation, due to lack of basic data. This means that the effect has been slightly underestimated.
10	Zero emissions/sustainable biofuel in transport of bulk material and waste from building and construction on contract for the City of Oslo Uncertainty: Low Consequence: -	There is potential for overestimating the effect in the short term. As it takes time for the market to adjust, 50% effect has been included for the first few years; this may still be an overestimate in the short term. The effect of the measure may be underestimated in the longer term as a result of uncertainty as to the actual transport level, which could potentially be higher.
11	Zero-emissions/biogas-driven heavy vehicles Uncertainty: Low Consequence: -	There is potential for underestimating the effect in the longer term. The effect of the measure is calculated based on the Climate Agency's market surveys in connection with establishing energy stations. The effect of the measure may be underestimated because the Climate Agency's market surveys are unlikely to have captured all the developments within zero-emissions/biogas-driven heavy vehicles.
12	Zero emissions/sustainable biofuel in municipal machinery Uncertainty: Medium Consequence: Low	There is potential for overestimating the effect in the short term. The uncertainty relates to the possibility that some machinery will continue running on fossil fuels after 2020. The full effect is expected to be achieved towards 2024.
13	Fossil-free public transport by 2020 – ferries Uncertainty: Low Consequence: -	There is potential for overestimating the effect in the short term, but as the public transport operator Ruter is well on the way to achieving the target of fossil-free public transport by the end of 2020, the level of uncertainty is low. The calculated effect is based on actual fuel consumption and is therefore robust.
14	Establishment of shore power Uncertainty: Low Consequence: -	There is potential for overestimating emissions reductions in the short term. The effect of the measure for international ferries is based on actual consumption of power, as have the calculations for cement ships. These estimates are therefore considered robust with a low level of uncertainty. There is potential for underestimating the effect for the cement ships because parts of the activity (pumps in the port) are not covered by the current data capture method.



Photo: Krister Sørbo

3 Emissions limits 2020-2030

The principal climate targets form the basis for the annual climate budgets:

- Reduction of 41% in 2020 compared with 2009
- Reduction of 52% in 2023 compared with 2009
- Reduction of 95% in 2030 compared with 2009

The emissions reduction targets are anchored in Oslo's climate strategy leading up to 2030 (City of Oslo, 2020a): See Climate budget 2021 (Proposition 1/2021, chapter 2) for more information on the targets.

3.1 Setting emissions limits 2020-2030

Annual emissions limits are set via the Climate budget in order to steer the development in emissions from 2020 towards the climate target in 2030. The emissions limits are an aid in budgeting for an even downwards development towards the targets in 2023 and 2030, and are used as a basis for prioritising and implementing measures in the Climate budget. The emissions development will probably look different in reality, implying that the emissions limits between 2020 and 2030 can be adjusted in the annual climate budgets if new knowledge emerges.

The annual emissions limit 2020-2030 in Climate budget 2021 is the same as was used in Climate budget 2020. The methodology for setting the emissions limit is described in the Appendix to Climate budget 2020 (City of Oslo, 2019).

Climate budget 2021 applies to the economic plan period 2021-2024. It budgets for emissions reductions of 45% in 2021 and 71% in 2024, compared with the 2009 level.

Table 3.1: Emissions limits 2020-2030 showing planned emissions reductions compared with 2009 level.

2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
41%	45%	49%	52%	71%	75%	79%	83%	87%	91%	95%

3.2 Analysis of emissions development 2018–2024

The Climate budget shall establish which measures are to be implemented in the current economic plan period. The 2021 budget assesses the emissions reductions that will be provided by the adopted measures and instruments in the period from 2018 (the last year for which emissions figures are available) to 2024 (the last year in the economic plan period). This section provides a more detailed analysis of how the measures in the climate budget may affect the development in emissions from 2018 to 2021 and 2024.

GHG-emissions in Oslo in 2018 were calculated at just over 1.3 million tonnes CO₂e. This is approximately 60,000 tonnes CO₂e more than the emissions level used in the projection. According to the Climate Agency's analysis, total emissions will fall in 2019 and 2020 as a result of the measures incorporated in the Climate budget.

It is most likely that the emissions from road transport will be lower in 2019 than in the projection, because the share of electric passenger cars was higher than estimated (Climate Agency, 2019). At the same time, sales of biofuel were higher than estimated in the projection (Norwegian Tax Administration, 2020), which will help to reduce the emissions from all vehicles (passenger cars, vans, heavy vehicles and buses). Emissions from fossil-fuel heating of buildings will probably fall to a level in line with the estimate in the projection, as a result of the ban on fossil oil-fired heating in buildings having come into force on 1 January 2020. The use of fossil fuels in district heating increased from 2018 to 2019, and is at a higher level than estimated in the projection (Fortum Oslo Varme AS, 2020).

The Climate Agency estimates that the emissions from other mobile combustion (including construction machinery) will fall to the level in the projection in 2019. There is reason to assume that some of the consumption in 2018 was extraordinary. Among other things, it is likely that Oslo was allocated emissions – based on sales of construction diesel in Oslo – arising from a major international military exercise that took place in Norway that year. The construction sector is, moreover, cyclical and subject to annual fluctuations. Sales of construction diesel declined in Oslo from 2018 to 2019 (Statistics Norway, 2020a) and there was a simultaneous decline in housebuilding (Statistics Norway, 2020b), which suggests that emissions in Oslo will fall. This trend is also apparent in the national emissions, with emissions rising from 2017 to 2018 and then falling again in 2019 (Statistics Norway, 2020c).

The Climate Agency's analysis shows that the quantified measures in the Climate budget, including the measures in the projection, have the potential to reduce Oslo's GHG-emissions by 25% in 2020, 27% in 2021 and 31% in 2024, compared with 2009 levels. This leaves a gap, or shortfall in emissions reduction, of 16 percentage points in 2020, 18 percentage points in 2021 and 40 percentage points in 2024 in order to achieve the targets and emissions limits in these years. The gap will probably be smaller than this, because emissions reductions are also expected from the measures in Table 2.2b. Nevertheless, the gap shows that achieving the 2020 targets may be challenging and that there is a need to step up efforts to identify new measures or further develop existing measures if the City of Oslo is to keep within the emissions limits in 2021 and 2024.

The emissions reductions are presented as a percentage, but can also be stated in absolute tonnes CO₂e, as shown in Table 2.1 in Proposition 1/2021, chapter 2. The quantified measures have the potential to reduce Oslo's GHG-emissions to 1,106,000 tonnes CO₂e in 2020, 1,074,900 tonnes CO₂e in 2021 and 1,018,400 tonnes CO₂e in 2024. To keep within the emissions limits for 2021 and 2024, the emissions must be further reduced by 260,100 tonnes CO₂e in 2021 and 588,800 CO₂e in 2024.

The emissions limit for 2024 depends on full-scale CO₂ capture at Fortum Oslo Varme AS's waste incineration facility at Klemetsrud. It is uncertain if and when the full effect of a facility of this nature will be achieved, as it depends on the decision of the Norwegian Parliament (Storting), and when it is made. The earliest date when full effect can be achieved from a CO₂ capture facility is 2024. According to the Climate Agency's calculations, the effect of this facility will be just under 200,000 tonnes CO₂e in 2024. The premises underlying this estimate are set out in Section 3.3.

Table 3.2.a presents quantified emissions reductions in the Climate budget (excluding the measures in the projection) by emissions sector. Most of the quantified measures in the Climate budget target road transport, and the analysis shows that this is also where the largest emissions cuts can be expected. The transition to zero-emissions taxis and goods and utility transport (measures no. 7 and no. 8) and fossil-free public transport (no. 9) are expected to have the biggest effects in this sector. The figures also include fairly significant emissions reductions from waterborne navigation, where the measure concerning fossil-free public transport by 2020 (no. 13) will generate the largest reductions, while establishing and using shore power (no. 14) will contribute to emissions reductions in the period to 2024. Emissions reductions for waste incineration and energy supply will be achieved by phasing out fossil oil and gas in district heating (peak load) in 2020 (no. 2).

Previous Climate budgets (2017–2019) have presented the results of the analysis as annual emissions reductions compared with the last known emissions level. Table 3.2.b presents the results of Climate budget 2021 in the same way, i.e. emissions reductions in the period 2021–2024 compared with the 2018 level. Emissions reductions from the 2018 level are the sum of the quantified measures in the Climate budget and the underlying emissions development in the projection.

The analysis shows an increase in emissions from waste incineration and energy supply and other mobile combustion (incl. construction machinery) in the period. In the case of waste incineration, this is due to the lack of measures. The City Government has initiated a study of how emissions from combustion of household and commercial waste can be reduced, and will propose new measures in the area in the Climate budget for 2022. In the case of other mobile combustion (incl. construction machinery), several measures and instruments that have been implemented are being studied but have not yet been quantified in the Climate budget. Measures no. 22 and 23 (requirements for fossil-free and zero-emissions building and construction sites) are expected to generate fairly significant emissions reductions in this sector.

Table 3.2.a, Top: Quantified emissions reductions in excess of effects in the projection¹

Table 3.2.b, Bottom: Emissions reductions in the period 2021–2024 compared with the 2018 level

Emissions sector	2021	2022	2023	2024
Road transport	23,100	31,900	39,800	45,600
Waste incineration and energy supply	2,700	2,600	2,600	2,500
Heating	0	0	0	0
Other mobile combustion	1,600	1,600	1,600	1,600
Waterborne navigation	9,200	10,400	10,400	10,600
Waste and wastewater	0	0	0	0
Industry, oil and gas	0	0	0	0
Aviation	0	0	0	0
Total emissions reduction	36,600	46,500	54,400	60,300
Remaining emissions level	915,900	1,050,700	1,033,400	1,018,400

Emissions sector	Emissions	Emissions reductions from 2018 level ¹			
	2018	2021	2022	2023	2024
Road transport	615,924	105,100	132,800	154,900	174,800
Waste incineration and energy supply	274,846	-2,200	-3,900	-5,600	-7,300
Heating	77,754	61,000	61,000	61,000	61,000
Other mobile combustion	256,242	-5,200	-7,500	-9,900	-12,400
Waterborne navigation	40,028	7,200	7,700	7,100	6,600
Waste and wastewater	6,904	-200	-300	-400	-500
Industry, oil and gas	29,684	0	0	0	0
Aviation	0,2	0	0	0	0

1) Accumulated annual effect. The columns for 2021–2024 cannot be totalled.

3.3 Strengthening existing measures and instruments in the period to 2030, and introducing new ones

The annual climate budgets are used to identify, plan and implement measures that provide emissions reductions in the economic plan period. At the same time, it is important to facilitate emissions reductions in the period to 2030, following up on Oslo's Climate strategy.

For Oslo to achieve its target of reducing emissions by 95% compared with the 2009 level, it is necessary to strengthen existing measures and instruments, while simultaneously working to get new ones in place. The Climate Cure 2030 report provides a summary of the City of Oslo's roles and instruments in its climate work:

- social developer – prime mover, facilitator, and collaborator with residents and the business community
- exerciser of authority – planning authority, including for land and transport, grant administrator
- service provider – delivers services such as education, health, care and public transport
- owner and operator – buildings, infrastructure, forests, own transport, municipal entities,
- investments
- buyer – goods and services

However, the City of Oslo's portfolio of instruments is not inexhaustible, and it will not be possible to cut Oslo's emissions sufficiently without the contribution of central government. The Climate Agency has assessed that the government's work on national targets and guidelines, including in its Climate strategy report for 2017 (Report to the Storting 41 (2016-2017)) and the government declaration to the Christian Democratic Party, the Liberal Party, the Conservative Party and the Party of Progress (the Granavold platform, 2019), are crucial to Oslo's ability to become a zero-emissions city in 2030 (City of Oslo, 2020a).

The City Government has initiated a number of studies with a view to tightening up existing instruments or identifying new measures and instruments that can further reduce GHG-emissions in Oslo. This work is concentrated around the biggest emissions sectors: road transport, other mobile combustion, and waste incineration and energy supply. The following areas of work to strengthen existing instruments or introduce new ones are decisive in achieving the emissions reduction target in 2030:

The road toll payment system (measure no. 4 in Table 2.2a)

GHG-emissions from road transport can be reduced by further developing the road toll payment system as a climate instrument. Norconsult (2020) has analysed the potential for achieving emissions reductions by charging higher road tolls. An increased price differential between electric and fossil-fuel cars will speed up the phase-in of electric cars. The staged introduction of a NOK 100 price difference between the tolls for fossil-fuel and zero-emissions light vehicles will bring Oslo close to the climate target for light vehicles. GHG-emissions from passenger cars in Oslo are estimated to fall by almost 95% from 2017 to 2030. The overall reduction in GHG-emissions from road transport in 2030 will be 66%. Emissions reductions for heavy vehicles require multiple instruments. There are currently few zero-emissions vehicles available in this segment, making it more difficult to switch.

In a memorandum of 13 March 2020, the Climate Agency assessed various scales of charges for the road toll payment system (Climate Agency, 2020b). The calculations are based on the analyses carried out by Norconsult (2020) and calculations of the reduction in traffic from the Oslo Package 3 secretariat. The calculations show that emissions reductions of approximately 13% can also be achieved in the short term with an average toll of NOK 14 (against just over NOK 10 today); this is in comparison with the emissions level under the current toll system and the maximum toll provided for under the current Storting resolution. If the toll is raised above the current maximum, the potential is greater. The Climate Agency's assessment uses basic data and methodology that is not directly comparable with the climate budget analysis. The actual effect of strengthening the road toll payment system in the Climate budget needs to be reassessed once negotiation of the new agreement is complete.

Requirement for fossil-free and zero-emissions construction sites (no. 22 in Table 2.2b)

GHG-emissions from the building and construction sector in Oslo will be reduced as a result of the requirement for fossil-free and zero-emissions building sites in new zoning plans. Sites may use either zero-emissions solutions, such as electricity and district heating, or biofuel. The requirement covers machinery, motorised equipment and other non-roadgoing vehicles that use construction diesel. The requirement will also extend to construction heating, i.e. use of energy to dry concrete and heat buildings in the construction phase. The City of Oslo already requires fossil-free building sites in its own construction projects. The new requirements will apply to all building and construction activity, including projects with central-government or private-sector actors as the contracting builder.

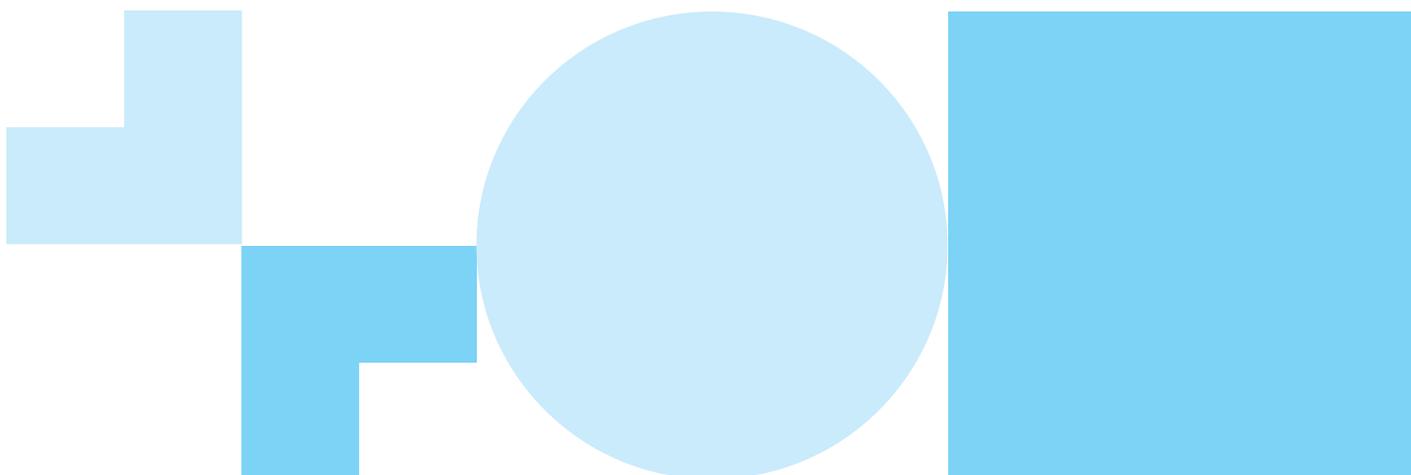
Preliminary calculations show that the requirement could cover approximately 43% of all newbuild sites in the City of Oslo in 2024. This share is based on assessments of future building activity carried out by the Climate Agency in collaboration with the Agency for Planning and Building Services (Climate Agency, 2020c).

If the requirement is applied to both ongoing planning matters and plans that have already been approved, approximately 80% of building activity will be covered in 2024. Forecasts of future building activity are subject to significant uncertainties. These include the proportion of planning proposals submitted that will be realised and how the market will develop. The estimates make allowance for this.

Added to this will be the effect from fossil-free and zero-emissions construction sites (e.g. building of infrastructure for the rail network and the Oslo Metro), which are not included in the projections for building and construction. The combined effect of introducing the requirement will increase over time, and in the period to 2030 it could lead to a significant share of the emissions from building and construction sites being avoided.

Carbon capture at Klemetsrud (measure Q in Table 2.3)

GHG-emissions from waste incineration in Oslo can be reduced by investing in carbon capture at Forum Oslo Varme AS's plant at Klemetsrud. The earliest date that a CO₂ capture facility can be in full operation is from 1 January 2024. There is potential for an emissions reduction of between 185,000 and 200,000 tonnes CO₂ in 2024, depending on actual volumes of waste for incineration. The estimate takes its starting point in basic figures from the baseline (CICERO, 2020) and is based on CO₂ emissions from household waste outside Oslo, commercial waste and imported waste that is incinerated at Klemetsrud. The effect of this measure will increase in the period to 2030 in line with the assumed growth in waste incineration in the baseline. The measure could potentially have a greater effect if the household waste currently incinerated at the Haraldrud facility is handled at Klemetsrud. In addition, the calculation focuses solely on the fossil-fuel fraction of the waste (fossil CO₂). In reality, carbon capture will be carbon negative, as it will also capture biogenic CO₂, which will roughly double the effect. The estimated effect of capturing fossil CO₂ can be incorporated in the Climate budget if a decision is taken to go ahead with the carbon capture facility.



4 Description of calculations methodologies for measures and instruments

A description of how the effects of the measures in Table 2.2a in Proposition 1/2021, chapter 2, are calculated is provided below. For descriptions of the actual measures, please refer to Table 2.2a with related description of measures.

Measure no. 1 Phasing out of oil-fired heating in buildings

The emissions-reducing effect of the measure is incorporated in the projection (CICERO, 2020). This measure is the main reason why the emissions from heating are expected to fall substantially towards 2020, and it is assumed that emissions from fossil-fuel heating will fall to zero. It is possible to apply for exemption/dispensation from the ban, so the effect of the measure may differ from the assumptions in the projection. The Climate Agency's calculations indicate the emissions resulting from dispensations granted to be low, below 1,000 tonnes CO₂e in 2020. The Department of Urban Environment follows the intentions behind the regulation and the associated guidance, and is restrictive in granting dispensations from the ban.

Measure no. 2 Phasing out of fossil oil and gas in district heating (peak load)

The effect of the measure is estimated to be 2,700 tonnes CO₂e in 2021 and 2,500 tonnes in 2024. The calculation is based on activity data and emissions calculations from Fortum Oslo Varme AS (Fortum Oslo Varme AS, 2020) and Avantor for CO₂ emissions from peak load 2015–2019 (Avantor, 2020). An estimate of emissions of methane and nitrous oxide from biofuel has been added, based on the indicator for the proportion of methane and nitrous oxide in emissions from district heating published by the Norwegian Environment Agency (2020a). The effect of the measure is calculated based on the difference between the projection and the estimated reduction in emissions. The calculations assume a 75% reduction in emissions in 2020 compared with 2019. From 2021, the remaining fossil-fuel emissions from peak load are estimated to be approximately 600 and 400 tonnes CO₂e a year from Fortum Oslo Varme AS and Avantor respectively. This is because some fossil gas will be used to depressurise the system and for test runs. The proportion of fossil gas used could increase in the event of low availability of biofuel. There is some uncertainty linked to the effect of the measure, as it has been estimated based on Fortum Oslo Varme AS's target and not on direct instruments.

Measure no. 3 National requirement for sale of 22.3% biofuel

The emissions-reducing effect of the measure is incorporated in the projection (CICERO, 2020). From 2018 to 2020, sales of biofuel are expected to increase from 12% to 16%. The projection of Oslo's GHG-emissions depends on continuation of the sales requirement in 2020 up to 2030 (16% actual volume, ignoring the fact that advanced biofuel with a high climate benefit counts double). As per the national sales requirement from 1 July 2020, there is no guarantee of sales in excess of 16%, which would have resulted in additional effect from this measure. A further increase in the sales requirement (which the government has notified from 2021) could provide an additional effect in future Climate budgets.

Measure no. 4 Introduction of new road toll payment system

The emissions-reducing effect of the measure is incorporated in the projection (CICERO, 2020). This shows an expected reduction in emissions from road transport of 13% from 2018 to 2021 and 19% from 2018 to 2024. A large part of this reduction can be attributed to the effect of the road toll payment system, but the reduction is also a result of other policies in the road transport area, such as national and local benefits for electric cars. It has not been possible to quantify the effect of the road toll payment system separately from other measures within road transport. The exemption from tolls for electric vans, which comes into effect with the introduction of Phase 3, will provide a further emissions reduction in addition to that in the projection. This effect is incorporated in measure no. 8, which shows emissions reductions linked to zero-emissions goods and utility transport.

Measure no. 5 Zero emissions/sustainable biofuel in municipal vehicles

The effect of the measure is estimated to be 1,700 tonnes CO₂e in both 2021 and 2024. The effect of the measure is calculated on the basis of data on municipal vehicles from the Agency for Improvement and Development, and actual average mileage data for Oslo's vehicles (UKE, 2020). Emission factors have been sourced from CICERO (2020). Emissions data for 2018 and 2019 have been used to estimate the effect of the measure. As reference, it is assumed that the vehicle fleet and mileage will remain constant at the 2018 level. It is further assumed that the emissions will be reduced by 50% in 2020 and will be zero in 2021 (excluding minor residual emissions of methane and nitrous oxide). If the estimated effect of this measure is to be achieved, it is important to follow up the target for full transition to zero emissions or sustainable biofuel within relevant municipal entities.

Measure no. 6 Better facilities for cycling

The effect of the measure is estimated to be 1,700 tonnes CO₂e in 2021 and 2,700 tonnes by the end of 2024. The reduction in emissions depends on cycling replacing car journeys. Based on the initial results from the national travel habits survey (Norwegian Public Roads Administration, 2019), the Department of Urban Development has made an assessment of a realistic percentage of cyclists in the period to 2024. The percentage of cyclists is expected to increase to 13% in 2024. In addition to the percentage of cyclists, the calculations for the measure are based on population figures, emission factors, share of electric cars up to 2024 (CICERO, 2020) and average daily journeys (Ellis et al., 2015). The proportion of journeys made by cycle rather than car has been calculated based on an average percentage of cyclists in Oslo who specify cars as their alternative method of travel (11% according to Loftsgarden et al. (2015)) and the share of total journeys (minus cycle) in Oslo that are made by car (34% according to the Norwegian Public Roads Administration (2019)).

Measure no. 7 Legislation for taxis: zero emissions by 2025

The effect of the measure is estimated to be 1,000 tonnes CO₂e in 2021 and 12,700 tonnes in 2024. The effect has been calculated using data from Statistics Norway (2020d and e) for the vehicle fleet (number of licences) and annual mileage in the period 2018–2019. The calculation also includes the number of licences issued in 2020 and actual data for the renewable share of the vehicle fleet in 2018 and 2019 sourced from the taxi centrals (Department of Urban Environment, 2020). Emission factors have been sourced from CICERO (2020). The calculation depends on the number of licences remaining constant at the 2019 level. Kilometres driven have been increased in proportion to the increase in kilometres driven for light vehicles in the projection. It is subsequently assumed that the proportion of renewable vehicles remains constant at 4% in the baseline scenario (emissions if no measures are taken). The effect of the measure depends on a transition to zero-emissions vehicles (Department of Urban Development, 2017), based on a cumulative phasing-in rate of 5% in 2020, 10% in 2021, 30% in 2022, 60% in 2023, 80% in 2024 and 100% from 1 January 2025. Emissions from licensed taxis in Oslo will be zero in 2025. The effect of the measure depends on enforcement of the environmental requirement. Pursuant to the professional transport regulations, the supervisory bodies are the police and the Norwegian Public Roads Administration. The greatest uncertainty in the calculation concerns the number of taxis and how many of them will be zero emissions in the years ahead. This is difficult to calculate, because deregulation will probably lead to more taxis on the road in Oslo than today.

Measure no. 8 Zero-emissions goods and utility transport

The effect of the measure is estimated to be 3,000 tonnes CO₂e in 2021 and 11,300 tonnes in 2024. Much of the effect of electrifying vans is already included in the projection, and this measure is about further increasing the share of electric vans. The effect of the measure is estimated based on expected sales of electric vans in Oslo. The Enova subsidy scheme is used as an indicator of the trend in sales figures for electric vans. It is assumed that everyone who switches to an electric van will use the subsidy scheme, which is therefore considered to be a good indicator of future sales figures. The Climate Agency has developed two scenarios for the development in electric vans in the period to 2024: a high and low level of development based on assumptions of the amount budgeted in the subsidy scheme. The low-level scenario shows that the development will be roughly the same as the share of electric vans in the projection. In this scenario, the measure will not provide an additional emissions-reducing effect. The emissions-reducing effect of the high-level scenario has been incorporated in Climate budget 2021, based on a higher share of electric vehicles than in the projection. It is assumed around 60% of newly registered vans on the road in

Oslo will be electric towards the end of the economic plan period. For comparison, 16% of newly registered vans in Oslo in 2019 were electric. Implementation of the instruments (in full) under this measure is an important prerequisite for achieving the effect of the measure. The calculation indicates that 29% of vans on the road in Oslo in 2024 will be electric. For comparison, the share of electric vans in the projection in 2024 is 18%.

Measure no. 9 Fossil-free public transport – buses

The effect of the measure is estimated to be 14,700 tonnes CO₂e in both 2021 and 2024. Emissions from public transport operator Ruter's city buses are estimated based on the number of kilometres driven using fossil fuels for bus contracts in Oslo (Ruter, 2020), multiplied by emission factors from CICERO (2020). Emissions of nitrous oxide and methane from biogas buses are also included (Norwegian Environment Agency, 2020c). The calculation depends on kilometres driven and the share of renewable fuel remaining constant at the 2018 level in the period 2020–2024. The increase in capacity resulting from Oslo City Government's investments in public transport does not affect the number of kilometres driven using fossil fuels. The effect of the measure implies that the fossil-fuel emissions from Ruter's bus operations are zero in 2021. The calculations have assumed a 50% reduction in emissions in 2020 compared with 2018. Emissions from Ruter's regional buses are not included in the calculation, due to lack of basic data. This results in a slight underestimation of the effect of the measure.

Measure no. 10 Zero emissions/sustainable biofuel in transport of bulk material and waste from building and construction on contract for the City of Oslo

The effect of the measure is estimated to be 1,000 tonnes CO₂e in 2021 and 2,000 tonnes in 2024. The calculation is based on total emissions from lorries transporting bulk materials in Oslo of approximately 10,000 tonnes CO₂e, according to the Institute of Transport Economics (TØI, 2019), and the City of Oslo accounting for around one fifth of sales (Prognosesenteret's sales figures (EBA, 2019)) in the building and construction market. The effect implies that all heavy vehicles used to transport bulk materials and waste to/from municipal building and construction sites will be zero emissions or use sustainable biofuel from 2022. It is assessed that market participants need slightly more time to make the change, and that it will take a little time before all contracts are carried out with zero emissions/sustainable biofuel, for which reason 50% effect has been incorporated for 2020 and 2021. The criteria for awarding contracts may also favour suppliers with the capacity to provide climate-friendly transport of persons, equipment and materials. The emissions-reducing effect may therefore be higher than has been estimated for this measure. It is also possible that the effect has been underestimated because the actual transport level is higher than TØI's estimate (2019). There is no basis on which to quantify this effect.

Measure no. 11 Zero-emissions/biogas-driven heavy vehicles

The effect of the measure is estimated to be 500 tonnes CO₂e in 2024. The calculation is based on information sourced from a market survey conducted by the Climate Agency ahead of the competition to establish an energy station on Oluf Onsums vei in Oslo. The market survey was sent to carriers that had signed a declaration of intent with the Climate Agency regarding increased use of biogas. It showed that the current demand for biogas in Ryen was around 5 GWh. If an energy station is established by 2022, this demand will increase to around 7 GWh. This is estimated to be equivalent to around 450 tonnes CO₂e a year, starting from 2022. An annual effect of 100 tonnes CO₂e from the work on zero-emissions routes has also been incorporated, based on data from the package of measures for efficient and climate-friendly goods and utility transport (Multiconsult, 2018).

Measure no. 12 Zero emissions/sustainable biofuel in municipal machinery

The effect of the measure is estimated to be 1,600 tonnes CO₂e in both 2021 and 2024. The estimate is based on reported figures for diesel consumption in construction machinery in the City of Oslo's Environment and climate report 2019 (City of Oslo, 2020b). The calculations use the emissions level in 2018 as a reference, i.e. a constant level of consumption at the 2018 level and zero emissions in 2021 is assumed. A 50% reduction in emissions is assumed from 2019 to 2020.

Measure no. 13 Fossil-free public transport – ferries

The effect of the measure is estimated to be 6,200 tonnes CO₂e in 2021 and 6,700 tonnes in 2024, for the Nesodden ferries and the island ferries in total. The expected emissions reduction provided by the transition to fully electric operation for the Nesodden ferries is estimated to be approximately 5,800 tonnes CO₂ in total for the three vessels

“Kongen”, “Dronningen” and “Prinsen”. The effect will be achieved in 2020. The measure will provide a 100% reduction in GHG-emissions in port and on crossings. The estimated effect is based on the ferry operator Norled’s reported consumption data for 2019 (Ruter, 2020). The expected emissions reduction provided by electrification of the island ferries is estimated to be approximately 700 tonnes CO₂e from 2022. The estimates are based on reported fuel consumption for the period 2017–2019 (Ruter, 2020). As fuel consumption varies significantly with the weather, an average for the last three years has been used. The current operator uses biodiesel (HVO 100), so the GHG reduction will in reality be lower. The total effect can, however, be booked against the municipal emission inventory. Ruter expects an increase in traffic (8%) for the island ferries from 2021 when the Langøyene route reopens after restoration. The increase in traffic will be covered by electric services and is therefore not included in the calculation.

Measure no. 14 Establishment of shore power

The effect of the measure is estimated to be 3,000 tonnes CO₂e in 2021 and 3,900 tonnes in 2024, for international ferries and the cement ships in total. The expected emissions reduction provided by the transition to shore power for international ferries is estimated to be approximately 2,200 tonnes CO₂e in total for the three vessels “Pearl Seaways”, “Crown Seaways” and “Stena Saga”. The effect will be achieved in 2020. The estimates for “Pearl Seaways” and “Crown Seaways” are based on reported figures for use of the shore power facility in 2019. The estimate for “Stena Saga” is based on activity data and sourced from the Action plan for Port of Oslo as a zero-emissions port (Port of Oslo, 2018). Stena Line closed its service to Frederikshavn in Denmark in the spring of 2020. Shortly afterwards, DFDS announced that it would open a new service on the same route, but using the ferries that currently service the Oslo–Copenhagen route. It is uncertain whether this will lead to an increase in traffic or a shake-up of the timetable resulting in less traffic between Oslo and Copenhagen, but an increase in traffic equivalent to that on the former Stena Line service is assumed. Overall, this means no change in traffic on the routes between Oslo and Denmark. The expected emissions reduction provided by the transition to shore power for the cement ships at Sydhavna port is estimated to be approximately 1,500 tonnes CO₂e in 2021 and 1,800 tonnes in 2024. The estimate is based on activity data for 2017 and sourced from the Action plan for Port of Oslo as a zero-emissions port (Port of Oslo, 2018). There is a certain risk of underestimation for the cement ships, as the current methodology does not capture the fuel needed to operate the large pumps used in the port.

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