

# Oslo

## Key information

Current bus fleet	1,150 buses
No. of stops	Not available
Current type of fleet	Diesel, biogas, biodiesel, hydrogen, battery-electric
Ridership	168 million passengers (2018)
Fare system	Mobile ticketing (through the Ruter Billett app) and paper tickets
Technology (mobile applications)	The RuterReise app allows passengers to plan trips and check real-time arrival and departure information.

## Industry Structure

Ruter AS Manages public transportation in Oslo and Akershus.

It is owned by Oslo municipality (60%) and Akershus municipality \*40%

Operators of bus services

Unibuss

Nobina

Norgesbuss AS

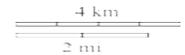
Nettbuss

Ruter has 23 contracts with bus operators

\*Note - Data is for 2017

## City background

### Population



Population density  
1,598/square km



### Public transport modes

Tram, bus, metro, train, ferry



No. of passengers cars and vans per 1,000 inhabitants\*  
547



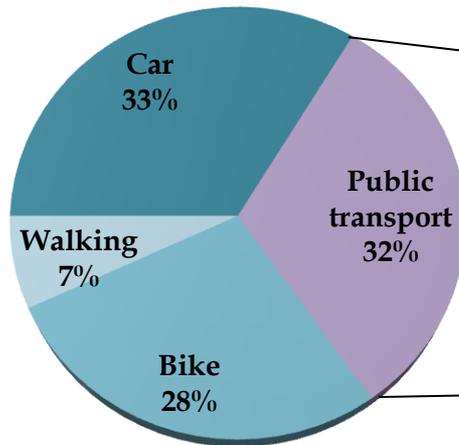
No. of electric cars per 1,000 inhabitants\*  
37



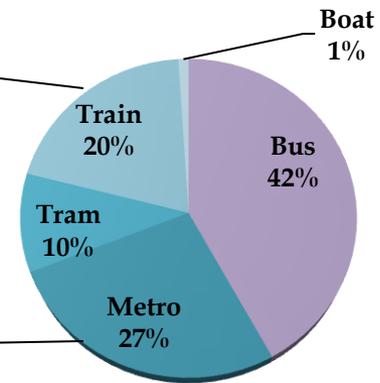
Average annual household income (EUR)  
37,465

# Currently, diesel buses are the dominant mode of transport

### Modal split in Oslo

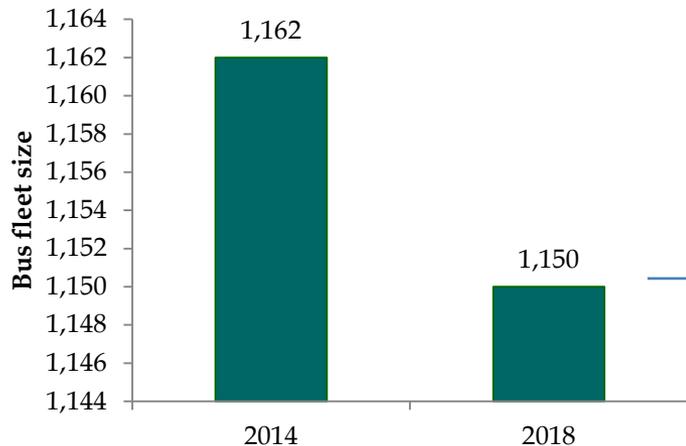


### Distribution of modes by public transport in Oslo

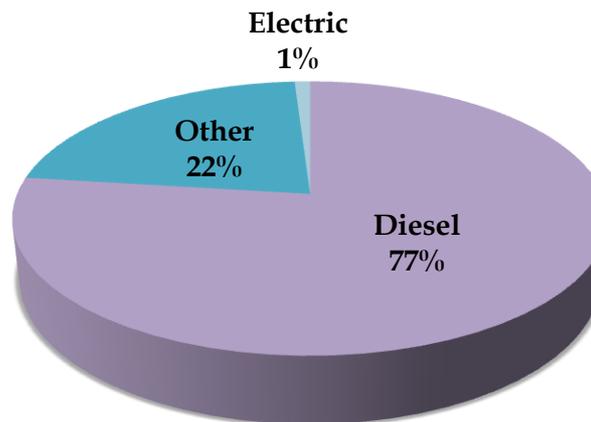


Oslo's bus fleet has decreased from 1,162 buses in 2014 to 1,150 in 2018

### Decline in Oslo's bus fleet



### Oslo's current bus fleet by type



886 diesel buses

5 hydrogen buses

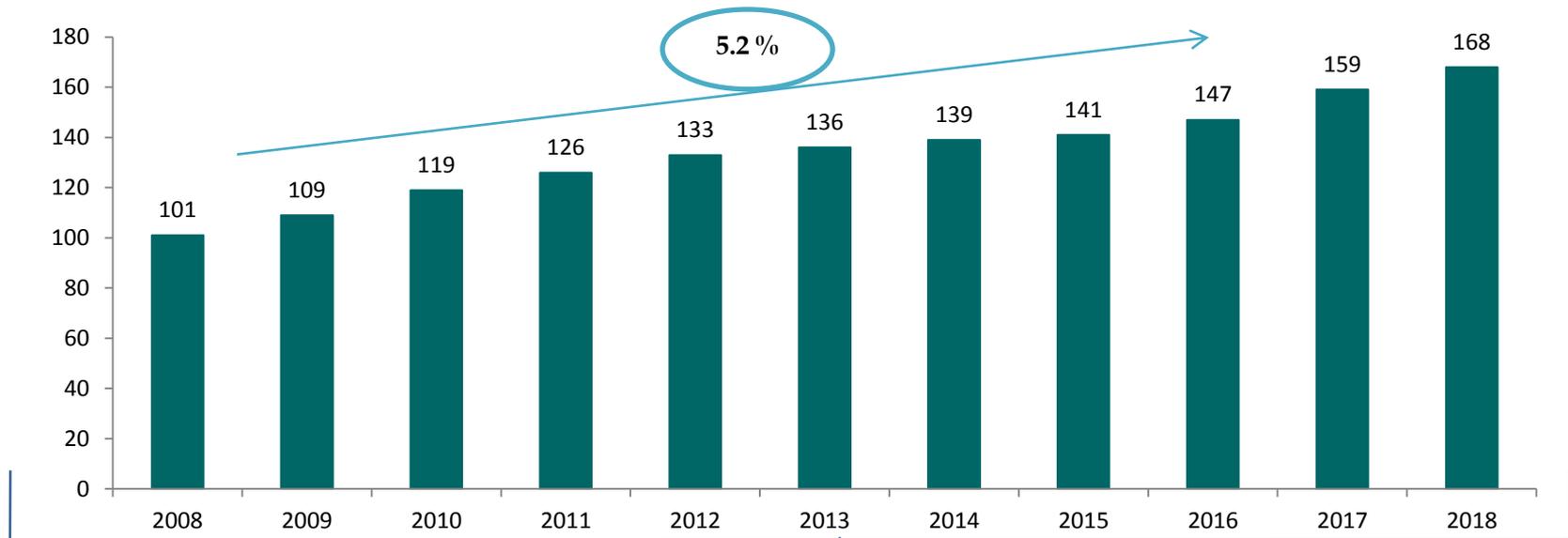
6 battery electric buses

Remaining 253 buses include biogas and biodiesel

\*Note - Data for modal split is for 2015 and distribution of modes by public transport is for 2017

# Ridership has increased despite a decline in bus fleet due to ticketing upgrades

## Bus ridership growth in Oslo

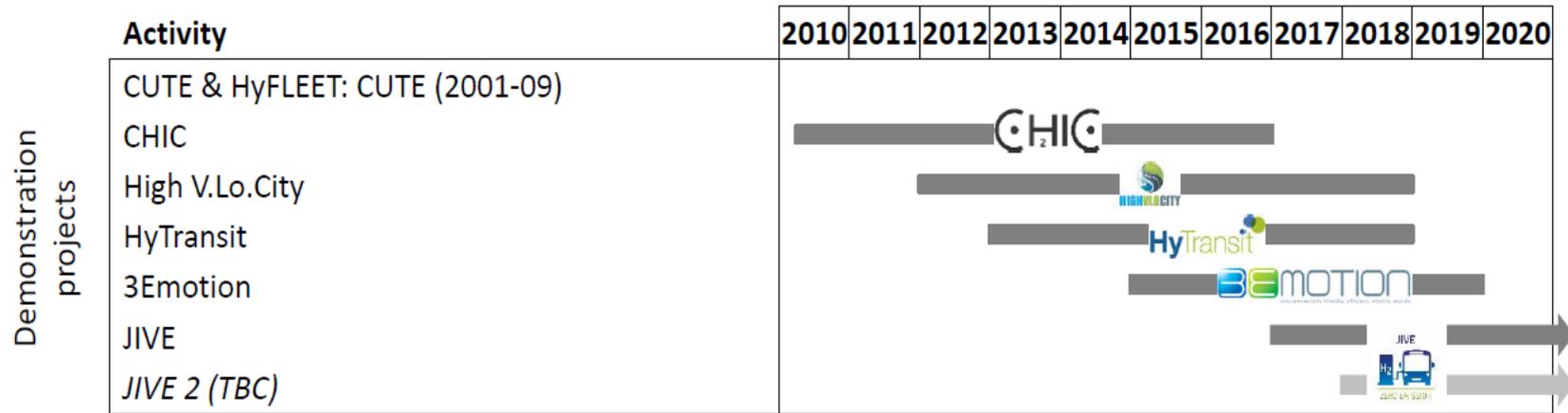


Ruter replaced its smartcard ticketing system with a smartphone-based ticketing system through the RuterBillet mobile application. The app allows passengers to buy tickets and supports payments through credit/debit cards and mobile wallets.

In addition, the RuterReise app has made it convenient for passengers to plan trips and check real-time arrival and departure information for all bus, rail and ferry services in Oslo. These innovations in ticketing have resulted in a 60 per cent increase in public transit ridership over the last 10 years.

# Oslo has been part of several hydrogen-fuelled bus pilot projects

## Strategic planning for deployment of fuel cell buses



### CHIC

- Ruter tested five hydrogen fuel cell buses under the EU-supported Clean Hydrogen in European Cities (CHIC) programme.
- Five Van Hool hybrid buses with Ballard 150 kW fuel cell were used for the project.

### JIVE2

- Ruter is also participating in the Joint Hydrogen Vehicle Initiative (JIVE 2) to improve accessibility of fuel cell buses.
- 10 buses will be tested in regular traffic for with each bus travelling a minimum of 150,000 km from 2018 to 2023.

### Key takeaways for Ruter from CHIC

Fuel cell bus technology still in nascent stage

Higher operating costs

Dedicated personnel needed for refueling

Good for sustainability, but low overall energy efficiency

# Bus procurement is driven by demographic trends, policies and technology

## Population

Oslo's population is expected to increase to 854,000 by 2040.



## Policies and plans

City of Oslo has plans to convert its entire fleet into a zero emission fleet by 2028.



## Technology accessibility

The cost of battery electric buses has gone down over the last few years. This will make them more accessible for commercial operations.



## GROWTH DRIVERS

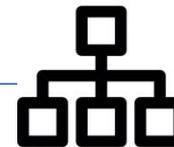
## EU Clean Vehicles Directive

The EU's Clean Vehicles Directive includes a legislative proposal with targets for clean bus procurement for all member states.



## Network expansion plans

Plans to develop infrastructure, including new bus terminals to improve connectivity.



# In particular, several policies guiding clean bus deployment have been drafted



In 2020, Ruter plans to power its entire public transportation network by renewable energy. It also plans to reduce greenhouse gas emissions by 80-90 per cent by 2025.

## Fossil Free 2020

Ruter plans to power the entire public transport network using renewable energy sources in 2020. The plan also calls for increased use of biogas as alternative fuel as well as testing and deployment of electric buses.



## M2016

M2016 is Ruter's public transport strategy that focuses on urban mobility solutions. The plan builds on several regional and national guidelines like the National Transport Plan (NTP).

## PLANS DRIVING BUS PROCUREMENT

## Oslo Package 3

Oslo Package 3 highlights a financing plan for the expansion of road and public transportation infrastructure in Oslo and Akershus. In May 2012, the plan was extended from 2013 to 2032 with a budget allocation of NOK90 billion.



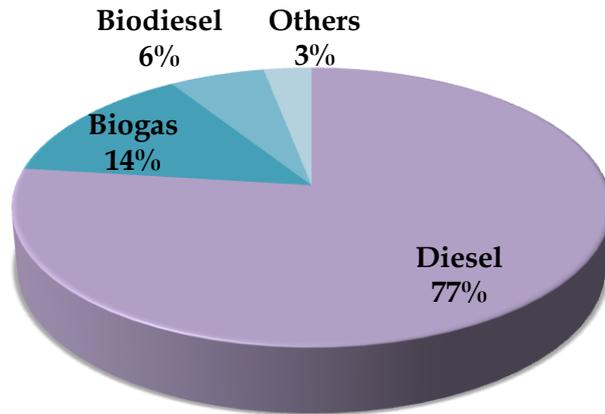
## Autonomous vehicles

Integrating autonomous vehicles with public transportation is a key part of Ruter's plans to promote sustainable urban mobility. In January 2018, Norway passed legislation allowing the testing of autonomous vehicles in public.

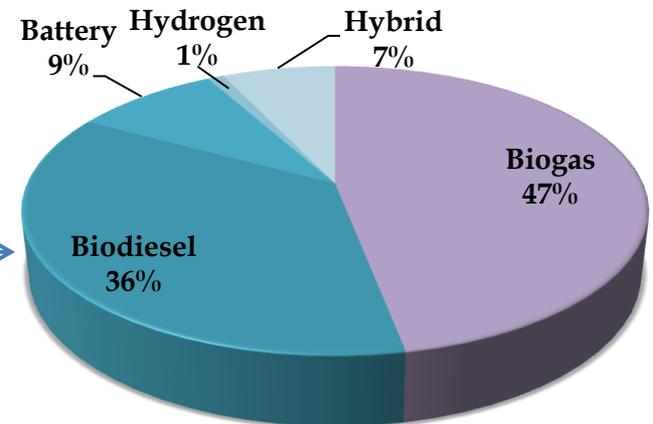
# By 2025, entire bus fleet to be equipped with low/zero-emission technology

According to Ruter's estimates, by 2025 the share of battery electric buses in the fleet will increase to 20 per cent.

Oslo's bus fleet by fuel type 2015



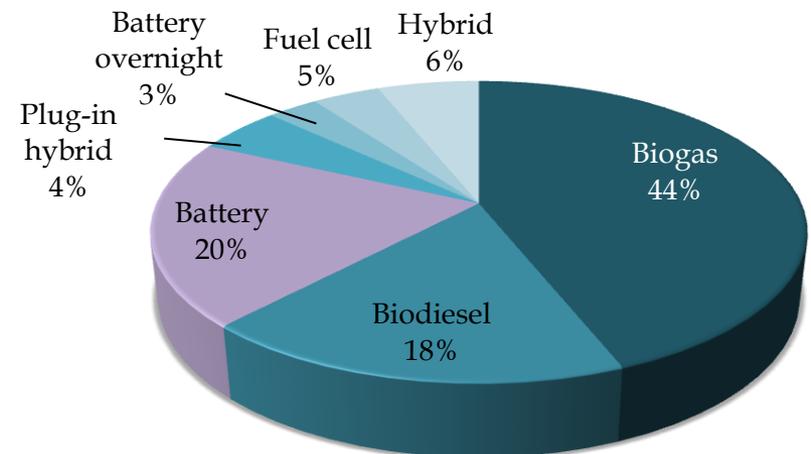
Oslo's bus fleet by fuel type in 2020



## Need for buses

- Oslo is estimated to have a population of 854,000 by 2040.
- The bus fleet size would need to increase to 1,451 buses, to maintain the existing level of 1.7 buses per 1000 people.

Oslo's bus fleet by fuel type in 2025



# Going forward, electric and biogas buses will be in the spotlight



1. Trial runs for 6 **electric buses** underway. Later in 2019, 70 electric buses to be deployed.

## Details of Oslo's e-bus pilot project

Operator/ Parameter	Norgesbuss	Unibuss	Nobina
Electric bus type	Standard	Standard	Articulated
No. of buses	2	2	2
Supplier	Solaris	Solaris	BYD
Battery capacity of the buses	125 kWh	75 kWh	307 kWh
Expected range of the buses	55-95 km	45-65 km	180-230 km

- In January 2018, the city of Oslo launched a two-year long e-bus pilot project. Under the programme, Norgesbuss, Unibuss and Nobina will deploy and operate electric buses.

## Technical details of VDL's electric buses

Bus type/ Parameter	Articulated	Standard
No. of buses supplied	30	10
Passenger capacity	46	34
Range on a single charge	70-90 km	70-110 km
Maximum charging power	450 kW	375 kW
Battery capacity	170 kWh	127 kWh

Ruter plans to introduce 70 battery-powered electric buses in 2019. Netherlands-based VDL will supply 40 buses, with BYD supplying 20 articulated buses and Solaris supplying 10 standard buses.

## 2. Transition to biogas fuels



- Ruter has plans to acquire around 500 buses fuelled by biogas between 2020 and 2025.

- In August 2016, Poland-based Solaris secured a contract to supply 75 Urbino models to Unibuss and 12 Urbino models to Nobina for service in the Oslo metropolitan area. The buses will be fuelled by the biofuel HVO and comply with Euro 6 standards.

# Focus on new terminals with EV charging and autonomous shuttles



## 3. New bus terminals

New transport hubs are in various stages of development. These depots will be equipped with charging infrastructure and equipment necessary for the electric buses.

Area/Location	Study/plan/decision timeline	Implementation timeline
Oslo S bus terminal	2015-17	2018-21
Sinsen	2027-30	Till 2040
Skøyen	2016-19	2020-22
Lysaker	2015-18	2019-21
Hauketo	2015-19	2020-22
Sandvika	2021-24	2025-27



## 4. Autonomous shuttle trials

### September 2018

Agreement signed to test up to 50 driverless shuttles in Oslo and Akershus.

### May 2019

Testing began on Line 35 along Akershusstranda in the center of Oslo, with no existing public transport services.

### Summer 2019

Second test run planned on Nedre Bekkelaget, from Malmøya to Mosseveien.

### 2019-2022

Testing on several routes with different learning goals related to the complexity of customer needs, traffic supply and infrastructure.

Key agencies involved in trials as part of a JV called "Smarter transport in the Oslo region" (LARGE)

Norwegian Public Roads Administration

City Environment Agency in Oslo

Ruter

Autonomous Mobility A/S

Navya

Denmark-based company responsible for testing and operations.

Supplier of autonomous shuttle called Arma that can accommodate 11 passengers.

## Recent developments, contracts awarded and key contacts

### Recent developments

Area	Developments
<b>Autonomous shuttles</b>	<ul style="list-style-type: none"> <li>Ruter announced a partnership with Denmark-based Autonomous Mobility to test up to 50 driverless shuttles in Oslo.</li> </ul>

### Recent contracts awarded

Area	Description
<b>Charging infrastructure</b>	<ul style="list-style-type: none"> <li>In November 2018, Heolix secured a contract to supply 40 fast charging stations (12 300-kW chargers, 28 50-kW chargers, 9.8-MW infrastructure) in Oslo for 40 fully-electric buses.</li> </ul>
<b>Rolling stock</b>	<ul style="list-style-type: none"> <li>In October 2018, Heolix secured a contract from Nobina to supply eight Heliox OC 300kW fast-charging stations for 42 BYD all-electric buses in two depots.</li> <li>In July 2018, BYD secured a contract from Nobina to supply 42 18-metre long electric articulated buses in Oslo.</li> <li>In June 2018, Volvo Buses secured a contract from Norgeskuss to supply and maintain 17 Volvo 7900 Electric buses.</li> </ul>

### Contact information

Ruter	
Address	Dronningens gate 40, 0154, Oslo
Phone no	+47 22 05 70 70
Website	<a href="https://ruter.no/en/">https://ruter.no/en/</a>
Key personnel	Bernt Reitan Jenssen: Chief Executive Officer and Managing Director, Anders Finckenhagen: Director Operations, Rune Pedersen: Finance Director