

Climate budget 2020

Chapter 2, Oslo City Government's
budget proposal 2020 with
appendices



Names and abbreviations of the City of Oslo's departments and agencies

Abbreviation	English names
BYM	Department of Urban Environment
BYU	Vice Mayor for Urban Development
EBY	Agency for Real Estate and Urban Renewal
EGE	Waste to Energy Agency
FIN	Department of Finance
HAV	Oslo Port Authority
KLI	Agency for Climate
MOS	Department of Environment and Transport
NOE ?	Department of Business Development and Public Ownership
OBY	Municipal Undertaking for Social Service Buildings
PBE	Agency for Planning and Building Services
REN	Agency for Waste Management
UDE	Education Agency
UKE	Agency for Improvement and Development
VAV	Agency for Water and Wastewater services
VEAS	VEAS wastewater facility

2.1 Introduction

Oslo City Government and the City Council have adopted ambitious climate targets which are incorporated into Oslo City Government's proposal for a new climate strategy for 2030 (Oslo City Government Proposition 214/19). Two of the targets in the climate strategy are to reduce the direct greenhouse gas (GHG) emissions by 95% when compared with emissions in 2009 and for the city to be climate-resilient – both to be achieved by 2030.

The climate budget is a necessary governance tool to allow the implementation of efficient measures so that the target of a 95% emissions cut can be reached in 2030. The climate budget represents a commitment for all municipal entities to issue regular reports on the status of execution of the climate measures for which they are responsible. The climate budget shows that the targets can only be met by implementing a wide range of measures. This requires the participation of the city's inhabitants and businesses, and an active and successful collaboration between regional and governmental authorities and across the City of Oslo's own organisation.

The climate budget for 2020 is the fourth such budget to be prepared. These budgets have developed in line with increased knowledge, experience and use of improved methods. The budgets remain groundbreaking work, but several cities, both in Norway and abroad, are now in the process of copying Oslo's climate budget as an efficient governance tool.

Oslo has achieved significant GHG emissions reductions since 2013. The most recent emissions statistics (June 2019) show that emissions were down 16% from 2015 to 2017. The emissions limits established in Oslo's climate budget for 2017 have been met. A large volume of the reduction is attributed to governmental, regional and local climate measures. It will not be possible, however, to sustain this positive development without new measures and reinforcement of existing measures. The provisional nationwide emissions statistics published by Statistics Norway show that GHG emissions on a national scale increased by 0.4% in 2018. This is most probably due to a lower share of biofuel in road transport and increased use of diesel in construction work. For Oslo, this means that the emissions reduction in 2018 must be expected to be lower than that achieved in 2015 to 2017, as the use of biofuel has contributed substantially to reductions in Oslo. The statistics for GHG emissions in Oslo in 2018 will not be published until the spring of 2020.

Oslo City Government remains loyal to its climate ambitions. Emissions shall be cut by half in 2020 when compared with levels in 1990, adjusted for the delayed carbon capture at the Klemetsrud waste-to-energy facility. There is a need to adapt the climate budget to new governmental climate statistics, so that Oslo's targets and annual results can be directly compared with these statistics. As a result, 2009 will be used as the reference year for the climate budget for 2020, and the climate targets will be amended to a percentage figure. This is a technical amendment that does not have any impact on the level of ambition. The changes to the climate targets are in line with Oslo City Government's proposal for a new climate strategy leading up to 2030. The emissions reduction targets for 2020 and 2030 are therefore 41% and 95% respectively when compared with levels in 2009. A climate budget will be presented for the entire economic plan period, and Oslo City Government proposes an emissions reduction of 52% for 2023 when compared with 2009.

An emission reduction target of 41% in 2020, when compared with emission levels in 2009, corresponds to a reduction of 560,800 tonnes of CO₂ equivalents (CO₂e). The estimates in the climate budget show that emissions in 2020 will be reduced by 452,000 tonnes CO₂e, or 33%. In addition to this quantified reduction, we expect to see further reductions produced by measures implemented, but for which we currently are unable to estimate a quantified effect.

The major share of the reduction that has been achieved after 2013 is proof that GHG emissions in a large city can rapidly decline by means of targeted measures within road traffic, heating of buildings and construction. These estimates show, however, that it may be difficult to achieve Oslo's climate target for 2020. The final statistics for GHG emissions in Oslo in 2020 will not be published until the spring of 2022.

Oslo City Government believes it is correct to maintain the emission reduction target for 2020, partly as a number of measures have been implemented (mentioned in table 2.2b) in the climate budget that are expected to provide non-quantifiable emissions reductions, and partly because the governmental emissions statistics for Oslo to date have shown better results than those in Oslo's own prognoses.

The detailed appendix to the climate budget provides more information on the method and calculations underlying the climate budget for 2020.

Important climate initiatives in the climate budget for 2020

In the climate budget for 2020, measures that were implemented in the climate budget for 2019 have been developed, with proposals for new measures laying the foundations for future work.

The introduction of new road toll stations and a new rates system from 1 June 2019 is one central measure to reduce road transport in to and within Oslo and to increase the share of low-emissions and zero-emissions vehicles. The new road toll stations also help finance the development of roads and public transport, reduce delays and provide a fairer balance in road tolls, as more people now have to pay the tolls. The decision has been made to increase road toll rates for zero-emissions light vehicles from 1 March 2020, while electric light commercial vehicles are exempt from road tolls. On assignment for the Norwegian Ministry of Transport, the Norwegian Public Roads Administration is carrying out an assessment of the technical and practical options for implementing lower tolls in the road toll ring for heavy vehicles that use 100% biogas. If such a discount is implemented, it may represent a significant contribution to reduced emissions from heavy vehicles in Oslo.

The new road toll stations are expected to help reduce the number of fossil fuel vehicles on the roads and encourage some road users to make the move to public transport, cycling and walking. Public transport company Ruter has reinforced its bus capacity to cater for an expected increase in passengers.

Several measures shall be implemented to ensure that emissions from taxi transport and transport of goods and utilities are as low as possible. In a move to achieve zero-emissions taxi transport, the City Council adopted a Proposition (386/19) in December 2018: Change in regulations relating to taxis – Introduction of requirement for zero-emissions on licence holders in Oslo. The resolution implies that all taxis registered for up to nine persons shall not have emissions from a combustion engine. The environmental requirement must be met after a transitional period of four years.

The transition to zero-emissions goods transport is promoted by a gradual introduction of restrictions, such as reserving loading and unloading bays for zero-emissions goods vehicles, as well as contributing to freight consolidation. The work to dedicate commercial parking spaces to zero-emissions utility vehicles continues. At the same time, subsidy schemes for companies and professional drivers continue in order to facilitate charging infrastructure.

The subsidy schemes provided by the Climate and Energy Fund, aiming for a transition from fossil fuel vehicles to climate-friendly forms of transport, are to be continued and developed. Private companies can, for example, apply for subsidies to encourage employees to travel to work by cycle or by foot instead of by car. The most important charging infrastructure for electric cars is charging at home. The municipal subsidy scheme for establishment of a charging infrastructure in co-owner properties and housing cooperatives contributes towards private developments and shall continue. In the space of just over two years, applications for support for charging infrastructure in housing cooperatives and co-owner properties allowing for the installation of around 34,000 charging stations have been approved.

Oslo City Government proposes setting aside 600 parking spaces on street level for carpooling, so that fewer people will need to travel in their own cars. It is difficult to estimate figures for the expected GHG emission-reducing effect of changes in behaviour. However, this is an important contribution to reaching the total emissions limits.

In the budget for 2018, a figure of NOK 99 million was allocated to the establishment of new municipal charging stations over a period of three years. The City of Oslo maps the requirement for charging stations in the individual districts to identify where there is a lack of private parking and where the need for public charging stations is greatest. The outcome of this mapping process may result in requirements to adjust where and how many charging stations are built in order to achieve the best improvements to charging facilities. The plan is to develop 575 new ordinary charging stations in 2020. Moreover, the City of Oslo collaborates with Fortum Oslo Varme to establish and operate fast charging points, and dedicated fast charging points are being built for taxis.

In 2019, the City of Oslo introduced payment for charging electric cars at municipal charging points. Experience to date shows that demand has fallen slightly where payment has been introduced, so that it is easier to find available charging points when you need to charge.

The work on promoting a more climate-friendly building and construction industry is being accelerated. The first 100% zero-emissions building and construction projects have been implemented in 2019, and new zero-emissions projects in 2020 will provide valuable experience. New joint guidelines have been prepared for how climate factors shall receive more focus in municipal building and construction projects. The Agency for Planning and Building Services is also introducing a set of criteria for evaluation of climate-related consequences in planning and building issues, for use in their own case management and in dialogue with private developers. The City of Oslo's municipal entities are all working to replace fossil fuel vehicles and machinery. Good progress has been made in this area, although one challenge remains in that not all necessary vehicles and machines have climate-friendly alternatives.

Further development of existing measures and need to identify new measures

If Oslo is to reach its emission reduction target for 2030, the work on reinforcing and developing existing measures must receive priority. Oslo City Government's proposal for a new climate strategy leading up to 2030 (Oslo City Government Proposition 214/19) identifies target areas that will help cut direct GHG emission, i.e. emissions within Oslo. This requires intensive efforts within passenger transport, heavy goods transport and building and construction in the years to come. In this context, there is a special demand for cooperation with businesses, knowledge environments and other cities so that we can further develop knowledge, measures and tools both in the short and long term.

Oslo City Government aims to continue its work on reinforcing existing tools and investigating new measures that can be implemented in the period from 2020 to 2023. In 2020, for example, the following studies will be conducted:

- Road toll payment system: Investigation of how further emission reductions can be achieved.
- Buses: The majority of emissions from buses in Oslo in 2017, which totalled 34,000 tonnes CO₂e, came from buses not operated by the public transport company Ruter. Oslo City Government proposes to map emissions from other buses and to identify and assess measures to reduce these emissions.
- Heavy vehicles: The Agency for Climate is in charge of a process to study emissions from heavy transport and handling of bulk material. This process will continue in 2020.
- Waste incineration: There is vast potential in reducing emissions from fossil components (plastic) in waste incineration. A study will be carried out to identify how we can reduce emissions in all parts of the commercial cycle for plastic.

2.2 Oslo's climate targets in 2020 and 2030

During the discussions of the Climate and Energy Strategy for Oslo (City Council Proposition 195/16), a target was adopted to reduce emissions by 50% by 2020 and 95% by 2030 when compared with levels in 1990. In the climate budget adopted for 2019, the target for 2020 is to reduce emissions to 766,000 tonnes CO₂e. In the climate budget for 2020, Oslo City Government proposes adapting these targets to new governmental climate statistics. The level of ambition in the targets remains unchanged.

New reference year

In 2018, the Norwegian Environment Agency published new and improved emissions statistics by municipality. These statistics were updated in 2019 and cover the years from 2009 to 2017. The climate budget is based on these statistics.

Previously, climate targets in Oslo have had 1990 as the reference year for emission levels. If we are to be able to assess whether we have reached the target, the emissions in the target year and in the reference year should be calculated according to the same method. The new reference year will therefore be 2009.

Inclusion of additional emissions sectors

A proposal has been made to include all sectors covered by the new statistics from the Norwegian Environment Agency in Oslo's climate targets. Waterborne navigation and aviation have not previously been covered by Oslo's climate targets, but will now be included – and consequently also in the climate budget.

Emission reduction target expressed as a percentage figure

The annual emission limits in the climate budget have to date been stated as the number of tonnes of CO₂e. Changes in governmental climate statistics have resulted in a variation in these figures, making it difficult to compare the climate budget and emission inventories over time. Instead of absolute figures, Oslo City Government therefore expresses emission reduction targets as a percentage for annual emissions reductions in the future. The proposed resolution in the climate budget will also include the number of tonnes of CO₂e, based on the most recent published statistics.

In order to establish a percentage-based target, a fixed level of ambition and the addition of the new emissions sectors have been assumed. The starting point is that emissions in 2020 shall be maximum 766,000 tonnes of CO₂e for the following sectors: "other mobile combustion", "waste and wastewater", "waste incineration and energy supply", "industry, oil and gas", "heating" and "road transport". In addition, emissions shall be added for waterborne navigation and aviation, which have previously not been part of Oslo's climate targets.

2020 target

Concerning these changes, the Oslo City Government, proposes that Oslo's target for 2020 is a 41% reduction in GHG emissions when compared with the level in 2009. This target encompasses all sectors in the emissions statistics.

2030 target

Oslo City Government's proposal for the Climate Strategy for 2030 implies that Oslo shall reduce GHG emissions by 95% by 2030 when compared with levels in 2009.

2.3 Uncertainties

Oslo's climate budget is groundbreaking work, and presents several challenges relating to uncertainties. Among these challenges is the uncertainty in the governmental emissions statistics for Norwegian municipalities, the "business as usual"-prognoses in GHG emissions and assessments of the emissions reducing effect of planned or implemented measures.

Oslo City Government's approach to these challenges is based on the use of best available knowledge, transparency relating to data and method utilised, transparency about uncertainties and a gradual improvement of the climate budget in line with developments in knowledge. Estimates of the effect of various measures are conservative.

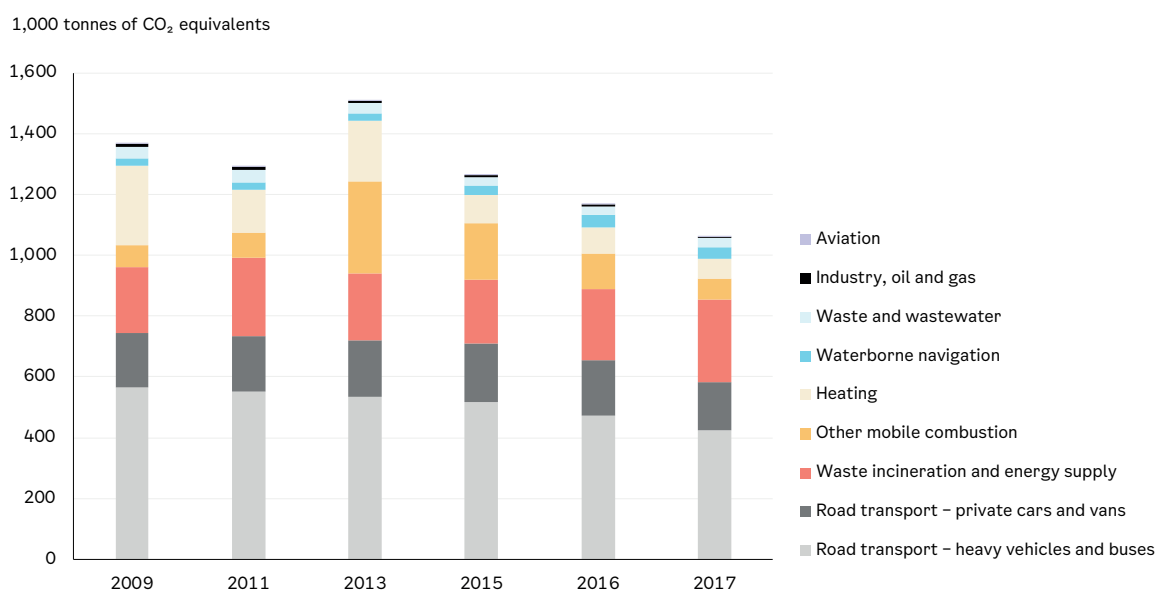
2.4 Status for GHG emissions in Oslo

The governmental statistics showing GHG emissions in Norwegian municipalities provide the fundamental data for Oslo's climate budget. A new set of GHG statistics covering the years 2009 to 2017 was published in the spring of 2019. The statistics are based on a new methodical approach, particularly for the road transport sector, and this new method shows that the level of emissions has slightly increased for all years when compared with previous figures. The methodology changes have been implemented for the entire time series, allowing assessment of the changes from year to year in the statistics.

Oslo's total GHG emissions, according to final statistics, were down by more than 22% from 2009 to 2017. In 2009, GHG emissions were close to 1.37 million tonnes of CO₂e. By comparison, GHG emissions in 2017 were close to 1.06 million tonnes of CO₂e. From 2016 to 2017, total GHG emissions were down by more than 9%, corresponding to an absolute reduction of 105,900 tonnes of CO₂e.

The road transport sector is definitely the largest contributor to emissions, representing 55% of total emissions in 2017. The second largest emissions sector, waste incineration and energy supply, represented 25% of total emissions in 2017.

Figure 2.1 Development in Oslo's GHG emissions, 2009-2017. Source: The Norwegian Environment Agency (2019a)



The emissions reduction from 2016 to 2017 is mainly attributed to reduced emissions from road transport, heating and other mobile combustion. Measures and policy instruments resulting in a move away from fossil fuel transport, together with warnings of a ban on oil-fired heating in buildings from 1 January 2020, may be the cause of this change. For road transport, a major share of the reduction from 2016 to 2017 may be attributed to increased use of biofuel.

From 2016 to 2017, emissions from waste incineration in Oslo increased by 16%. This is due to the fact that Oslo receives a larger volume of waste for incineration than before, and that the composition of the waste and a lot of wet material required increased use of auxiliary fuels (mainly oil) in order to obtain furnace effect.

“The climate barometer” for Oslo is a valuable tool when monitoring the development of those emissions sources thought to have the greatest impact on emissions in Oslo. Updated information from the climate barometer is available (in Norwegian) at www.klimaoslo.no/klimabarometeret/.

2.5 Status description

Oslo is undergoing major change. A lot of important work is carried out every day for the climate, and this work is producing results. Below is a presentation of important target areas for work on the climate. This overview is not exhaustive. For more detailed information, please refer to Oslo City Government’s reports to the City Council.

New road toll payment system from 1 June 2019 helping to reduce road traffic

The introduction of a new inner-city road toll ring and new rates system on 1 June 2019 is a key and important initiative for GHG emissions reductions in Oslo. The new toll stations shall help finance road and public transport developments, and 98% of the revenue from road tolls shall subsidise measures to increase climate-friendly transport systems. In addition, the new road toll stations will help reduce road traffic, promote a more rapid transition in the vehicle fleet by encouraging a change to electric cars, reduce delays, improve the inner-city environment and provide a fairer balance with more people paying road tolls.

Zero-emissions utility and goods transport

Work is under way to facilitate zero-emissions utility and goods transport. Two freight consolidation centres for climate-friendly goods transport were opened in the spring of 2019. These types of systems are to be further developed, with municipal facilities allowing existing businesses to succeed, and others to follow suit. In the city centre, Ragn-Sells, Bring and KLP are cooperating on distribution of goods and collection of waste using zero-emissions vehicles. DB Schenker also has a new logistics terminal in Filipstad, where they aim to have 80% zero-emissions deliveries within the Ring 3 area in Oslo in 2019.

Significant growth in public transport

More and more people are leaving their cars at home to use public transport or cycle. Traffic figures for the public transport provider Ruter showed 387 million passengers using public transport in 2018, up 4.2% since 2017. In 2019, Oslo City Government has strengthened public transport by increasing subsidies for the purchase of public transport services.

From January 2019, the age limit for free public transport was raised from four to six years, and the age limit for children’s tickets was raised from 16 to 18 years. Ruter is testing age-friendly public transport in the districts of Nordre Aker, Vestre Aker and Sagene, and use of public transport to activities is being tested in cooperation with sports clubs such as Vålerenga Football.

Ruter has a total of 115 electric buses that were introduced in the summer of 2019 – 76 in Oslo and 39 in Akershus. A charging station has been built at Rådhusbrygge 4 for the Nesodd ferries, and in the autumn of 2019, the first of three Nesodd ferry boats was converted to electric operations. The charging station can also be used to charge the boats carrying passengers to the islands in the inner Oslofjord, which are due to make the transition to electric operations in connection with a new contract (starting in 2021). As Oslo is to have 87 new trams from 2021, work is also under way to upgrade the streets and tram rails.

Testing of self-driving vehicles started in May 2019 on the route between Vippetangen and Kontraskjæret in Oslo centre.

A cleaner fleet of vehicles

Recent statistics show a fall of 11% in emissions from road transport from 2016 to 2017. This is mainly due to biofuel and the transition to electric vehicles. In 2018, there was a substantial increase in the share of electric cars driven by private individuals in Oslo. At the end of Q2 2019, 16% of all private cars registered in Oslo were electric cars, and 62% of new car sales in Oslo in the first half of the year were electric cars.

More stringent climate requirements for municipal procurement

The Agency for Improvement and Development (UKE) is in the process of preparing common climate requirements on the procurement of services in areas such as transport, plastic and building and construction. This process has involved the development of instructions for how Oslo shall have zero use of fossil fuels and, in the long term, zero emissions. The City of Oslo's procurement strategy and use of common requirements are important tools in the climate budget.

Phasing out oil-fired heating

On 1 January 2020, a national ban will be introduced against heating buildings with fossil oils. Leading up to 1 December 2018, the City of Oslo provided support to housing cooperatives and co-owner properties that wanted to replace their oil-fired central heating. Enova is continuing its support scheme, at reduced rates, until the end of 2019. To date, 1,953 housing cooperatives, co-owner properties and commercial buildings have received subsidies from the City of Oslo to replace their oil-fired boilers. The sale of heating oil in Oslo has seen a substantial decline. Emissions from this source shall be close to zero after 2020.

Status for carbon capture at Klemetsrud

Fortum Oslo Varme AS' waste-to-energy plant at Klemetsrud is one of two industrial installations in Norway carrying out a pilot project for CO₂ capture. Provisional results at Fortum Oslo Varme AS show stable CO₂ capture, with the capacity to capture 90% of CO₂ emissions from the effluent gas.

Once the pilot project has been completed and external quality assurance performed, the Government will assess whether the demonstration projects should be realised and whether this shall cover one or two carbon capture installations. The Government's recommendation will be presented to the Parliament along with a possible decision on investment in 2020 or 2021. A carbon capture plant at Klemetsrud could potentially provide emissions reductions of around 200,000 tonnes of CO₂e when in full operation from 2023.

Increased investment in zero-emissions construction sites

Oslo started the work to upgrade Olav Vs gate in the city centre in September 2019. This is the first zero-emissions construction site in Oslo. The Agency for Improvement and Development, in cooperation with the Agency for Climate, has developed new standard climate and environmental requirements for the City of Oslo's building and construction sites. These comprise a proposed minimum requirement for fossil-free construction, and allocation criteria will emphasise zero-emissions solutions.

The City of Oslo, together with the international network of major cities, C40, has taken the initiative to establish a Clean Construction Forum to reduce GHG emissions from construction sites and use of materials in buildings. One of the main purposes of the C40 Clean Construction Forum is to develop a declaration of demand for zero-emissions construction machinery and climate-friendly materials from interested C40 cities, and to promote cooperation and exchange of experience between cities to reduce emissions from this sector.

Climate transition in the Port of Oslo

The Port of Oslo has intensified its work for the environment and climate in 2019 via follow-up of the action plan for a zero-emissions port (City Council Proposition 352/18). Stena Line and DFDS have implemented shore power at Vippetangen in 2019 and, by the start of 2020, all international ferries in Oslo will use shore power. The first shore power installation in the cargo port, Sydhavna, is planned in 2020, with support from Enova. The Port of Oslo is currently building a fully electric working boat, Pelikan. This boat shall work to remove more than 20 tonnes of waste every year from the sea area in Oslo. In 2019/2020, the need for energy, hydrogen and biogas for sea and land transport in Sydhavna port will be assessed in order to investigate what is required for Oslo to have Norway's first zero-emissions port.

This year's Climate Survey shows wide support for the climate targets

The Climate Survey has been carried out for the third year in a row, and the results for 2019 show wide support for Oslo's climate strategy and targets, not just among Oslo's citizens but also inhabitants in neighbouring municipalities. A clear majority of the city's citizens – 63% – feel that the work to achieve the climate targets will make the city a better place to live in. 76% of citizens in Oslo support the principal target of a 95% GHG emissions reduction by 2030. 54% support Oslo taking the lead in efforts for the climate, ahead of other cities, both at home and abroad.

The survey is an important tool for measuring the effect of climate-based communications from the City of Oslo, by charting the attitudes and behaviour of the population and businesses in relation to the environment, climate and the City of Oslo's climate strategy.

2.6 Emissions limits for the climate budget 2020

Oslo City Government's climate target is to reduce emissions by 41% in 2020 and 95% in 2030, when compared with levels in 2009. The climate budget shall establish upper limits for emissions in the economic plan period and is an annual plan comprising measures to ensure that the climate targets are reached. For the climate budget 2020, this implies that measures need to be assessed in the period from the last known level of emissions (2017) up to the last year in the economic plan period (2023). In the process to achieve the target for 2030, Oslo City Government proposes an emissions reduction of 52% in 2023 when compared with 2009.

In order to establish annual emissions limits for the next decade, an assumption has been made of a possible development in emissions between the emission targets in 2020 and 2030 of approx. 4 percentage points per year, with the exception of 2024, comprising the effect of a full-scale CO₂ capture installation at Klemetsrud waste-to-energy plant. The timing of the full effect of the installation depends on the decision regarding financing to be made by the Parliament. The earliest date when full effect from the CO₂ capture installation can be achieved is 2023/2024.

The estimate of an emissions reduction of 4 percentage points in the remaining years is a simplification. It is important to underline that execution of the measures in the climate budget will not provide the same emissions reduction every year, and the reductions will vary somewhat. The proposal for the new climate strategy shows that new technology and governmental regulations are expected to provide a boost towards the end of the period. This implies larger cuts at a later date. This remains uncertain, and it is important to get started as early as possible, indicating higher cuts earlier on in the period.

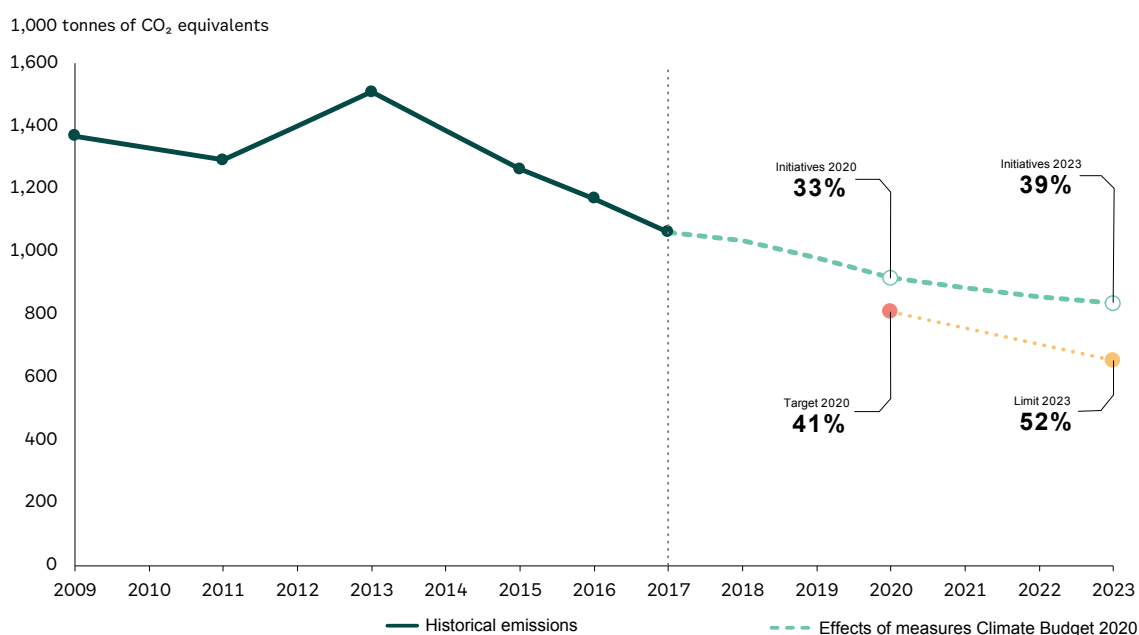
Calculating the emission reduction effects of measures

The methods for estimating effects of measures in the climate budget for 2020 have been improved to take into account the estimated effects of current policy, using a BAU-baseline. This baseline is not used to establish climate targets. The baseline is a projection of emissions caused by external factors, such as growth in population, technological developments and economic cycles. In addition, the emission reduction effects of governmental, regional and municipal climate policies as of May 2018 are included. The development in emissions assumes that these measures are carried out according to plan. The baseline comprises the following adopted policies:

- 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

In addition to the climate effect found within the baseline, updated calculations of effects have been prepared for all measures that can be quantified (see table 2.2a below). Figure 2.2 below shows the climate target for 2020, emissions limits in 2023, estimated emissions reduction, including the effect of climate measures adopted by the Government and the City of Oslo. The figure also illustrates the need for further emissions reductions (the gap between effect of measures and climate target 2020, emissions limit 2023).

Figure 2.2 Estimated effects of climate measures in the baseline and climate budget 2020



Oslo's total GHG emissions were down by more than 22% from 2009 to 2017. In the lead up to 2023, measures included in the baseline and in the climate budget are expected to provide further emissions reductions. In total, the effect of measures already adopted and found in the baseline and quantifiable measures in the climate budget 2020 (table 2.2a) help cut emissions by 33% in 2020 and 39% in 2023, when compared with levels in 2009.

The need for further emissions reductions is portrayed by the gap between effect of measures in 2020 and the target of 41% emissions reduction in 2020 and the emissions limit of a 52% reduction in 2023. This represents a shortage in effect from measures of 8 percentage points (108,800 tonnes CO₂e) between the climate target for 2020 and the estimated effect of quantified measures. As mentioned above, an emissions reduction is also expected from measures where we are not able to calculate effects with sufficient certainty (see measures in table 2.2b and 2.3 below). Nonetheless, this gap is an expression of the uncertainty relating to achievement of targets for 2020. At the time of writing, there is a gap in 2023 of 13 percentage points, corresponding to 183,200 tonnes of CO₂e, between the effect of measures and the emissions limits.

It will be difficult to meet the target for 2020. If this target is to be reached, we must achieve significant emissions reductions, which it has not been possible to quantify at this point in time. The governmental emissions statistics for 2020 will be published in 2022.

Oslo City Government's proposed resolution

The City of Oslo has an objective to reduce Oslo's GHG emissions in budget year 2020 by 41% from 2009 emission levels. At the end of the economic plan period, emissions shall be cut by 52% from 2009. According to the most recent statistics available, this corresponds to maximum emissions of 807,100 tonnes CO₂e in 2020 and 651,200 tonnes CO₂e in 2023.

Oslo City Government proposes the following resolution:

Table 2.1 limits for GHG emissions in the City of Oslo in 2020 and 2023 ¹⁾

	2009 (reference year)	2017 (statistics)	2020	2020
Historical emissions	100%	-22%	-	-
Level of emissions	1,367,900	1,062,500	-	-
Baseline and effect of measures in climate budget 2020	-	-	-33%	-39%
Level of emissions	-	-	915,900	834,400
Further need for emissions reduction ²⁾	-	-	8 percentage points	13 percentage points
	-	-	108,800	183,200
Target and emissions limit	-	-	-41%	-52%
Level of emissions	-	-	807,100	651,200

¹⁾ All percentage figures are relative to 2009, the reference year. All absolute figures are stated as tonnes CO₂e. The figures are based on the most recent emissions statistics available from the Norwegian Environment Agency, published 25 June 2019. 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 provide emissions reductions that have not been quantifiable. These measures and activities will imply a lesser need for further emissions reductions.

The City Council supports the measures in table 2.2a and table 2.2b in chapter 2, the Climate Budget, in Proposition 1. Oslo City Government, in its ordinary reports issued to the City Council, reports expected achievement of the climate target for 2020 and the emissions limit in 2023. These reports are based on the status for execution of the measures presented in table 2.2a and table 2.2b in chapter 2, The Climate Budget, in Proposition 1, and the indicators for GHG emissions in Oslo, "The Climate Barometer".

2.7 Measures in the climate budget 2020–2023

The Agency for the Climate has assessed the emissions reductions that may be expected from the measures. More detailed explanation of the technical assessments underlying the estimated effects is available in the "Appendix to the climate budget Proposition 1/2020". All measures and activities are classified in accordance with tables 2.2a, 2.2b and 2.3, based on categorisation and whether they are quantifiable or not. A brief description of the measures is provided below tables 2.2a and 2.2b.

Measures with quantified emissions reduction

Table 2.2a provides an overview of the measures where it has been possible to estimate a quantified emissions reduction. The terms "emissions sector" and "emissions source" in the table refer to the categorisation in the emissions statistics, and where an effect is expected. The estimated effect of measures is rounded off to the closest 100 tonnes CO₂e. The estimated effect on emissions for several important measures in the climate budget can be found in the baseline. The estimated effects reflect the reductions to be achieved in 2020 and 2023, compared with the baseline for the same years.

Table 2.2a – Measures with quantified emissions reduction

	No.	Measures and policy instruments	Effect 2020 (t CO ₂ e) ¹⁾	Effect 2023 (t CO ₂ e) ¹⁾	Responsibility ²⁾
Historical emissions reduction and emissions reduction in baseline¹⁾			412,600	462,600	
Emissions sector: Heating					
Emissions source: 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	<i>The effect of the measure is found in the baseline.</i>		Government/ MOS / (KLI)
Emissions sector: Waste incineration and energy supply					
Emissions source: 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	1,800	3,600	NOE
Emissions sector: Road transport					
Emissions source: Light and heavy vehicles	3	National requirement for sale of 20% biofuel in 2020	<i>The effect of the measure is found in the baseline.</i>		Government
	4	Introduction of new road toll payment system - Establish sufficient charging infrastructure for private cars - Continuation of local and regional policy instruments to promote zero-emissions cars - Continuation of national policy instruments to promote zero-emissions cars - Exemption from payment for electric vans	<i>The effect of the measure is found in the baseline.</i>		MOS (BYM) MOS Government
	5	Zero-emissions/sustainable biofuel in municipal vehicles	1,100	1,600	All / (UKE)
Emissions source: Private cars	6	Better facilities for cyclists - Cycling strategy	1,200	2,200	MOS / (BYM)
	7	Licensing regulation for taxis: zero emissions by 2024 - Contribute to establishment of sufficient charging infrastructure for taxis - Subsidy scheme	1,600	13,400	MOS (BYM) KLI
Emissions source: Buses	8	Transition to zero-emissions utility transport: Dedicated commercial parking spaces - 25 parking spaces will be dedicated in 2020. Further escalation plan being prepared in dialogue with businesses in 2019. - Charging infrastructure - Procurement requirements made in City of Oslo - Subsidy scheme - National subsidy schemes for electric vans - Provide information on exemption from parking fee in resident-only parking zones for zero-emissions vans	6,900	17,500	MOS / FIN (BYM) BYM UKE KLI Government

	No.	Measures and policy instruments	Effect 2020 (t CO ₂ e) ¹⁾	Effect 2023 (t CO ₂ e) ¹⁾	Responsibility ²⁾
Emissions source: Buses	9	Fossil-free public transport by 2020 – buses	7,600	12,100	Ruter
Emissions source: Heavy vehicles	10	Zero emissions/sustainable biofuel in transport of bulk material and waste from building and construction operations on assignment for the City of Oslo - Procurement requirements made in City of Oslo	2,000	2,000	KLI / (UKE)
Emissions sector: Other mobile combustion					
Emissions source: Light and heavy vehicles	11	Zero emissions/sustainable biofuel in machinery for building and construction operations on assignment for the City of Oslo - Procurement requirements made in City of Oslo	12,000	12,000	KLI / (UKE)
	12	Zero emissions/sustainable biofuel in municipal machinery	1,000	1,500	All / (UKE)
Emissions sector: Waterborne navigation					
Emissions source: Waterborne navigation	13	Fossil-free public transport by 2020 - boats	4,200	5,000	MOS / Ruter
Total effect of measures in climate budget¹⁾			39,400	70,900	
Total effect of historical emissions reductions, emissions reductions in baseline and measures in climate budget 2020¹⁾			452,000	533,500	

¹⁾ The effect of the baseline is assessed in relation to emission levels in 2009. The effect of measures is estimated using the baseline in the same year. This means that the effects of measures cannot be summarised between the column for 2020 and 2023, as this states the effect in the year in question when compared with 2009. The effects are calculated on the basis of assumptions regarding the time the measures are implemented.

²⁾ The information in brackets shows responsibility for reporting.

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 will be banned as of 1 January 2020. The City of Oslo is actively involved in the work to phase out fossil oil-fired heating in municipal buildings (eight installations in the municipality's own buildings and five installations in leased buildings) and in following up on previous pledges made via the Climate and Energy Fund regarding support for the phasing out of oil-fired heating in private buildings, so that as many households as possible execute the initiative.
- 2. Phasing out of fossil oil and gas in district heating (peak load) in 2020.** Fortum Oslo Varme AS shall phase out the use of fossil oil and gas as peak load in the district heating system by the end of 2020. This objective applies under normal operations. Peak load will be replaced by electricity, bio-oil/biodiesel or pellets, depending on price and availability.
- 3. National requirement for sale of 20% biofuel in 2020.** The Norwegian Product Regulations place demands on biofuel blends in petrol and diesel sold for road transport in Norway (Requirements for sale of biofuels for road transport). The requirement for sale of biofuels for road transport in 2020 is 16% actual volume (disregarding the fact that advanced biofuel with high climate benefit is counted twice). In 2017 and 2018, sales of biofuel were 16% and 12% respectively. The City of Oslo has no direct follow-up of this initiative.

4. **Introduction of new road toll payment system.** The introduction of a new road toll payment system is a central initiative to reduce road traffic in to and within Oslo and to increase the share of low-emissions and zero-emissions vehicles. The road toll payment system also helps finance the development of roads and public transport, reduce delays and provide a fairer balance in road tolls, as more people now have to pay the tolls. The decision has been made to increase road toll rates for zero-emissions light vehicles from 1 March 2020, but electric light commercial vehicles are exempt from road tolls. On assignment for the Norwegian Ministry of Transport, the Norwegian Public Roads Administration is carrying out an assessment of the technical and practical options for implementing lower tolls in the road toll ring for heavy vehicles that use 100% biogas. If such a discount is implemented, it could make a significant contribution to reduced emissions from heavy vehicles in Oslo.
5. **Zero emissions/sustainable biofuel in municipal vehicles.** By the end of 2020, all vehicles in the City of Oslo's vehicle fleet (passenger cars, vans and heavy vehicles) shall have zero emissions or run on sustainable biofuel. For vehicles where zero emissions are not an option, sustainable biofuel (preferably biogas) shall be used. As of Q1 2019, 53% of the City of Oslo's total vehicle fleet had zero emissions and 4% used biogas. Moreover, several entities under the City of Oslo now use biodiesel/hydotreated vegetable oils (HVO) for the remaining vehicles.
6. **Better facilities for cyclists.** The City of Oslo aims to increase the ratio of cyclists, measured in terms of daily travel, to 25% by 2025. One of the most important initiatives in 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, operations and maintenance, in addition to research and development within this area.
7. **Licensing regulation for taxis: zero emissions by 2024.** This measure is based on the new regulations for taxis in Oslo, which lay down a requirement for 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 and various pilot systems for fast charging, prioritised and dedicated charging infrastructure for zero-emissions taxis at taxi stands, and subsidies via the Climate and Energy Fund to allow taxi drivers to charge their taxis at home. The Parliament has adopted deregulation of vehicles in Oslo (due to a new national regulation on licensing areas) from 2020, and there is some uncertainty around the impact this may have on emissions up to the entry into force of the environmental requirement. Currently, Akershus county authority and the City of Oslo have a joint licensing district, and the four-year transition period will therefore only start once the joint licensing area has been dissolved. The effect of the measure depends on enforcement of the environmental requirement. The police and the Norwegian Public Roads Administration are the control authority, according to the Professional Transport Regulations.
8. **Transition to zero-emissions utility transport.** Dedicated commercial parking spaces: 28 commercial parking spaces within Ring 1 (toll ring) will be reserved for zero-emissions utility vehicles by the end of 2019. In the long term, all 125 commercial parking spaces within Ring 1 will be reserved for zero-emissions utility vehicles. The Department of Urban Development shall dedicate 25 commercial parking spaces to zero-emissions utility vehicles in 2020. As of 2019, zero-emissions vans have been granted free parking in the resident-only parking zone. The effect this measure has on reducing emissions is dependent on sufficient charging infrastructure (the Department of Urban Development is preparing a strategic plan in 2019/2020 for charging infrastructure), subsidy schemes from the Climate and Energy Fund for professional drivers for charging vehicles at home and charging at company premises, and procurement requirements for zero-emissions transport in the City of Oslo. There are also national subsidy schemes for zero-emissions commercial vehicles. The national Government has set aside NOK 500 million in both 2019 and 2020 to support the transition to zero-emissions commercial transport. This is additional to the Norwegian Environment Agency's scrap vehicle deposit scheme for petrol/diesel vans that are replaced with zero-emissions vans.

9. **Fossil-free public transport by 2020 – buses.** Ruter’s project entitled “Fossilfri 2020” or fossil-free 2020 aims for fossil-free public transport in Oslo and Akershus by the end of 2020. The project will be executed by incorporating requirements in new bus tenders for 100% renewable energy sources, and by amending existing contracts so they include a requirement for renewable energy as fuel, as a replacement for fossil diesel. Ruter also aims to achieve zero-emissions operations by the end of 2028. As the Oslo Metro trains and trams are already electric, the initiative targeting buses is most important for this measure.
10. **Zero emissions/sustainable biofuel in transport of bulk material and waste from building and construction operations on assignment for the City of Oslo.** This joint procurement requirement shall help ensure that all heavy vehicles used to transport bulk material and waste picked up from and delivered to municipal building/construction sites in Oslo run on fossil-free fuel from 2020. During the procurement process, there is an emphasis on the suppliers’ share of zero-emissions and/or biofuel-driven vehicles (preferably biogas) for the transport of bulk materials picked up from/delivered to building and construction sites. The suppliers are also assessed on more efficient (reduced) transport based on the number of kilometres and tonnes of bulk material.
11. **Zero emissions/sustainable biofuel in machinery for building and construction operations on assignment for the City of Oslo.** Joint, standardised procurement requirements shall help ensure that all machines utilised on municipal building/construction sites in Oslo use fossil-free fuel from 2020. During the procurement process, suppliers gain extra points for a higher share of zero-emissions and/or biofuel-driven machinery (preferably biogas) for execution of the contract.
12. **Zero emissions/sustainable biofuel in municipal machinery.** The joint procurement requirement for zero emissions/sustainable biofuel shall help boost the process already initiated to change all machinery on municipal building and construction sites in Oslo to run on fossil-free fuel. The consumption of biofuel in the municipal machine fleet almost doubled from 2017 to 2018, from 15,568 litres to 29,839 litres.
13. **Fossil-free public transport by 2020 – boats.** Ruter’s project entitled “Fossilfri 2020” or fossil-free 2020 aims for fossil-free public transport in Oslo and Akershus by the end of 2020 and zero emissions by the end of 2028. This also includes fossil-free solutions for Ruter’s boats. The measure comprises the establishment of the necessary shore power supply and charging infrastructure for electric power for the Nesodd boats, and conversion of existing boats so they can run on electricity within existing contracts. The measure also comprises converting the boats that carry passengers to the islands to electricity by 2021.

Non-quantified measures expected to provide emissions reductions

Table 2.2b contains measures for which there are no technical bases on which to quantify the effect for the climate budget 2020, but which are expected to produce emissions reductions in 2020 and 2023. The challenge in quantifying the effect of these measures may be due to uncertainty about the size of the measures and the time any effect may emerge.

Although it is not possible to quantify the reduction provided by these measures, they do not necessarily have a lesser impact on GHG emissions in Oslo than the quantified measures. Measures such as shore power facilities for cruise ships, restrictive parking and incentives for climate-friendly travel to/from work, for example, have the potential to produce higher emissions reductions than some of the measures that have been quantified. Oslo City Government aims to work towards strengthening existing policy instruments to achieve further emissions cuts. The terms “emissions sector” and “emissions source” in the table refer to the categorisation in the emissions statistics for municipalities, and where an effect is expected.

Table 2.2b – Non-quantified measures expected to provide emissions reductions in 2020 and 2023

	No.	Measures and policy instruments	Responsibility ¹⁾
Emissions sector: Waste and wastewater			
Emissions source: Waste landfill gas	14	Collection of landfill gas - Rommen and Stubberud (study) - Rommen landfill – increased collection of landfill gas (Climate-related initiative application) - Grønmo – minimise downtime for gas facility and establish new system for exploitation of energy generated by the gas	MOS / REN / EGE / (EBY)
Emissions sector: Waste incineration and energy supply			
Emissions source: Waste incineration	15	Increased sorting of plastic from household waste - Study of waste system in Oslo - Waste strategy - Information campaigns to increase sorting of waste at source in households - Reduced use of unnecessary plastic and disposable plastic articles in the City of Oslo's own operations and in Oslo city, cf. Action plan to combat plastic pollution in the Oslofjord 2019-2020	MOS / EGE / (REN)
Emissions sector: Road transport			
Emissions source: Waste landfill gas	16	Increased investment in public transport - Increased capacity in public transport - Powerful measures to reduce delays	MOS / Ruter / BYM
	17	Joint environmental requirements in the City of Oslo's procurement of transport (NEW) - Minimum requirement/allocation criteria that promotes electric/hydrogen/biogas/sustainable biofuel	All / (UKE)
Emissions source: Private cars	18	Climate-friendly travel to/from work - Support scheme and certification in the City of Oslo - Subsidy scheme targeting private individuals	All (KLI)
	19	Street and parking measures - Resident-only parking - Re-prioritisation of street use	MOS / (BYM)
Emissions source: Vans	20	Transition to zero-emissions goods transport: dedicated loading and unloading bays and increased efficiency - Dedicated loading and unloading bays (cf. escalation plan) - Contribute to freight consolidation - Charging infrastructure - Subsidy scheme - Procurement requirements made for the City of Oslo's goods delivery - National subsidy schemes for electric vans	MOS / (BYM) / UKE / KLI
Emissions source: Heavy vehicles	21	Facilitate energy stations and simultaneous transition to renewable fuel via letters of intent (previously M) - Facilitate plots of land and financing solutions - Letter of intent for investment in biogas/hydrogen	KLI
Emissions sector: Other mobile combustion			
Emissions source: Diesel-driven motorised tools	22	Zero emissions/sustainable biofuel in machinery for building and construction operations on assignment for private developers - Subsidy scheme - Voluntary agreement	(KLI) / FIN / NOE
Emissions sector: Waterborne navigation			
Emissions source: Waterborne navigation	23	Establishment of shore power installation - Shore power, international ferries - Shore power, Sydhavna port	NOE / (HAV)

¹⁾ The information in brackets shows responsibility for reporting

Description of measures in table 2.2b

- 14. Collection of landfill gas.** The aim of this measure is to increase collection of landfill gas (methane) from the landfill sites at Grønmo and Rommen. Measures shall also be studied for implementation at the Stubberud landfill site. The Waste-to-Energy Agency is responsible for minimising downtime for the gas facility at Grønmo and establishing a new system for exploitation of energy generated by the gas.
- 15. Increased sorting of plastic in household waste.** The Agency for Waste Management (REN) and the Waste-to-Energy Agency (EGE) are working to ensure improved sorting of waste at the sorting plants in Oslo and on improving attitudes towards increased sorting of plastic packaging from households. REN, along with several relevant bodies, shall carry out a study of the waste system in Oslo in order to evaluate measures that may reduce the volume of plastic that is incinerated, in both the short and long term.
- 16. Increased investment in public transport.** Plans have been made for increased investment in public transport operations in order to cover future requirements. New trams will go into service in the period from 2021 to 2024, and a study of the future need for new Oslo Metro carriages has been started. At the same time, the project entitled “Powerful measures to reduce delays” shall continue, working to reduce delays in public transport. A number of major measures for public transport are under way or in the planning stage: the Fornebu line, new Metro tunnel through the city centre with a new station at Majorstua, the tram programme, and a new signalling and interlocking system for Oslo Metro. These measures contribute to making public transport more attractive than travelling by car. These measures are funded by road tolls, governmental funding (urban environment/urban growth agreement), contributions from landowners, income from sale of tickets and subsidies from Oslo and Akershus.
- 17. Joint environmental requirements in the City of Oslo’s procurement of transport.** In 2019, the Agency for Improvement and Development prepared joint environmental requirements on transport for the City of Oslo's goods and services procurements, and the issue will be presented to Oslo City Government for decision-making in the autumn of 2019. The intention is to demand climate friendly vehicles and fuel as minimum requirements or use these as criteria when awarding procurement contracts. Minimum requirements may be made on vehicles running on electricity, hydrogen and biogas.
- 18. Climate-friendly travel to/from work.** Oslo City Government has launched the “Green travel to/from work scheme”, a support system targeting municipal workplaces to reduce GHG emissions caused by travel to/from work, by encouraging more people to choose public transport, cycling and walking rather than a car. A total of NOK 5 million has been allocated to the scheme in 2019, with NOK 25 million in 2020. Moreover, the Agency for the Climate has signed an agreement with the Norwegian Cyclists’ Association (SLF) regarding the roll-out of the certification scheme for “cycle-friendly workplaces” at 100 municipal workplaces. A subsidy scheme entitled “Smart travel to work” has also been established under the Climate and Energy Fund.
- 19. Street and parking measures.** Resident-only parking shall ensure optimal access to public parking for residents within a delimited area. This will make it easier for residents to park and more expensive and difficult for others to park. In 2020, resident-only parking will be developed further, including measures to better facilitate carpooling and new measures to help reduce GHG emissions. Oslo prioritises reduced delays for e.g. cyclists and public transport over parking for cars and is re-allocating street areas from parking to other purposes, where necessary.
- 20. Transition to zero-emissions goods transport: dedicated loading and unloading bays and increased efficiency.** The transition to zero-emissions goods transport takes the form of a gradual introduction of restrictions whereby loading and unloading bays can only be used by zero-emissions goods vehicles, also contributing to freight consolidation. In order to facilitate the transition to zero-emissions goods transport, the City of Oslo shall also work on establishing sufficient charging infrastructure, and on using subsidy schemes from the Climate and Energy Fund and making requirements for zero-emissions transport in Oslo. National benefits for zero-emissions cars are a prerequisite for full effect of the City of Oslo's measures.

- 21. Facilitate energy stations and simultaneous transition to renewable fuel via letters of intent.** The City of Oslo will facilitate the development of energy stations ensuring the supply of renewable fuel (such as biogas and hydrogen) for road transport. This measure has three parts: allocating plots of land, proposing financing solutions and preparing letters of intent for simultaneous transition to renewable fuel for both businesses and public sector. The Agency for Real Estate and Urban Renewal and the Agency for Planning and Building Services shall assist the Agency for Climate in finding suitable plots of land for energy stations, cf. activity J in table 2.3.
- 22. Zero emissions/sustainable biofuel in machinery for building and construction operations on assignment for private developers.** The City of Oslo plans to facilitate renewable energy supply for building and construction sites by for example establishing a new subsidy scheme under the Climate and Energy Fund, and ensuring emissions cuts from the building and construction industry through voluntary agreements with businesses. Moreover, the City of Oslo plans to work towards a legal basis in the Norwegian Planning and Building Act and/or Pollution Act authorising the stipulation of requirements for fossil-free/zero-emissions construction in development projects.
- 23. Establishment of shore power installation.** The Port of Oslo is working on the establishment of shore power at Vippetangen and in Sydhavna port. All international ferries in Oslo will use shore power from Q1 2020. In addition, shore power systems are being planned for container ships, tankers, bulk carriers, vehicle carriers etc. calling at Sydhavna port. These shore power systems provide the option of supplying the power required by these ships when at quay, with zero emissions. The measure is estimated to provide an annual emissions reduction of approximately 4,000 tonnes of CO₂e from 2021, but as the reduction effect is not incorporated in the emissions statistics by municipality, the measure has not been quantified.

Activities that lay the foundations for future emissions reductions

Table 2.3 covers activities that reinforce work for the climate in the City of Oslo. A number of activities are also under way that are paving the way for further emissions reductions after 2020. These activities are included in the climate budget in order to clarify the wide range of instruments that are utilised to promote emissions reductions in Oslo, and to denote responsibility for the different activities. These activities are categorised as follows: “communication/mobilisation”, “prerequisites for emission reductions” and “studies/plans/pilots”.

Table 2.3 - Activities that lay the foundations for future emissions reductions

No.	Activity	Responsibility ¹⁾
Category: Communication/mobilisation		
A	Market governmental (including Enova) and Climate and Energy Fund subsidy schemes in Oslo - Contribute to increase knowledge of support and subsidy schemes - Contribute to increased execution rate for climate measures - Contribute to climate-related initiative applications in businesses in City of Oslo	KLI
B	Communication regarding climate solutions to change behaviour - Distribute information on practical climate measures/solutions to the population and businesses, and promote a change in behaviour - Inform about the City of Oslo's work for the climate - Further develop the communication platform, KlimaOslo.no - Further develop climate communication on social media	KLI
C	Businesses for the climate - Continue and further develop cooperation regarding climate measures between businesses and authorities in the City of Oslo	KLI

No.	Activity	Responsibility ¹⁾
D	Climate communications targeting children and adolescents <ul style="list-style-type: none"> - Education portal "Climate School" for teachers and pupils in Oslo schools - "Climate pilots" with lecture tour of Oslo schools - Cooperation with the Climate House regarding communication and information on the role of the city in relation to work for the climate The Climate House <ul style="list-style-type: none"> - Climate-related input/cooperation with the Climate House - Teaching and active information for primary and lower-secondary schools - Exhibition and information to the city's residents 	KLI UDE
E	Bykuben – Oslo centre for urban ecology <ul style="list-style-type: none"> - Further develop offer for all those who want to learn about and participate in work on urban ecology - Help the citizens of Oslo gain a sense of ownership of and notice the opportunities on the path towards a zero-emissions society - Guide the districts in the development and promotion of local environmental and climate measures 	PBE
Category: Prerequisites for emission reductions		
F	More life in the city <ul style="list-style-type: none"> - Measure to create a better urban environment and more life in the city within Ring 1 - The Department of Urban Development will prepare a staged plan for the work on this measure 	BYU/MOS
G	Better facilities for pedestrians <ul style="list-style-type: none"> - Complete the pedestrian strategy 	BYM
H	Climate-friendly urban development with densification around transport hubs <ul style="list-style-type: none"> - Introduction of set of criteria for assessment of climate consequences in planning and building issues 	(PBE), BYM, EBY
I	Increased material recovery of commercial waste collected by the City of Oslo <ul style="list-style-type: none"> - The Agency for Waste Management will work towards a material recovery ratio in 2019 and 2020 of 36% of commercial waste - Measures will be introduced to allow increased receipt and secondary processing of commercial waste 	REN
J	Procure area for the City of Oslo's climate measures (including energy stations) <ul style="list-style-type: none"> - Obtain an overview of the City of Oslo's area requirement for various climate measures, contribute to localisation and procure necessary area on order. - This measure particularly 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 of bulk material. 	EBY/KLI (municipal orderers)
K	Production of biogas for fuel <ul style="list-style-type: none"> - Production of liquid biogas from food waste at Romerike biogas plant - Production of compressed biogas from wastewater sludge at Bekkelaget purification plant - VEAS will start production of liquid biogas in 2020 	EGE VAV VEAS
L	Preparation of procurement guidelines	UKE
M	Facilitating smarter and more climate-friendly travel <ul style="list-style-type: none"> - Pilot project: Comprehensive mobility service to simplify daily logistics (several parties) - Pilot project: Smarter transport in Oslo region (safer, more efficient and eco-friendly driving) - Further develop intelligent transport systems (ITS) for parking and traffic management - Establishment of new priority system for public transport 	BYM/Ruter BYM/Ruter BYM

No.	Activity	Responsibility ¹⁾
Category: Studies/plans/pilots		
N	Facilitate more efficient and climate-friendly goods and utility transport - Intelligent transport systems (ITS) in goods transport - Zero-emissions last-stage goods distribution (incl. freight consolidation centres) - Pilot for electric system in Filipstad	BYM
O	Pilot project for electrification of an entire housing cooperative (EU - Green Charge)	BYM
P	Pilot project for transport of bulk material - Chart transport of bulk material in Oslo and surrounding area and introduce a cooperation with the Agency for Water and Wastewater Services, the Department of Urban Development, Omsorgsbygg KF (Municipal Undertaking for Social Service Buildings) regarding a pilot for more eco-friendly and climate-friendly handling of bulk material. Other relevant organisations may be involved in the work as required.	(KLI), VAV, BYM, OBY, EBY, PBE, HAV
Q	Pilot zero-emissions route - Work to facilitate a pilot for zero-emissions route for heavy goods transport The purpose is to promote technology that allows for climate-friendly heavy goods transport on established routes.	KLI
R	Study emissions and assess possible measures to reduce emissions from long-distance buses, tourist buses, charter buses etc.	KLI
S	Study volume of emissions from recreational boats and charter boat operations in Oslo and potential for possible measures to reduce emissions	KLI
T	Carbon capture at the Klemetsrud plant (Fortum Varme AS)	NOE
Category: Measures leading up to 2030		
U	The Fornebu metro-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 of the plastic cycle	MOS
V	New central tunnel for the metro	MOS
W	Tram programme	MOS
X	New signalling and interlocking system for Oslo Metro	MOS

¹⁾ The information in brackets shows responsibility for reporting

2.8 New grants for climate measures 2020–2023

The tables below provide a total overview of additional grants for climate measures for 2020–2023, in addition to those already incorporated in the adopted budget and economic plan.

Climate measures in the operational budget

Table 2.4 Climate initiatives in the operational budget

Operations Category cf. tables 2.2a, 2.2b and 2.3	ACTIVITIES FINANCED BY THE CITY TREASURY					<i>figures in millions NOK</i>
	Name of measure	Responsibility	2020	2021	2022	2023
16	Subsidies for Ruter	chapter 711	75.6	156.6	216.6	298.6
15	Follow-up of action plan to combat plastic pollution in the Oslofjord	chapter 542	5.0	5.0	5.0	5.0
6, 7, 8, 18, 20, 22	Strengthen the Climate and Energy Fund	chapter 950	50.0			13.0
	Total		130.6	161.6	221.6	316.6

Climate measures in the investment budget

Table 2.5 Climate investments in the investment budget

Investment Category cf. tables 2.2a, 2.2b and 2.3	ACTIVITIES FINANCED BY THE CITY TREASURY					<i>figures in millions NOK</i>
	Name of measure	Responsibility	2020	2021	2022	2023
5 and 7	Establishment of charging infrastructure	chapter 542	8.2			
19	Carpooling in municipal parking spaces	chapter 542	15.0			
	Total		23.2			

The Climate and Energy Fund

A proposal has been put forward to increase the Climate and Energy Fund by NOK 63 million in the economic plan. In total, Oslo City Government has contributed NOK 276 million to the fund since 2017. A proposal has also been made to sustain the loan commitment limit from 2019 of NOK 120 million in 2020. By comparison, the loan commitment limit in 2015 was NOK 45 million. In recent years, several new subsidy schemes have been launched under the fund, with several others in the pipeline.

Charging infrastructure

In the adopted economic plan, a figure of NOK 40 million has been allocated to investments in charging infrastructure in 2020. Oslo City Government has also proposed increasing the investments in charging infrastructure by NOK 8.2 million in 2020. The increase in allocations is mainly related to the investments in charging infrastructure for taxis. Furthermore, several subsidy schemes under the Climate and Energy Fund support the establishment of infrastructure for charging for private cars, vans and taxis, in addition to the establishment of charging infrastructure at workplaces.



Appendix to the climate budget 2020

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

1 Introduction

The climate budget 2020 is the fourth such budget to be prepared. The methodology used for the technical assessments in the climate budget remains groundbreaking, and it is therefore necessary to continuously develop, update and improve the underlying knowledge base.

This appendix provides more detailed information on the climate budget 2020, as described in the Oslo City Government's budget proposal 2020 and economic plan 2020-2023, chapter 2. These documents should therefore be read in context of each other. The purpose of the document is to illustrate the technical basis for the emissions reduction targets, emission limits, methodology and analysis. Calculation of the effect of all quantified measures (in table 2.2a) is described in chapter 4 of this appendix.

The background documentation and technical reports underlying the preparation of the climate budget 2020 are available at: <https://www.klimaoslo.no/category/english/>

2 Methodology and data

Both the data and method in the climate budget 2020 have been developed from previous climate budgets. The effects of measures in the climate budget have, for the first time, been calculated using a baseline.

2.1 Historical emissions and baseline

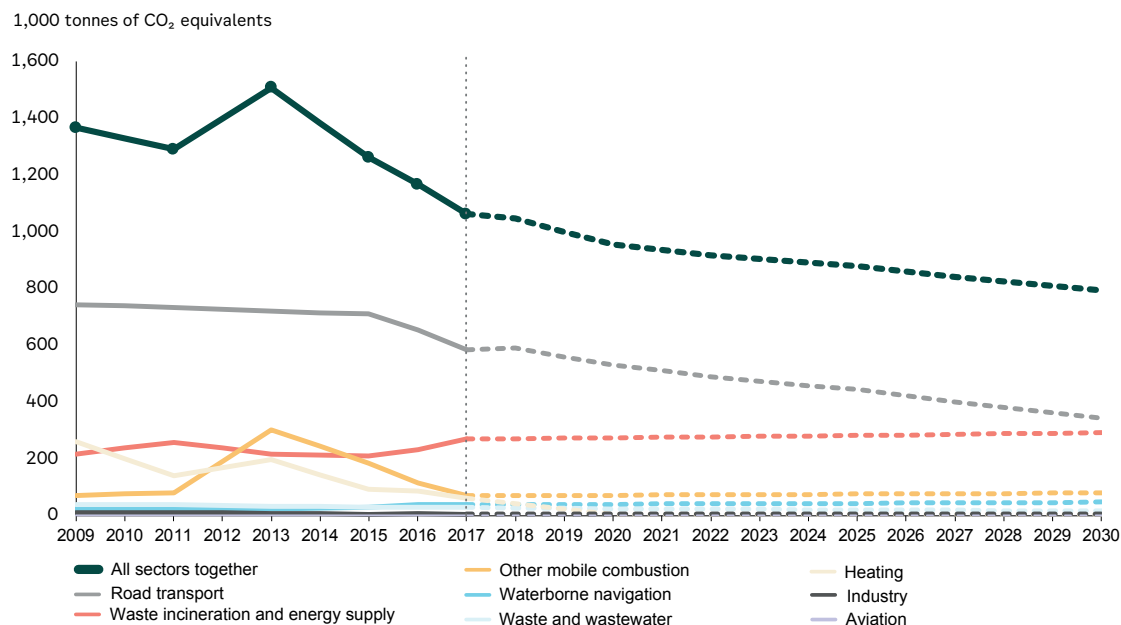
Oslo's climate budget is based on the last available emissions statistics at municipal level, which comprise the period from 2009 to 2017 and cover the greenhouse gases CO₂, methane and nitrous oxide (the Norwegian Environment Agency, 2019a). The climate budget 2020 is based on statistics updated as of 25 June 2019. A more detailed description of the statistics for greenhouse gas emissions in Oslo is provided in Oslo City Government's budget proposal 2020, chapter 2 and in the memorandum on statistics published by the Climate Agency on 7 August 2019 (Climate Agency, 2019).

Table 2.1 Greenhouse gas emissions in total and by sector in tonnes CO₂ equivalents, 2009-2017

Emissions sector ¹⁾	2009	2011	2013	2015	2016	2017
Other mobile combustion	71,987.2	80,972.2	304,270	186,127	115,739	70,345
Waste and wastewater	39,537.5	39,119.5	33,265.4	30,033.8	30,469.8	31,485.3
Waste incineration and energy supply	217,008.3	258,703	218,404	209,853	233,722	270,657
Industry, oil and gas	9,981.5	11,000.2	8,458.3	4,179.1	6,271.4	4,916.3
Aviation	0.2	0.9	0.8	0.7	0.5	0.4
Heating	260,069.3	141,564	197,064	92,232.5	87,259.3	62,741.6
Waterborne navigation	24,876.2	24,876.2	24,876.2	29,486.3	38,807.2	38,715.3
Road transport	744,478.6	735,205	721,985	711,985	656,156	583,682
Total	1,367,938.8	1,291,441	1,508,324.7	1,263,025.4	1,168,425.3	1,062,542.9

¹⁾ The figures above have not been rounded off.

For the analysis of measures, the development in greenhouse gas (GHG) emissions in Oslo for the period 2018-2030 has been projected using a baseline (CICERO, 2019). This projection is referred to as a baseline and is a prognosis of how emissions may develop leading up to 2030, if no new measures are taken. The baseline is based on best available knowledge about the factors that will impact GHG emissions up to 2030, such as growth in population, economic growth and technological developments. Historical emissions and projected emissions in the baseline are illustrated in Figure 1.1.

Figure 1.1 Historical development in emissions for the years 2009-2017 and projections for the years 2018-2030.

The emission-reducing effect of adopted governmental, regional and municipal policies as of May 2018 is included in the baseline. The development in emissions is based on the assumption that these measures are implemented according to plan, i.e. with good effect and without delays.

Measures included in the baseline:

- 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 baseline shows an expected decline in total GHG emissions from 1.06 million tonnes CO₂ equivalents (CO₂e) in 2017, to approximately 955,300 tonnes in 2020, falling further to approximately 793,500 tonnes in 2030. When compared with the reference year 2009, this is a decline of 30% in 2020 and 42% in 2030.

The decline is mainly associated with the road transport sector, where GHG emissions from private cars are expected to fall significantly. This is first and foremost attributed to the transition from fossil fuel cars to electric cars, but also to the projection of an increased number of cars running on biofuel and a reduction in the total number of kilometres driven per person. The implementation of the revised agreement for Oslo Package 3 (also referred to as the road toll payment system) is of decisive importance in realising the projected emissions reduction. Although the road transport sector shows an overall reduction, emissions from heavy vehicles are expected to increase up to 2030 if no new measures are taken.

In addition, the total emissions will be affected by a significant fall in emissions from heating, due to the ban on oil-fired heating to be introduced in 2020. Developments in the other sectors rely mainly on estimated growth in population and/or economic growth. This applies, for example, to waste incineration and energy supply, which represented around 25% of emissions in 2017, but will increase their relative share of Oslo's GHG emissions leading up to 2030. Road

transport is expected to remain the largest emissions sector in 2030, but waste incineration and energy supply appear set to take over the position as the predominant emissions sector. The baseline 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 baseline have been adjusted in line with the updated emissions statistics on 25 June 2019. CICERO's documentation report does not reflect this adjustment.

2.2 Calculating the effect of measures and instruments

Assessing and calculating the emissions reduction effects of various measures is a complex process, requiring a number of premises and assumptions to be made. 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. As a main rule, the Climate Agency has performed the calculations in consultation with other municipal entities. The effect assessments in the climate budget shall be based on transparent methodology and assessments of practical feasibility, and all assessments shall be verifiable.

The quantified assessments of the effect of measures apply only to direct emissions of greenhouse gases within municipal borders (scope 1). This concurs with the limits set for the climate budget and the municipal emissions statistics. The greenhouse gases CO₂, methane and nitrous oxide are included. The method for conversion of GHG to CO₂e follows the guidelines provided by the UN's panel on climate change (IPCC AR4, GWP100, 2007).

Bottom-up and top-down approaches

There are two approaches to calculating the effect of measures: bottom-up and top-down. In this context, bottom-up implies that the effect of measures has been calculated as a change in activity (activity data) or emissions per unit of the activity (emission factor).

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

Bottom-up calculations require good data on the change in activity or emission factor to be produced by the measure, and can often provide more detailed information on both premises for and effect of the measure. Top-down calculations are often more general and are based on total emissions, calculating what percentage of emissions can be removed by means of the measure. Calculations using bottom-up methodology are thought to provide more precise estimates than top-down methodology. Attempts have therefore been made to increase the number of bottom-up assessments in the analyses of measures relative to top-down assessments.

Examples of bottom-up calculations are measures no. 5 and no. 7, where the number of vehicles, mileage, expected rate of change and emission factors are used to estimate effect. Examples of top-down calculations are measures no. 10 and no. 11, where the emissions reduction has been estimated as a percentage of total emissions. For more details, please refer to the description of calculations for measures in chapter 4.

Baseline approach

The effect of measures shall be calculated as a reduction in GHG emissions, compared with a zero alternative or baseline scenario in which the measure does not exist. In the baseline scenario/zero alternative, the emissions may in practice increase or decrease in the absence of measures. This will influence the emissions reduction effect of the measure. The baseline scenario has been extracted from CICERO's projection of GHG emissions in Oslo for 2018-2030, using the central estimate for the baseline (CICERO, 2019).

The effect of measures is calculated using the following formula:

$$\text{Effect per year} = (\text{emissions in baseline scenario without measures}) - (\text{emissions after implemented measures})$$

In the assessment of the emissions reduction effect for each measure in table 2.2a in the Oslo City Government's budget proposal 2020, chapter 2, assumptions have been made as to when and/or at what rate the measure will be executed. An annual effect of the measures has been estimated for the economic plan period, even though the effect may last longer. In table 2.2a, the effects of each quantified measure in 2020 and in 2023 are specified and compared with baseline emissions in the same year.

Correction for double counts

Effects have been categorised as changes in activity (e.g. reduction in driving), technological changes (e.g. transition to electric cars) or use of biofuel in order to eliminate any double counts. Double counting the effect of measures is particularly relevant for the road transport sector, as measures have been developed within all three categories in this sector. The baseline includes e.g. the emissions reduction resulting from electrification of vehicles due to the revised Oslo Package 3 (also referred to as the road toll payment system) as well as other benefits for electric cars, and biofuel blends resulting from the requirement for sale of biofuels for road transport. Measures that produce further emissions reductions compared with the baseline, e.g. electrification or use of biofuel, can be deducted from the remaining emissions in the baseline. To calculate the effect of road transport measures, an emission factor is applied that includes biofuel blends, in order to eliminate double counts of emissions reductions in the baseline.

The difference between measures and instruments

In preparing the climate budget, attempts have been made to clarify the difference between measures and instruments. In the technical basis for calculations for White Paper 41 (2016–2017), Norway's Climate Strategy for 2030 – a transformational approach within a European cooperation framework (Norwegian Environment Agency, 2017) – measures and instruments are defined as follows:

“It is important to be aware of the difference between measures and instruments. We define a measure as the actual physical change in society that produces reduced GHG emissions. Instruments are the tools that the authorities can introduce with a view to triggering the measures, such as changes in duties, regulations, individual decisions, information campaigns or various support schemes.”

The assessments of measures in the climate budget contain only a limited analysis of instruments. An attempt has been made, however, to show the emissions reduction effect that can be achieved by executing the measure.

Assessment of non-quantified measures

It has not been possible to estimate the emission-reducing effect of the measures included in table 2.2b in this year's climate budget. There are various reasons for this, for example, the fact that the measures are at an early stage of development and execution, or that the knowledge base does not exist or is insufficient. In the future, 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 study of the emission-reducing effect, among other things. One example of a measure where it may be possible to calculate effect for the climate budget 2021 is exemptions from road tolls for electric vans.

Other cost-benefit effects

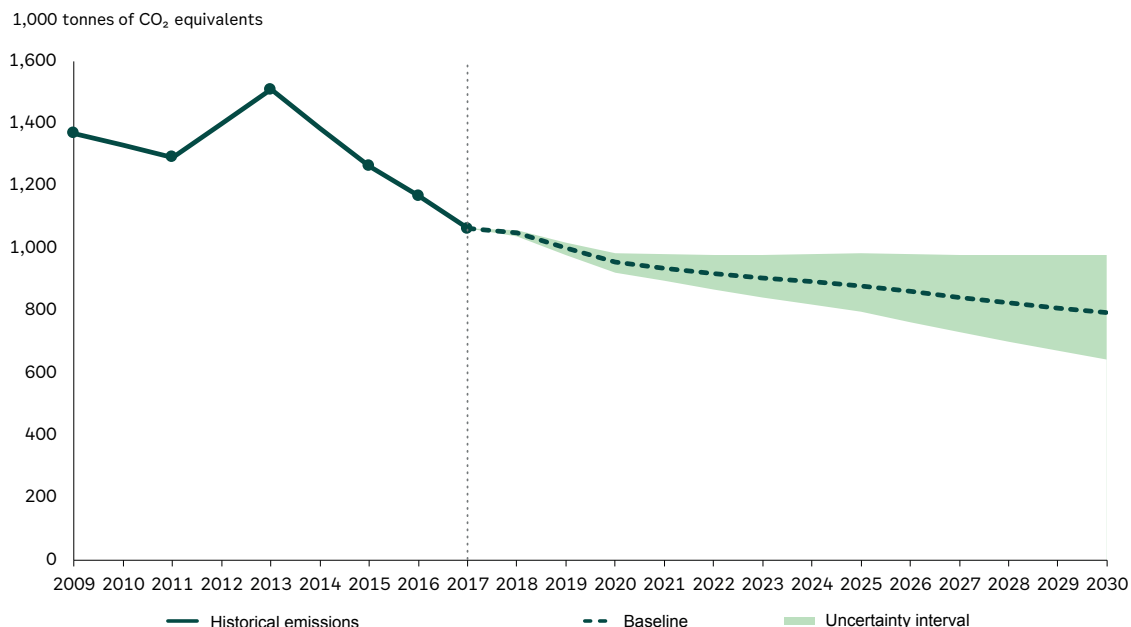
Chapter 4 provides a description of the calculation method for the measures in table 2.2a. Several of the measures also have other cost-benefit effects. One example of benefit effects is measures that improve air quality and health as a result of a reduction in car usage. The measures in the climate budget may have economic impacts not covered by the city treasury. Electrification of vehicles is one example of a measure that may result in increased costs for industry and residents in the short term, but may not necessarily imply higher costs for the entire vehicle lifetime, due to lower running costs. Several measures result in increased sale of biofuels, which potentially could have negative effects for GHG emissions or biodiversity in other parts of the world. It is difficult to carry out a comprehensive assessment of additional effects. This is due to complex correlations between several measures and the fact that such assessments require additional data. The climate budget therefore makes reference only to the emission-reducing effect the measures are expected to have in the City of Oslo.

2.3 Uncertainties in the analyses

The GHG emissions statistics for Norwegian municipalities are subject to continuous developments, partly because Oslo and other municipalities have demanded more accurate and frequent updates. Each time the statistics are published, the entire time series is recalculated if a new method or new data have been applied. As a result, target figures and analyses (presented as absolute tonnes) in the climate budget 2020 relate to one specific publication of the statistics and must be updated if the statistics are recalculated. This explains why the figures in the climate budget may change from one year to the next.

The greatest improvement in this year's published emissions statistics is the application of a new model for calculation of GHG emissions from road transport. This has helped to eliminate a good deal of uncertainty surrounding these figures. At the same time, there is still considerable uncertainty regarding the historical emissions figures for fossil fuel heating and use of construction diesel (other mobile combustion).

Use of a baseline to analyse the effects of measures is a methodical improvement, compared with previous calculation methods. At the same time, the baseline is a model calculation developed to predict future developments, and this will always imply significant uncertainty. The central estimate for the baseline, shown in Figure 2.1, is used in the climate budget. The baseline has an uncertainty interval with a lower and upper limit, and the interval shows quantified uncertainty in the basic figures for the factors that impact the development in emissions. In addition, there will also be uncertainty regarding execution of measures in the baseline and, not least, uncertainty relating to emission levels in historical figures. This uncertainty has, however, not been quantified. The baseline needs to be updated if the municipal statistics are recalculated, implying a possible change in figures in the climate budget from one year to the next.

Figure 2.1 Central estimate of the baseline with uncertainty interval

All quantified measures in the climate budget are calculated on the basis of best available knowledge base and methodology, but both the size of the emissions reductions and the time for realisation 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. It is technically challenging to estimate the efficiency of measures and instruments, and the effect must therefore be seen as an estimate and not a direct result.

The emission-reducing effect of measures in the climate budget depends on actual execution. The measures have to be carried out according to plan and without delays if the total effect in the climate budget analyses is to be realised. This also applies to measures in the baseline, such as the effect of the road toll payment system. All entities assigned responsibility for measures in the climate budget must execute the measures in accordance with the plan if the emission-reducing effect is to be achieved. The emission-reducing effect may be greater or lower than estimated.

GHG emissions in Oslo are impacted by numerous factors. In addition to emissions caused by the activities of the city's residents, businesses and governmental/municipal activities in the city, Oslo's emissions are also impacted by activities that occur outside the city boundary. Correspondingly, the measures in Oslo's climate budget may generate both higher and lower emissions outside the city boundary. This makes the system boundaries of the climate budget challenging, as it only includes direct GHG emissions in the City of Oslo as a geographical unit. It is important to note such effects, even if they are not included in the climate budget.

3 Emission limits 2020

3.1 Technical adjustment of the emissions reduction target in 2020

Oslo's emissions reductions target for 2020 is mentioned in Oslo City Government's budget proposal 2020, chapter 2. Adjustment of the 2020 target, from an absolute target to a percentage target including all emissions sectors and with reference year 2009, allows comparison of the 2020 target with the target for 2030. This also allows for a more robust position in relation to future changes in methodology for the statistics and assessment of measures and is in line with recommendations in the climate strategy leading up to 2030.

The technical adjustment to a percentage target with reference year 2009 was based on maintaining a fixed level of ambition, while at the same time including the new emissions sectors. The starting point is therefore that maximum emissions shall be 766,000 tonnes CO₂e for the following sectors: road transport, other mobile combustion, waste and wastewater, waste incineration and energy supply, industry, oil and gas and heating (cf. original emissions reduction targets from the climate budget 2019). Emissions from waterborne navigation and aviation shall also be added. Waterborne navigation and aviation accounted for emissions corresponding to 38,715 tonnes and 0.4 tonnes CO₂e respectively in 2017.

The adjusted emissions reduction target in 2020 in absolute tonnes is as follows:

$$\begin{aligned} \text{Adjusted target (t)} &= \text{Original target} + \text{new emissions sectors}^{2017 \text{ level}} \\ &= \\ 766\,000 \text{ t CO}_2\text{e} + 38\,716 \text{ t CO}_2\text{e} &= \mathbf{804\,716 \text{ t CO}_2\text{e}} \end{aligned}$$

This can be converted to a percentage emissions reduction target, compared with reference year 2009:

$$\frac{\text{Emissions level 2009} - \text{adjusted target (t)}}{\text{Emissions level 2009}} = \frac{1\,367\,939 \text{ t CO}_2\text{e} - 804\,716 \text{ t CO}_2\text{e}}{1\,367\,939 \text{ t CO}_2\text{e}} = \mathbf{41,2\%}$$

Using general rounding-off rules, the target is rounded down to 41% compared with the emissions level in 2009. An emissions reduction of 41% compared with the 2009 level implies that emissions shall be reduced to maximum 807,000 tonnes CO₂e in 2020.

Even though the target has been changed from an absolute target to a percentage target, the emissions reductions *can* still be stated as tonnes CO₂e, but these do not necessarily allow comparison from one climate budget to the next – as the statistics on which the budget is based will be updated and recalculated from year to year. We also expect future improvements in methodology for the governmental statistics showing GHG emissions in Norwegian municipalities. The emissions reduction target is therefore always expressed as a 41% emissions reduction, compared with the emissions level in reference year 2009.

3.2 Calculating the emissions limit

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

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

Annual emissions limits are established (see table 3.1 below) in order to set the course from 2020 and up to the emissions reduction target in 2030. The emissions limits up to 2030 are not, however, adopted through the climate budget, and the emissions limit must therefore not be confused with the emissions reduction targets. The development in future emissions 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.

In order to establish annual emissions limits for the next decade, an assumption has been made of a possible development in emissions between the emissions reduction targets in 2020 and 2030 of approx. 4 percentage points per year. The exception is 2024, as the figures include the effect of full-scale CO₂ capture at the Klemetsrud waste-to-energy plant. The timing of the effect of full-scale CO₂ capture depends on the decision regarding financing to be made by the Parliament. The earliest date when full effect from the CO₂ capture installation can be achieved is 2023/2024. The emissions reduction this year is estimated at approximately 208,000 tonnes CO₂, based on the emissions projections in 2024 (CICERO, 2019).

The assumption of an emissions reduction of approximately 4 percentage points in the remaining years is a simplification. It is important to underline that execution of the measures in the climate budget will not provide the same emissions reduction every year, and the annual reductions will vary somewhat. The proposal for the new climate strategy shows that new technology and governmental regulations will provide a boost towards the end of the period. This implies larger emissions reductions at a later date. This remains uncertain, and it is important to get started as early as possible, indicating higher emissions reductions earlier on in the period.

The climate budget 2020 applies to the economic plan period 2020-2023. For 2023, the emissions limit is established as a 52% emissions reduction compared with the 2009 level, see table 3.1 below.

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%

If the Parliament's investment resolution does not cover CO₂ capture at the Klemetsrud waste incineration plant, the annual emissions limit for the period 2020-2030 should be revised.

3.3 Analysis of emissions development 2017-2023

The climate budget shall establish which measures are to be implemented in the present economic plan period. For the 2020 budget, this means assessing the emissions reductions to be provided by adopted measures and instruments in the period from 2017 to 2023, the last year in this economic plan period. This chapter provides a more detailed analysis of how the measures in the climate budget may affect emissions developments from 2017 to 2020 and 2023.

The Climate Agency's analysis shows that the quantified measures in the climate budget, including the measures in the baseline, have the potential to reduce Oslo's GHG emissions by 33% in 2020 and 39% in 2023, compared with 2009 levels. This represents a gap or shortfall in effect of measures of 8 percentage points in 2020 and 13 percentage points in 2023. This gap will probably be smaller, as emissions reductions are also expected from measures where we are not able to predict the effect with sufficient certainty. Nonetheless, this gap is an expression of the need for increased effort if we are to achieve the emissions reduction target for 2020. We also need to identify new measures or further develop existing measures that may provide emission-reducing effects leading up to 2023.

The emissions reductions are presented as a percentage figure, but can also be produced in absolute tonnes CO₂e, as shown in table 2.1 in the Oslo City Government's budget proposal 2020, chapter 2. The quantified measures have the potential to reduce Oslo's GHG emissions to 915,900 tonnes CO₂e in 2020 and 834,400 tonnes CO₂e in 2023. If we are to reach the target in 2020 and the emissions limit in 2023, emissions must be reduced by a further 108,800 tonnes CO₂e in 2020 and 183,200 tonnes CO₂e in 2023.

Quantified emissions reductions in the climate budget (not including the measures in the baseline) by sector are presented in table 3.2. Most quantified measures in the climate budget target the road transport sector, and the analysis shows that this is where the largest emissions reductions can be expected. Moreover, there are plans for major emissions reductions in the sector for other mobile combustion, where the main emissions reductions will come from the use of zero emissions/sustainable biofuel in machinery for building and construction operations on assignment for the City of Oslo (measure no. 11). In the waterborne navigation sector, the emissions reductions are produced by the measure for fossil-free public transport by 2020 (measure no. 13), while the emissions reduction measure in the sector for waste incineration and energy supply involves phasing out fossil oil and gas in district heating (peak load) in 2020 (measure no. 2).

Table 3.2: Quantified emissions reductions based on baseline ¹⁾

Emissions sector	2020	2021	2022	2023
Road transport	20,400	30,900	39,400	48,800
Waste incineration and energy supply	1,800	3,700	3,600	3,600
Heating	0	0	0	0
Other mobile combustion	13,000	13,500	13,500	13,500
Waterborne navigation	4,200	4,200	4,900	5,000
Waste and wastewater	0	0	0	0
Industry, oil and gas	0	0	0	0
Aviation	0	0	0	0
Total emissions reduction	39,400	52,300	61,400	70,900
Remaining emissions level	915,900	884,900	857,400	834,400

¹⁾ Accumulated annual effect. The columns for 2020-2023 cannot be totalled.

Previous climate budgets have presented the results as annual emissions reductions compared with the last known emissions level. Table 3.3 presents the results of the climate budget 2020 correspondingly, i.e. emissions reductions in the period 2020-2023 compared with the 2017 level. Emissions reductions from 2017 levels are a sum of the quantified measures in the climate budget and the underlying emissions projections in the baseline. As some sectors are expected to have a higher emissions level in 2020 and 2023 than in 2017, the net emissions reductions are not necessarily positive for all sectors. The waste incineration and energy supply sector currently expects an increase in emissions in the period. Oslo City Government plans to investigate how to reduce emissions in all parts of the commercial cycle for plastic, and will issue proposals for new measures.

Table 3.3: Emissions reductions in the period 2020-2023 compared with the 2017 level

Emissions sector	Emissions	Emissions reductions from 2017 level ¹⁾			
	2017	2020	2021	2022	2023
Road transport	583,700	72,400	104,100	132,900	158,100
Waste incineration and energy supply	270,700	-2,900	-2,600	-4,300	-6,000
Heating	62,700	56,700	56,700	56,700	56,700
Other mobile combustion	70,300	10,900	10,600	9,800	9,100
Waterborne navigation	38,700	2,200	1,600	1,600	1,000
Waste and wastewater	31,500	7,300	7,300	8,200	9,100
Industry, oil and gas	4,900	0	0	0	0
Aviation	0,5	0	0	0	0

¹⁾ Accumulated annual effect. The columns for 2020-2023 cannot be totalled.

4 Description of calculations for measures

A description of how the effects of measures in table 2.2a in Oslo City Government's budget proposal 2020, chapter 2, have been 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 oil-fired heating in buildings

The emission-reducing effect of the measure is included in the baseline (CICERO, 2019). This measure is the main reason why the emissions in the "heating" sector are expected to fall substantially up to 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 baseline.

Measure no. 2 Phasing out fossil oil and gas in district heating (peak load) in 2020

The effect of the measure is estimated as 1,800 tonnes CO₂e in 2020 and 3,600 tonnes CO₂e in 2023. The calculation is based on activity data and emissions calculations received from Fortum for CO₂ emissions from peak load in 2015-2018. The Climate Agency has adjusted the figures to take into account the emissions of methane and nitrous oxide, thereby converting emissions to CO₂e, based on the ratio of methane and nitrous oxide in the emissions from district heating (Norwegian Environment Agency, 2019a). It is assumed that the fossil fuel emissions from peak load are zero in 2021. The calculations are based on the assumption of a one-third reduction in emissions in 2019 and a two-thirds reduction in 2020. The effect of the measure is calculated as the difference between the baseline and the estimated emissions reductions. There is some uncertainty surrounding the effect of the measure, as it has been estimated on the basis of a target and not on direct instruments. The effect of the measure may be slightly lower than estimated if fossil energy sources continue to be used after 2020, for example due to supply commitments.

Measure no. 3 National requirement for sale of 20% biofuel in 2020

The emission-reducing effect of the measure is included in the baseline (CICERO, 2019). As sales of biofuels in 2020 are expected to remain on the same level as in 2017, this measure will not provide further emissions reductions for future years when compared with 2017. The baseline for Oslo's GHG emissions assumes a continuation of the sales requirement in 2020 and up to 2030 (16% actual volume, ignoring the double count of advanced biofuel with a high climate benefit).

Measure no. 4 Introduction of new road toll payment system

The emission-reducing effect of the measure is included in the baseline (CICERO, 2019). This shows an expected reduction in emissions from road transport of 9% from 2017 to 2020 and 19% from 2017 to 2023. A large share 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 within road transport, such as other 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 the road toll payment system for electric vans, to come into effect on 1 March 2020, will provide a further emissions reduction in addition to that in the baseline. This effect has not been quantified in the climate budget 2020, but may be quantified in future climate budgets.

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

The effect of the measure is estimated as 1,100 tonnes CO₂e in 2020 and 1,600 tonnes in 2023. The effect of the measure is calculated on the basis of data from the Agency for Improvement and Development relating to municipal vehicles, and actual data for average mileage for the vehicles. Emissions factors are sourced from CICERO (2019). The estimated emissions for 2017 and 2018 provide the basis for the estimated effect of the measure. As reference, it is assumed that the vehicle fleet and mileage will remain constant at the 2017 level. It is assumed that the emissions will be reduced by one third in 2019 and by two thirds in 2020, and that the emissions will be down to zero in 2021 (excluding minor remaining emissions of methane and nitrous oxide). To achieve the estimated effect of this measure, the target for full transition to zero emissions or sustainable biofuel must be followed up by action and monitored in relevant municipal entities.

Measure no. 6 Better facilities for cyclists

The effect of the measure is estimated as 1,200 tonnes CO₂e in 2020 and 2,200 tonnes by the end of 2023. The emission-reducing effect of the measure is estimated on the assumption that car journeys will be replaced by cycling. Based on the initial results from the national travel survey (Norwegian Public Roads Administration, 2019), the Department of Urban Development has carried out an assessment of a realistic percentage of cyclists leading up to 2023. The percentage of cyclists is expected to increase to 12% in 2023. In addition to the percentage of cyclists, the calculations for the measure are based on population numbers, emissions factors, share of electric cars up to 2023 (CICERO, 2019) and average daily journeys (Ellis et al., 2015). The proportion of journeys by cycle that would normally have been made by car is calculated on the basis of an average percentage of cyclists in Oslo who state that they use cars as an 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 Licensing regulation for taxis – zero emissions by 2024

The effect of the measure is estimated as 1,600 tonnes CO₂e in 2020 and 13,400 tonnes in 2023. The effect of the measure is calculated using data from SSB (2019a and b) for taxi vehicles (number of licences) and the annual mileage in the period 2017-2018, and actual data for the share of renewable vehicles in the vehicle fleet in 2017 and 2018, sourced from the taxi centres (collected by the Department of Urban Development in 2019). Emissions factors are sourced from CICERO (2019). The calculation is based on the assumption that the number of licences and mileage remain constant at the 2018 level. It is subsequently assumed that the proportion of renewable vehicles remains constant in the baseline scenario (emissions without measures). The effect of the measure assumes a transition to zero-emissions vehicles (Department of Urban Development, 2017), based on a cumulative phasing-in rate of 10% in 2020, 20% in 2021, 50% in 2022, 90% in 2023 and 100% from 1 January 2024. Emissions from taxis are zero from 2024. The effect of the measure is based on the assumption that the environmental

requirement is enforced. The greatest element of uncertainty in the calculation relates to the number of vehicles and, thereby, the baseline in a situation without environmental requirements. In addition, there is a deregulation of vehicles in Oslo (due to a new national regulation on licensing areas) from 2020, and it is not possible to estimate the effect this may have on emissions up to the entry into force of the environmental requirement from 2024. Moreover, Akershus county authority and the City of Oslo currently have a joint licensing district, and the four-year transition period will therefore only start once the joint licensing area has been dissolved.

Measure no. 8 Transition to zero-emissions utility transport: Dedicated commercial parking spaces

The effect of the measure is estimated as 6,900 tonnes CO₂e in 2020 and 17,500 tonnes CO₂e in 2023. The calculation of the measure is based on phasing in dedicated parking spaces for zero-emissions vans within Ring 1. The effect is based on the assumption that all parking spaces for fossil commercial vehicles are removed in the long term. In addition, the other instruments for the measure (see Oslo City Government's budget proposal 2020, chapter 2, table 2.2a) must be implemented if the measure is to have full effect. The calculations for the measure are based on a calculation model described by Multiconsult (2018), based in turn on a mapping of the number of vehicles by Caspersen and Orving (2018). The calculation in the climate budget 2020 has been updated to include new percentages of electric cars and emissions factors from CICERO (2019) in addition to a later phasing-in rate for dedicated parking spaces. It is estimated that one third of utility vehicles in Oslo will be affected by the measure, as they operate within Ring 2. If this figure is higher or lower, the effect of the measure will be impacted. The full effect of the measure will be achieved when all commercial parking spaces in Oslo are dedicated to zero-emissions vehicles. The final date for when all parking spaces are dedicated to zero-emissions vehicles will be established in the Department of Urban Development's escalation plan prepared in the autumn of 2019.

Measure no. 9 Fossil-free public transport by 2020 – buses

The effect of the measure is estimated as 7,700 tonnes CO₂e in 2020 and 12,200 tonnes in 2023. Emissions from public transport company Ruter's city buses are estimated on the basis of the number of kilometres using fossil fuels for bus contracts in Oslo (data from Ruter) multiplied by emissions factors from CICERO (2019). The emissions factors are lower in relation to previous climate budgets (a new source has been used in line with the emissions statistics from the Norwegian Environment Agency), resulting in a downwards adjustment of the emission-reducing effect. In addition, emissions of nitrous oxide and methane from biogas buses have been included (Norwegian Environment Agency, 2019b). The calculation is based on the assumption that mileage remains constant at the 2018 level. 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. As a result, the number of kilometres with fossil fuels remains constant at the 2018 level. The effect of the measure is based on the assumption that the fossil fuel emissions from Ruter's bus operations will be zero in 2021. It is assumed that the emissions will be reduced by one third in 2019 and two thirds in 2020. Emissions from Ruter's regional buses are not included in the calculation, due to lack of data. This results in an 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 operations on assignment for the City of Oslo

The annual effect of the measure is estimated as 2,000 tonnes of CO₂e from 2020 onwards, and assumes that all heavy vehicles used to transport bulk materials and waste to/from municipal building and construction sites will run on zero-emissions technology or use sustainable biofuel. The calculation is based on the assumption that the City of Oslo represents approximately one fifth of sales (sales figures from Prognosesenteret (EBA, 2019)) in the building and construction

market and that total emissions from heavy vehicles carrying bulk material in Oslo according to TØI (2019) are approximately 10,000 tonnes of CO₂e. The tender criteria may also favour suppliers with the capacity to provide climate-friendly transport of persons, equipment and materials. The emission-reducing effect may therefore be higher than that estimated for this measure. There is no basis on which to quantify this effect.

Measure no. 11 Zero emissions/sustainable biofuel in machinery for building and construction operations on assignment for the City of Oslo

The annual effect of the measure is estimated as 12,000 tonnes of CO₂e from 2020 onwards and assumes that all machinery on municipal building and construction sites will run on zero-emissions technology or use sustainable biofuel. This is based on an estimate of the scope of future municipal building and construction projects, combined with factors for GHG emissions per area unit for new buildings and per NOK for contractors, estimated by DNV GL (2018). Both the basis for historical emissions and the potential for emissions reductions are uncertain. There is a large gap between emissions figures in the Norwegian Environment Agency's statistics (2019a) (based on sales figures for tax-free diesel from SSB) and calculations performed by DNV GL (2018) (based on activity data and emissions factors from a small number of example projects). The effect of the measure has been adjusted downwards in relation to the climate budget for 2019, due to delayed implementation of the voluntary agreement and establishment/use of funding schemes. These instruments have been included in measure no. 22 in table 2.2b in the climate budget 2020.

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

The effect of the measure is estimated as 1,000 tonnes CO₂e in 2020 and 1,500 tonnes in 2023. The calculations for the measure are based on reported figures for diesel used by construction machinery (City of Oslo, 2019). The calculations apply emissions levels in 2017 as reference, i.e. assuming a constant level of consumption at 2017 levels and zero emissions in 2021. It is assumed that emissions will be reduced by one third in 2019 and two thirds in 2020. The developments in emissions from municipal machinery the past years indicate that large reductions are required in 2019 and 2020 to reach the target of zero-emissions or sustainable biofuel only in municipal machinery by the end of 2020.

Measure no. 13 Fossil-free public transport by 2020 – boats

The effect of the measure is estimated as 4,200 tonnes in 2020 and 5,000 tonnes in 2023. The expected emissions reduction provided by the transition to fully electric operation for the Nesodd boats is estimated to be approximately 4,200 tonnes CO₂ in total for the three boats: "Kongen", "Dronningen" and "Prinsen" (Port of Oslo, 2018). The effect will be achieved in 2020. The measure will provide a 100% reduction in GHG emissions in the port and for sailings. The estimated effect of the measure is based on AIS data and harmonises with the figures from Ruter in 2017, which are based on Norled's reported consumption data (received from Ruter in 2019).

The expected emissions reduction provided by fully electric boat transport to the islands is estimated at approximately 600 tonnes CO₂ from 2022 (Port of Oslo, 2018). The calculations are based on reported fuel consumption in 2015 (DNV GL, 2017) and have been quality assured in relation to the environmental report for the Oslo ferries (received from Ruter in 2019). The current operator uses biodiesel (HVO 100) at their own initiative, so the GHG reduction will in reality be lower. The total effect can, however, be booked against the municipal emissions statistics.

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