



URBANIZED

MODULAR AND FLEXIBLE SOLUTIONS FOR URBAN-SIZED
ZERO-EMISSIONS LAST-MILE DELIVERY & SERVICES VEHICLES

Creating the conditions for flexible, zero-emission, 100% electric city logistics

Online workshop
2nd July 2021



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101006943.

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TNO innovation
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Agenda



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Session 1 - URBANIZED Project: A new generation of electric & modular city logistics vehicle

9:00 am - 9:15 am	Welcome & scope of the workshop	IDIADA - PC
9:15 am - 9:30 am	Introduction to URBANIZED: scope, objectives & innovation	Bax & Company
9:30 am - 9:45 am	Main characteristics & key success factors of the URBANIZED vehicle	TNO
9:45 am - 10:25 am	Open Questions & Discussion	CERTH

Coffee Break (5 min)

Session 2 - Towards a zero-emission city logistics sector: Appropriate policy mix & narrative future city logistics scenarios

10:30 am – 10:45 am	Policy measures for supporting the uptake of EVs in city logistics	Bax & Company
10:45 am - 11:30 am	Scenario planning: where we may go with the appropriate policy response	CERTH
	Open Questions & Discussion	
11:30 am – 11:35 am	Closing	CERTH

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Project scope, objectives & innovation

Lorena Axinte
Bax & Company



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Project scope

Future-proof cities with **sustainable last-mile delivery** by solving the trade-offs between “one size fits all” and “design for purpose” in the design of **adaptable and modular** all-electric Light Commercial Vehicles (**LCVs**)

Facts & Figures



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36

months



9

partners



6

countries



5m

EU contribution

Meet the partners



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Spain

Applus+ IDIADA
Bax & Company



Italy

Alkè



Belgium

VUB
CLEPA
bpost



Netherlands

TNO



Germany

VITESCO



Greece

CERTH



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Challenges for EV development and acquisition

- Purpose-designed e-LCVs cost 2x more than their one size fits all ICE counterparts
- UFT vehicles with no flexibility lead to oversized fleets with up to 75% more vehicles needed
- There is a perception of low usability, reliability, and safety of small, all-electric LCVs

Solutions



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Integration

Novel e-powertrain platform with
component right-sizing



Modularity

Easily swappable multi-purpose
modular cargo bodies adaptable
to fluctuating demands



Connectivity

Integrated multi-level EMS with
fleet connectivity

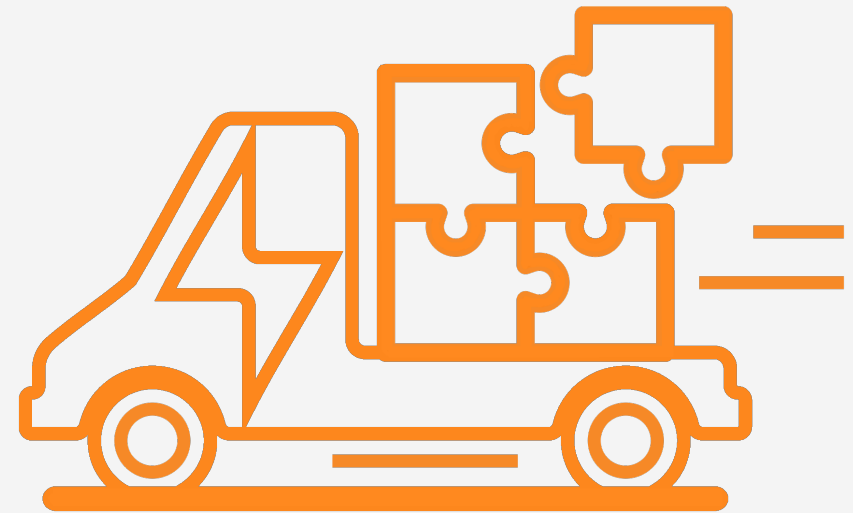


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Why modularity?

- Optimise overall transport capacity
- Increase energy efficiency
- Reduce costs



Project objectives



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1

10% energy efficiency
increase in our
systems

2

Up to **25% lower cost systems**
with high **safety standards**

3

Up to **12,8%**
reduction in
energy consumption
on a fleet level

4

Up to **81%**
Increase in
fleet efficiency

3-level innovation



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Vehicle systems level

Reduce production costs by solving trade-offs between standardisation and customisation



Vehicle level

Increase uptake of zero-emission LCVs by offering superior solutions to those in use today



Fleet level

Use modularity to build a mixed fleet that is both "one size fits all" and "designed for purpose"

Our vehicle

- From five to three essential components
- **One vehicle** can handle at least **four cargo bodies**
- Integrated **multi-level EMS** with fleet connectivity to **reduce energy consumption 12.8%** and **increase operational efficiency**



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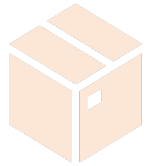
Two use cases:



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**BPOST – Last-mile delivery of
Retail, Courier and Post**



**Coffee Island – On-demand
services and HoReCa**





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Our expected impact

- Collaborate with OEMs for **accelerated replicability** of solutions
- URBANIZED solutions can **cost 51% less** than a standard EV fleet
- Reduce 2027-2031 **transport emissions** by
 - 87M tones of CO₂
 - 215,000 kg of NO_x
 - 6,900 kg of PM_x
- Increased safety (equivalent 4-stars Euro NCAP 4 safety rating)

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Success factors and vehicle characteristics

Thijs Purnot (TNO)



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Objectives



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Approach



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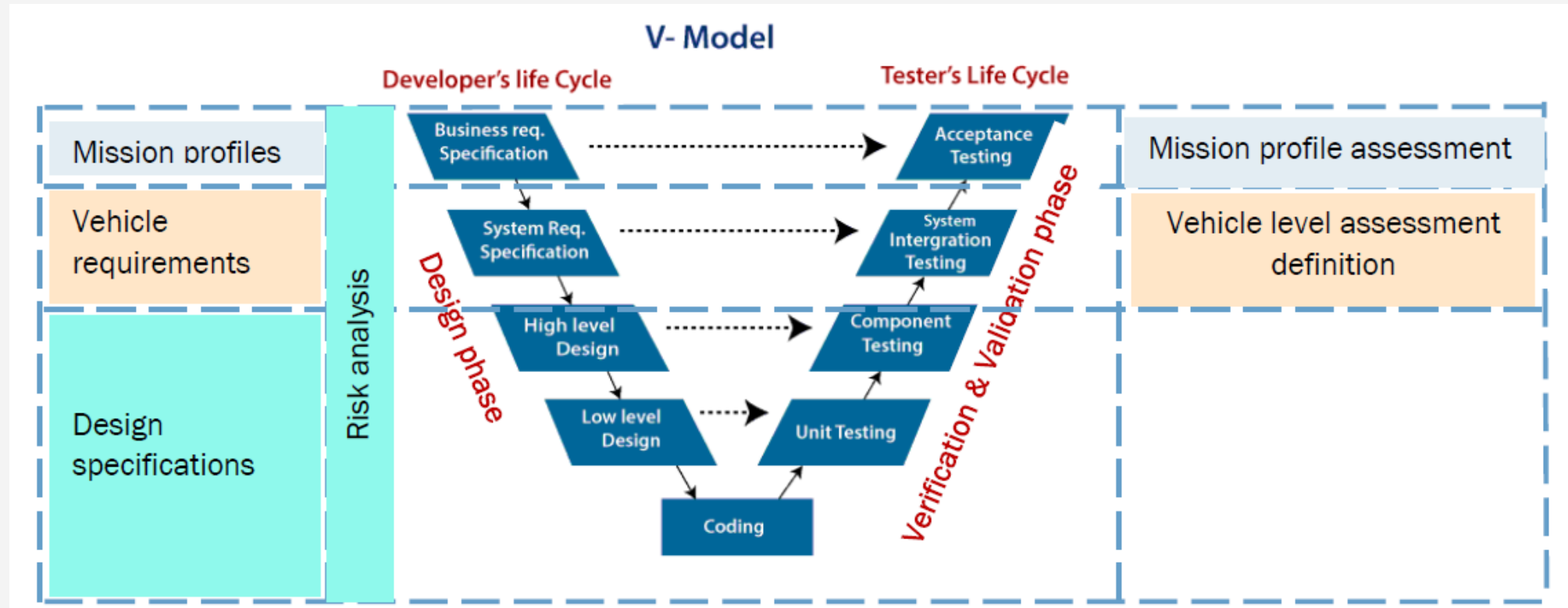
Fleet level



vehicle level



Vehicle systems level



Objectives



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1

**10% energy
efficiency**
increase in our
systems

Success factors

- ***Powertrain inverter efficiency:*** Up to 98% efficiency of the power inverter to be achieved
- ***Integrated on-board charger efficiency:*** The vehicle integrated on-board charger plus port for external power tooling shall achieve 95% efficiency
- ***Integrated e-powertrain efficiency:*** The vehicle integrated e-powertrain solution (eAxleDrive) shall increase the energy efficiency of at least 10 % (WLTP cycle at test bench), achieving a total efficiency of 91 % compared to current 82% baseline.

Objectives



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2

Up to **25% lower cost systems** with high **safety standards**

Success factors

- **Vehicle lifecycle cost reduction:** *The vehicle multi-level EMS shall deliver a vehicle lifecycle cost reduction of at least 20% (depending on mission profiles)*
- **Powertrain inverter cost reduction :** *The vehicle shall provide a cost reduction of 20% for the powertrain inverter.*
- **On-board charger cost reduction:** *The vehicle shall provide a cost reduction of 25% for the on-board charger.*
- **E-powertrain production costs reduction:** *The vehicle shall provide a total production cost reduction for the novel e-powertrain (excluding the battery) of up to 25%*
- **Vehicle fleet acquisition cost reduction:** *The vehicle shall demonstrate a lower fleet acquisition cost by up to 40% obtained thanks to the multi-purpose swappable cargo body design having the possibility of using different cargo bodies with a single vehicle to cover fluctuating demands.*
- **Vehicle safety rated 4 stars Euro NCAP**

Objectives



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Reduce **energy consumption**
on a fleet level
by **12,8%**

Success factors

- ***Multi-level EMS energy efficiency increase:** The vehicle shall integrate a multi-level EMS with fleet connectivity that reduce the energy consumption at least 12.8% using 4 ECO functionalities:*
 - ***eco-comfort***
 - ***eco-driving***
 - ***eco-routing***
 - ***eco-charging***

Objectives



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4

Increase
**fleet
efficiency**
by up to **81%**

Success factors

- *Reduction of the number of stop & go events and the time spent during loading and unloading operations (min/daily mission)*
- *Increase in cargo load factor*
- *Reduction of daily distances driven by optimizing the routes for all vehicles in the fleet*
- *Reduction of necessary urban space for loading and unloading operations (m²/h)*
- *Increase of vehicle utilization rates (reduction of idle time)*



Main vehicle characteristics

Drive train

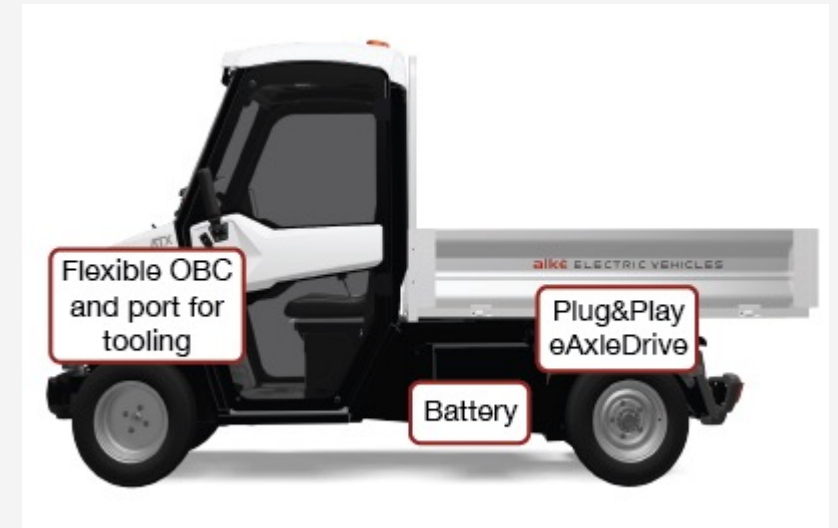
1. *48V operating voltage for powertrain*
2. *Battery lifetime at least 4 years, 2.000 cycles*
3. *2 speeds (high speed (70kmh/hr) and 50kmh/hr)*
4. *Battery preconditioning*

1 2

1 2

1

2



1

10% energy efficiency increase in our systems

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Main vehicle characteristics

Cabin

1. *Driver presence recognition*
2. *Automatic unlock of doors after driver presence recognition*
3. *Large display on dashboard as operator support tool for delivery efficiency and navigation*
4. *Overall comfort of cabin & seats (audio systems, no of seats, accessories/ compartments, air conditioning/ heating)*

2

2

3

4



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Main vehicle characteristics

Cargo body

1. *Modular cargo body*

2 4

2. *e-hand truck*

4



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Main vehicle characteristics

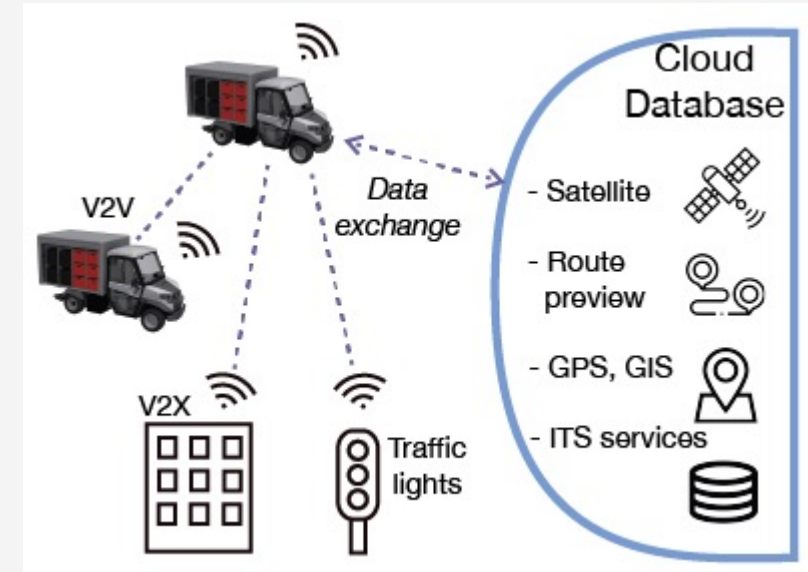
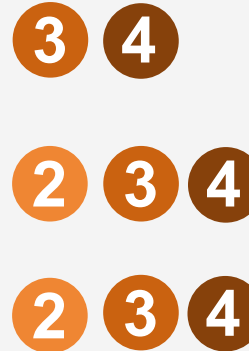


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ICT Platform and Energy Management System

1. *Cloud connectivity for support of fleet level eco-functions*
2. *Battery intelligent charging capability*
3. *Vehicle monitoring, diagnostics tracking, data security, local communication protocol*



1. **10% energy efficiency** increase in our systems
2. Up to **25% lower cost systems** with high **safety standards**
3. Reduce **energy consumption** on a fleet level by **12,8%**
4. Increase **fleet efficiency** by up to **81%**

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Thank you!

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Policy measures to support the uptake of EVs in city logistics

Elpida Xenou
CERTH

Lorena Axinte
Bax & Company



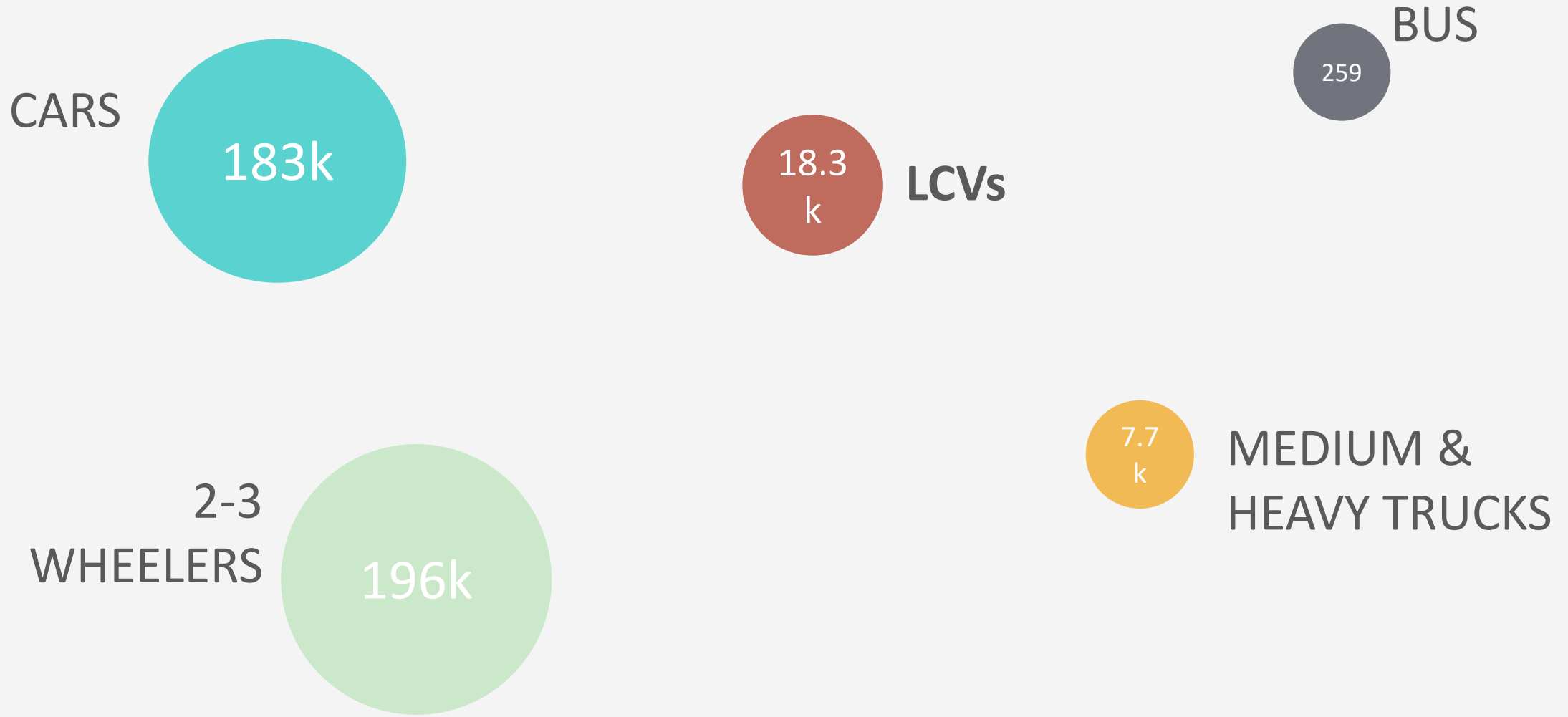
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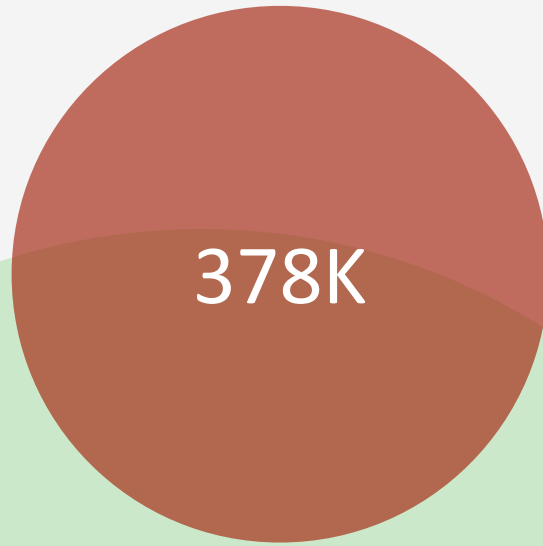
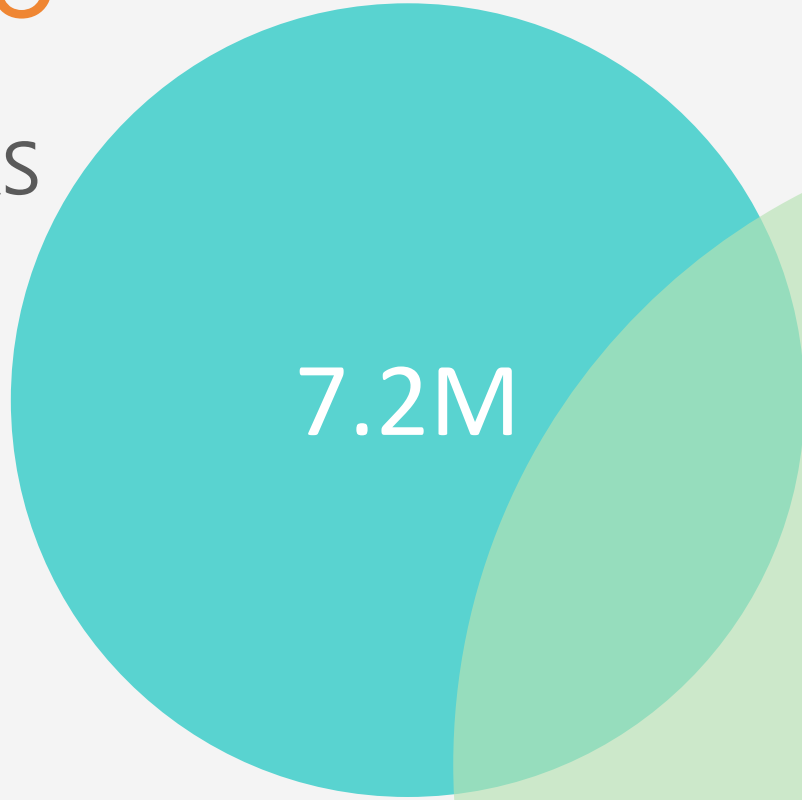
The rise of global electric vehicles stock – from...



in **2012**

... to

CARS

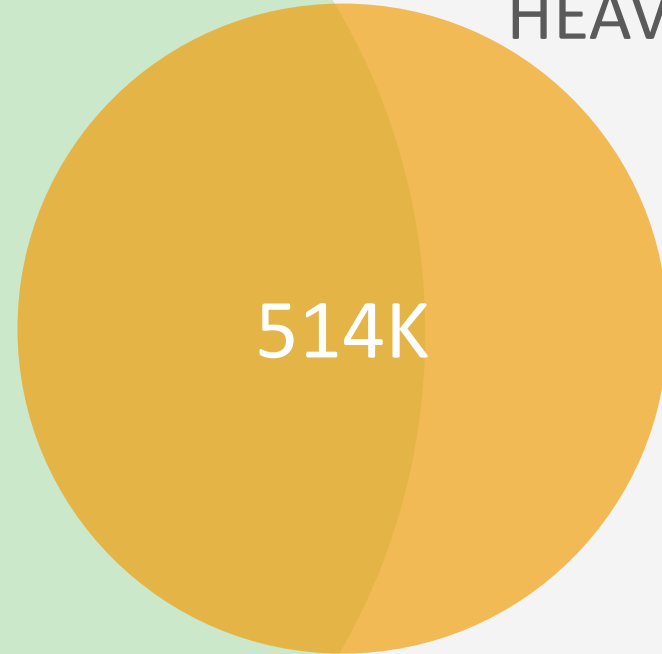
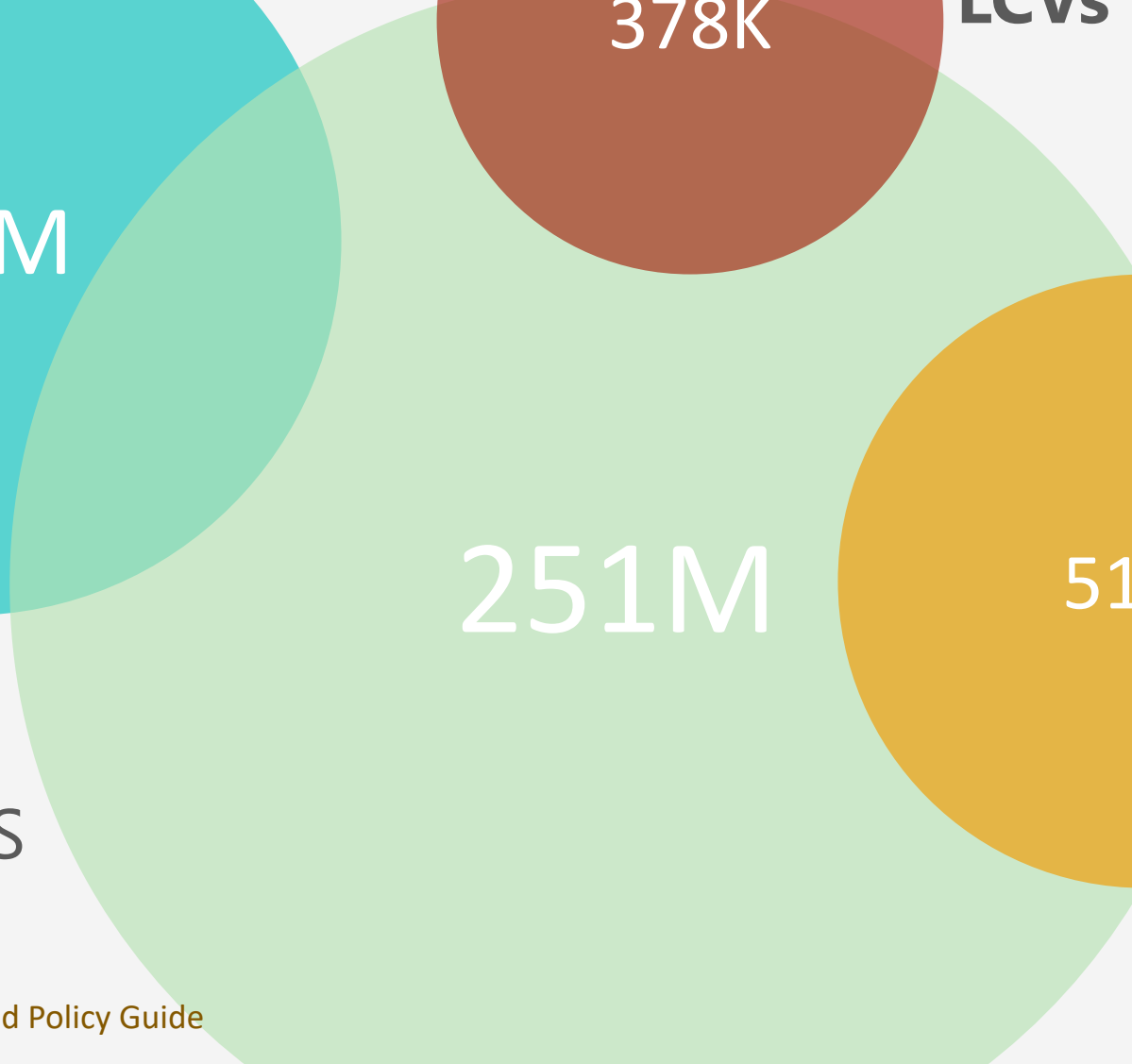


LCVs



BUS

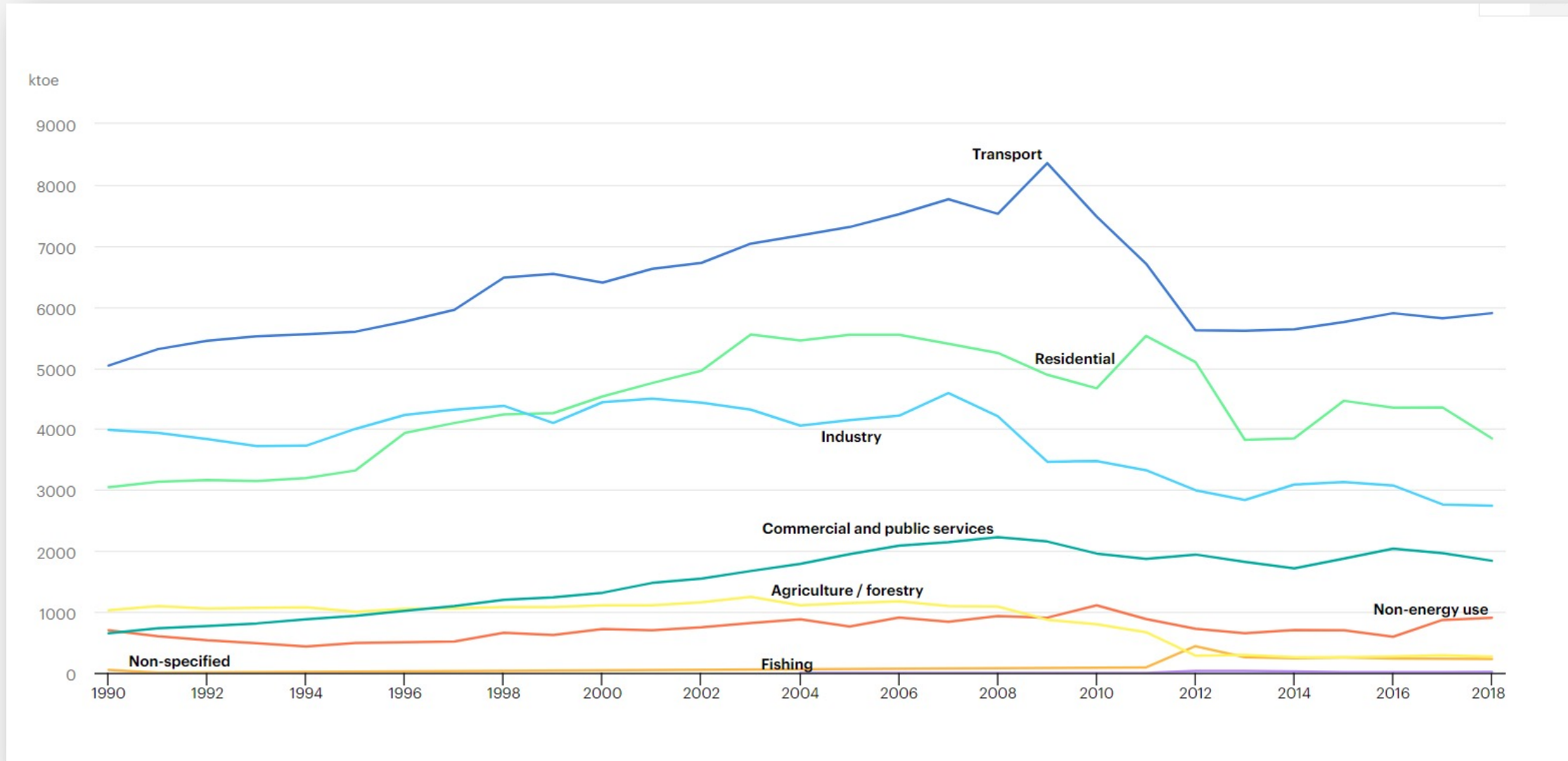
MEDIUM &
HEAVY TRUCKS



2-3 WHEELERS

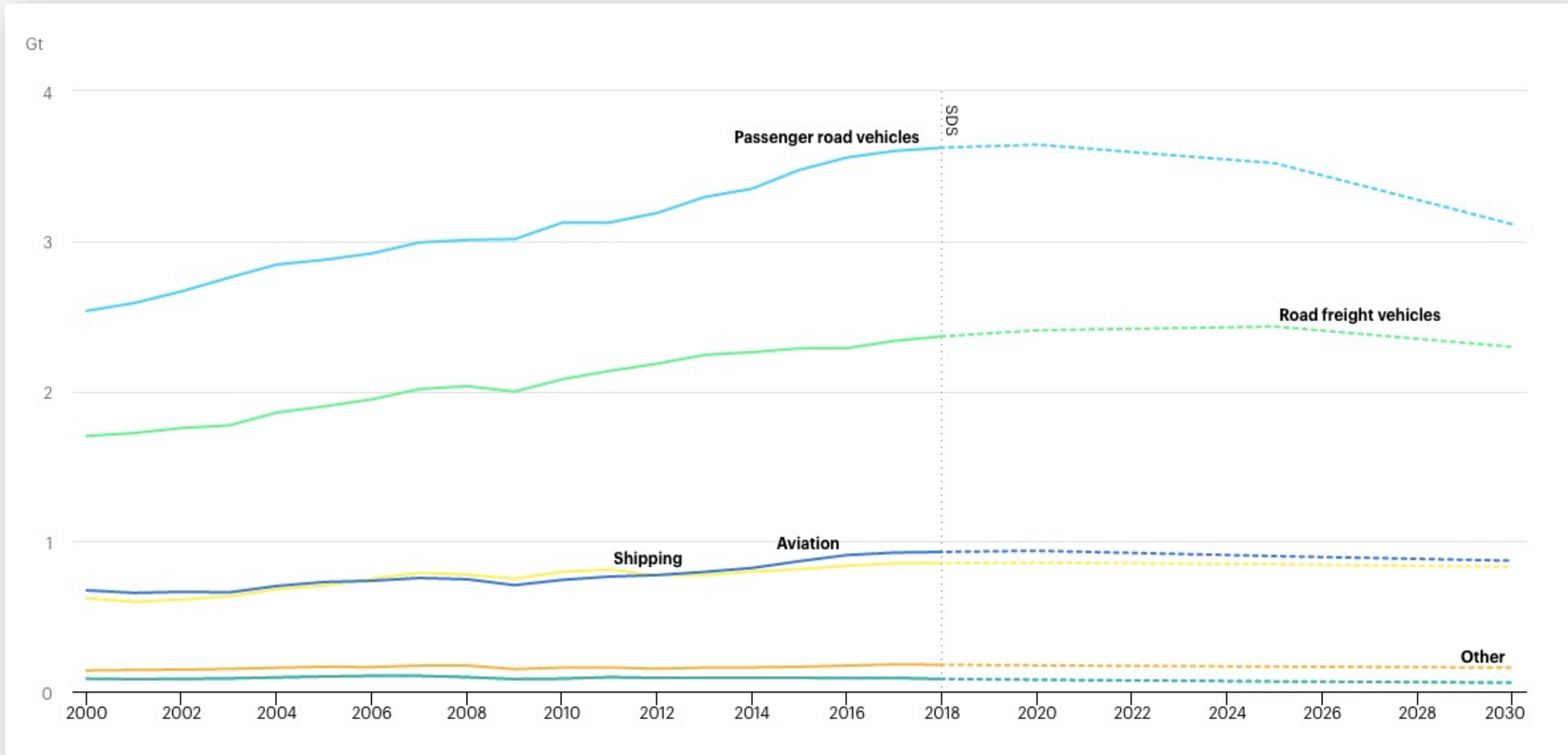
in 2019

Transport CO2 emissions



Source: IEA (2020) Tracking Transport 2020

CO2 emissions by transport mode in the SD Scenario



Source: IEA (2020) Tracking Transport 2020

EVs in urban freight

current barriers

Economic:

- High procurement & battery replacement costs
- Limited, unreliable and expensive after-sales support

Technical & infrastructure barriers

- Grid issues for large fleets
- Energy consumption peaks
- Limited loading capacity
- Limited availability of charging stations & vehicles

Policy barriers

- Regulatory barriers in smart charging
- Absence of incentives in some countries

&

opportunities

- Low fuel costs
- Improvements and cost reductions in battery technologies
- (Requirements for) reduced noise emissions
- (Requirements for) reduced GHG emissions
- Positive acceptance by public and increasing awareness



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The next multi-purpose and flexible electric commercial van for urban use



The Challenges
 The barriers we are addressing:

- Purpose-designed e-LCVs cost two times more than their one-size-fits-all ICE counterparts
- UFT vehicles with no flexibility lead to oversized fleets (up to 75 % more vehicles needed)
- Perception of low usability, reliability and safety of small, all-electric LCVs

Solution: our Unique Selling Points

System Level

INTEGRATION

Novel e-powertrain platform with component right-sizing, integration and modularization is 10% more energy efficient and up to 25% cheaper.

Vehicle Level

MODULARITY

Easily swappable multi-purpose modular cargo bodies adaptable to fluctuating demands reduces fleet size operational costs by € 72.500 (25%, for 10 EV fleet).

Fleet Level

CONNECTIVITY

Integrated multi-level EMS with fleet connectivity that reduce the energy consumption with 12,8% and increases operational efficiency.

From five to three essential components

One vehicle can handle at least four cargo bodies

Delivery efficiency increase of up to 81% on fleet level

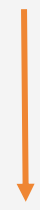
Reach: our expected impact

Due to the holistic vehicle solution and connected technologies, URBANIZED will have a big impact and reach. Some examples:

- Accelerated replicability of the solutions due to collaboration with other interested high volume OEMs (Ford, first target), European cities (Bergen, Madrid, Groningen) and UFT operators (BPost, Coffee Island).
- URBANIZED solutions applied at fleet level can become at least 51% more affordable than a standard EV fleet, reaching similar levels of investments than an ICE fleet

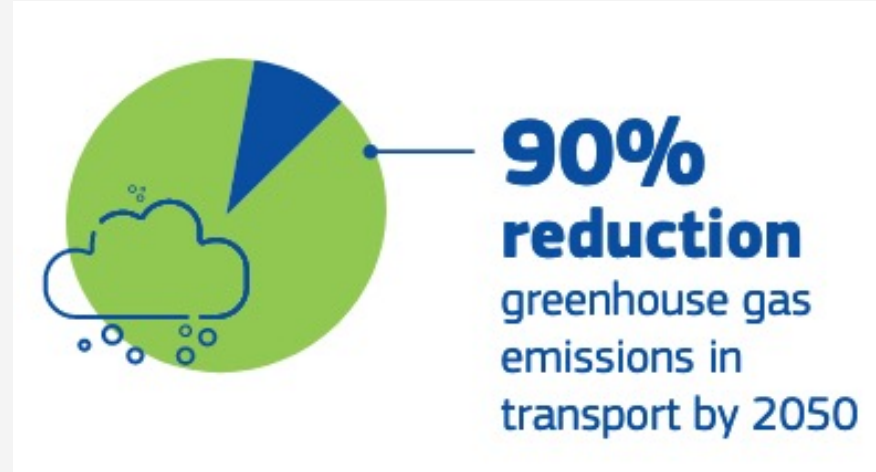


URBANIZED – overcoming operational limitations of LEVs



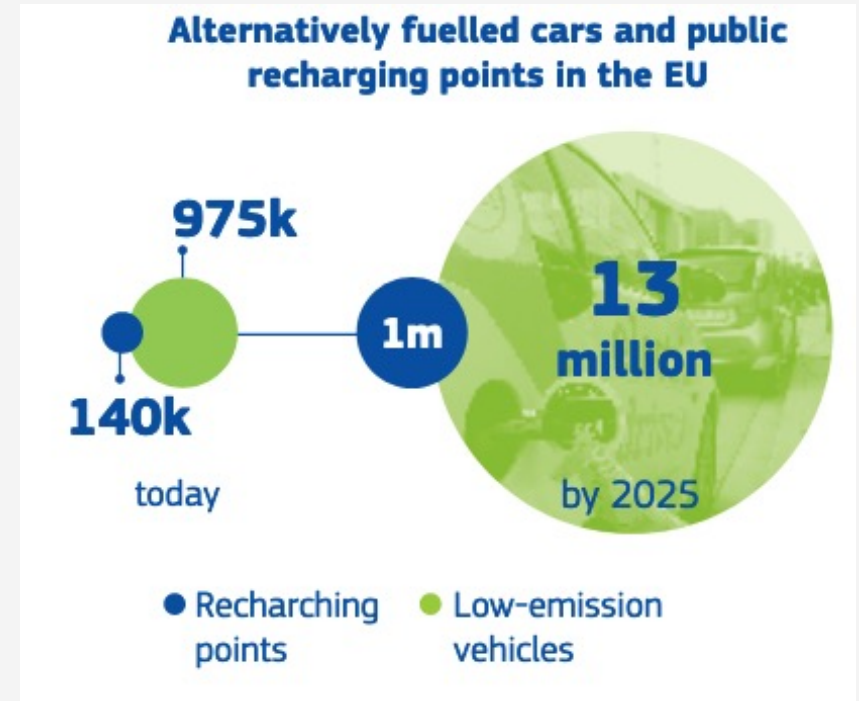
Supportive government policy – securing the uptake of EVs and overcoming all other limitations

EU's position towards zero-emission urban mobility



New Roadmap towards an EU urban mobility framework

- Directive 2013/18: Build up charging infrastructure
- Revised Clean Vehicles Directive (2019/1161): national targets for a minimum % of clean vehicles for each member state
- European Parliament resolution 2017/2545: decarbonisation through the promotion of electromobility
- EC (2020) Sustainable and Smart Mobility Strategy: putting European transport on track for the future



Policies and actions for EV penetration in urban mobility (freight & passenger)

Non-financial / Regulatory & strategic

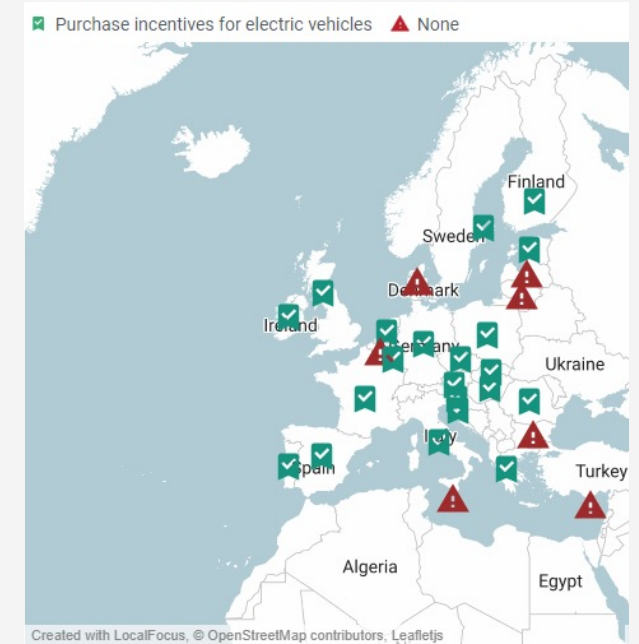
- Low/Zero emission zones and diesel bans (e.g., Denmark, France, Spain, etc.)
- Parking incentives (e.g., free parking in Norway, Spain, Hungary, etc.)
- Shared lanes (e.g., Estonia, Germany, Netherlands)

Environmental zones and driving bans



Financial Incentives

- Acquisition (e.g., VAT reduction and exemption for zero-emission cars in Austria, Belgium, France, Greece, etc.)
- Purchase incentives / Subsidies in 23/27 EU Members
- Tax benefits for ownership (e.g., minimum rate for vehicle in Finland or exemption in Bulgaria)
- Exemptions and tax deductions for company cars in Greece, Denmark, Germany, etc.



Infrastructure

- Public charging points (e.g., France, Estonia, Malta, etc.)
- Replacement of public municipality fleets with EVs (e.g., Estonia, Spain, etc.)

Awareness raising

- Community information campaigns (e.g., Belgium, Poland, Estonia, etc.)
- Research financing (e.g., Greece, Germany, etc.)
- Fuel economy labels in car sales (e.g., Belgium)

Policies and strategies that support the use of EVs in city logistics

EU legally binding commitments

- CO₂ emission performance standards for cars and vans (2020 – 2024):

- new cars: 95g CO₂/km
- vans: 147g CO₂/km

Netherlands

Zero emission transport zones to be introduced in 14/30 cities by 2025

EU (2025-2030)

CO₂ emissions reduction for vans by 15% by 2025 and 31% by 2030, compared to 2021 baseline year.

Belgium

20% ZEV sales by 2025 and 50% BEV or FCEV sales and 20% PHEV in 2030.

France

500 000 light commercial BEV and FCEV stock by 2028.

Finland

700 000 electric cars and 45 000 electric van stock by 2030 (of which at least 50% are BEVs).

Netherlands

roadmap for logistics charging infrastructure

Legislation

Targets

Proposals

Ambitions

Sweden

ban on new petrol or diesel cars sales after 2030.

France

no sales of the most polluting vehicles (emitting more than 123 g CO₂/km) by 2030

Practical examples for EVs support and development in city logistics

Public-private financial support driving one of the largest electrifications of a private logistics facility in the world.

Catalysing electrification of logistics by introducing a **LEZ**.

Developing a **progressive procurement framework** that considers EVs first for any vehicle replacement and transport service in the municipality.
National political leadership catalysed the decarbonisation of the municipal fleet in Stockholm.

For higher levels of penetration, we need:

- A mix of policy measures
- The appropriate political support at higher levels
- Collaboration among private & public actors

Electrifying the entire government fleet, with more than 800 electric vehicles already deployed.



Private leadership - deploying 1000 electric logistics vehicles (including delivery vans, e-bikes, and e-trikes) over the past six years across several of DHL's Berlin depots for delivering parcels and letters.

Creating a **fast charging plaza** through **cooperation** among different non / logistics actors

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Thank you!

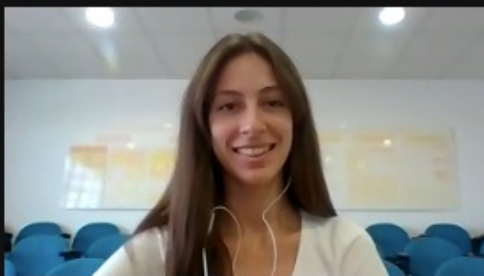
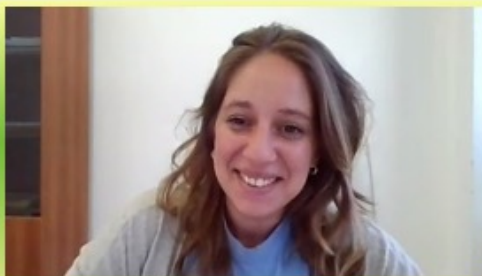
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