Framework of benefits of zero-emission trucks for workers

Ricardo

20th September 2023

Agenda

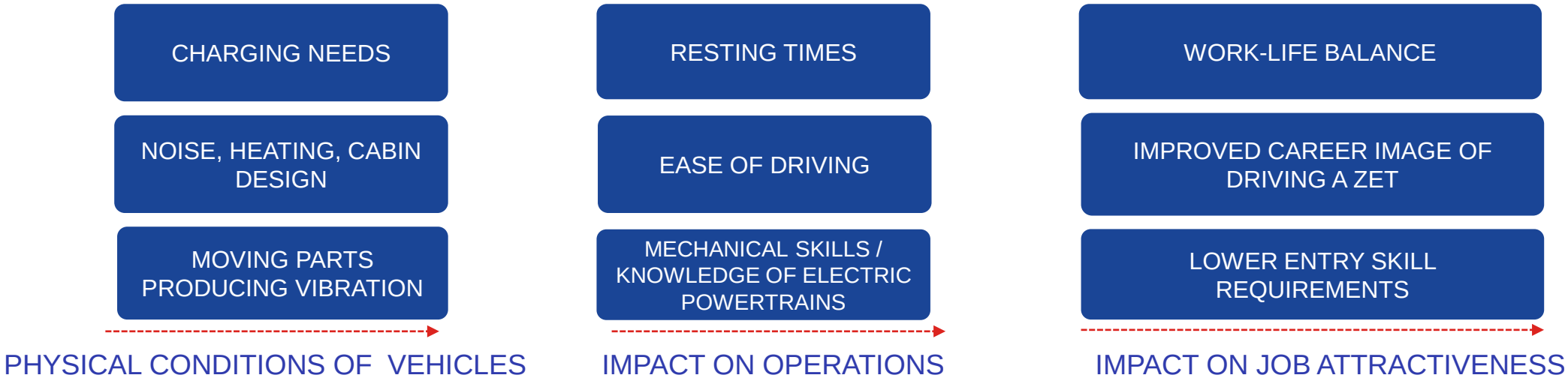
Framework of benefits: objective and approach

Objective

- Developing a Framework to identify and analyse potential ZETs benefits for drivers' working conditions.

Approach

- Initially, we defined the **changes to the physical conditions of driving ZET vehicles** compared to driving conventional trucks, through literature review, interviews of truck drivers and a survey.
- We developed a **conceptual framework** linking these changes to expected operational impacts of ZET driving and consequently on drivers' job attractiveness as presented below.



Agenda

Objectives and approach

Context

Methodology of the interviews

Results from the interviews

Summary of the survey

Overall main findings

Annex

Context: the EU represents 7% of the world's road freight activity

Trucking market snapshot (over 3.5 tonnes)

Road transport accounts for **around three-quarters of all inland freight transport activities** in the EU

There are around **4.27 million registered trucks** in the EU as of 2020 [1]

MHGVs account for roughly **20% of the EU's road CO_2 emissions**, despite making up only **2% of the vehicles** on European roads [2]

ZE MHGV deployment pathway

ZE MHGVs are **increasing at a fast pace,**

driven by uptake of BEVs, but still make up <1% of the truck fleet [3]

Deployment of charging and H_2 refuelling infrastructure is **minimal and insufficient** in many EU Member States

Overview of the trucking sector

Composition of fleet: relatively new

- The average age of trucks in the EU is 13 years but most of the road freight activity is undertaken by a relatively young fleet [1]
- From 4.27 M trucks, less than 1% is zero emission [2]

Composition of logistics activity: concentration of small firms

- 500,000 firms averaging 12 goods vehicles per company (most only 1 or 2). [6]
- Micro-companies (<10 employees) represent 90% of the market and 30% of turnover [7]

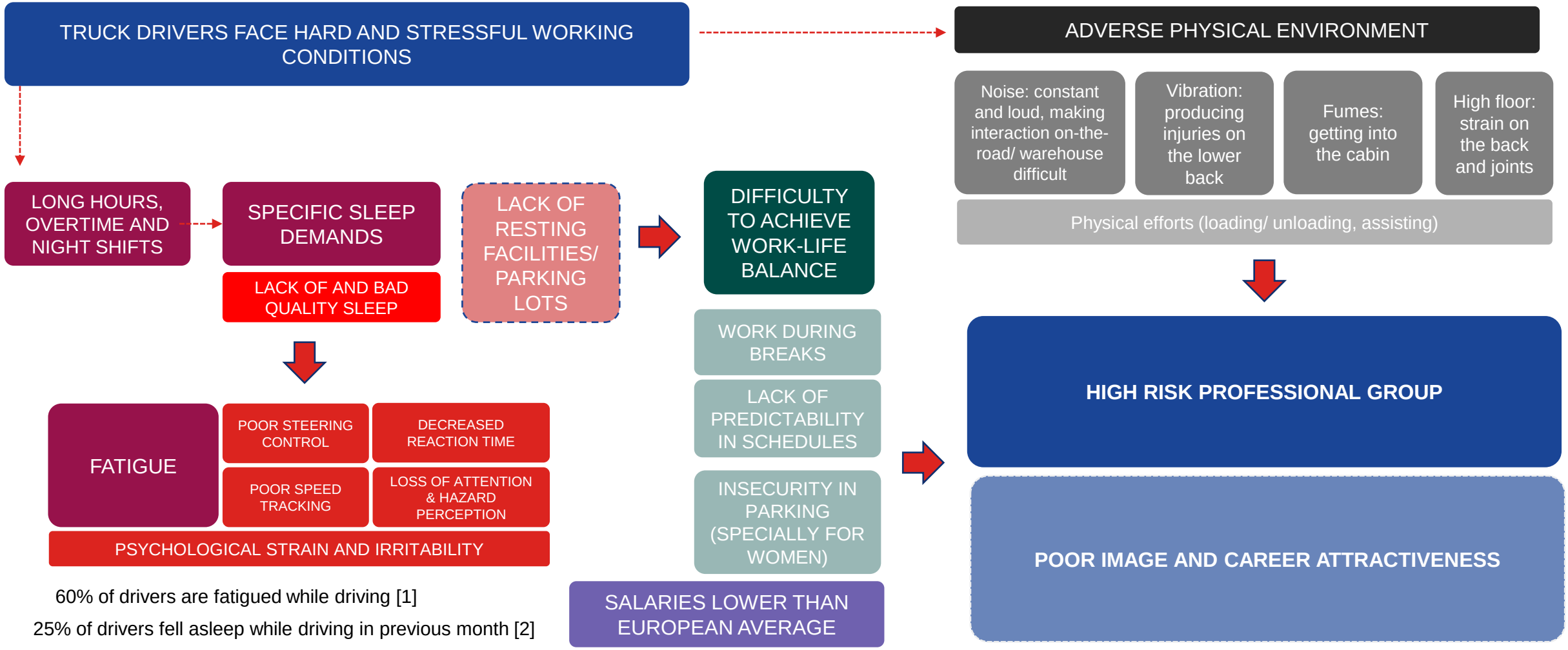
Workforce: ageing and with small share of women

- Ageing workforce, over 44 years. Under 25 y.o. are less than 7%. [3]
- For instance, Portugal.
  - 30% 50 y.o. or over.
  - 15% 18-34 y.o. [4]
- Women <3% [5]

Shortage of drivers: a steady problem

- Long-term staff shortages. 425,000 unfilled truck driver jobs across Europe [8]
- Higher turnover rate and lower retirement age than average
- Gap between end of school age and age to obtain truck drivers licence

Literature review: the current problem with the sector's workforce



60% of drivers are fatigued while driving [1]

25% of drivers fell asleep while driving in previous month [2]

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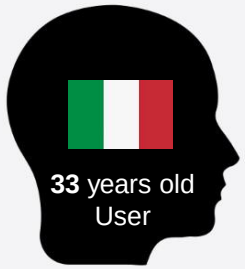
Profile of the drivers we interviewed

He is the test driver of a Spanish **OEM of electric trucks and vans**.

He has worked as professional truck driver all his life, mainly focusing on HGVs. This job is his first experience with electric trucks.



He is truck driver for a **manufacturer of bottled water**. There, he has been using electric trucks for 6 months. Before that, he had transported different type of goods in natural gas trucks. His overall experience driving trucks is slightly over 1 year.

He is also studying Business Administration.

He drives diesel trucks in Slovenia and has no experience with electric trucks. He transport **ice-cream and fresh fruit**.

During the interview, he offered his views and believes on the performance of electric trucks.

He supervises the test drive activity in the Spanish OEM of electric trucks already mentioned. He is not a professional driver but a technical expert in the automotive industry. But he requested to participate and add his contribution in the interview to the OEM's test driver.

The sample of interviewees gathers professional truck drivers from 3 different countries (Spain, Italy and Slovenia), of different age (from 33 to 60) and combines users and non-users of electric trucks.

Each interview lasted for about 1 hour and followed a flexible guide that enabled the interviewer to spontaneously introduce questions and requests of clarification as the conversation unfolded

Agenda

Analysis: benefits offered by the physical characteristics of electric trucks

DIRECT HEALTH BENEFITS

NOISE: manufacturer's test found that a Volvo FL Electric truck has a **10 dB lower noise level** than a regular diesel vehicle. This means that the perceived sound level is cut by about half

VIBRATION: healthier lower back and an easier-to-maneuver vehicle when backing up into docks. Removing rumble contributes to concentration and calm state of mind

FUMES: no fumes penetrating in cabin.

LOWER FLOOR: decreases strain on the back and joints. A reduction of 15 cm in the level of the floor equates to stop climbing approximately 11 flights of stairs every day.

BODY POSITION/ ERGONOMICS: ride comfort also improve when battery pack is placed longitudinal closer to front axle

SIMPLIFIED MAINTENANCE

Electric trucks typically require less maintenance than their diesel counterparts since they have **fewer moving parts**.

No specific maintenance required on traction **voltage system** and fluids top up check only required after 40,000km.

Reduced need to **service braking system** to replace brake pads and discs with regenerative braking

SAFETY BENEFITS OF STATE-OF-THE-ART TECHNOLOGY

ZET typically including ADAS and **safety warnings**

ZET typically including **speed control device**. Better control of speed and lane

Mirror Cam improving visibility

Shared characteristics with modern diesel

Challenge: need to train drivers on tackling renewed risk of electric fire and other battery-related hazards (see specific slide).

Verbatims on physical characteristics of electric trucks I

SIMPLER DEVICE

"It is true that there are also fewer elements that can be broken. The vehicle is simpler, but repair is more difficult".

ALARMS AND TROUBLESHOOTING

"If I get an alert on my screen, there is a button like a re-setting, like rebooting. You just wait 2 or 3 minutes and you put inside keys and start again. Most of the times, I fix my problems like this".

VEHICLE AS A "BLACK BOX"

"Not many people know how to fix it, you need to place another computer working on the repair. Even if it looks simple, it is not. Before putting your hands on it, you have to be careful. You have to wait between 4 to 6 hours, for the system to cool down and then you can touch cables. Even for the mechanics is not the same as the diesel, that you open up, check a few screws and that's it".

VEHICLE AS A "BLACK BOX"

"When you stop the (broken) vehicle you do not know what to do, because you need to plug in the computer and diagnostic software. It behaves like a very modern car. You open the hood and say: What do I touch? There is nothing here to touch. They are all **closed boxes, sealed**, and with the label that warns of high voltage danger. You can't do anything, just warn the emergency towing vehicle.".

MAIN FINDINGS:

With regards to maintenance: more simple device with less part to get broken, but more difficult to fix.

Sense of losing control. The vehicle behaves like a "black box", closer to an unknown computer than to an old well-known mechanical machine (also true for modern diesel vehicles, but even more here).

Analysis: impact of electric technology on operations

EASE OF DRIVING

Electric trucks typically have instant torque and **smooth acceleration**, providing a more enjoyable driving experience

The **absence of gear shifts** and smoother power delivery can minimise driver fatigue and make long drives less tiring

Advanced driver assistance systems like **automatic emergency braking, and adaptive cruise control** improve ease of driving

Easier-to-maneuver vehicle when **backing up into docks**.

Route optimizer technology is normally included, contrary to diesel trucks

CHARGING NEEDS

Dynamic approach to adjust charging strategy depending on road and traffic conditions, vehicle load, and charging facilities

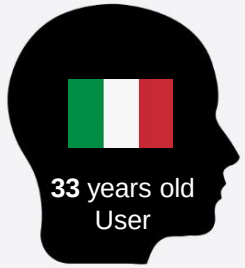
Regenerative braking able to extend the vehicle operating range

Challenge: **psychological anxiety** is associated with charging (see specific slide)

Verbatims on impact of physical conditions on operations of ZETs

EASE OF MANEUVERING/ SMOOTH RESPONSE

"I would point out that having no clutch, the pedal is very modulable, very **pleasant to manoeuvre**. It's very sensitive: you squeeze your foot a little, and the vehicle moves a little smoothly forward.



ALARMS AND TROUBLESHOOTING

"If I get an alert on my screen, there is a button like a re-setting, like rebooting. You just wait 2 or 3 minutes and you put inside keys and start again. Most of the times, I fix my problems like this".

NO VIBRATION/ NO NOISE

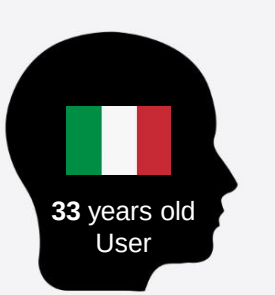
"No vibrations, no smoke, no noise at high speed. It is a very silent driving".

MAIN FINDINGS:

Ease of manoeuvre, smooth acceleration, responsiveness are the great differentials expressed by drivers.

The non-user expresses curiosity about it (although he has an intuition over improved manoeuvrability). He also has doubts about the electronic component of steering.

Verbatims on impact of physical conditions on operations II



REGENERATIVE BRAKES

"When I am going from my parking lot to the company where I unload the water, it is up on the hill. And when I go down, I recharge my battery. If I spend 40% to go up there, when I go back to the parking, I still have the same amount of energy. I do 78 km without using energy, because I **regenerate it**".

MANDATORY REST

"It is possible to use **charging time to take legally required breaks** for truck drivers".

MANDATORY REST

"The **charging stations could be used for mandatory rest** (e.g. every 8 hours of drive) but there would need to be a lot of stations (also the station would need its own transformer station to charge e.g. 100 trucks at the same time during resting… huge electric flow/voltage)".

MAIN FINDINGS:

Regenerative brake relevant to extend range and reduce range anxiety.

Common idea that charging time can be made coincide with mandatory breaks for truck drivers. But for this, requirements regarding distribution and capacity of charging points should be attained.

The challenge of charging and other negative aspects

LACK OF FAST CHARGERS

"From the moment we leave until we return, we have 250 km of charge. To get back to 100%, we need 4 hours, but it is **difficult to find these chargers** (fast chargers) on the road".

CHARGING POINTS NOT ACCESIBLE FOR TRUCKS

"There is the issue of **accessibility**. We ran out of battery because we could not enter a supermarket because of the height of the cabin.

COORDINATION OF LEGAL HOURS OF DRIVE WITH CHARGING NEEDS

"Driving the number of hours that you are allowed, by the Law, as a driver. If you don't have SOC (charge) and you have only a few hours of driving left (by law), what do you do?

COMMUNICATION WITH THE ENGINE

"When I turn on the engine it doesn't make any noise and I cannot really understand it, especially if I want to use the manual option on the gears".

MAIN FINDINGS:

Charging takes a lot of space in their mind. It implies a wide variety of problems: low range, lack of fast chargers, accessibility of charging points to trucks, need to coincide mandated hours with charging needs.

Communication with the engine through noise is also considered.

Analysis: work-life balance and career attractiveness

WORK-LIFE BALANCE

Strategically scheduled charging time which allows for more predictability in everyday life and a less strenuous schedule with optimized family and sleeping times

Possibility of resting during breaks for recharging, making both periods coincide

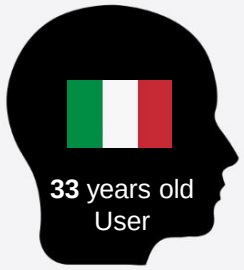
Reduction of night shifts and overtime due to the constraints imposed by the requirement of the overnight charging

CAREER ATTRACTIVENESS

Cleaner repair workshops and work, which is more attractive for women. It is possible to think about a white coat type of service facility.

Environmental consciousness: younger generations, in particular, are increasingly concerned about environmental issues and are actively seeking sustainable alternatives.

Verbatims on work-life balance and career attractiveness



PREDICTABLE SCHEDULE

"More predictable schedule and route to drive on, as it requires careful route planning before the journey. I know when I wake up every day, and I know that every night I am on my bed, I don't sleep on the truck".

HOURS OF WORK

"I work less hours as a result of driving electric trucks. I went from 12-14 with a natural gas truck to 7-8 hours now".

CLEAN WORK SPACES

"Repair space is a surgery room. Yes, our workshop is an operating room. Well, there is brake fluid here too, but there is much less, almost nothing".

DIFFERENT PROFILE OF WORKERS

"Women are more skilled in this type of vehicles that require much more engineers and computer professionals, more than the *pure and hard* mechanics".

MAIN FINDINGS:

More predictable routes as a result of: a) need for planning charging, b) branded trucks (trend?)

Less working hours acknowledged.

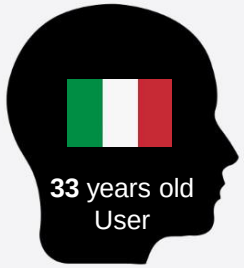
Cleaner and more attractive spaces as an incentive for entry of new segments: women, young.

Mechanics vs computer scientists: change of professional profile.

Verbatims accounting for a generational split

"Now I find it novel and attractive. I have **always been more favourable to internal combustion engines**. But hey, maybe things changed... We become modern and we have to adapt".

"As things stand now, I see (electric vehicles) **complicated for** long distance. To make urban or interurban delivery, I see it very well".



"It is true that my vehicle does not pollute. But I am concerned about **where the energy comes from**.

I am studying. Before I was listening podcasts while I was driving and I realised that I could use that time to learn.

OLD GUARD:

- hard-to-change mindset. No explicit environmental sensitivity.
- Adaptation is forced to them, imposed by external forces
- Attached to the mechanics of vehicles.
- Pessimistic feeling.

NEW GENERATION:

- explicit environmental concerns
- No specific attachment to mechanics (no knowledge of it)
- Enter the market if employment is attractive ("work less hours").
- May do other tasks in parallel.

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Summary of results from the SURVEY ON DRIVERS (full results in the Annex)

METHODOLOGY

- In June 2023, ECTA launched a survey aiming to collect the perception and opinion of professional truck drivers on the use of zero-emission trucks (ZET) along European roads. The following are the results of the survey:

SAMPLE COMPOSITION

- 15 truck drivers, mostly men from a variety of European Union countries, between 35-50 years old (73%) and between 5 and 25 years of experience (60%)
- 73% had previous experience with electric trucks (not with any other ZE powertrain). Mainly covering less than 200 km a day and with an HGV (67%)

NOISE AND EASE OF DRIVING, THE FAVOURITE ATTRIBUTES

- Most liked aspects: zero noise (7 mentions), smooth speed/ acceleration (4 mentions), ease to manoeuvre (3 mentions)
- Least liked aspects: range (5 mentions), no engine noise requires adaptation (2 mentions), Lack of charging points (2 mentions)

PERCEIVED AS CLEARLY DIFFERENT THAN DIESEL TRUCKS

- Noise, comfort and vibrations are the main aspects differentiating ZET and diesel trucks. Cabin space and access to the cabin are not differentiators.

ATTRACTIVE FOR WORKERS

- Positive assessment of attractiveness and image.

Agenda

Summary of overall findings

A GOOD JOB

- Main benefits are concentrated in work-life balance, career attractiveness and operations (e.g. ease of manoeuvring and mandatory rest).

EASE OF DRIVE AS KEY BENEFIT

- Regarding physical aspects, ease of manoeuvring, responsiveness and smooth acceleration are the main benefits. Reduced noise, vibration and fumes comes in a second place in the interview results, but are top results in the survey.
- Fewer noise may be also associated with a negative aspect: loss of communication with the engine/ vehicle and reduced awareness by other road users.

REPAIRS: LOSS OF CONTROL OR BEING FREED FROM THAT TASK?

- They acknowledge the benefits of ZETs for maintenance, and that they do not need knowledge or interest in mechanics for their role. But there is also the sense of loss of control when facing malfunctioning, instead of the feeling that they have been freed from that responsibility.

MORE ATTRACTIVE FOR WOMEN AND YOUNGSTERS

- There is an indication of a general shift in workers' profile: mechanics vs informatics; clearer and cleaner spaces which are felt as more attractive for women and the young.

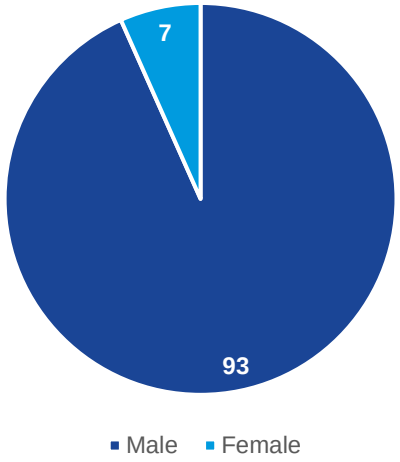
GENERATIONAL SPLIT REGARDING ENVIRONMENTAL AWARENESS

- The younger generation are more open-minded, value less the tradition of ICE, are more sensitive for environmental aspects and would enter the workforce only if the employment is attractive and has a good work-life balance.

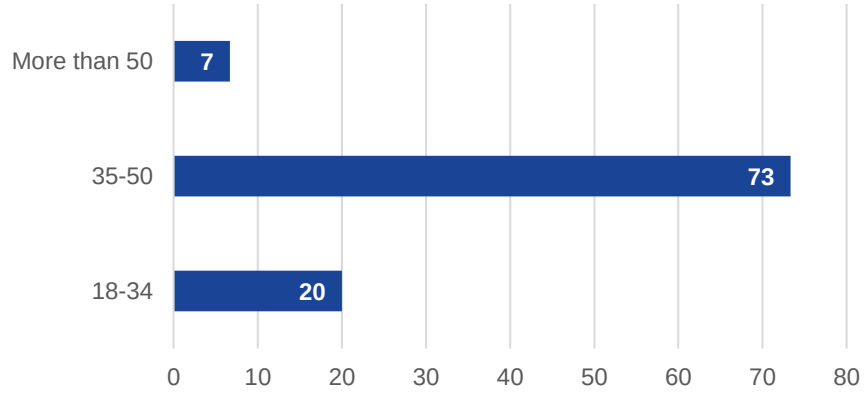
Agenda

Complete results of the survey: Sample composition (15 respondents)

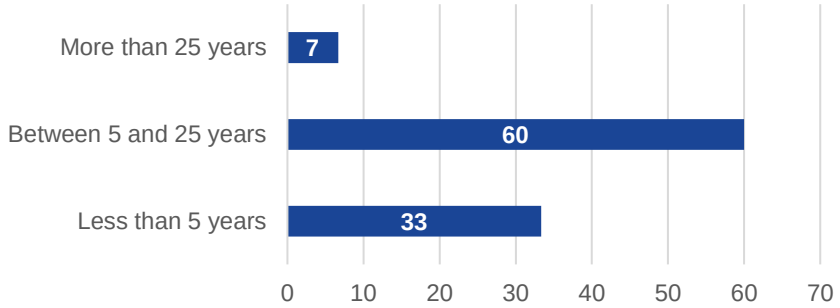
Gender (%)



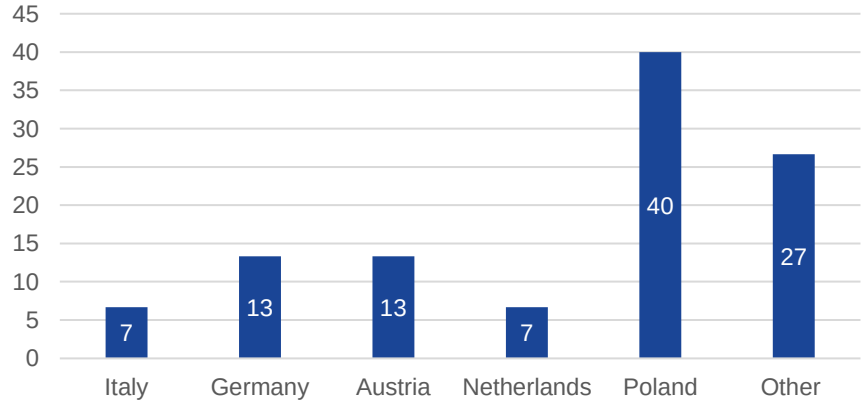
Age (%)



Years driving (%)



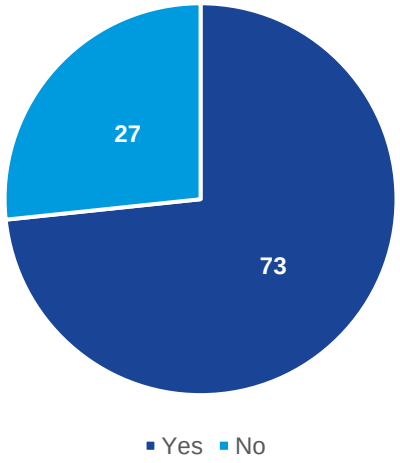
Country of operation (%)



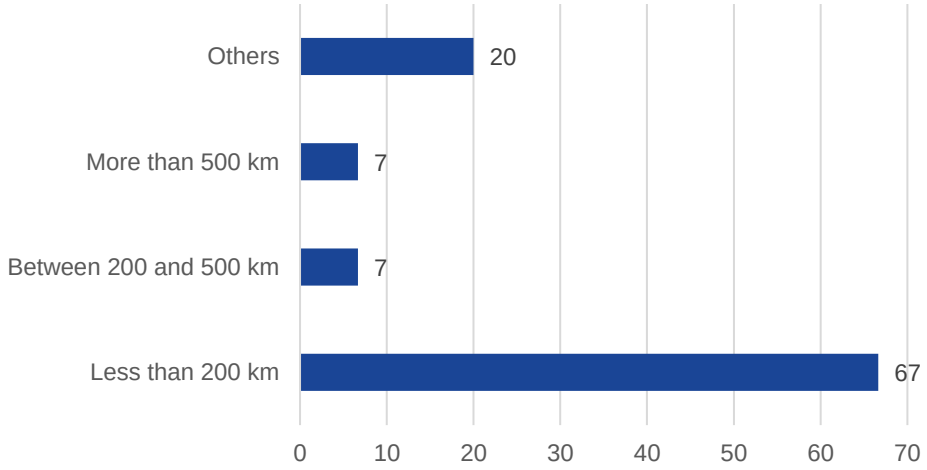
Middle-age workforce, with expertise in trucking business. Variety of countries. Only 1 woman.

Complete results of the survey: Previous experience with ZET

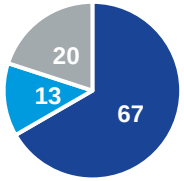
Previous experience with electric trucks (%)



Typical distance covered with ZET (%)



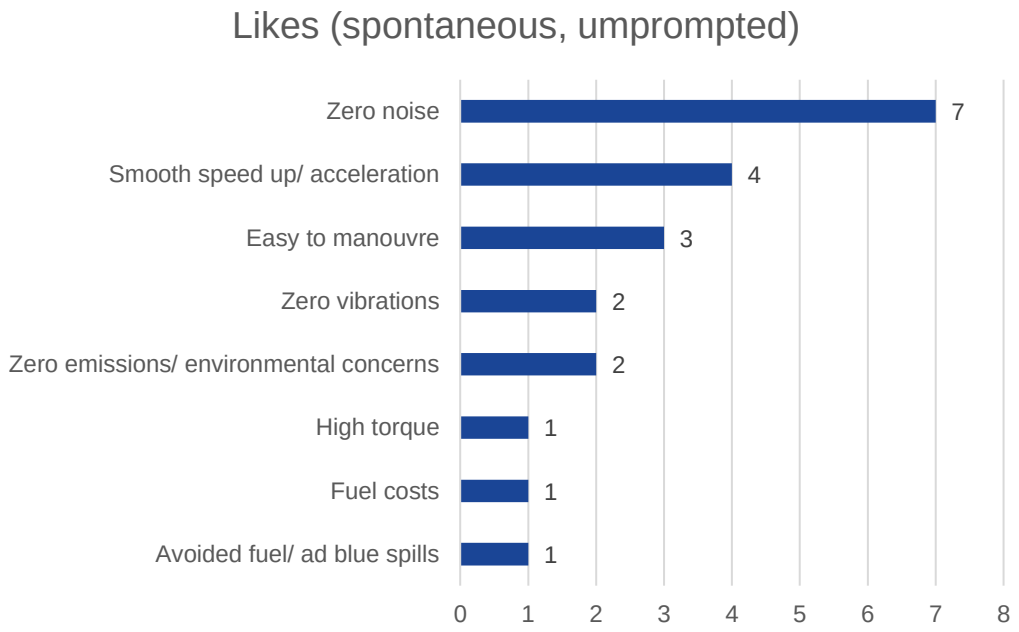
Size of ZET (%)

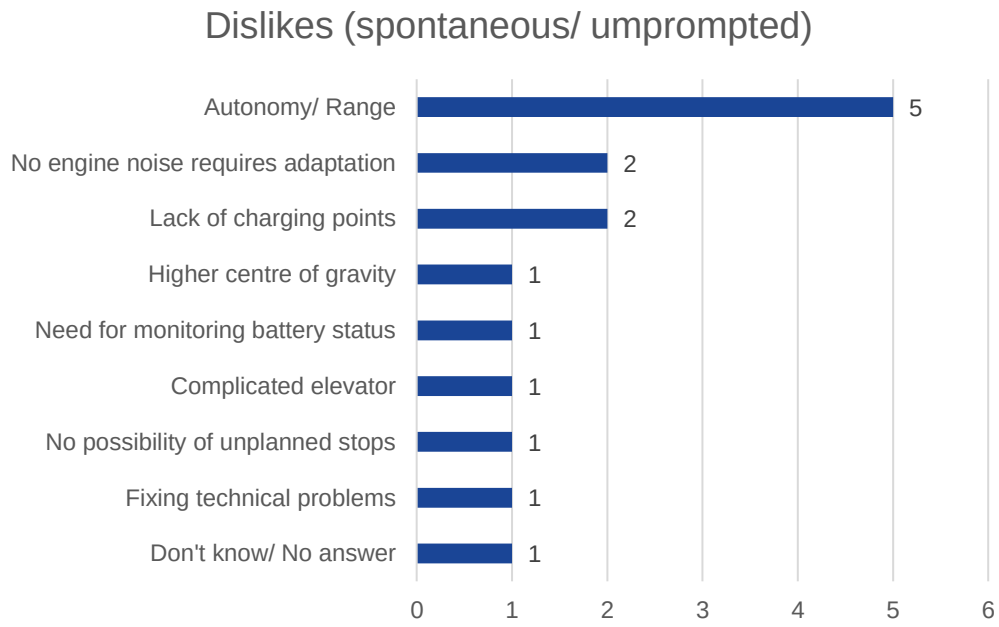


- Heavy Goods Vehicle (>12 tonnes of gross vehicle weight)
- Light Goods Vehicle (<3.5 tonnes of gross vehicle weight)
- Do not drive ZET

All experience with ZET is with BEV. 3 out of 4 have experience with electric truck. Mainly for urban distances with HGV.

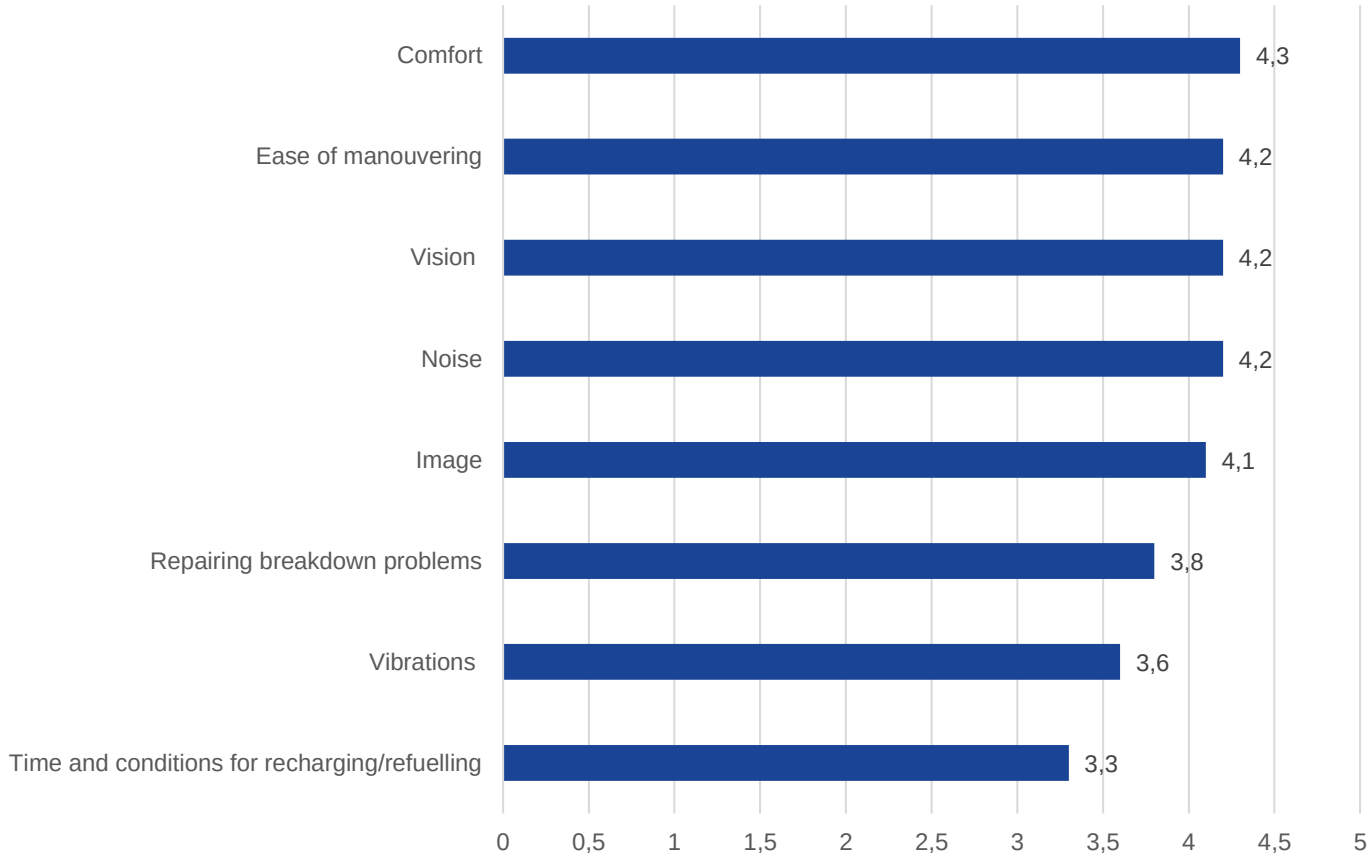
Complete results of the survey: Likes and dislikes (number of responses, unprompted)





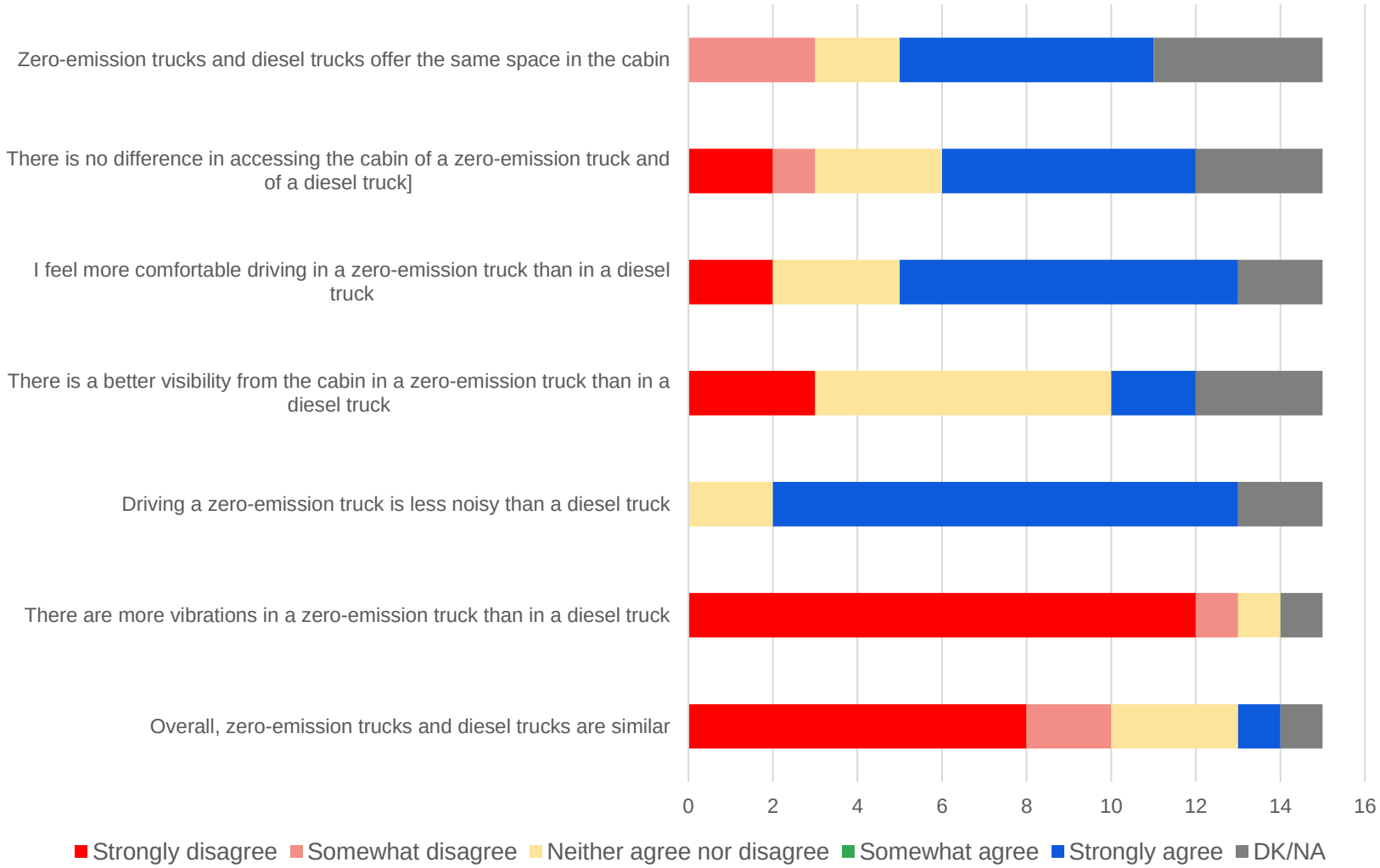
On one hand, zero noise and on the other ease of driving and smooth acceleration are the aspects most appreciated. Absence of noise may have a negative side which can be addressed. Range anxiety is, so far, a clear concern that outweighs the others

Complete results of the survey: Importance of aspects at the moment of driving (average rating from 1 to 5)



Comfort is the only aspect that leads with slight advantage. Then, ease of manoeuvring, noise and vision.

Complete results of the survey. Comparison with diesel trucks: physical aspects

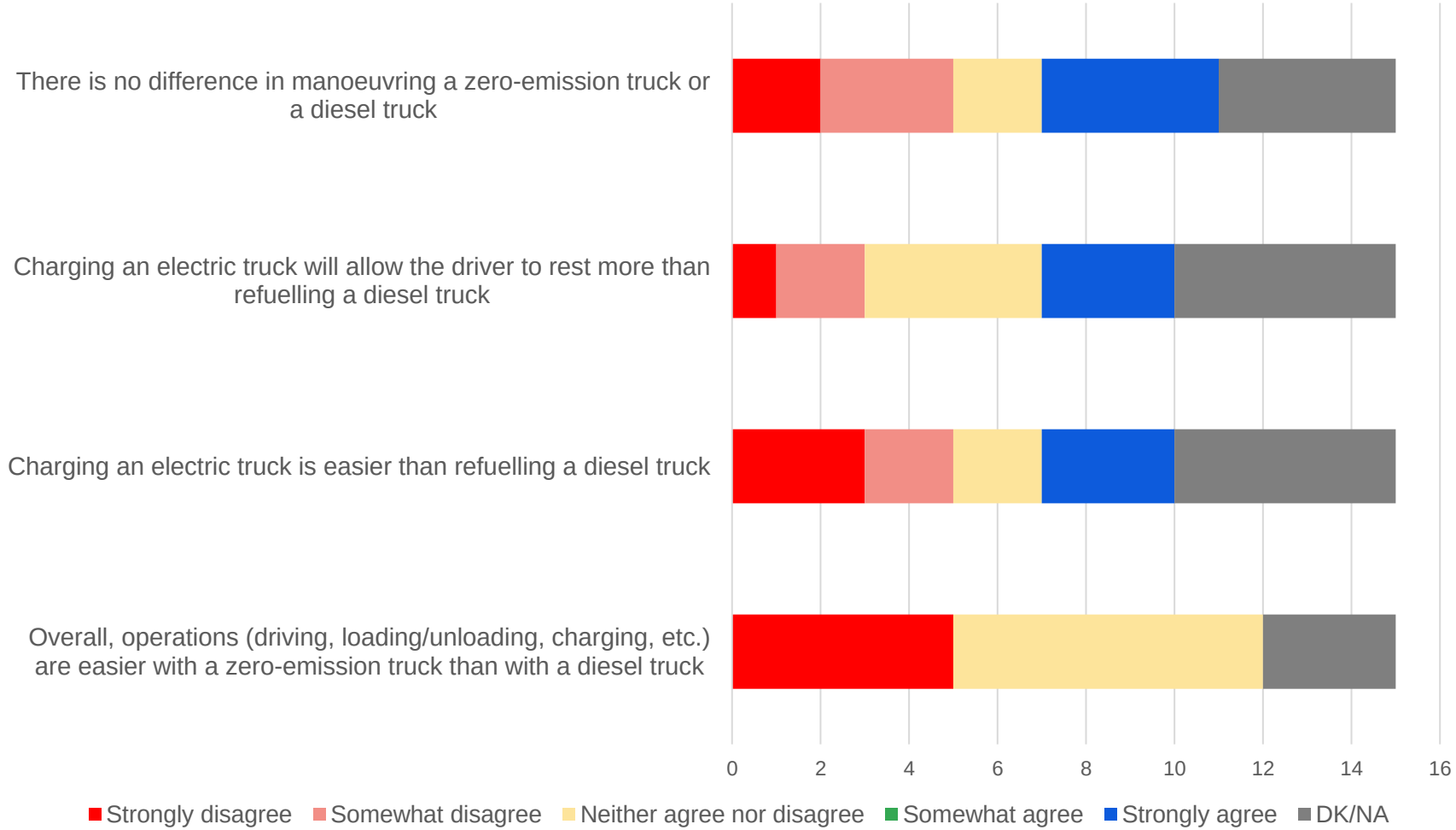


ZE and diesel trucks are clearly perceived as different one from another.

Noise, comfort, vibration are the main aspects that differentiate them.

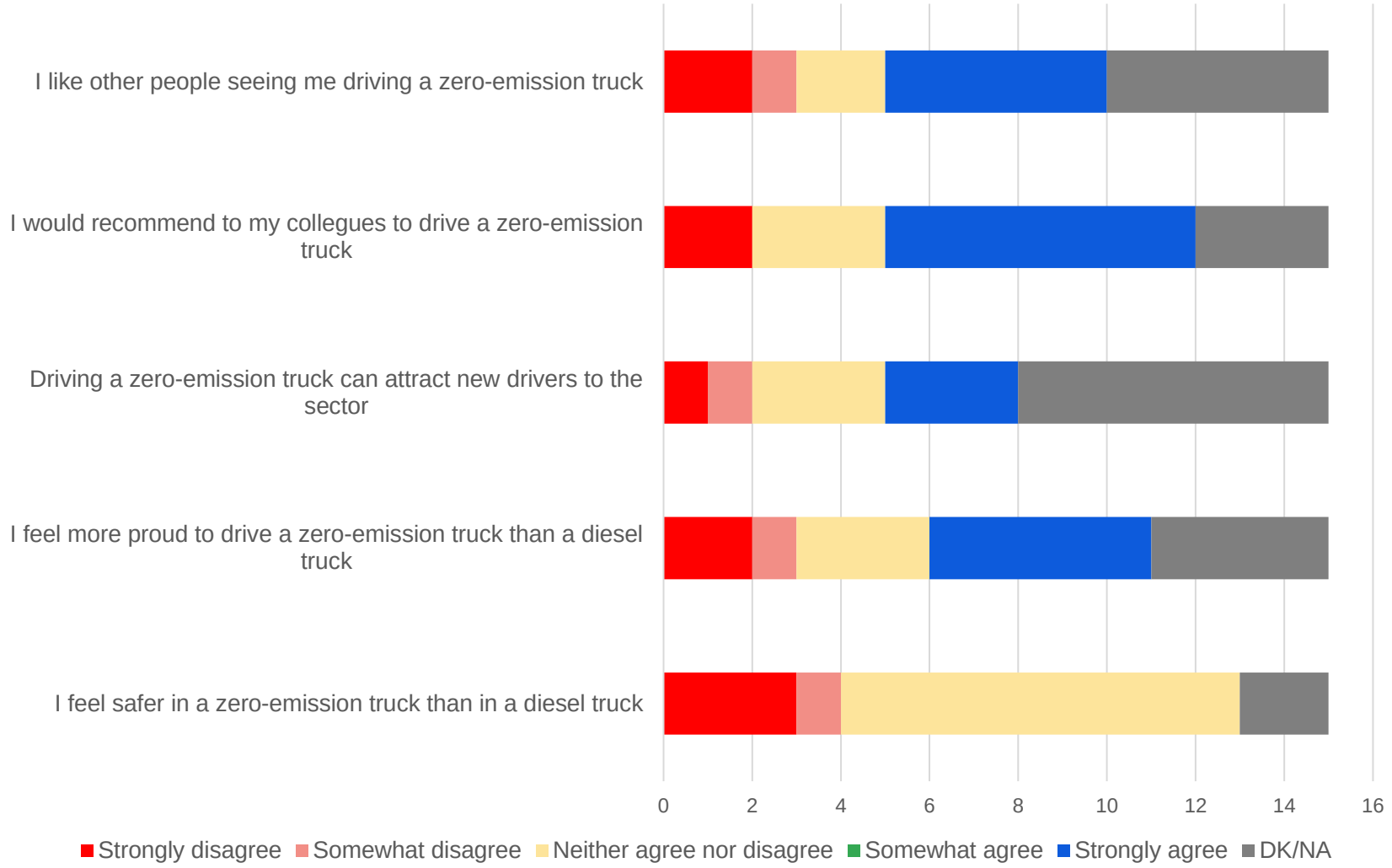
Cabin space and access to the cabin are not differentiators.

Complete results of the survey. Comparison with diesel trucks: impact on operations



Divided opinion on operational aspects.

Complete results of the survey. Attribute evaluation: job attractiveness



More positive than negative responses on image/ attractiveness. Except for feeling safer.

References

Slide	Number	Document
3	[1] [2] [3]	Ricardo (2023) Global zero-emisión MHDV freight market Outlook. For the Environmental Defense Fund.
4	[1] [2]	Ricardo (2023) Global zero-emisión MHDV freight market Outlook. For the Environmental Defense Fund.
4	[3] [4]	Sousa, I. C. & Ramos, S (2018) Working conditions, health and retirement intentions: a case study of truck drivers. International Journal of Workplace Health Management. 11 (3), 114-129
5	[1] [2]	ETF (2021) Driver Fatigue in European Road Transport

Contact details

Sofia Amaral
Ricardo Energy & Environment Ltd
30 Eastbourne Terrace
London W2 6LA
United Kingdom
Sofia.Amaral@ricardo.com

Andres Kilstein
Ricardo Energy & Environment Ltd
Agustin de Foxa 29
Madrid 28036
Spain
Andres.Kilstein@ricardo.com