pspa

City of Clean Transport

REPORT

THE LARGEST RESEARCH PROJECT FOR THE COMMERCIAL USE OF ELECTRIC VEHICLES IN POLAND AND THE CEE REGION

PROJECT PARTNERS

ŁÓDŹ KREUJE · RENAULT · webfleet solutions a Bridgestone company · EVBOX · DHL · VEOLIA · H&M

IKEA · ZWIK ŁÓDŹ · EV Charge · ARVAL BNP PARIBAS GROUP · RHENUS HOME DELIVERY · JASZPOL · InPost

Why „ELAB”?

E

ELECTROMOBILITY
ECOLOGY

EL

MARKING OF THE
LICENSE PLATES
OF THE CITY OF ŁÓDŹ

LAB

RESEARCH
LABORATORY

Ladies and Gentlemen,

with the progressive development of e-mobility, an increasing number of entrepreneurs in Poland are facing a strategic decision to electrify the company's fleet. Investing in electric cars brings many benefits – first of all, it allows you to reduce the costs of vehicle operation and improve the implementation of logistics tasks. Moreover, it enables the implementation of the mission of social responsibility related to climate and environmental protection. At the same time, taking into account the current market and legislative conditions, the implementation of electric cars in the fleet may be associated with a number of challenges that require skilful planning.

In order to address these challenges, the Polish Alternative Fuels Association initiated the "ELAB – City of Clean Transport" project. "ELAB" is another step towards electrification of transport in Poland, with particular emphasis on last mile transport. The project was implemented in cooperation with a number of industry partners from various business sectors and with the City of Łódź, which hosted the study. It is an initiative consisting of many projects, which superior goal is to popularize zero-emission solutions in urban space.

As part of the project, a multi-stage pilot research was carried out, which allowed the collection of an extensive data in real conditions of use of electric and internal combustion cars. The study addressed 6 key areas from the perspective of entrepreneurs planning to electrify the company's fleet.

The results of the pilot study were used to compare the Total Cost of Ownership (TCO) of electric and internal combustion cars, to assess their environmental impact, and to assess the challenges of fleet upgrade to electric. The project also allowed to determine the impact of the weight of transported loads on the range of zero-emission vehicles, define the stages of planning a private charging infrastructure and assess the implementation potential of charging stations integrated with urban lighting.

The ELAB project is another initiative that PSPA carried out to promote the transformation towards e-mobility. Each time we are convinced that zero-emission transport can be successfully implemented in many fleets all over Poland, generating environmental, image and economic profits. The decision to electrify the fleet is not the easiest one, we are aware of the challenges faced by fleet managers, but we believe that we are already one step ahead of a massive revolution in this sector, which will also be contributed to by a report based on the results of the ELAB project.

Enjoy the read.

Maciej Mazur
Managing Director
Polish Alternative Fuels Association (PSPA)

Ladies and Gentlemen,

the City of Łódź has shown more than once that it is not afraid of e-mobility. We are pioneers in many ways when it comes to introducing and promoting zero-emission transport. As the first in Poland, we introduced special pictograms informing that electric cars have the privilege of driving on bus lanes. We are also buying the first 17 electric buses. And our officials used electric bicycles at work.

Last year, we hosted the City of Clean Transport research project. And we started the largest project in Central and Eastern Europe in which, as a city, we tested electric cars. For 18 weeks, zero-emission vehicles were used in the City of Łódź Office car fleet as well as in municipal units: the Water and Sewerage Plant and the Road and Transport Authority.

The results of the study confirm that investment in e-mobility can pay off, and electric cars can also be used by municipal entities. Especially because it brings benefits for the environment and climate, and thus improves the quality of life of all inhabitants.

I would like to thank the Polish Alternative Fuels Association for cooperation on this project.

Hanna Zdanowska
Mayor of the City of Łódź

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EXECUTIVE SUMMARY

On 5th October 2020 the Polish Alternative Fuels Association in co-operation with the City of Łódź initiated one of the largest research projects connected with the e-mobility sector in Central and Eastern Europe. The overriding goal of the study entitled “ELAB – City of Clean Transport” was to identify financial, environmental and functional benefits resulting from the operation of electric vehicles. The objective was to provide comprehensive knowledge with regard to commercial use of passenger EVs and electric vans as well as expert support for businesses when making decisions on investing in e-mobility.

A multi-stage test was carried out as part of the project to collect an extensive amount of data in actual conditions of using electric and internal combustion vehicles. The research addressed 6 key areas from the perspective of businesses planning to electrify their company fleet. The results of the pilot project were used to compare the Total Cost of Ownership (TCO) of electric and internal combustion vehicles, to assess their environmental impact and challenges of replacing the fleet with electric vehicles. The project also made it possible to determine the influence of the weight of transported loads on the range of zero-emission vehicles, define the stages of planning a private charging infrastructure and assess the implementation potential of charging stations integrated with urban lighting.

15 entities from the entire e-mobility value chain got involved in the “ELAB – City of Clean Transport” project. Renault Polska delivered electric vehicles (Zoe passenger cars, as well as Kangoo Z.E. and Master Z.E. vans) and corresponding combustion models (Clio, Kangoo and Master). The vehicles were used in a wide variety of applications. DHL Parcel, H&M, IKEA, inPost, Rhenus Logistics and Veolia tested the vehicles while performing the activities related to their ongoing business operations, including maintenance services and last mile deliveries. The ELAB project also involved Zakład Wodociągów i Kanalizacji (Water Supply and Sewerage Company) in Łódź and Zarząd Dróg i Transportu (Road and Transport Authority) in Łódź, and the Łódź City Hall included the tested passenger cars in the fleet of the Emergency Management and Safety Department. In order to carry out the pilot project it was necessary to provide access to the charging infrastructure. EVBox was responsible for the delivery and installation of wall-mounted charging stations (wallboxes), while EV Charge provided chargers integrated with street lighting. In addition, the infrastructure partners aggregated data on the amount of energy consumed by electric vehicles. ARVAL was responsible for the professional support of the project and their analyses were used to determine the total cost of ownership (TCO) of the tested cars. Technical servicing of the vehicles was provided by JASZPOL – a Łódź-based Renault dealer. The vehicles used in the project were equipped with a Webfleet Solutions tracking device, which monitored their location and operating parameters in real time.

Pilot tests under the “ELAB – City of Clean Transport” project lasted a total of 18 weeks, during which the tested vehicles covered a total of 24,500 km within more than 600 hours, making over 2,300 different journeys. The analysis of the data collected during the test in actual operating conditions allowed to determine the answers to a number of key questions faced by fleet managers before deciding to electrify their car fleet or when planning this process.

An additional benefit of launching the “ELAB – City of Clean Transport” project is in-depth comparative analysis of the environmental impact of electric and internal combustion vehicles under actual operating conditions and presenting the overall environmental advantages resulting from the electrification of the fleet. This is a particularly important issue in Polish conditions. CO_2 emissions from the transport sector in Poland increased by as much as 206% in 1990-2016, with the EU average at 28%. The test carried out as part of the ELAB project has shown that electric vehicles can be 100% zero-emission by powering EVs with renewable energy. In this case, the provision of green energy by Veolia means that an introduction of an electric vehicle in the fleet reduces all the CO_2 emissions, which is 25.9 kg/100 km (vans segment), 16.6 kg/100 km (light commercial vehicles segment) and 13.1 kg/100km (passenger car segment).

As part of the ELAB project a comparative analysis of the noise emissions of electric and internal combustion vans was also conducted. Noise is a factor that is – wrongly – often overlooked in discussions about the environmental benefits of fleet electrification. Actually, around 65% of the European population is exposed to noise levels above the acceptable limits during the day, and almost 20% to noise levels that also pose a health risk at night. The noise measurements during the ELAB project were performed by the Sundoor research laboratory, which had the appropriate technological capabilities and qualifications to carry out the tests. The analysis of the results confirms that electric vehicles reduce noise emissions to the greatest extent at lower driving speeds, i.e. those most often applied in the city. With a speed of 40 km/h, the average value of the exposure level related to driving electric vehicles was almost twice as low for light commercial vehicles and by 1.86 dB in the case of heavy commercial vehicles. That means tangible benefits in urban conditions, where, on one hand, higher speeds are rarely achieved, and, on the other hand, the problem of environmental noise pollution is the most essential. As speed increases, the difference in favour of EVs reduces, but it is still apparent. It is worth noting that an increase in sound level by 1 dB is equivalent to an approx. 26% increase in noise, and with a difference of 3 dB, the increase is double.

EXECUTIVE SUMMARY

Moreover, the implementation of the ELAB project allowed us to develop the first Polish comparative analysis of the environmental impact of the wear and tear of combustion and electric vehicles. In the case of conventional vehicles, more components affected by faster degradation result in the need to produce a large number of spare parts and an increase in waste generation, which in the case of engine oils, for example, can be a serious hazard when released into the environment. For the purposes of the project, based on historical service data and standard specification of periodic inspections of vehicles participating in the test, an operational forecast of vehicle wear and tear was prepared, taking into account the frequency of replacement of particular elements over time. The test shows that the total amount of projected activities in the case of an electric passenger vehicle compared to its internal combustion counterpart with the mileage of 60,000 km is lower by 75%, with the mileage of 120,000 km – by 43%, and 150,000 km – by 50%. In the entire operational life (mileage of 300,000 km), the difference amounts to as much as 26%. In the light commercial vehicle segment, the electric vehicle requires less maintenance than its conventional counterpart by 28.4%, while in the heavy commercial vehicle segment – less by 16%.

Another element, innovative on a Polish scale, was the analysis of the impact of the weight of the load on the energy consumption of electric vans. Entrepreneurs planning to electrify their fleet should take into account this factor as affecting the maximum range of electric vehicles on a single charge. This issue may affect the efficiency and reliability of the entire logistics chain. The calculation model as part of the project was based on data obtained empirically with the use of Webfleet Solutions tracking devices in vehicle tests under actual operating conditions. The results obtained from the devices show that in the case of light electric vans, each additional 100 kg of load weight increases energy consumption by approx. 7%, and in the case of heavy electric vans by approx. 5.25%, which is lower than estimates made prior to the test..

The ELAB project also included an analysis aimed at defining the challenges faced by companies electrifying their fleet with particular emphasis on the issues of preparing workforce for optimal handling of electric vehicles. For this purpose, at the project implementation stage, 2 research questionnaires were prepared, which were delivered to partners testing electric vehicles. A total of 50 questionnaires were collected from employees who use company vehicles on a daily basis. The survey was carried out in two stages: the drivers were required to complete the first questionnaire before the start of the tests, and the other one after their completion. Its results identified 5 main practices that each company should implement in order to optimize the process of fleet electrification. In this respect, it is particularly important to conduct test or pilot drives, which will contribute directly to the optimization of official duties with the use of electric vans. An important element of the adequate preparedness of the staff for the use of EVs is the initial assessment of the practical knowledge of employees in the field of EV handling, as well as the implementation of training aimed at enhancing the professional competence after test drives. What is important, 74% of the drivers participating in the survey declared that an electric vehicle could be their everyday work tool.

The implementation of the ELAB project also made it possible to set the stages of proper planning of the installation of private charging infrastructure by companies electrifying their fleet. Further stages of planning should include determining the location of the most frequent vehicle stops, determining the number and capacity of charging points and selecting the optimal type of infrastructure to be implemented. The test was based on data collected as part of a case study of one of the ELAB project partners.

One of the main elements of the project also included tests of EV charging stations integrated with city street lighting. The Combocharger provided by EV Charge was tested under actual conditions of use. Hybrid chargers of this type have the potential to accelerate the expansion of the public charging infrastructure network in Polish municipalities. The pilot test confirmed the effectiveness of the charging station integrated with street lighting – it was successfully launched in 2 out of 3 planned locations, where it provided the serevice of charging electric vehicles with the power declared by the manufacturer. At the same time, the test showed possible limitations in places where the lighting installation had not been modernized.

A key element of the ELAB project was a comparative analysis of the total cost of ownership (TCO) of electric and combustion vehicles under actual conditions of use. The test showed that the purchase of electric passenger cars and light commercial vehicles may be more profitable than in the case of their conventional counterparts, even assuming the absence of financial support programs for e-mobility. Higher EV prices are compensated by significantly lower costs chargeable to their owners during the operational phase. It is worth noting, however, that in the case of many companies, the relatively long TCO compensation time determined in the test (i.e. 4-5 years in the passenger car segment and 4-7 years in the light commercial vehicle segment) may prove to be an insufficient argument for making a decision to purchase an EV. Moreover, the results obtained in the project indicate a particularly urgent need to implement financing in the segment of heavy delivery vans. In this case, in the no-grant scenario, no TCO compensation was possible over the assumed lifetime of 8 years. Taking into account the current market conditions, the introduction of subsidies from public funds remains a key factor encouraging a wide group of entrepreneurs to e-mobility. Including the EV incentive in the TCO comparative analysis leads to the TCO of electric and combustion vehicles being levelled within one year of entry into the fleet.

6 areas of the ELAB project

TCO

Comparative analysis of the total cost of ownership (TCO) of electric vehicles – A study of the economic viability of fleet electrification

Environmental impact

Assessment of environmental benefits of using electric vehicles

Load and range

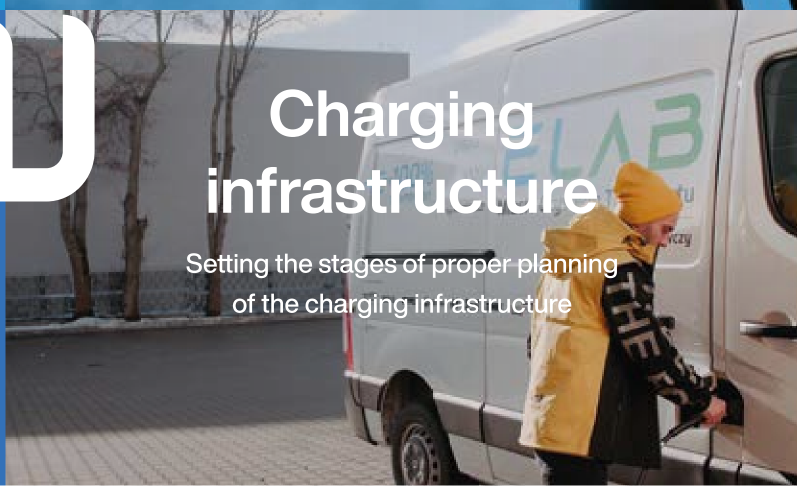
Analysis of the influence of the weight of the load on the energy consumption (range) of electric vans

Smart technologies

Pilot launch of a charging station integrated with street lighting

Implementation of EVs within the fleet

Defining challenges on the way to effective electrification of the fleet



Charging infrastructure

Setting the stages of proper planning of the charging infrastructure

PROJECT SUMMARY

18 weeks of testing

- **5/10/2020** – Test launch
- **26/10/2020** – Rotation of vehicles 1
- **16/11/2020** – Rotation of vehicles 2
- **7/12/2020** – Rotation of vehicles 3
- **28/12/2020** – Rotation of vehicles 4
- **18/01/2021** – Rotation of vehicles 5
- **5/02/2021** – Test end

6 test vehicles

PASSENGER CARS

Electric (EV)
Renault ZOE R135

Combustion (ICE)
Renault Clio TCE 130 EDC

LIGHT GOODS VANS

Electric (EV)
Renault Kangoo Z.E. Maxi Combi

Combustion (ICE)
Renault Kangoo Express Maxi

HEAVY GOODS VANS

Electric (EV)
Renault Master Z.E. Furgon L2H2

Combustion (ICE)
Renault Master Furgon L3H2

15 project Partners

Strategic Partners

- pspa – Napędzamy elektromobilność!
- Łódź kreuje
- RENAULT

Content Partners

- DHL
- VEOLIA
- H&M
- IKEA
- ZWIK Łódź
- RHENUS HOME DELIVERY
- InPost – out of the box

Technology Partners

- webfleet solutions – a Bridgestone company
- EVBOX
- EV Charge
- ARVAL – BNP PARIBAS GROUP
- JASZPOL

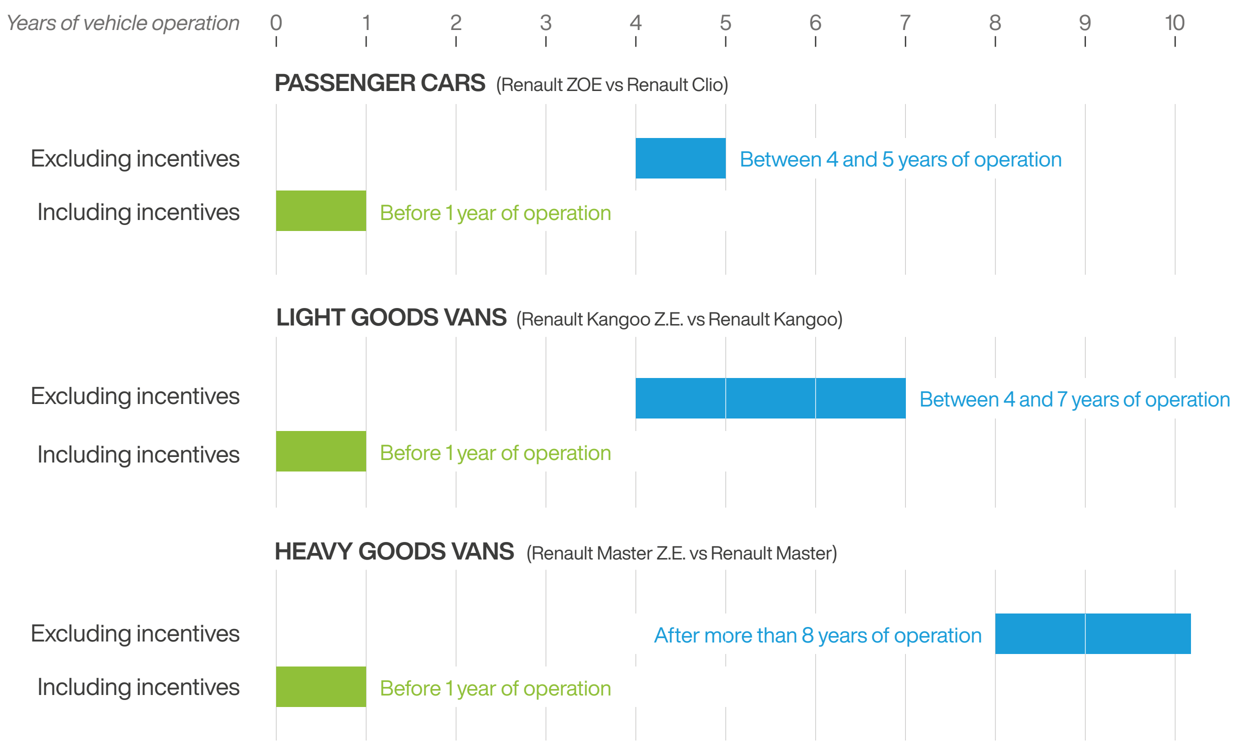
ELAB in numbers

City of the research

Distance covered	24,500 km
Total distance covered only on urban roads	72.8%
Average distance covered during the day	56.9 km
Average speed of the tested vehicles	39.7 km/h
Total driving time	602 h 3 min
Number of journeys	2,323
Number of questionnaires	265
Average energy consumption	21.9 kWh / 100 km / Passenger cars 24.2 kWh / 100 km / Light goods vans 40.8 kWh / 100 km / Heavy goods vans
Average fuel consumption	8.8 l / 100 km / Passenger cars 8.4 l / 100 km / Light goods vans 11.7 l / 100 km / Heavy goods vans

Key conclusions

he Total Costs of Ownership (TCO) of particular vehicles on average draw level:

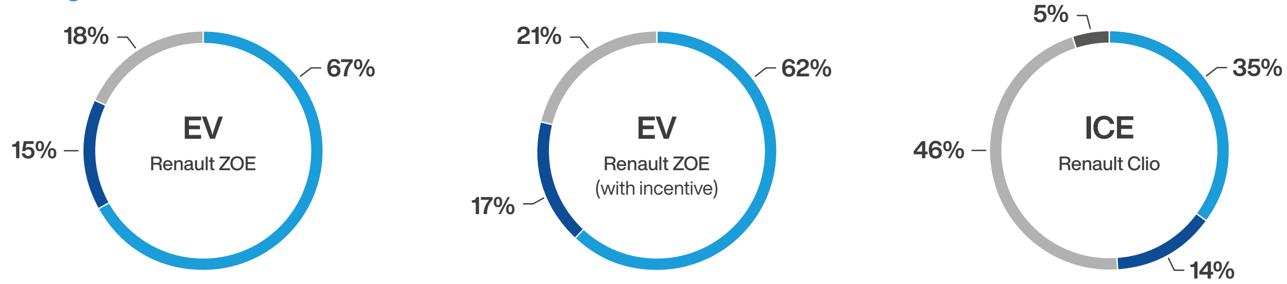


Division of TCO into basic cost groups over 8 years of operation

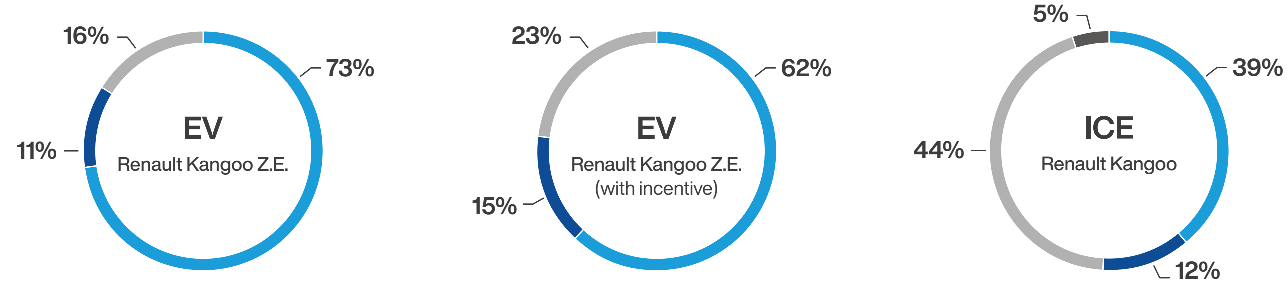
Costs:

- **One-off costs**
  Vehicle purchase
  Purchase and installation of a charging station
  Administrative expenses
  Costs of adapting a vehicle to the fleet
- **Recurring costs**
  Purchase of vehicle insurance
  Vehicle inspections
  Operating budgets (e.g. car wash)
- **Variable costs**
  Energy (fuel)
  Maintenance
  Repair of damage not covered by insurance
  Charging station maintenance
- **Other costs***
  Paid public car parks
  Entrance fees to Clean Transport Zones
  Saved time costs
  (possibility of driving on bus lanes)

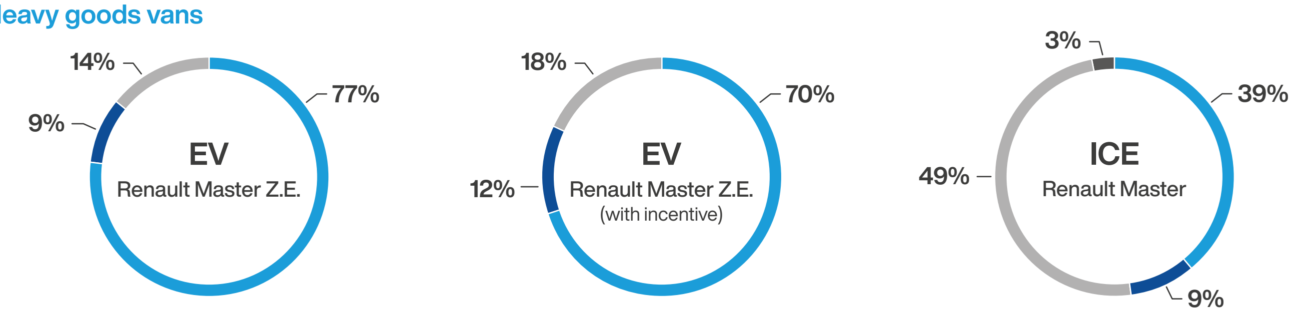
Passenger cars



Light goods vans



Heavy goods vans



* The costs from which electric vehicles are exempt

0%
of CO_2 emissions from electric vehicles

Leading providers of charging services in Poland provide stations with energy from renewable sources, thanks to which electric vehicles are completely zero emission in terms of carbon dioxide.

50-100%
less noise

With speeds of 40 km/h, the average noise level of electric vehicles is lower by almost 100% for light commercial vehicles and by nearly 50% for vans.

16-28%
less maintenance activities

Depending on the segment, electric vehicles require 16% to 28% less maintenance activities that generate additional pollution.

5.25-7%
more energy consumption

Each additional 100 kg of load weight increases energy consumption by approx. 7% (Renault Kangoo Z.E.) and approx. 5.25% (Renault Master Z.E.) - these are lower values than those estimated prior to testing.

2 out of 3
locations

The pilot project confirmed the effectiveness of the charging station integrated with street lighting, which was successfully launched in 2 of the 3 planned locations. At the same time, the test showed possible limitations in places where the lighting installation had not been modernized.

74%
of drivers

Almost 3/4 of the drivers (74%) participating in the survey declared that an electric vehicle could be their everyday work tool.

1

Project methodology

AREAS OF THE ELAB PROJECT

TCO

Comparative analysis of the total cost of ownership (TCO) of electric vehicles – A study of the economic viability of fleet electrification

Environmental impact

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1. Project methodology

1.1 Description of the tested vehicles

The “ELAB – City of Clean Transport” project involved 6 vehicles divided into 3 pairs, according to the segment they represent. The tables below contain the basic technical specification of the compared vehicles.

Passenger cars

Renault ZOE R135

BASIC PARAMETERS	
Drive	Electric
Maximum power	135 HP (100 KW)
Electric range (WLTP)	395 km
Battery capacity	52 kWh (netto)
Trunk space	338 l
CO_2 emission (WLTP)	0,0 g/km

Renault Clio TCE 130 EDC

BASIC PARAMETERS	
Drive	Combustion – Petrol
Maximum power	130 HP
Engine capacity	1 332 cm^3
Number of cylinders	4
Trunk space	391 l
CO_2 emission (WLTP)	130-131 g/km

Light goods vans

Renault Kangoo Z.E. Maxi Combi

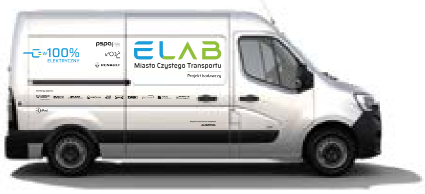
BASIC PARAMETERS	
Drive	Electric
Maximum power	60 HP
Electric range (WLTP)	200 km
Battery capacity	33 kWh (netto)
Trunk space	715 kg
CO_2 emission (WLTP)	0,0 g/km

Renault Kangoo Express Maxi

BASIC PARAMETERS	
Drive	Combustion – Diesel
Maximum power	95 HP
Engine capacity	1 461 cm^3
Number of cylinders	4
Trunk space	794 kg
CO_2 emission (WLTP)	166 g/km

Heavy goods vans

Renault Master Z.E. Furgon L2H2



BASIC PARAMETERS	
Drive	Electric
Maximum power	76 HP
Electric range (WLTP)	120 km
Battery capacity	33 kWh (netto)
Trunk space	1 049 kg
CO_2 emission (WLTP)	0,0 g/km

Renault Master Furgon L3H2

BASIC PARAMETERS	
Drive	Combustion – Diesel
Maximum power	180 HP
Engine capacity	2 299 cm^3
Number of cylinders	4
Trunk space	1 434 kg
CO_2 emission (WLTP)	233-330 g/km

1.2 Description of the charging infrastructure

2 types of charging stations were used in the project – a wallbox solution by EVBox, as well as an EV Charge charger integrated with a composite lighting pole.

Elvi Wallbox

BASIC PARAMETERS

Charging power
1 x od 7 kW do 22 kW Type 2

Protection
30 mA AC / 6 mA DC CCID

Authorization
Autostart / key fob / RFID card – Mifare 13.56 MHz RFID card reader

Level of protection
IP55

Mechanical resistance
IK10 (IEC 60529)

Combocharger

BASIC PARAMETERS

Charging power
2 x 8 kW Type 2

Charging power for vehicles other than cars
1 x 230V, 6A
Safe Schuko socket with a timer button (option)

Protection
RCBO 1P+N 6kA B 40A/30mA Typ

Authorization
RFID, GSM

Level of protection
IP44

Mechanical resistance
IK10

1.3 Description of the collected data

All the vehicles participating in the project were equipped with Link 710 tracking devices by Webfleet Solutions, which made it possible to monitor the location and a number of technical parameters of vehicle operation through the LINK CAN Sensor 100 sensor, which enables reading information from the CAN bus with the use of wireless connection. Link 710 is a device that offers the ability to monitor and manage a fleet for any type of vehicle, thanks to data transfer from the FMS interface and digital tachograph. With its help, fleet managers are able to optimize staff management and the operation of company logistic processes, thanks to the full use of the possibility of broad integration. The remote data download function in WEBFLEET Tachograph Manager or TachoShare2 makes compliance with law easier.

The use of Webfleet technology allows you to monitor a number of parameters related to the operation of the vehicle in actual time or in a selected time period. The WEBFLEET fleet management telematics application supports electric vehicles by displaying the battery level, current range, charging status and time left to charge the vehicle. There are also low battery notifications as well as reports: a charging connection report and a fleet electrification report, which, based on telematics data, suggests which combustion vehicles can be changed to electric vehicles.

Basic data processed by the system:

1. Vehicle location
2. Parking time
3. Driving time
4. Distance covered
5. Engine running time when stationary
6. Travel speed
7. Information on incidents – entering and exiting the Clean Transport Zone
8. Fuel consumption
9. Wasted fuel
10. Information about the type of road on which the vehicles travelled

In addition, a number of other data was obtained, making it possible, for example, to determine the driving style of the driver or battery level in electric vehicles.

All data was collected remotely in the Webfleet system, and then reported in the form of 13 different summaries covering a period of 3 weeks of testing:

1. Item address report
2. Current position report
3. Speeding report
4. Area notification report
5. Fuel level report
6. Fuel consumption report
7. Road Type Report
8. Idle Exception Report
9. Journey report – daily summary
10. Journey report – monthly summary
11. Journey report – details
12. Idle fuel consumption report
13. Report – incidents when driving

Link 710

The test drivers were obliged to record basic data each time with the use of special data cards, which they filled in before and after the end of work, and also keep a record of all the incidents related to charging the vehicle. During the working day, the drivers recorded the following

- → Weather conditions
- → The weight of the cargo
- → Average fuel/energy consumption
- → Battery level
- → Time and place of charging
- → Costs related to the purchase of fuel
- → Vehicle mileage
- → Vehicle range (for electric vans)

The collective data was sent to the organizer of the test every week and then digitized. Data with all necessary information was used in the analysis, and the distance covered by the vehicle within one journey was equal to or longer than 1 km.

AREAS OF THE ELAB PROJECT

TCO

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Environmental impact

Assessment of environmental benefits of using electric vehicles

Load and range

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2

A comparative analysis of the impact of electric and internal combustion vehicles on the environment at the operational stage

2. A comparative analysis of the impact of electric and internal combustion vehicles on the environment at the operational stage

2.1 Assessment of the impact of combustion vehicles on the air

Chart 1. Average value of CO_2 emissions for each 100 km in the case of using energy from renewable sources

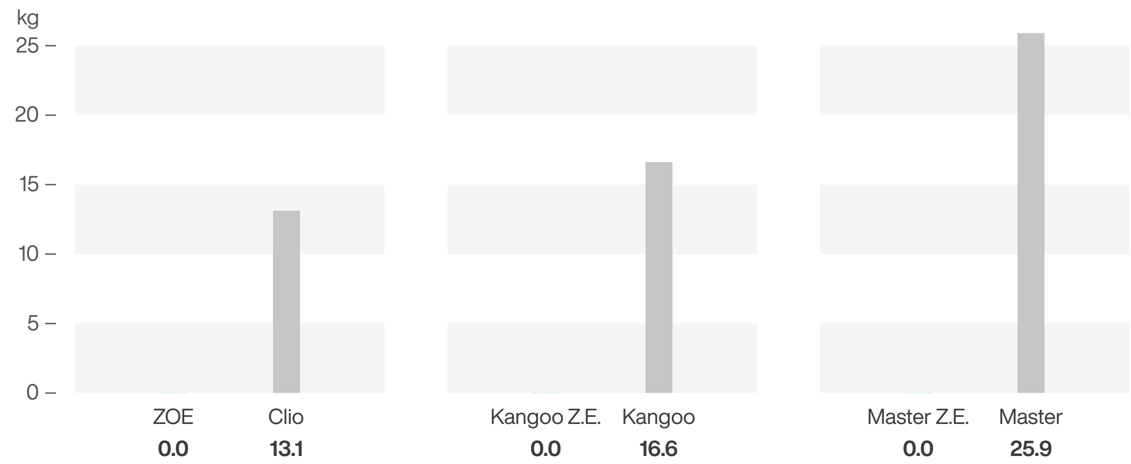


Chart 2. Total CO_2 emissions of particular combustion vehicles tested as part of the ELAB project

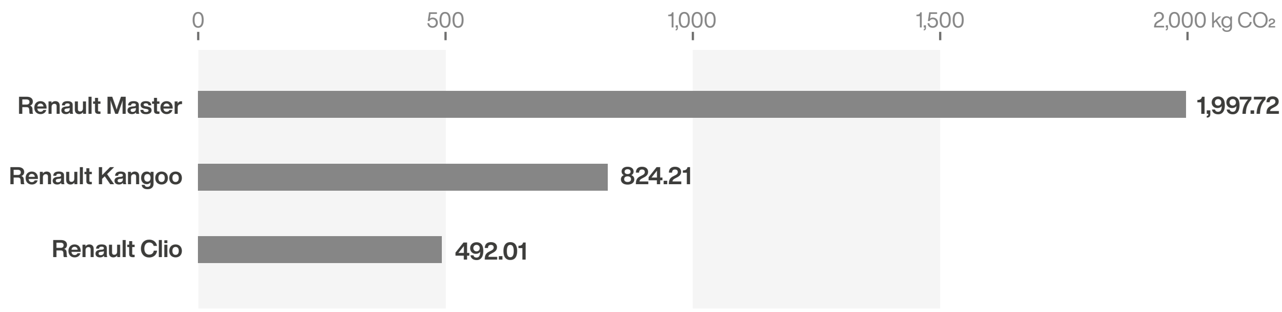
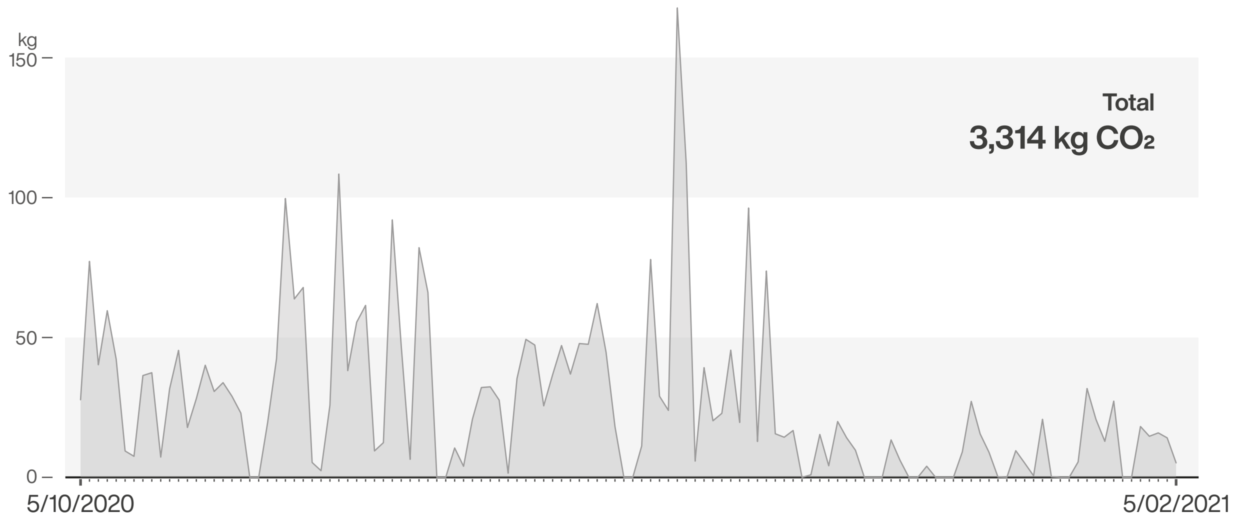
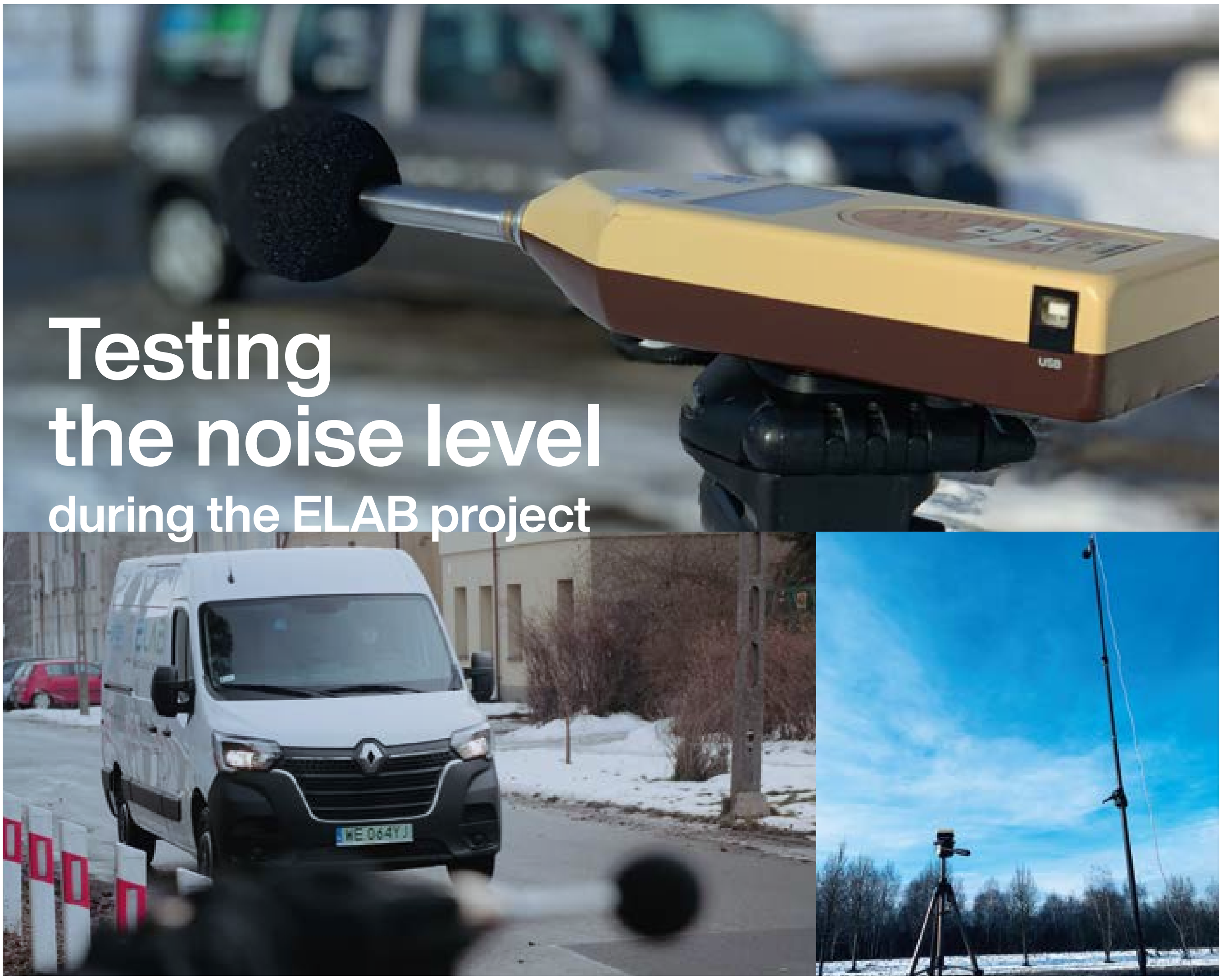


Chart 3. Total CO_2 emissions of all combustion vehicles tested as part of the ELAB project



Testing the noise level during the ELAB project



2.2 Noise level measurement results

Table 1. Average values of exposure sound level measurements for vehicles in running order

Parameter	Renault Kangoo	Renault Kangoo Z.E.	Renault Master	Renault Master Z.E.
Average value of the exposure level	56.7 dB	0 dB	59.2 dB	0 dB
Difference	**56.7 dB**	–	**59.2 dB**	–

Table 2. Average values of exposure sound level measurements at 40 km/h

Parameter	Renault Kangoo	Renault Kangoo Z.E.	Renault Master	Renault Master Z.E.
Average value of the exposure level	73.36 dB	70.71 dB	73.85 dB	71.99 dB
Difference	**2.65**	–	**1.86 dB**	–

Table 3. Average values of exposure sound level measurements at 70 km/h

Parameter	Renault Kangoo	Renault Kangoo Z.E.	Renault Master	Renault Master Z.E.
Average value of the exposure level	76.03 dB	74.43 dB	78.00 dB	77.72 dB
Difference	**1.6 dB**	–	**0.78 dB**	–

2.3 Analysis of the impact of operational wear and tear of vehicles on the environment

Chart 4. An overview of the number of maintenance activities for passenger cars

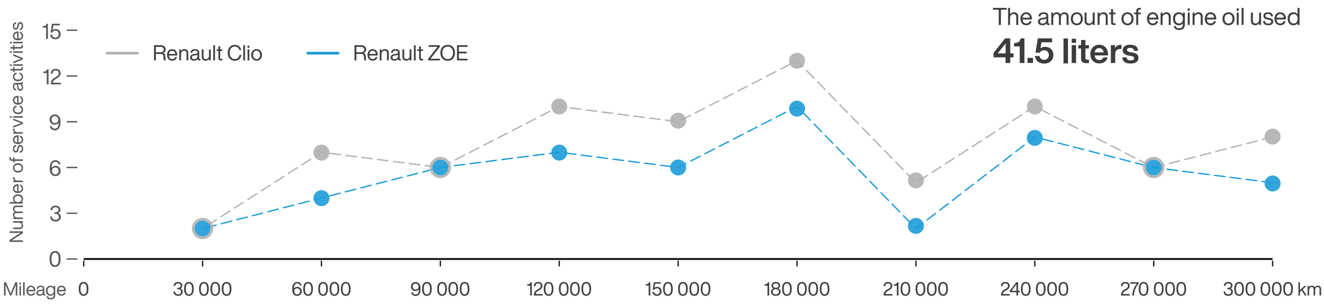


Chart 5. An overview of the number of maintenance activities for light goods vans

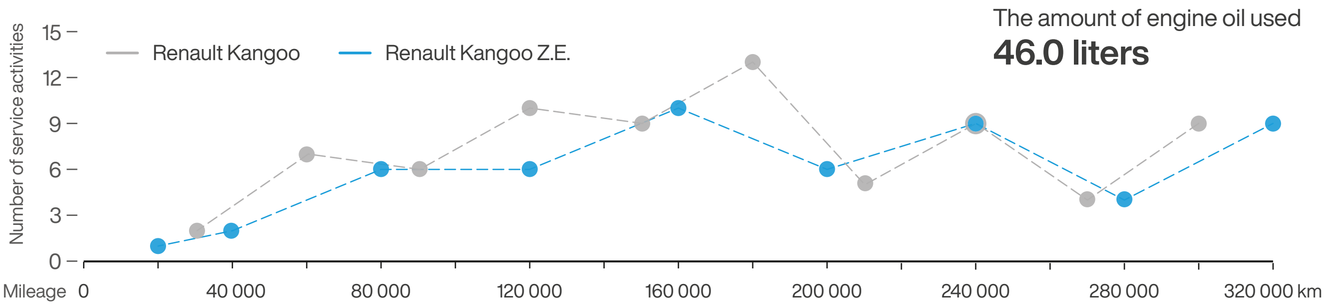
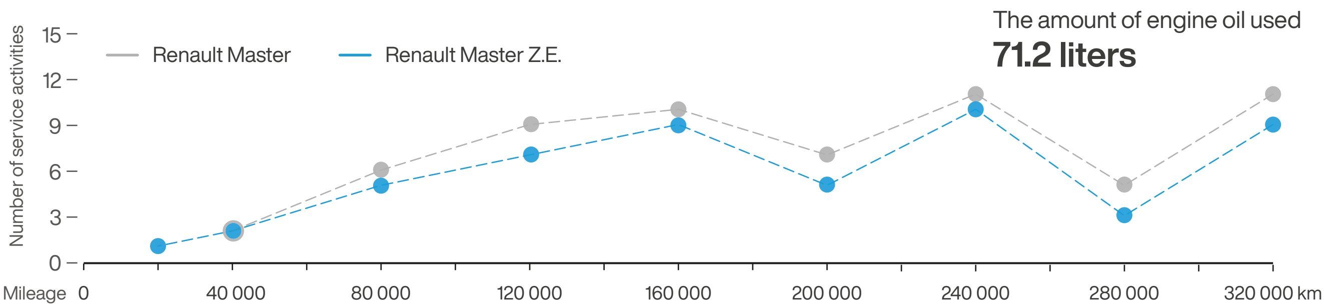


Chart 6. An overview of the number of maintenance activities for heavy goods vans



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Analysis of the influence of the cargo weight on the energy consumption of electric vans

3. Analysis of the influence of the cargo weight on the energy consumption of electric vans

3.1 Forecast model

$$ZE = \beta_0 + \beta_1 P_p + \beta_2 M_p + \beta_3 T_0 + \varepsilon$$

ZE – Energy consumption
β – Regression coefficient vector
P_p – Vehicle speed
M_p – Vehicle weight
T_0 – Air temperature
ε – Random error

The analysis was prepared for two test vehicles
– Renault Kangoo Z.E. and Renault Master Z.E.

3.2 Analysis results

Table 4. Summary of the average values of the parameters used in the analysis of the influence of load weight on energy consumption for Renault Kangoo Z.E models and Renault Master Z.E.

Parameter	Renault Kangoo Z.E.	Renault Master Z.E.
Number of data sets included	30	32
Average daily mileage	55.2 km	45 km
Average speed	39.4 km/h	38.2 km/h
Average air temperature	3.3°C	3°C
Average weight of the cargo	346 kg	581 kg
Average energy consumption	22.9 kWh	44.4 kWh
Scale of recorded temperatures for all data sets	From -5 to +15°C	From -4 to +13°C

Chart 7. Adjusting the forecast values to the measurement data for the Renault Kangoo Z.E model

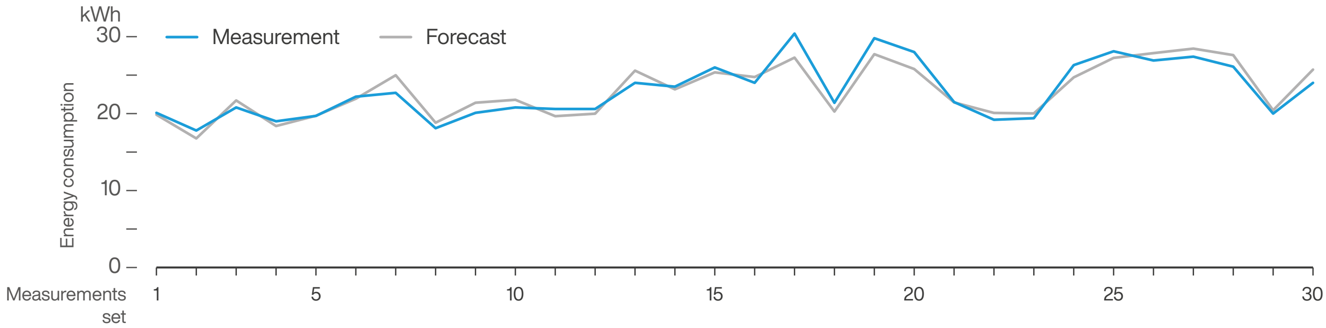


Chart 8. Adjusting the forecast values to the measurement data for the Renault Master Z.E model

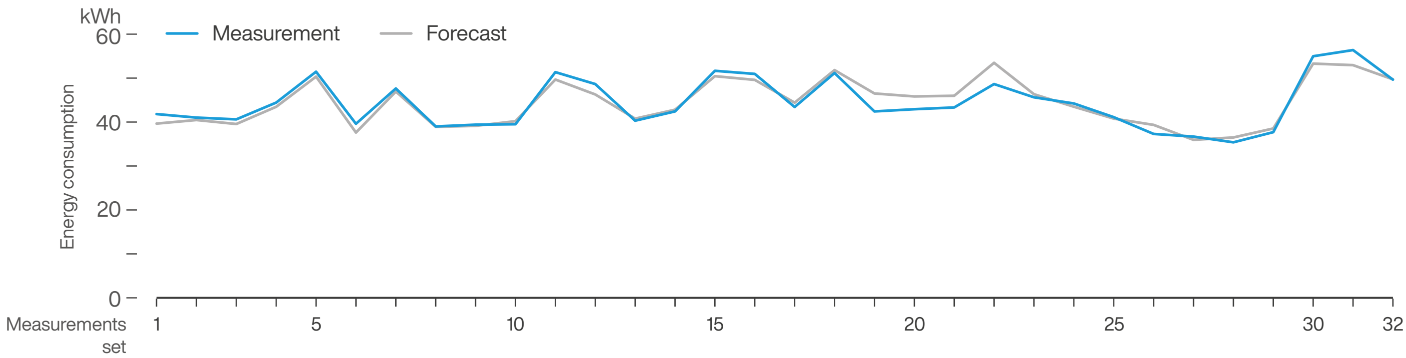


Chart 9. Projected energy consumption at -10°C for Renault Kangoo Z.E.

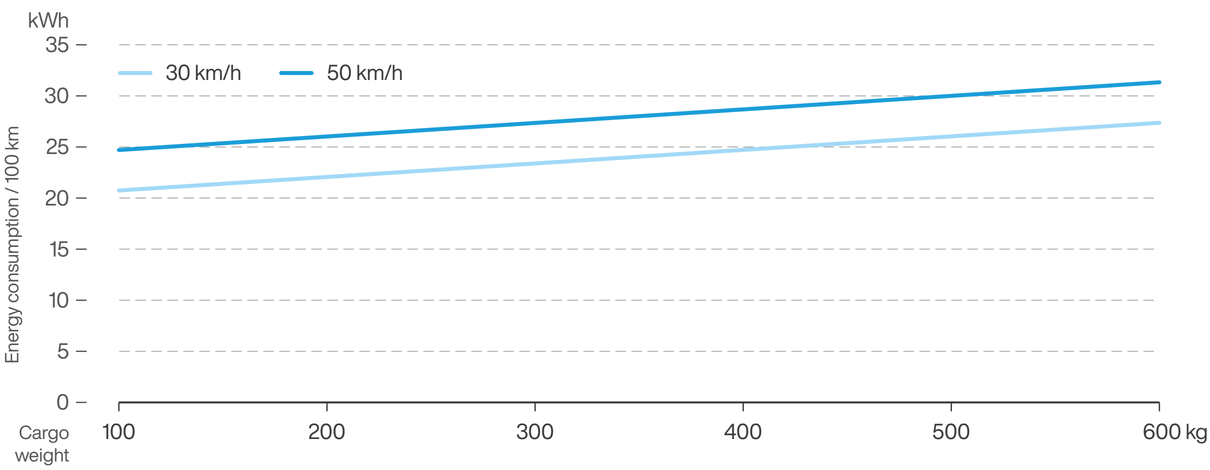


Chart 10. Projected energy consumption at -5°C for Renault Kangoo Z.E.

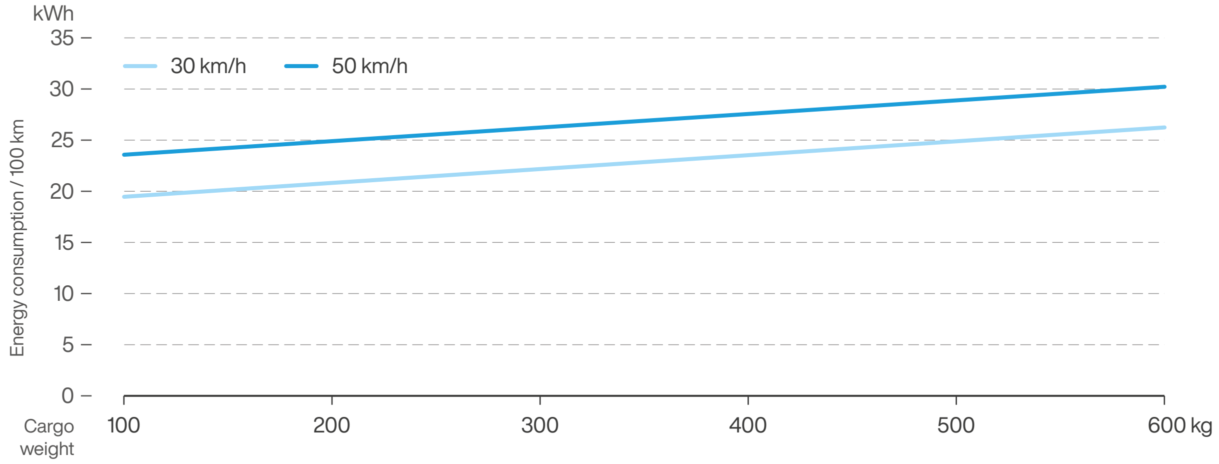


Chart 11. Projected energy consumption at 0°C for Renault Kangoo Z.E.

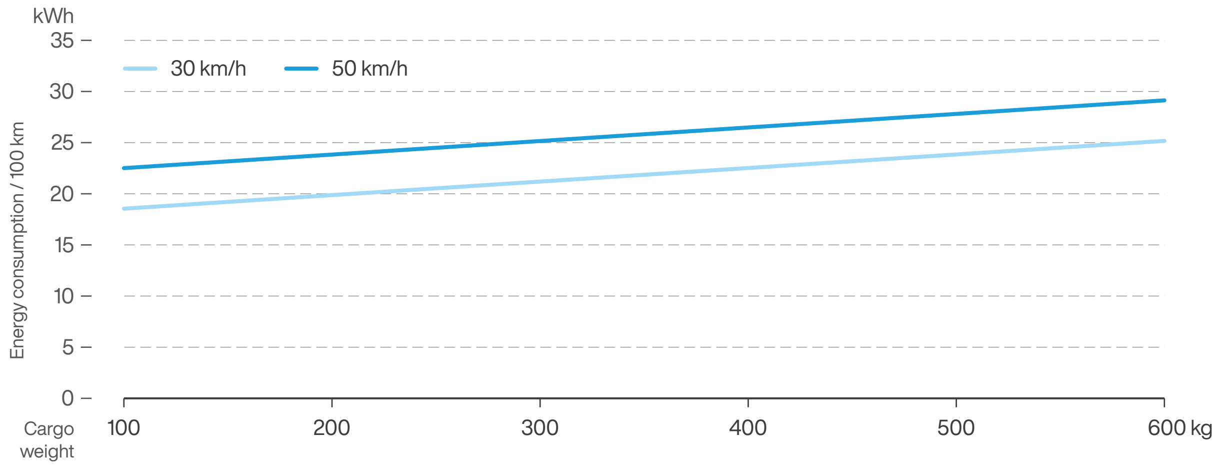


Chart 12. Projected energy consumption at 5°C for Renault Kangoo Z.E.

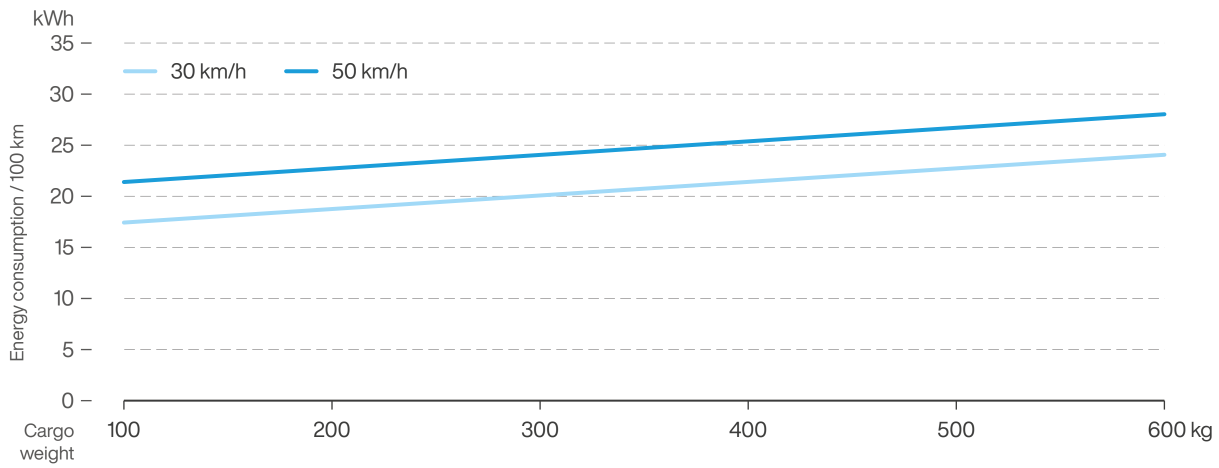


Chart 13. Projected energy consumption at 10°C for Renault Kangoo Z.E.

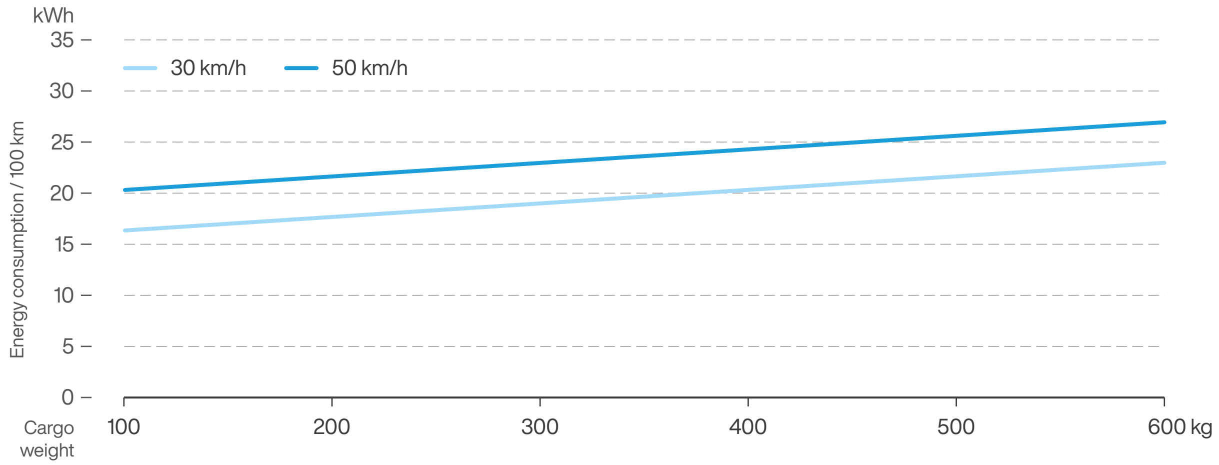


Chart 14. Projected energy consumption at -10°C for Renault Master Z.E.

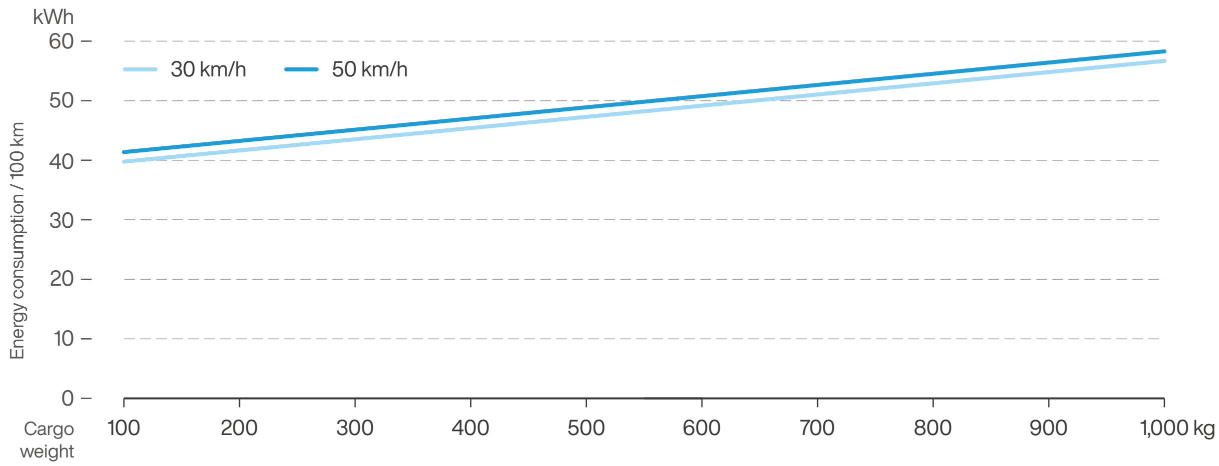


Chart 15. Projected energy consumption at -5°C for Renault Master Z.E.

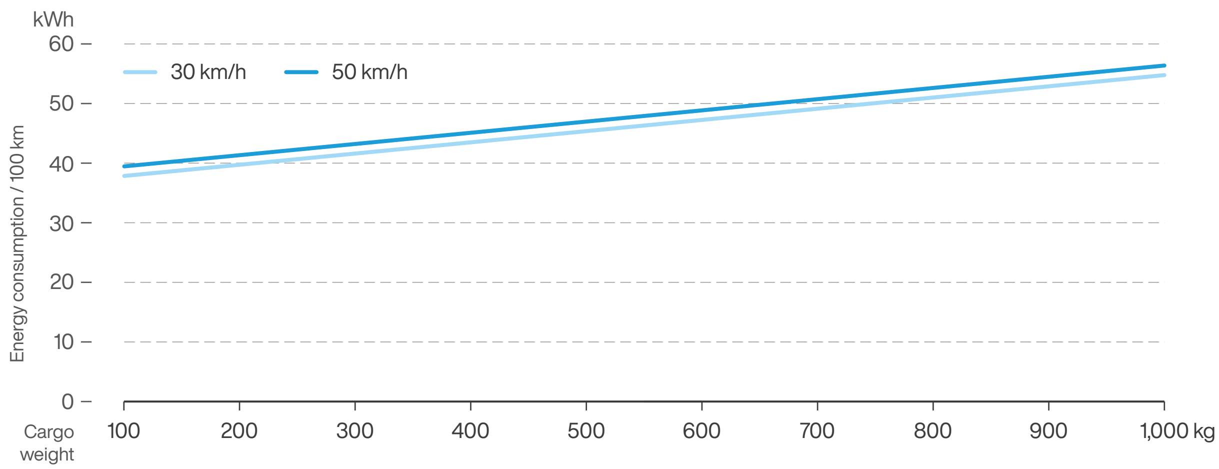


Chart 16. Projected energy consumption at 0°C forRenault Master Z.E.

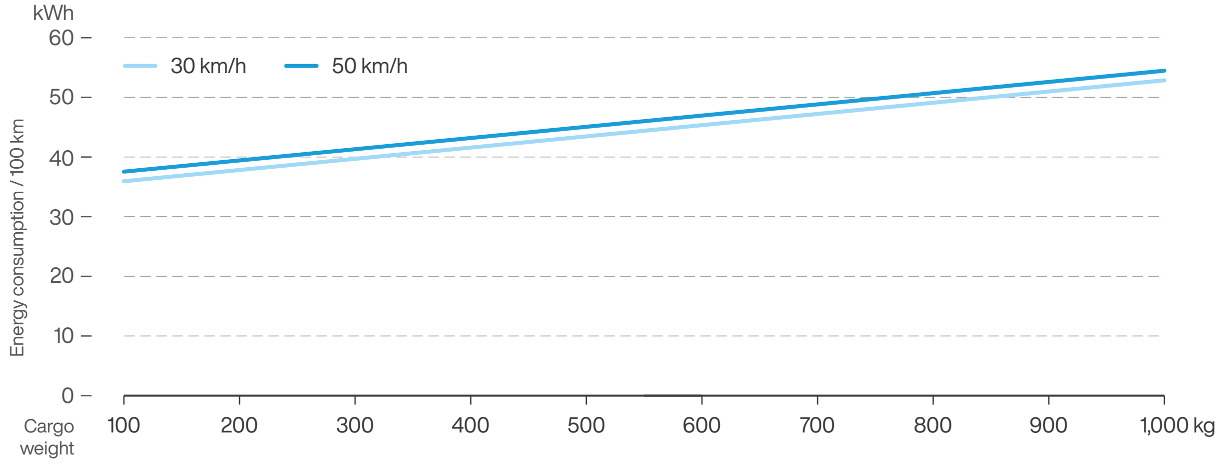


Chart 17. Projected energy consumption at 5°C for Renault Master Z.E.

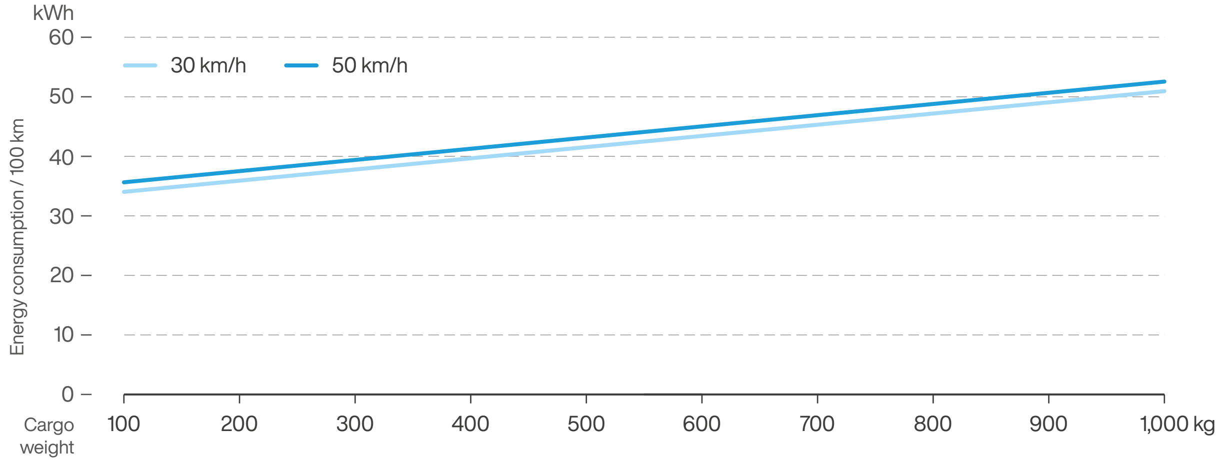
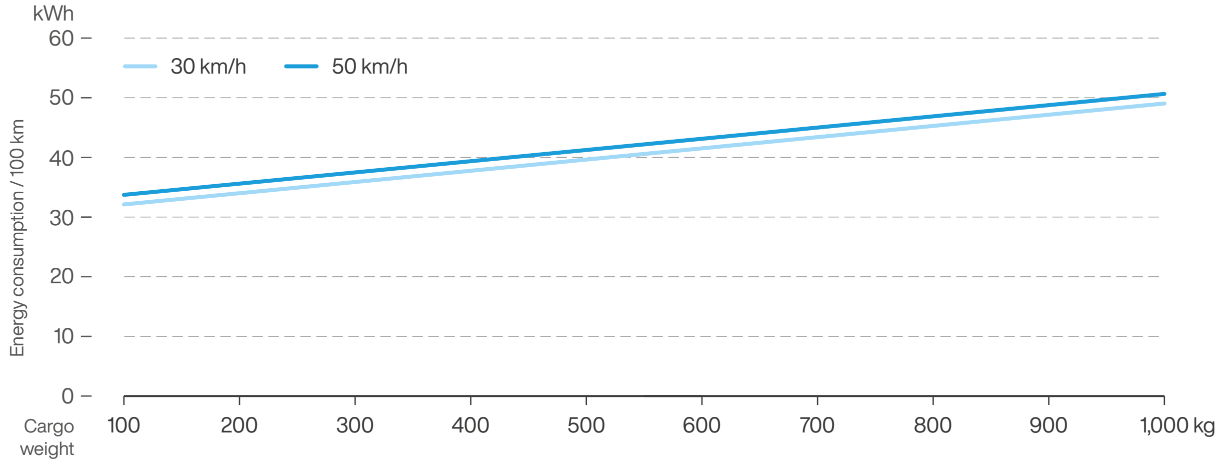


Chart 18. Projected energy consumption at 10°C for Renault Master Z.E.



Projected energy consumption data is based on Renault's official average energy consumption value determined according to the WLTP procedure. On this basis, the influence of the weight of 100 kg of cargo on the energy consumption was individually determined.

Table 5. Influence of 100 kg of cargo weight on energy consumption by Renault Kangoo Z.E. and Renault Master Z.E.

Vehicle	**Each additional 100 kg of load weight increases energy consumption by:**
Renault Kangoo Z.E.	ca. **7%**
Renault Master Z.E.	ca. **5,25%**

Table 6. Estimated range of Renault Kangoo Z.E. with a load of 346 kg in real operating conditions

Season	**Range from**	**Range up to**
Spring	161 km	171 km
Summer	181 km	206 km
Autumn	146 km	153 km
Winter	127 km	139 km

Table 7. Estimated range of Renault Master Z.E. with a load of 581 kg in real operating conditions

Season	**Range from**	**Range up to**
Spring	82 km	86 km
Summer	91 km	102 km
Autumn	75 km	79 km
Winter	67 km	72 km

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Effective implementation of electric vehicles into the fleet

4. Effective implementation of electric vehicles into the fleet

4.1 Test results

Preliminary information obtained before starting the test

Chart 19. Have you ever driven an electric vehicle?

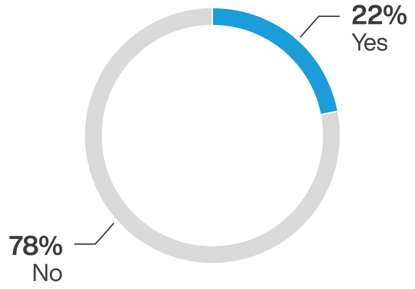


Chart 20. Do you have any concerns before starting work with an electric vehicle?

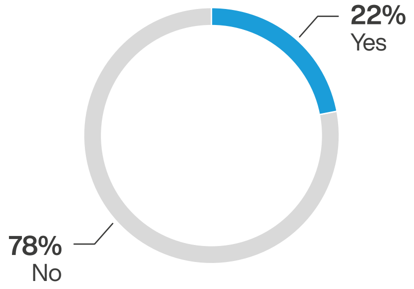
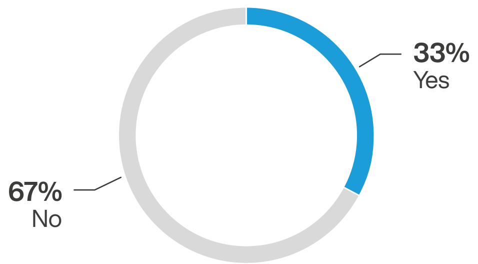


Chart 21. Do you know how an electric vehicle works? How to handle it?

Before the test



After the test

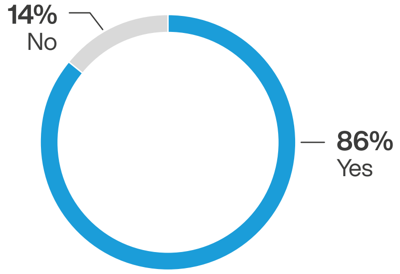
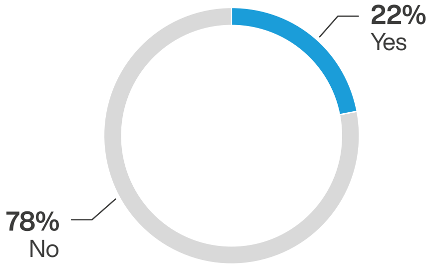


Chart 22. Do you know how you can extend the range of an electric vehicle?

Before the test



After the test

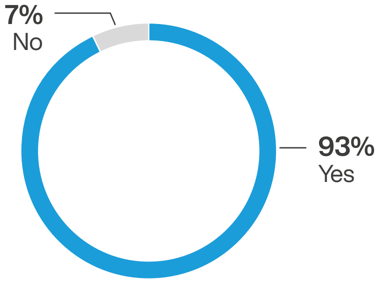


Chart 23. Do you know how to plan where and when to charge electric vehicles?

Chart 24. Do you know where to look for EV charging stations?

Chart 25. List the factors, from the most important to the least important, that you believe could affect or affect the range of an electric vehicle

Most often, the respondents pointed to:

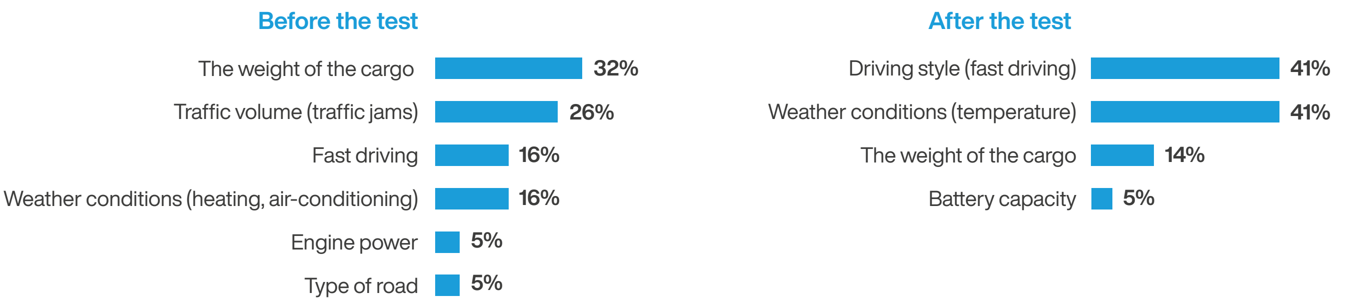


Chart 26. List the information that, in your opinion, every driver should necessarily obtain before using an electric vehicle

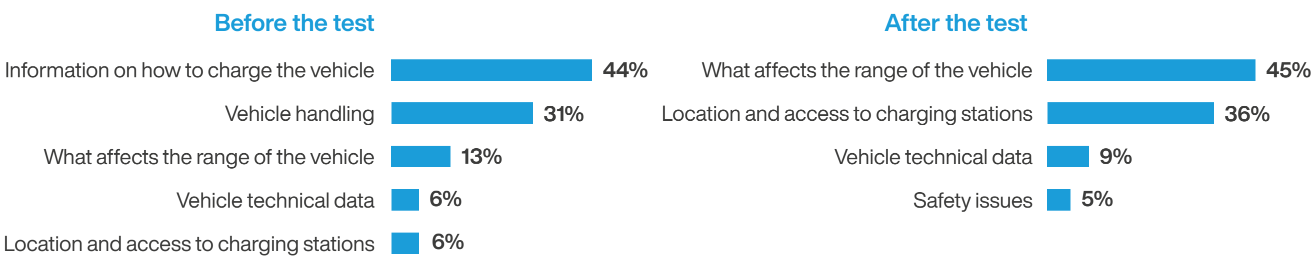
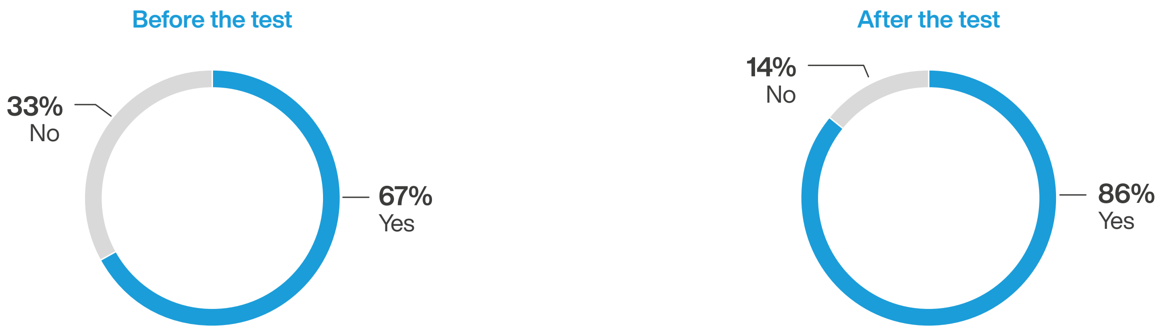


Chart 27. Do you think that EV operation training is necessary for you before you start working with such a car?



General information after the end of the test

Chart 28. Do you think an electric vehicle could be your everyday work tool?

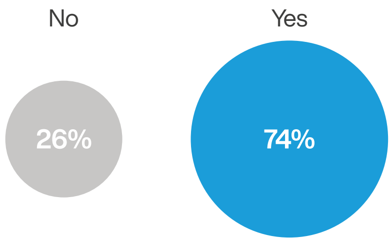


Chart 29. Describe the advantages that you noticed during the operation of an electric vehicle

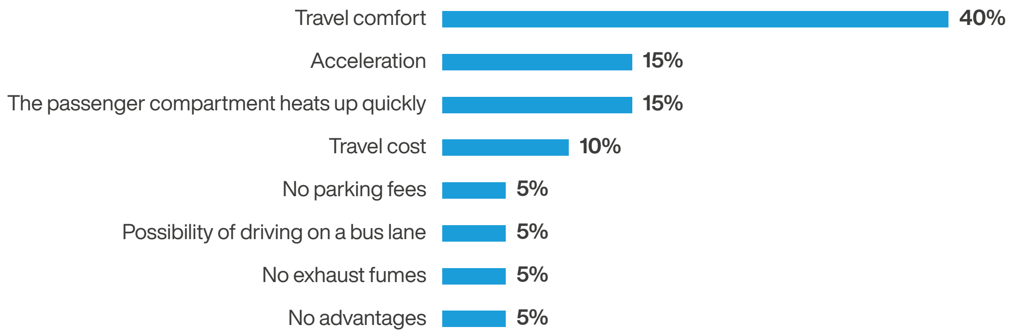
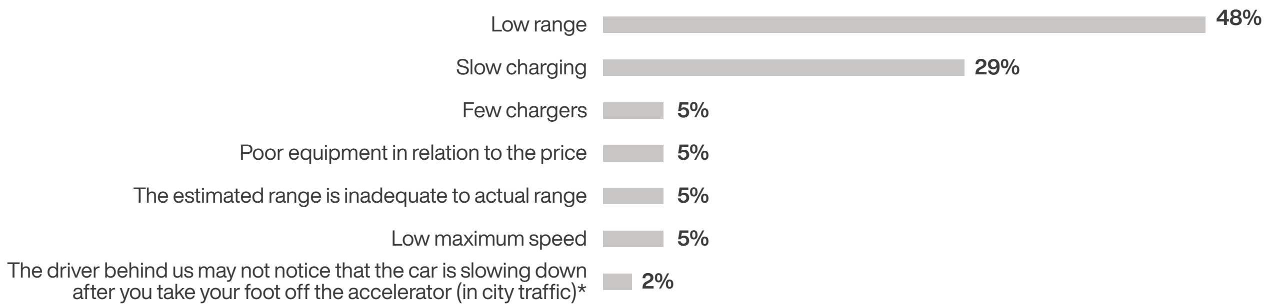


Chart 30. Describe the disadvantages that you noticed during the operation of an electric vehicle



* The quoted statement is false
– during recuperative braking, the brake lights of electric cars come on automatically

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Planning of EV fleet charging infrastructure – a conceptual case study

5. Planning of EV fleet charging infrastructure – a conceptual case study

5.1 Stages of the planning process

Stage 1
Determining the place of the most frequent stops longer than or equal to 6 hours

The analysis of the collected data began with the identification of the most frequent places of vehicle stops lasting at least 6 hours (i.e. in practice stops after the end of a working day). This data is crucial for determining the number and location of charging points that ensure maximum logistic efficiency of the electrified fleet

Stage 2
Determining the frequency and place of the most frequent stops from 2 to 6 hours

In the next stage of the analysis, the frequency of 2- to 6-hour stops during the working day was determined and the places of the most frequent breaks were identified.

Stage 3
Determining the number of charging points

The next stage of infrastructure planning should include the determination of the optimal number of private charging points for the company's electrified fleet

Stage 4
Determining the power of charging points

Correct determination of the power of charging points is crucial in optimizing the costs of handling the entire charging infrastructure. The power output should be adjusted to the technical capabilities of electric vehicles. Too low power will extend the EV charging time, while too high power will lead to additional and unjustified costs.

Table 8. Basic values

Parameter	**Renault ZOE**	**Renault Kangoo Z.E.**	**Renault Master Z.E.**
Usable battery capacity	52 kWh	33 kWh	33 kWh
Average energy consumption per 100 km	21.9	24.2	40.8
AC charging power	22 kW	7.4 kW	7.4 kW
DC charging power	50 kW	n/a	n/a

Aggregated data allows you to calculate the estimated charging time depending on the power of the charging point. It should be noted that the process of charging electric cars is not continuous with constant power. In the estimated calculations, it is worth taking into account the charging power equal to 90% of the declared value.

Stage 5
Determining the type of charging infrastructure needed

The knowledge gathered in the previous stages makes it possible to determine the number of necessary charging points, their optimal power and type.

Table 9. Analysis of optimal conditions for the necessary charging infrastructure

Vehicle (combustion – electric)	**Average parking time during the night**	**Optimal charger power**	**Number of sockets**
Renault Clio – Renault ZOE	11 h 24 min	2.3 kW (network socket)	x1
Renault Kangoo – Renault Kangoo Z.E.	11 h 55 min	3.7 kW (network socket)	x1
Renault Master – Renault Master Z.E.	11 h 3 min	7.4 kW (Wallbox)	x1

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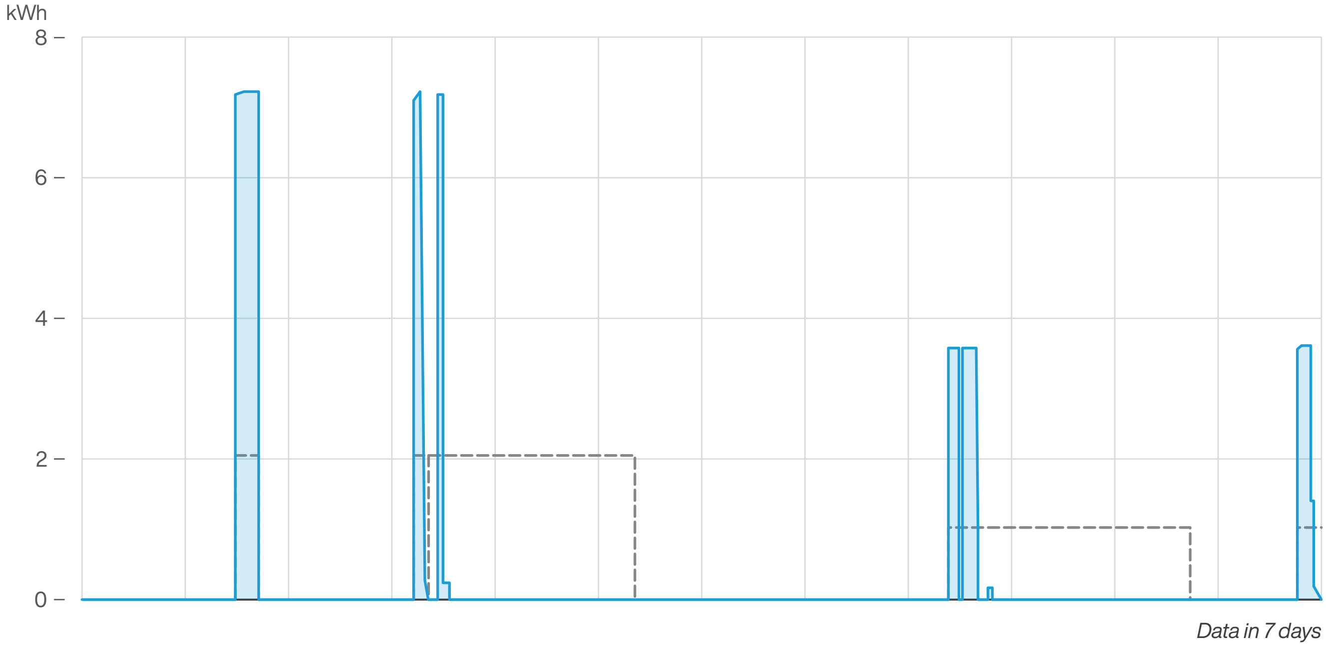
Pilot launch of a charging station integrated with street lighting

6. Pilot launch of a charging station integrated with street lighting

6.1 Conclusions

Chart 31. Charging power in relation to the battery level



The pilot project confirmed the functionality of Combocharger, which can successfully be an alternative to conventional charging stations with similar power. At the same time, the test showed possible limitations resulting from the technical parameters of the existing lighting infrastructure, which has not been modernized. In the two locations where the station was launched, the electric vehicles were charged at the full power offered by Combocharger (7.4 kW). At the same time, the charger was a fully functional lighting pole, also during the energy charging process.

The pilot project showed that thanks to its versatility and adaptation to urban conditions, the use of this type of installation has a significant potential to accelerate the expansion of the publicly accessible charging infrastructure for electric vehicles in Poland. The results of the test also set the direction for Polish municipalities planning to modernize the lighting infrastructure in the coming years. In order to develop a charging network based on integrated devices, local governments, as early as at the planning stage, should secure all technical issues that may improve the process of installing chargers of this type in the future.

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Total Costs of Ownership (TCO)

7. Total Costs of Ownership (TCO)

7.1 Understanding the concept

When choosing a vehicle to be used in a company fleet, it is worth considering not the price of purchase or the sum of lease or long-term rental instalments, but the more complex factor such as the total cost of ownership (TCO).

When deciding to buy a car, the price is usually considered the main factor determining the profitability of this investment. Such a simplified approach can lead to wrong conclusions as it fails to take into account component costs that will arise only after the vehicle is purchased. When making an economic cost analysis of modernizing a company fleet of vehicles, fleet decision makers should take into account all projected expenses expected at the stage of implementation, operation and disposal of the vehicle.

TCO Model

((components for electric vehicles)

ONE-OFF COSTS	RECURRING COSTS	VARIABLE COSTS	AVOIDABLE COSTS
Vehicle purchase	Purchase of vehicle insurance	Energy (fuel)	Paid public car parks
Purchase and installation of a charging station	Vehicle inspections	Maintenance	Entrance fees to Clean Transport Zones
Administrative expenses	Operating budgets (e.g. car wash)	Repair of damage not covered by insurance	Saved time costs (possibility of driving on bus lanes)
Costs of adapting a vehicle to the fleet		Charging station maintenance	

Residual value

7.2 TCO model in the ELAB – City of Clean Transport project

The main objective of the TCO model as part of the ELAB project was to use a realistic representation of the actual conditions of use of vehicles.

For this purpose, to build the calculation model, the project used data components that could be obtained at the project implementation stage with the use of measurement devices, questionnaires filled in by project participants and data provided by project partners.

The following formula was applied to determine the TCO value:

$$\mathbf{TCO}_{(t)} = P - \frac{d^t}{(1+p)^t} + C_{ins} + \sum_{t=0}^{n} \frac{f(t) + Ins(t) + I(t) + M(t) + Fl(t) + Sev(t)}{(1+p)^t}$$

- P – vehicle price
- d – residual value
- p – discount rate
- C_{ins} – price of the charger with installation
- F – annual cost of fuel/energy used for driving
- Ins – annual cost of inspection
- I – annual cost of insurance
- M – annual cost of maintenance
- Fl – annual fleet costs related to vehicle operation
- Sev* – annual savings resulting from the operation of an electric vehicle

* Value taken into account for combustion vehicles in the comparative model

* Office of Competition and Consumer Protection, Reference rate and archives: www.uokik.gov.pl/stopa_referencyjna_i_archiwum.php

7.3 TCO analysis

The ELAB project's objective of comparing the TCO of electric and internal combustion vehicles was to determine whether, under current operating conditions, an electric vehicle can compete in TCO with its conventional counterpart with similar technical characteristics.

During the study, the vehicles were operated in real conditions of use by 8 project partners. The performed tests allowed for the acquisition of the necessary data for the comparative TCO analysis.

7.3.1 Analysis objectives

Time of analysis	8 years	
Number of working days in a year	252	
Average annual mileage	**Passenger cars**	15,000 km
	Light goods vans	20,000 km
	Heavy goods vans	25,000 km
Fuel price	**Petrol**	PLN 4.19 net / liter
	Diesel	PLN 4.15 net / liter
Energy price	**Tariff C11**	PLN 0.49 net / kWh
	Tariff C12	PLN 0.44 net / kWh

Fuel / energy consumption

Summary of the average daily fuel/energy consumption – DHL

Renault ZOE	23.3 kWh /100 km
Renault Kangoo Z.E.	19.9 kWh / 100km
Renault Master Z.E.	40.1 kWh / 100km
Renault Clio	9.4 l / 100km
Renault Kangoo	7 l / 100 km
Renault Master	13.8 l / 100km

Summary of the average daily fuel/energy consumption – InPost

Renault ZOE	22.9 kWh / 100 km
Renault Kangoo Z.E.	27.6 kWh /1 00 km
Renault Master Z.E.	40.0 kWh /100 km
Renault Clio	9.1 l / 100 km
Renault Kangoo	9.2 l /100 km
Renault Master	13 l /100 km

Fuel / energy consumption
(cont.)

Summary of the average daily fuel/energy consumption – Veolia

Renault ZOE	22.8 kWh / 100 km
Renault Kangoo Z.E.	29.9 kWh / 100 km
Renault Master Z.E.	43.4 kWh / 100 km
Renault Clio	9.8 l / 100 km
Renault Kangoo	8.5 l / 100km
Renault Master	12.2 l / 100km

Summary of the average daily fuel/energy consumption – Road and Transport Authority in Łódź

Renault Kangoo Z.E.	27.5 kWh / 100 km
Renault Master Z.E.	37.5 kWh /100 km
Renault Kangoo	9.4 l / 100km
Renault Master	13.2 l / 100 km

Summary of the average daily fuel/energy consumption – Water Supply and Sewerage Company in Łódź

Renault Kangoo Z.E.	25.5 kWh /100 km
Renault Master Z.E.	41.1 kWh /100 km
Renault Kangoo	8.7 l /100 km
Renault Master	13.5 l / 100 km

Summary of the average daily fuel/energy consumption – IKEA

Renault Kangoo Z.E.	23.3 kWh /100 km
Renault Kangoo	6.9 l / 100km

Summary of the average daily fuel/energy consumption – Emergency Management and Safety Department in Łódź

Renault ZOE	19.5 kWh /100 km
Renault Clio	9.4 l / 100 km

Summary of the average daily fuel/energy consumption – Rhenus

Renault Master Z.E.	43.1 kWh /100 km
Renault Master	11.2 l / 100 km

7.3.2 TCO results

Passenger cars

EV TCO (Renault ZOE)
EV with incentives TCO (Renault ZOE)
ICE TCO (Renault Clio)

Chart 32. Comparative results of the TCO analysis of passenger vehicles – DHL

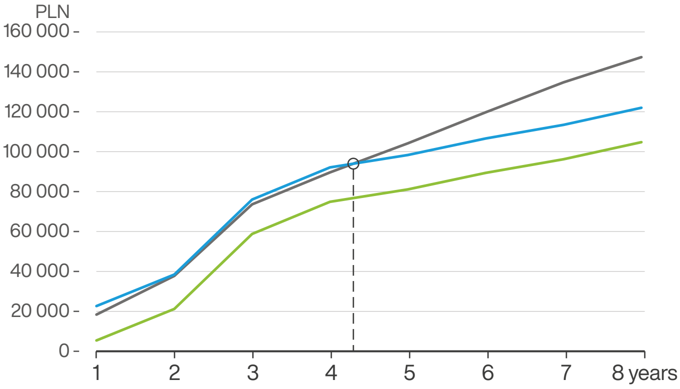


Chart 33. Comparative results of the TCO analysis of passenger vehicles – InPost

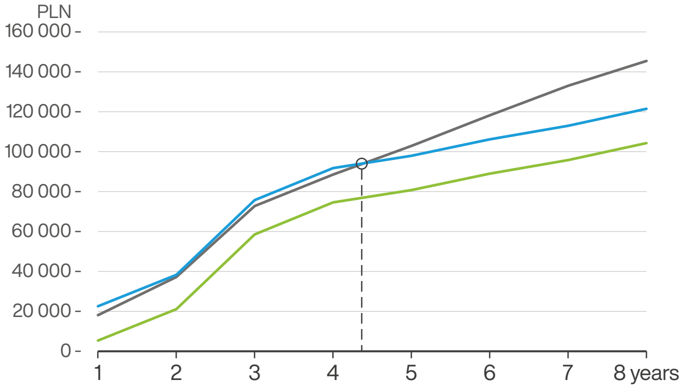


Chart 34. Comparative results of the TCO analysis of passenger vehicles – Emergency Management and Safety Department in Łódź

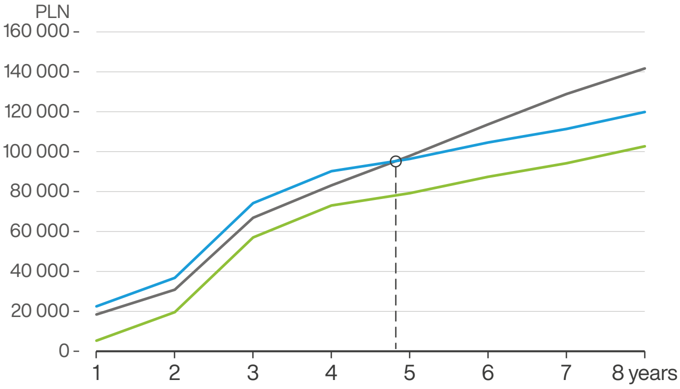
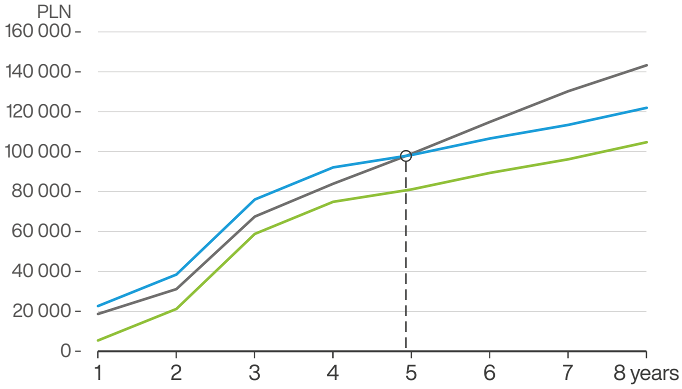


Chart 35. Comparative results of the TCO analysis of passenger vehicles – Veolia



In the analysed scenarios of commercial use of passenger cars, the TCO value of an electric and internal combustion vehicle draw level:

Excluding incentives	Between 4 and 5 years of operation
Including incentives	Within 1 year of operation

Light goods vans

EV TCO (Renault Kangoo Z.E.) | **EV with incentives TCO** (Renault Kangoo Z.E.) | **ICE TCO** (Renault Kangoo)

Chart 36. Comparative results of the TCO analysis of light goods vans – DHL

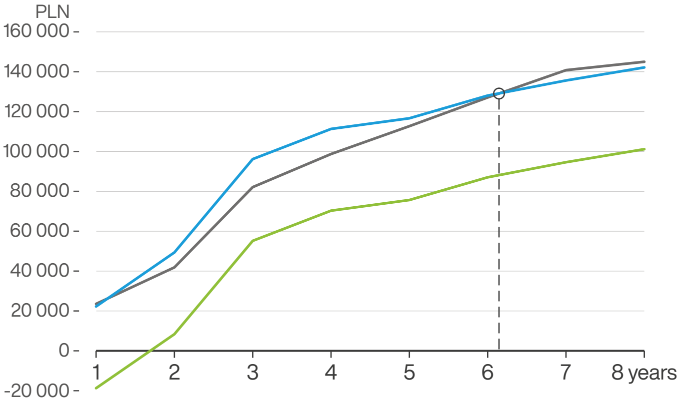


Chart 37. Comparative results of the TCO analysis of light goods vans – InPost

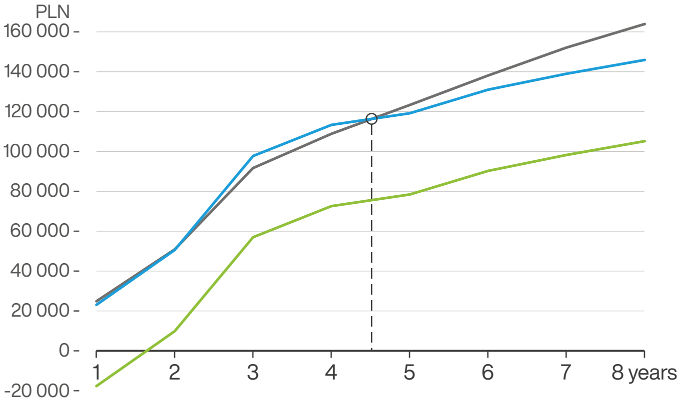


Chart 38. Comparative results of the TCO analysis of light goods vans – IKEA

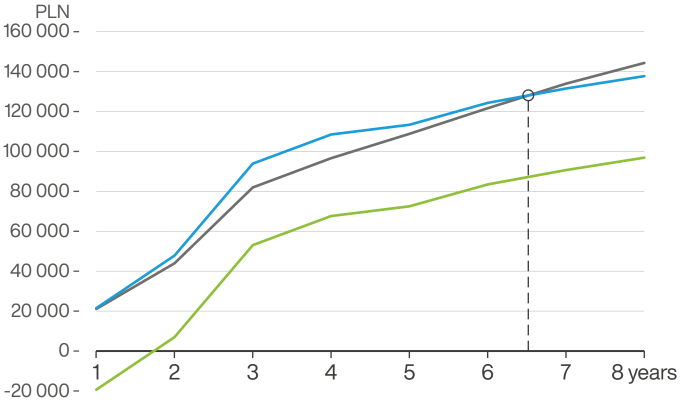


Chart 39. Comparative results of the TCO analysis of light goods vans – Veolia

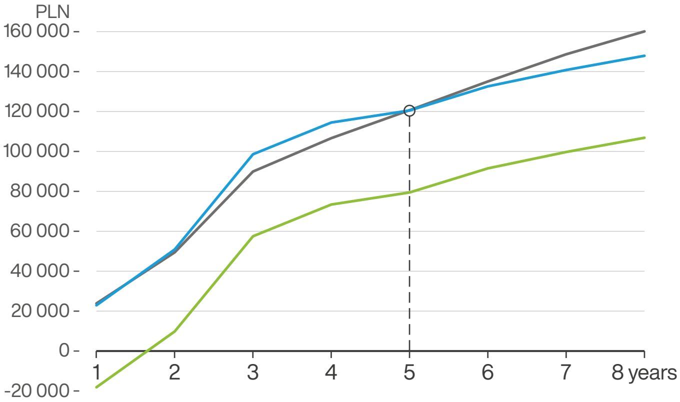


Chart 40. Comparative results of the TCO analysis of light goods vans – Road and Transport Authority in Łódź

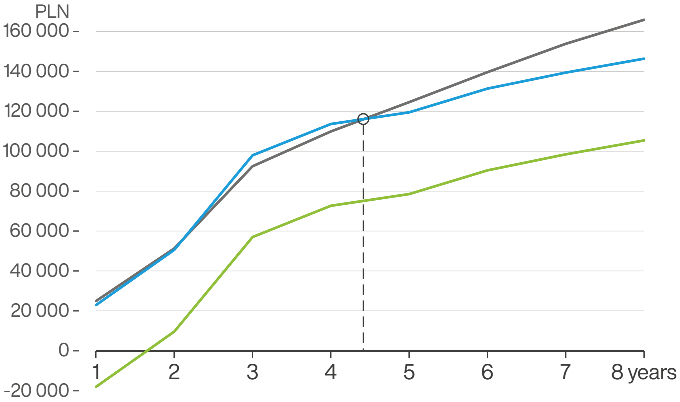
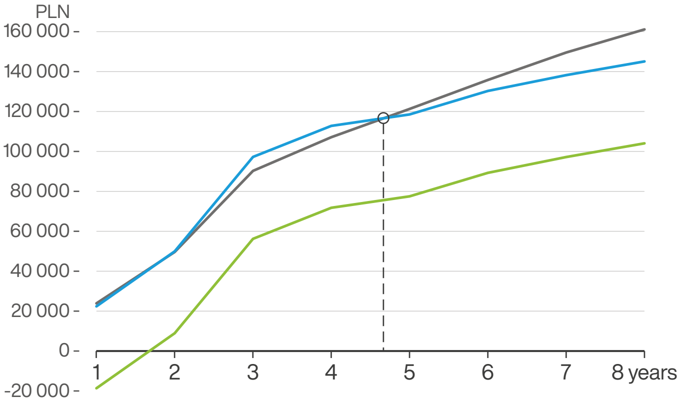


Chart 41. Comparative results of the TCO analysis of light goods vans – Water Supply and Sewerage Company in Łódź



In the analysed scenarios of commercial use of light goods vans, the TCO value of an electric and internal combustion vehicle draw level:

Excluding incentives	Between 4 and 7 years of operation
Including incentives	Within 1 year of operation

Heavy goods vans

EV TCO (Renault Master Z.E.)
EV with incentives TCO (Renault Master Z.E.)
ICE TCO (Renault Master)

Chart 42. Comparative results of the TCO analysis of heavy goods vans – DHL

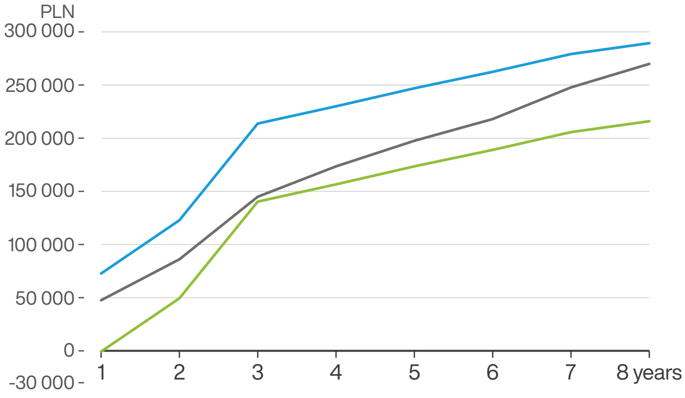


Chart 43. Comparative results of the TCO analysis of heavy goods vans – InPost

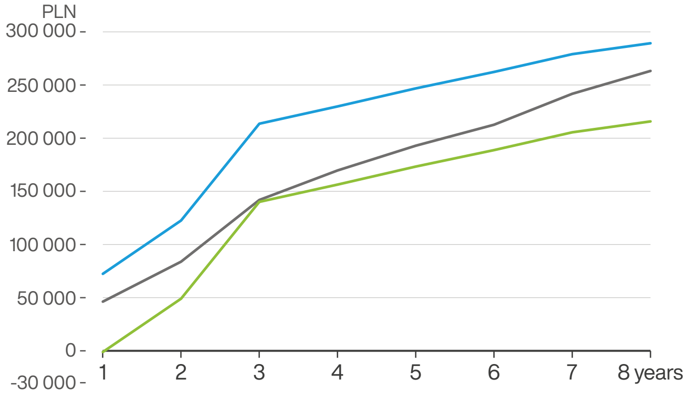


Chart 44. Comparative results of the TCO analysis of heavy goods vans – Rhenus

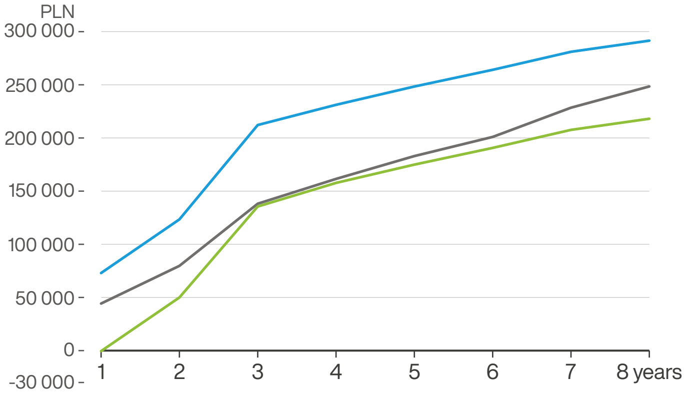


Chart 45. Comparative results of the TCO analysis of heavy goods vans – Veolia

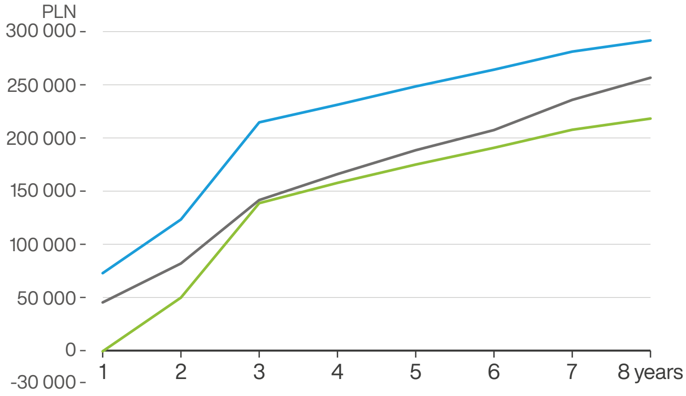


Chart 46. Comparative results of the TCO analysis of heavy goods vans – Road and Transport Authority in Łódź

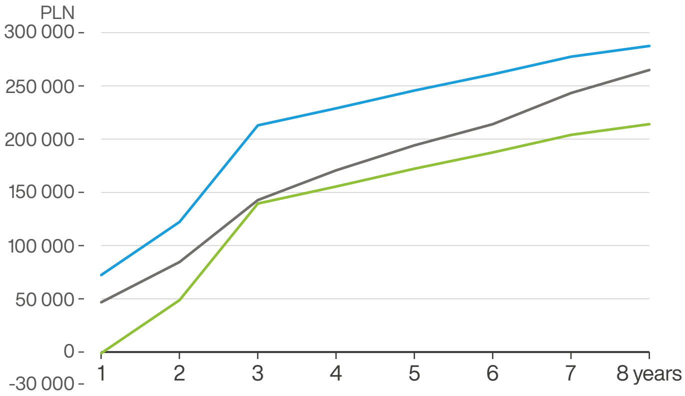
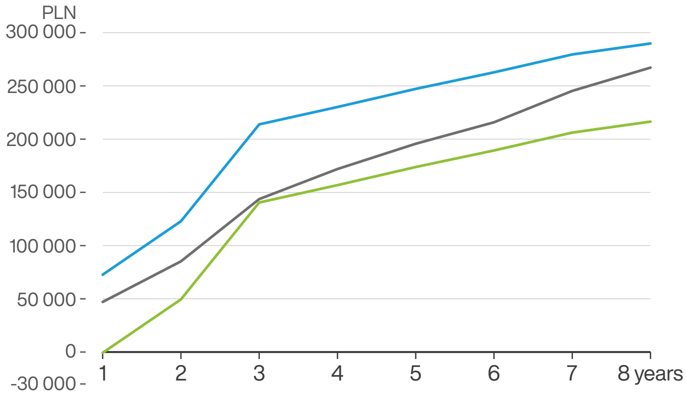


Chart 47. Comparative results of the TCO analysis of heavy goods vans – Water Supply and Sewerage Company in Łódź



In the analysed scenarios of commercial use of heavy goods vans, the TCO value of an electric and internal combustion vehicle draw level:

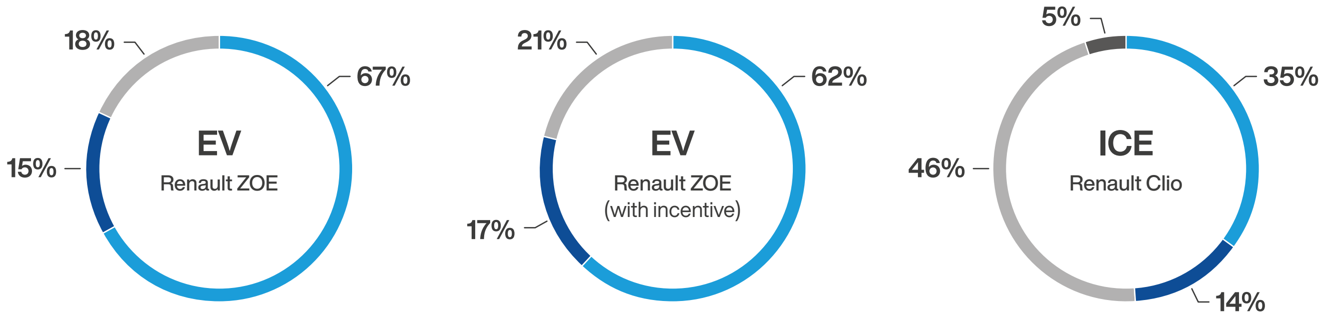
Excluding incentives	In all the analyzed scenarios, the 8-year period turned out to be insufficient to compensate for the TCO value
Including incentives	Within 1 year of operation

7.3.3 Division of TCO into basic cost groups over 8 years of operation

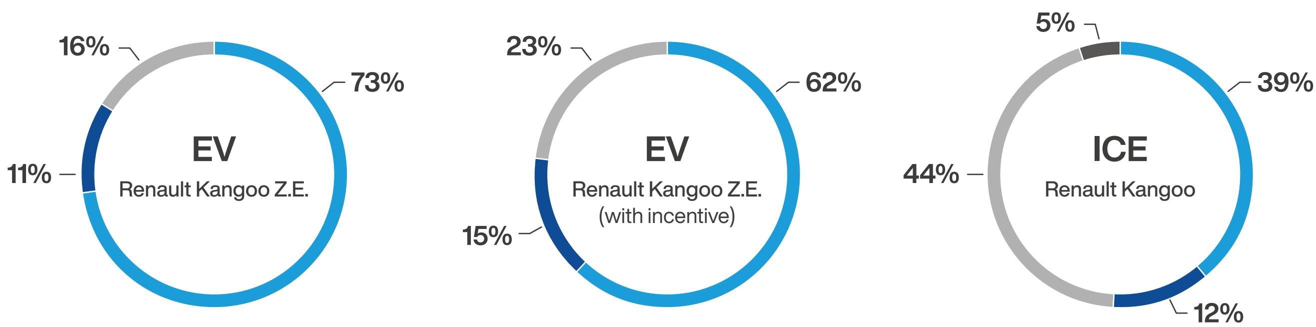
he presented data refers to average values determined for all analysed scenarios

Costs: One-off costs | Recurring costs | Variable costs | Other*

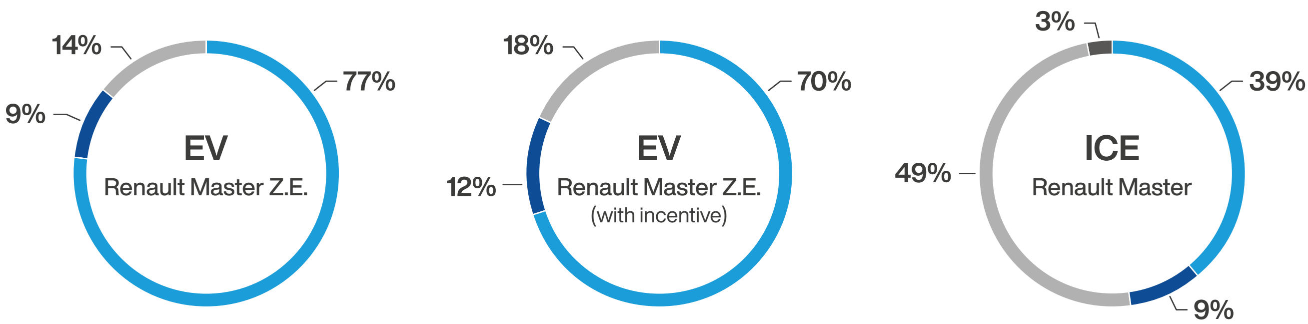
Passenger cars



Light goods vans



Heavy goods vans



* The costs from which electric vehicles are exempt

TCO

Comparative analysis of the total cost of ownership (TCO) of electric vehicles – A study of the economic viability of fleet electrification

Environmental impact

Assessment of environmental benefits of using electric vehicles

Load and range

Analysis of the influence of the weight of the load on the energy consumption (range) of electric vans

Smart technologies

Pilot launch of a charging station integrated with street lighting

Implementation of EVs within the fleet

Defining challenges on the way to effective electrification of the fleet

Charging infrastructure

Setting the stages of proper planning of the charging infrastructure

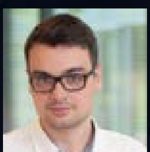
8

Project Partners

Polish Alternative Fuels Association (PSPA)

The Polish Alternative Fuels Association (PSPA) is the largest industry organization creating the e-mobility market in Poland. PSPA brings together almost 140 companies from the entire e-mobility value chain: vehicle and infrastructure manufacturers, charging service operators, fuel and energy companies, financial institutions, transport companies, technology providers and other entities and institutions active in the field of sustainable transport.

The ELAB project is another PSPA initiative to compare the TCO of electric and internal combustion cars. In 2018, we carried out the Zero Emission Mission project, where we tested the zero-emission Volkswagen e-Carfter and the Crafter with a diesel engine in terms of total cost of ownership. In 2019, the electric Mercedes-Benz eVito and the Vito with conventional drive took part in the "Fleet wit Energy" project. The turn of the year 2020/21 was dedicated to the implementation of the largest research project in the electromobility sector in the CEE region. During the ELAB study, we focused not only on financial, but also environmental and operational aspects, thus obtaining a vision of the overall benefits of electrification of company fleets. From our perspective, the final results of the project are very positive and confirm the findings made in the subsequent stages of the study. From year to year, we see a growing interest in e-mobility among logistics and transport companies operating in Poland. We hope that projects such as ELAB will contribute to an even greater intensification of efforts to replace company fleets with zero-emission vehicles.



Albert Kania
Data Analyst
ELAB project coordinator
Polish Alternative Fuels Association

pspa | We drive e-mobility!

Łódź City Hall

User opinions were consistent as to the usefullness of electric cars for everyday tasks, especially in the passenger car class. In the case of units carrying out tasks requiring the participation of delivery vehicles, the assessment was also positive, although their range and charging time made it necessary to properly plan the work mode. Undoubtedly, the nature of tasks performed in individual units also had an impact on the evaluation of the tests.

The Crisis Management and Safety Department of the Łódź City Hall tested Renault ZOE and CLIO. Officials traveled much more kilometers by electric car, which proves the potential of electric vehicles in the work of the Department. The car proved itself in carrying out everyday tasks, and the range did not pose any problems. Both cars should be considered comfortable, with an emphasis on an electric vehicle due to the low noise level and the re-education of operating costs.

The Water and Sewerage Plant tested Renault Kangoo Z.E. and Renault Master Diesel and Renault Master Z.E. and Renault Kangoo Diesel. The evaluation was positive (no technical problems, driving comfort, quiet operation, easy driving, acceleration). However, at sub-zero temperatures, the ranges on a single charge were limited.

The Roads and Transport Authority (ZDiT) tested Renault Kangoo and Renault Master. Although testing was not comprehensive due to the limitation of human resources, it could be concluded that at low temperatures, the Renault Master's range of 70 km significantly reduced the possibility of using it for ZDiT tasks, also due to the long charging time and problems with heating the cabin.

Certainly, the participation of the City in the project made it possible to collect data and information, in real conditions of use, that will allow enterprises performing public tasks to adapt more easily to the changes brought about by the development of e-mobility.

Adam Wieczorek
Deputy Mayor of the City of Łódź

Renault

Today, the fleet manager in the choice of alternative drives is primarily driven by economic considerations: how to reduce the costs of the fleet. On the other hand, the environmental issue is becoming more and more important: concern for environmental protection, ecological image of the company, reduction of CO_2 emissions. The planned introduction of clean transport zones in many cities in Poland will require an appropriate fleet of delivery vehicles. The ELAB study was to indicate, among other things, what conditions must be met for the operation of electric vehicles to be competitive in terms of economy and also ecology.

Renault electric vehicles participating in this project successfully fulfilled the same tasks that so far could only be fulfilled by internal combustion vehicles. It turned out that their range, usable properties – load capacity, usable capacity in combination with the adapted infrastructure for their charging allow for their actual introduction into car fleets.

The most important factor for these cost of ownership (TCO) components is, of course, the purchase price. The ELAB project clearly shows that the introduction of direct payments in the first period of e-mobility development and covering all economic entities with them will have the greatest impact on a significant reduction in the cost of using electric vehicles.

Andrzej Gemra
Public Affairs & Electromobility Promotion Expert
Renault

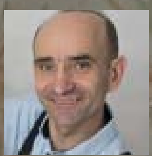
RENAULT

Webfleet Solutions

The decision to introduce electric vehicles to fleets, although it seems inevitable, is not a simple decision and requires new knowledge from fleet managers and consideration of a number of variables. Data obtained directly from vehicles is an extremely valuable and reliable basis for improving this process and making it as business-efficient as possible.

WEBFLEET telematics provided a large amount of data on the actual use of electric vehicles within the ELAB project, not only the mileage, range, battery charge status, but also 'default' data such as the number and duration of daily stops in which there could be recharging or the types of roads the vehicle travels on (urban, extra-urban, highways), which also affects the vehicle's charging capacity. The lack of standardization makes obtaining data from EVs still a challenge, but nevertheless in WEBFLEET we already present data from 90 models of electric vehicles available in Europe.

The ELAB project was for us, as a provider of telematics and fleet management solutions, a valuable experience, where we could not only test the functionalities for EVs of our solutions in real conditions of use, but also an opportunity to collect valuable tips for further development. Our analysis of the daily journeys of 100,000 fleet cars in Europe shows that more than 61% of them could already switch to electric vehicles. The ELAB report confirms this and we hope it will be an additional incentive and support for companies that want to electrify.



Michał Dmochowski
Product Manager EV
Webfleet Solutions Poland & EE

webfleet solutions
a Bridgestone company

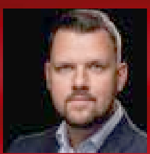
EVBox

EVBox, a leading provider of intelligent solutions for charging electric vehicles, has become a partner of the PSPA project "ELAB – City of Clean Transport".

It is the largest research project in Poland aimed at a detailed analysis of the commercial use of EVs on the example of the needs of the City of Łódź.

The main goal for EVBox in this project was to show the benefits of the practical use of intelligent charging stations for companies and local governments. EVBox solutions allow you to easily reduce the costs of building and maintaining a network of stations. For example, as standard, EVBox stations allow you to manage the power of the entire network so as not to exceed the available power level during peak hours and avoid additional costs related to the expansion of the connection. In addition, an electric car user who has a photovoltaic installation at home can connect it to the charging station and other electrical devices at home and intelligently manage the power distribution. Of course, in today's world, all this is available to the user thanks to convenient applications on the phone.

EVBox has delivered over 200,000 stations to over 70 countries. With solutions for residential, commercial, public spaces and fast charging solutions, EVBox helps build a future in which daily transport is emission-free. More information can be found at evbox.com.



Janusz Grądzki
Regional Director Eastern Europe
EVBox

EVBOX

EVCharge

The dynamic development of e-mobility observed in Europe, and slowly also in Poland, determines the need to create an appropriate infrastructure for charging stations for electric (zero-emission) and PLUG-IN (low-emission) cars.

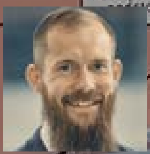
Undoubtedly, it will be a long-term process, requiring relatively high financial outlays. In order to reduce the costs of this process as much as possible, we were looking for a solution that would allow us to largely adapt the existing energy base. The answer is our innovative Combo Charger (7.4 or 22 kW), integrated in a safe and durable composite-based lighting pole, which we tested as part of the ELAB project.

Combo Charger stations allow you to use the already existing street lighting supply points, without the need to introduce additional devices to the public space and, most importantly, reduce the need to connect a new network of connection points. It is also an opportunity to eliminate dangerous concrete poles from public space, which, often in the event of a collision, can pose a real threat to the lives of the driver and passengers.

Krzysztof Joppke
Sales and Marketing Director of Alumast S.A. Group
Vice President of EV Charge Sp. z o. o.

Arval

The test carried out in Łódź is the best proof that electric cars are perfect for serving the city, as well as for companies implementing various business models. The ELAB study could help change the opinion of those who still do not believe in the e-mobility revolution in transport, and ultimately debunk many myths about e-vehicles, especially vans. Fortunately, the perception of electric cars is changing very quickly, and so is the energy transformation of corporate fleets. Today, enterprises are investing in charging infrastructure and are increasingly choosing electrics not only in the passenger version, but also in the delivery version. I am convinced that the future of urban transport is zero emission.

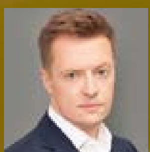


Radosław Kitala
Consulting & Arval Mobility Observatory Manager
Arval Service Lease Poland

ARVAL
BNP PARIBAS GROUP

DHL

The demand for courier services is constantly growing, among others due to the increasing popularity of online shopping. We have long been conducting intensive tests of various models of electric vans, which are perfect for urban logistics. They also collect very positive opinions from our couriers, who appreciate the comfort and convenience of an electric drive. As a company whose mission is to achieve zero CO_2 emissions, we will successively electrify the courier fleet. We want to be the leader of e-mobility in our industry and influence the direction of changes on the market. Only by the end of the year we will have about 150 electric cars, and in the coming years there will be over 500 of them. Cooperation with the Polish Alternative Fuels Association, as part of the largest research project on the commercial use of electric cars, is another step for us on the way to e-mobility. We use pro-ecological solutions not only in the context of the fleet. One of the examples is also the use of the renewable energy potential. In selected DHL Parcel terminals, we use electricity generated by our photovoltaic installations.



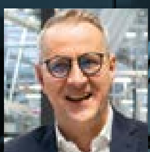
Bartłomiej Wnęk
Operations Vice President
DHL Parcel

H&M

Fashion and quality at the best price in line with the idea of sustainable development is the business motto of the H&M Group. We place great emphasis on issues related to climate protection and the circular economy. One of the H&M Group's key goals is to achieve a positive climate impact by 2040 (which means we will be removing more greenhouse gases from the atmosphere than we generate).

Along with the developing e-commerce business, transport is becoming an increasingly important area of interest for us. We strive to make our logistics as efficient as possible, with the greatest possible reduction in the use of natural resources and the lowest possible emissions. We choose our partners consciously, with a strong emphasis on environmental issues and the search and implementation of more sustainable means of transport. The ELAB – City of Clean Transport project fits perfectly into our activities related to promoting the use of new generation more environmentally friendly cars in distribution.

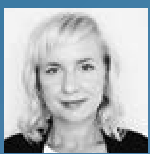
We also recognize that sustainability issues are becoming more and more important to our customers. We look forward to it and hope they also like this new, climate-friendly way of getting their orders delivered to their homes and collection points. More information about our sustainability efforts can be found on hm.com under "Our Responsibility".



Michael Schulz
Logistics Regional Manager Region East Europe
H&M

IKEA

We are glad that we could take part in the project. The test results additionally confirmed our belief that our strategy for sustainable transport and development of e-mobility is the right direction. We want 100% of transport for customer deliveries and services to be based on electric vehicles or other zero-emission solutions by 2025, and by 2030 we want to reduce greenhouse gas emissions more than IKEA emits in its entirety. value chain. We see great potential in the use of electric cars, especially in the urban area.



Beata Jasiczek
Fulfilment Sourcing Manager
IKEA Retail

Rhenus

As part of the ELAB project, we had the opportunity to test Renault Master and Renault Master Z.E. Thanks to the possibility of implementing an electric car into our daily activities, we were able to learn about the possibilities and limitations that will appear when introducing an electric fleet in our company. The drivers' experiences were very positive, they did not encounter any problems in their daily work. In their opinion, electric vehicles are very easy to operate. Work is now needed to extend the range of electric vehicles. It will be the biggest challenge in the future.

Maciej Dudek
Project Manager
Rhenus Delivery Services

RHENUS
HOME DELIVERY

Veolia

In Łódź, we extended our cooperation with the city last year to include e-mobility and urban electric transport projects. We are part of the EKOpact in Łódź, an initiative supporting the city's efforts to build a friendly environment, which is in line with our mission to reduce the impact of people on the climate and the environment.

I am glad that Veolia – the producer and distributor of heat in the city, is a partner of a pioneering project in Poland. As part of cooperation with ELAB, employees of Zakład Sieci Cieplnej Veolii Energii Łódź tested electric cars in their daily work for 15 weeks. The cars were powered by energy from renewable sources, which guaranteed zero CO_2 emissions for each kilometer driven. The entire project allowed us to very carefully check how electric cars would perform in our business and the results of this test are promising for us.

In the future, Veolia plans to expand its activities in the field of e-mobility by developing and implementing a model of supporting electric car rental service providers and shared use of electric cars in the "carsharing" formula, as well as the development of local electric car charging stations with green energy.

Adrian Sienicki
Development Director, Member of the Management Board
Veolia Energia Łódź

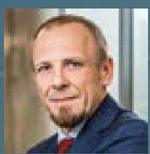
VEOLIA

InPost

We are glad that we could be part of this unique, pro-ecological project. ELAB – City of Clean Transport is an initiative which – due to the nature of our activities – is particularly close to us. For years, we have supported all activities that reduce harmful CO_2 emissions and contribute to reducing the carbon footprint.

The systematic development of our electric fleet is the best proof of this – this year we plan to increase the fleet by 250 electric cars. The new InPost electric cars will run in the largest cities in Poland. The mere delivery of many parcels to one parcel locker reduces carbon dioxide emissions, and the transport of the same parcels by electric car – reduces it to zero.

Moreover, we started the Green City program, the main goal of which is to reduce CO_2 emissions and car traffic in city centers. The first partner of the project was Łódź – this year the city will receive as many as a dozen new parcel lockers, access to EV chargers and new electric courier vehicles.



Sebastian Anioł
Director of the Logistics Innovation Department
InPost

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