Towards zero emission city logistics

FREVUE – demonstrating freight electric vehicles in urban distribution

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Agenda

1. Introduction zero emission city logistics
2. Current status FREVUE
3. FREVUE's state of the art study
4. Concluding remarks

Introduction

TNO

Netherlands Organisation for Applied Scientific Research

7 research themes
- Transport and Mobility
  Urban freight transport

Hans Quak

PhD Thesis (2008) *Sustainability of Urban Freight Transport*

Senior scientist @ TNO

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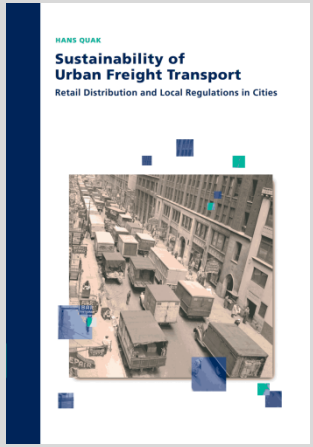


1. Introduction zero emission city logistics

- Air quality is a problem in cities and CO_2 reduction an ambition
- Cities are increasingly affected by significant *air* and *noise emissions* as well as increasing *congestion*
- The logistics industry is a significant driver of economic growth, as well as a major contributor to these issues. Improvements in this sector are required to ensure that cities fulfill their potential.
- The uptake of EFVs in the logistics industry does not go easily; experience and knowledge transfer is needed!
- Ambition European Commission: zero emission urban logistics in 2030

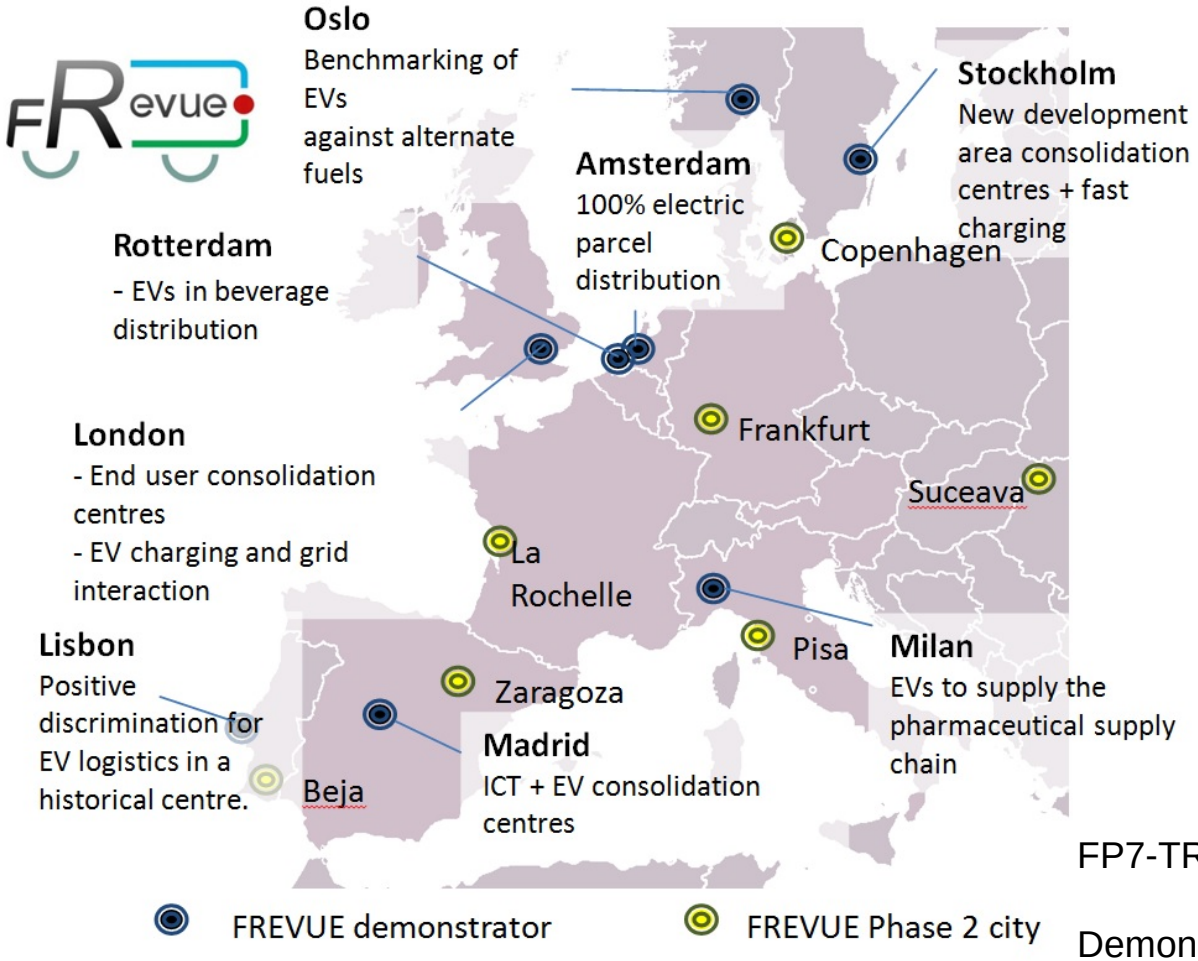
1. Introduction zero emission city logistics
FREVUE

- FREVUE will demonstrate to industry, consumers and policy makers, how electric freight vehicles can provide a solution to air and noise emissions caused by the logistics industry.

- Aim: to test with 127 electric vehicles before 2017.
- Demonstrate projects in 8 cities; covering a broad range of conditions:
  - good deliveries (including food, waste, pharmaceuticals, packages and construction goods)
  - vehicle types (from small vans to large 18 tons goods vehicles)
  - novel logistics systems and associated ICT (with a focus on consolidation centers which minimize trips in urban centers)
  - climates (from Northern to Southern Europe)
  - diverse political and regulatory settings that exist within Europe

1. Introduction zero emission city logistics

FREVUE



FP7-TRANSPORT-2012-MOVE-1

Demonstration of Urban freight Electric Vehicles for clean city logistics (theme: GC.SST.2012.1-7)

1. Introduction zero emission city logistics

FREVUE partners

1. Introduction zero emission city logistics
FREVUE

- A variety of logistic organizations will implement the freight EVs in their day-to-day operations, for at least one year

- The local authorities are involved in the demonstrations, to support the demonstrations and to explore supporting measures for the uptake of EFVs

- The research partners will assess the impacts and analyze the results

- Vehicle manufacturers and power companies to support and work on improved business model for EFV uptake

2. Current status FREVUE

Key challenges at this moment

Procurement

- Procurement of reliable electric freight vehicles of 12 or 18 ton (*including* maintenance and service)
- Overcome equipment availability issues
- Meeting operational and performance requirements within range of the EFV

Financing

- What determines the residual value of EVs?
- Leasing and financial issues with acquiring EFVs
- What is the difference (in practice) between the TCO of an EFV and ICE vehicle?

Measuring, data collection and comparability

2. Current status FREVUE

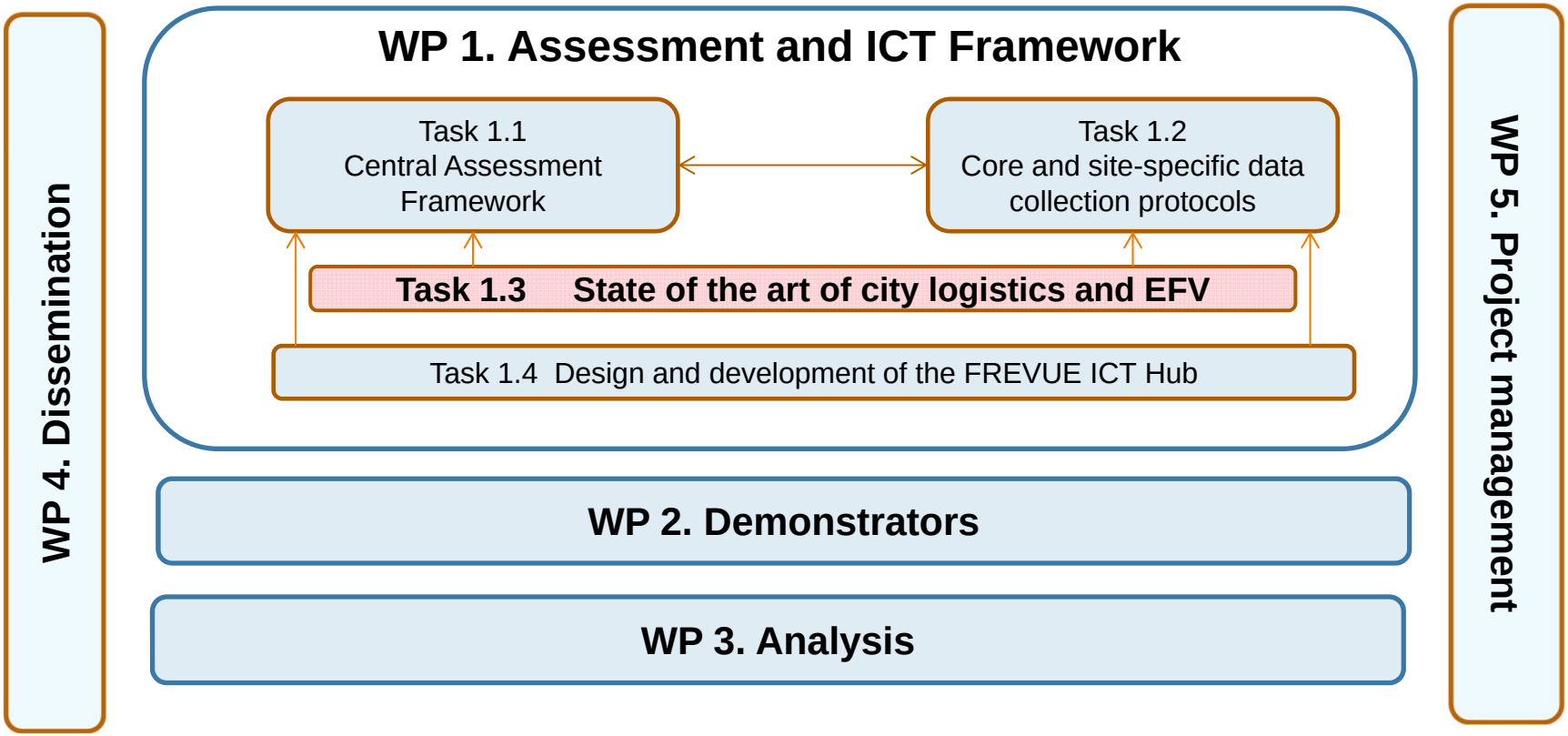
What did we find so far?

- State of the art study

- Demonstrators and cities have been visited by the research partners to gain insight in the objectives, criteria, KPIs, and measurement methods; and start local FREVUE communities.

3. FREVUE's state of the art study

Context



3. FREVUE's state of the art study

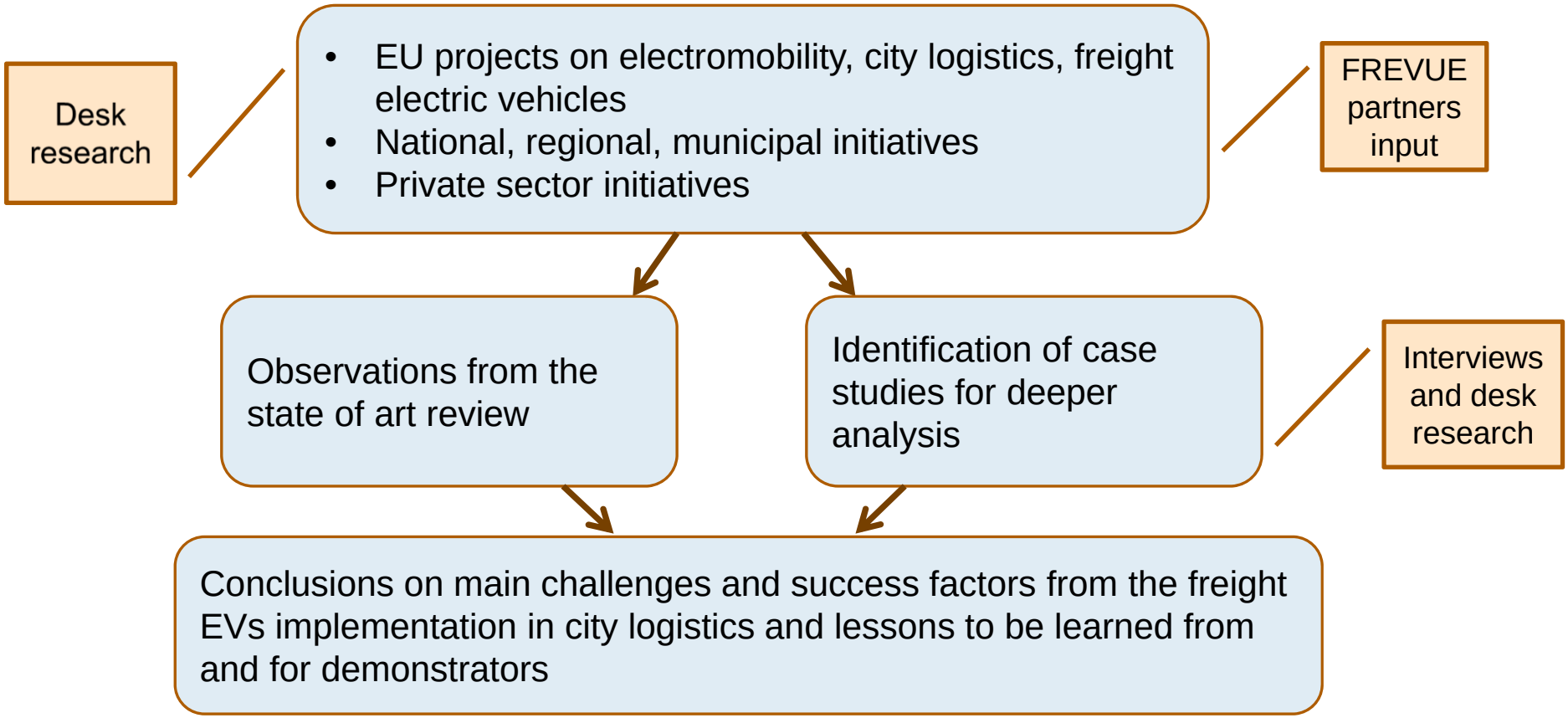
Objectives

- **Provide feedback and lessons learnt** from past and on-going initiatives to the FREVUE demonstrators
- **Support** the production of Central Evaluation Framework

› Show cases of how challenges are handled and success factors of EFV implementation

3. FREVUE's state of the art study

Approach



3. FREVUE's state of the art study
Approach

- Focus on the **deployment of freight electric vehicles in city logistics** and related services

Initiator/funding source	Projects/Companies
EU	EEO, EVUE, ELCIDIS, FIDEUS, ENCLOSE, Smartfusion, EFRUD, DemoEV, SUGAR, Straighstol, Bestfact I and II, TURBLOG, CIVITAS, ELTIS, CO2NeuTrAl, Staart, Green eMotion, CVP/Cleen Fleets, C-Liege, Green Post
National, regional, municipal	EVD Post, MOVELE (ES), Source for London (UK), Luccaport (IT), Going electric (EU), Electric Mobility Pilot Regions (GE), MOBI.E (PT), E-Laad (the NL)
Private sector	France (Carrefour, La Poste, Deret); The Netherlands (CityShopper, Binnenstadservice, UPS, 020 stadsdistributie, Cargohopper); Germany (UPS); Spain (Leche Pascual, Eroski, Correos, Seur); UK (TNT, DHL, Seymour Green, Tesco); Italy (Eco-Logis), Norway (Posten Norge)

Issues and challenges on:
- Technical performance
- Economics
- Operational performance
- Environmental performance and wider systemic impact
- Social and attitudinal impacts
- Local policy and governance structures

3. FREVUE's state of the art study

Technical performance

- **Range**
  - The range promised by the manufacturer is not reached; new(er) vehicles have higher real range
  - Whether the range is a limiting factor depends
  - Failing batteries (and limited or late) support
  - Equipment availability issues

- **Charging**
  - Relatively long charging time
  - Necessity to adapt charging infrastructure for fleet needs
  - The availability of public charging points is seen as a confidence boosting measure

- **Rapid improvement in technology** - new vehicles and batteries are available in near future. Reason to wait (at the moment) to buy.

3. FREVUE's state of the art study
Technical performance

- **Limited availability and types of vehicles on the market**
- Dealing with limited availability and types of vehicles on the market: converting conventional vehicles

Before… … and after conversion.

3. FREVUE's state of the art study

Technical performance

	Collection and Delivery under 100 km per day	Collection and Delivery over 100 km per day	Feeder
Walker or tricycle			
Electrically assisted tricycle			
Electric			
Range extended electric or hybrid			
Biomethane			
Biodiesel			
Natural gas (CNG, LNG)			
Hydrogen			
Propane (LPG)			

Key:	
	Good sustainability, feasibility, payback balance
	Backup
	Poor sustainability, feasibility, payback balance

Source: UPS EMEA Alternative Technology Roadmap

3. FREVUE's state of the art study

Economics

- **Costs**
  - High procurement costs
  - High cost of battery
  - Lower maintenance and fuel costs
  - Downtimes (due to malfunction)

- **Benefits**
  - Lower operating and (regular) maintenance costs which results in more working hours, better service quality and lower total lifetime usage costs
  - If regulative environment supports the introduction of EV's, the benefits from EV's implementation are higher

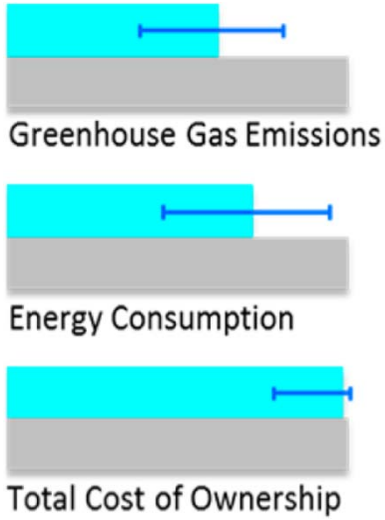
- Lack of knowledge on what really determines the EV's **residual value**

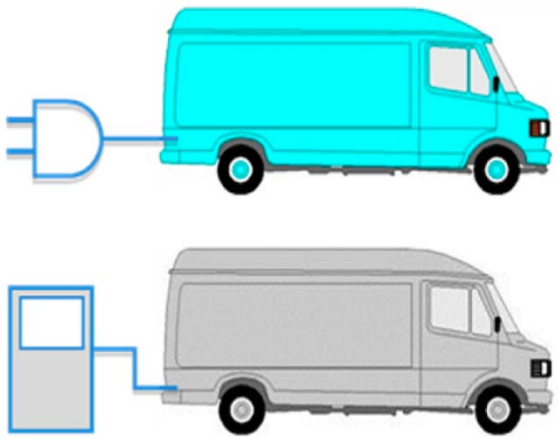
- **Innovative battery leasing schemes**

3. FREVUE's state of the art study

Economics

- In the short and medium term EV cost are high. EVs become more competitive in a long term. Wider uptake of EVs is difficult due to non viable business case in short term.

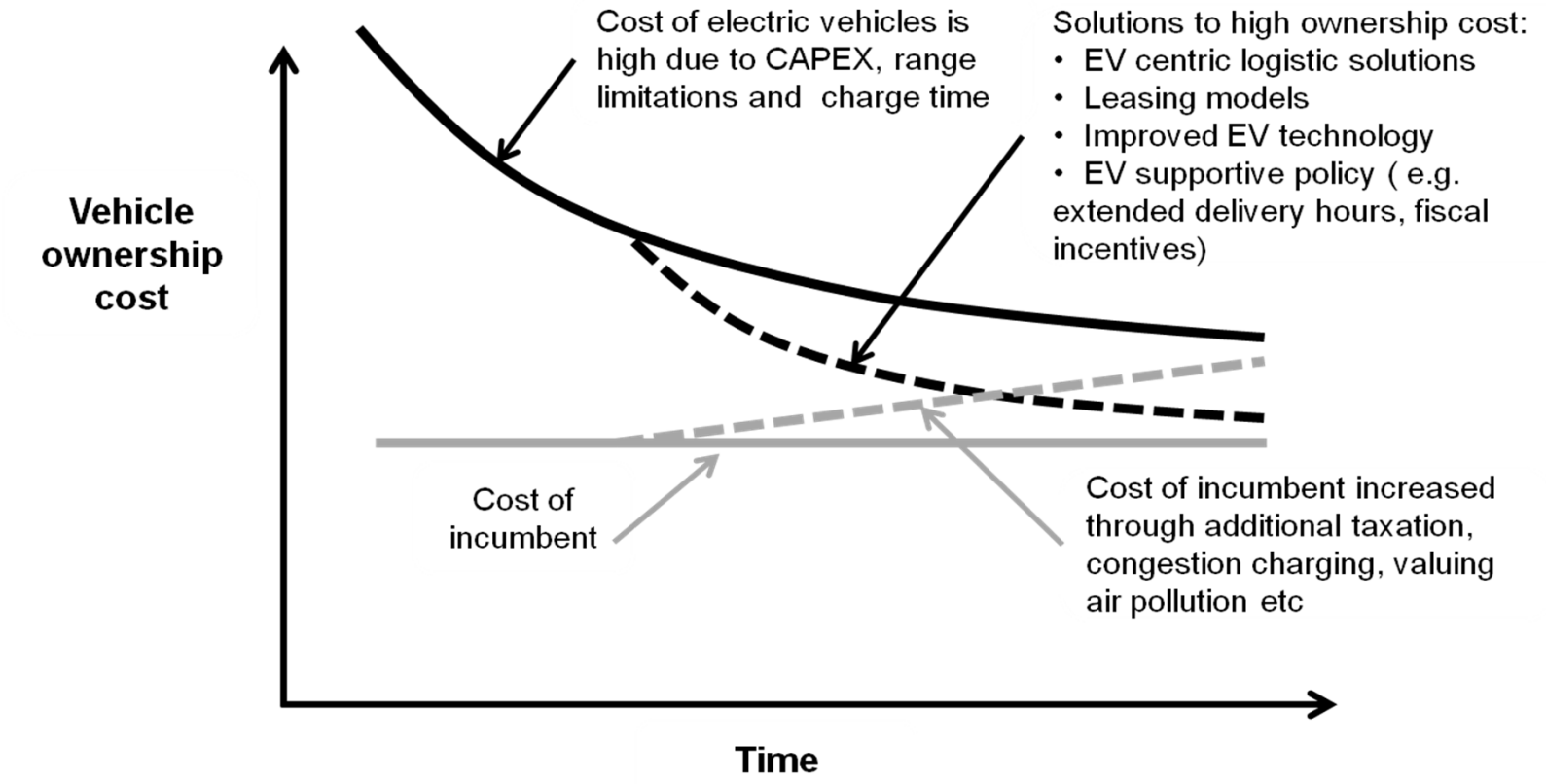




Lee et al, 2013

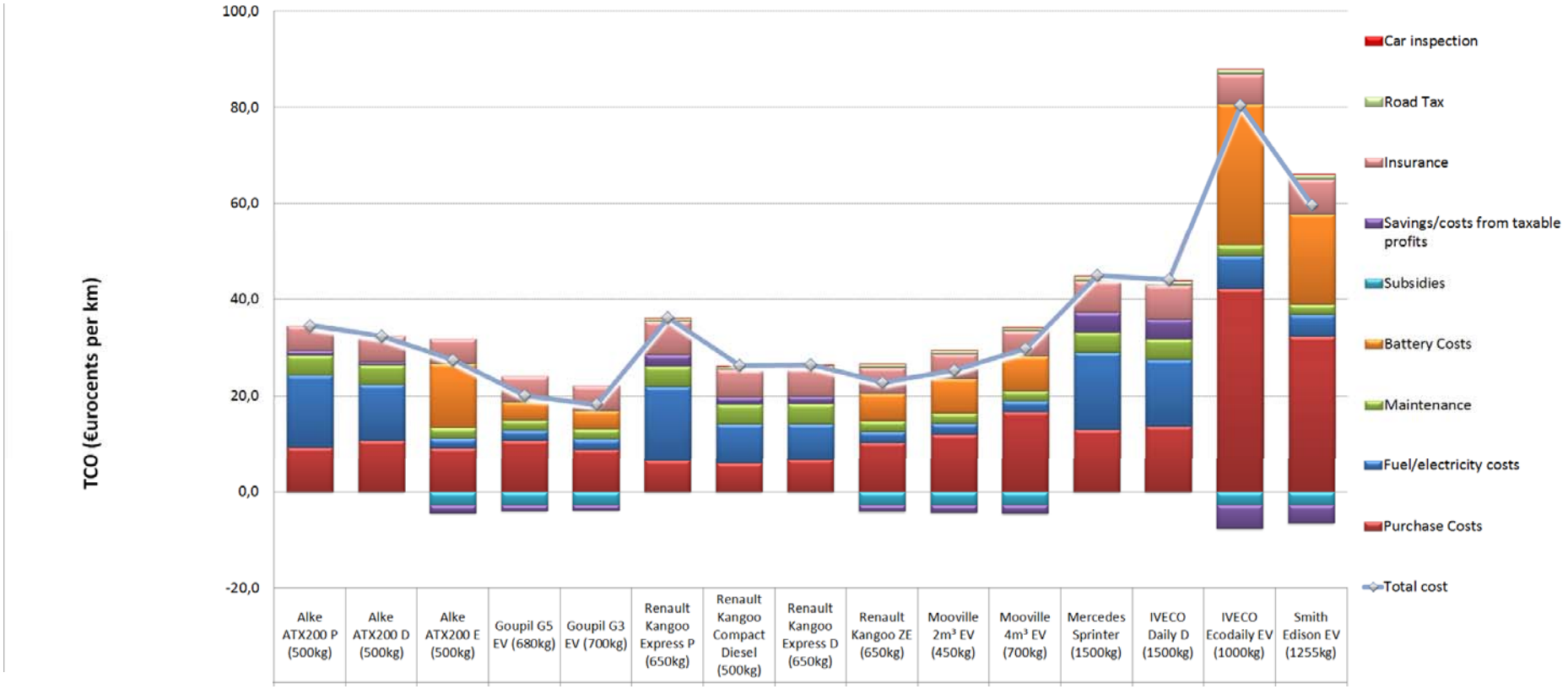
3. FREVUE's state of the art study

Economics



3. FREVUE's state of the art study

TCO electric vehicles



Source: VUB, MOBI, Macharis and Lebeau, 2013

3. FREVUE's state of the art study
Operational performance

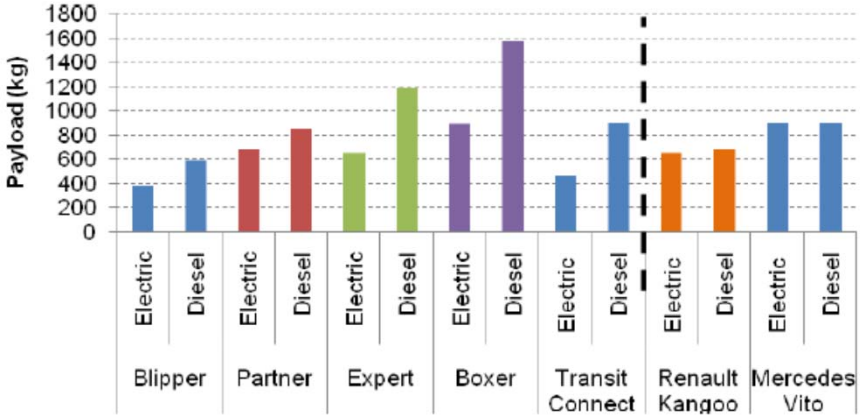
› **Higher operational efficiency**

- Larger time windows allow more efficiency in operations
- More efficient routes can be achieved as vehicle can drive inside environmental zones
- Free parking, use bus lanes

› **Loading capacity**

- Limited loading capacity

› **Logistics concepts need to be adapted for the usage of EVs**



Source: Comparison of payloads in electric and diesel vans. Source: Element Energy, Ultra Low Emission Vans study for the Department for Transport, UK, 2011

3. FREVUE's state of the art study
Operational performance

- **Maintenance**

- Manufacturing companies do not provide fast maintenance services and vehicles can be out of order for couple of months

- **Charging points**

- Home-charging (in company-charging) is most often used
- Downtime of vehicles is too long
- For vehicles on the fixed routes, home charging may be sufficient; for vehicles on variable distance routes it is necessary to consider complimentary charging methods (complimentary fast charge or battery swap technologies)

3. FREVUE's state of the art study
Environmental performance

- **Good environmental performance and improved air quality**:

- Posten Norge, Norway: savings of 1,4 – 2,1 ton CO_2 per vehicle per year by using EVs instead of fossil fuel vehicle
- Bristol CC, UK: Freight consolidation scheme in combination with two 9 tonnes EVs brought saving of 380.000 lorry/km, resulting in 102 tonnes CO_2 reduction and 3.300 kgs NOx, 100 kg PM 10's reduction
- Tesco, UK: operate 15 Modec EVs and each EV saves between 13 – 15 tonnes of CO_2 each year
- Deret, France: 38 times less of CO_2 emission per truck for the EV compared to truck of the same capacity

3. FREVUE's state of the art study

Social and attitudinal impact

- **Noise**
  - No noise from vehicles, but from (un)loading equipment and drivers behaviour
- **Drivers acceptance**
  - Drivers are very happy with vehicles having an acute turning range, which is very helpful in city's streets
  - Vehicles are very quite
  - Some time is needed to get used to, therefore training with vehicle is necessary
  - No long-term problems with range anxiety
  - Ambivalence in drivers' attitude
- **General acceptance**
  - Very positive general acceptance from public, vehicles attract a lot of interest
- **Contributed to the positive image of transport operator and shipper**
- **Uncertain safety level**

3. FREVUE's state of the art study

Policy and governance

- **Government policy supporting EVs or policies to limit ICE usage are a key factor of success.**

- The most common government support measures are:
  - Purchase subsidies
  - Exemption from purchase taxes (e.g. VAT on purchase)
  - No charges on toll roads
  - Free access on bus lanes
  - Free municipal parking

- Political support, procurement demands, public opinion and awareness also among private companies and surrounding municipalities are factors of success of demonstrators

3. FREVUE's state of the art study

Policy and governance

	Financial	Non-financial
Promoting EV	• Purchase subsidy • Exemption from vehicle registration taxes • Discount on toll and parking fees	• Preferential parking spaces • Access to restricted highways or bus lanes • Facilitating charging infrastructure • Sharing practical information • Carbon footprint related recognitions
Restricting CV	• Higher parking charges • Higher taxes	• Low emissions zones • Time windows

3. FREVUE's state of the art study

Main observations

- Biggest majority of documents available are on the implementation of the private electric vehicles; the scope and **the number** of the projects/initiatives **focused on freight is limited**, **but slowly growing**

- Only **few sources** are available **presenting real evaluation results**; majority are focused on the pre-trial or only context description information

› Challenges with implementation of the freight EVs during the first trials differ from today's challenges

- Then: high procurement costs, limited product diversity, little or no after sale support, long waiting time for spare parts, overruns in delivery dates, small range and low speed, necessity to develop more reliable and better performing batteries, EFVs were limited in power and payload
- Now: Scepticism, waiting for further technology development and viable business case

› **Use of EVs for city logistics still has to gain benefits from practical demonstrations in order to be recognized, notably by fleet managers.**

3. FREVUE's state of the art study
Main observations

What is needed for acceleration of uptake of EFVs?

- Adaptation of logistics concept enables EFV use in urban logistics
- Local governmental support to accelerate EFV introduction
- Companies that *want* to be sustainable

4. Concluding remarks

1. Many uncertainties about EFVs and (therefore) many risks
2. Mismatch EFV characteristics and current logistics operations and concept
3. High initial investment costs
4. Equipment availability issues, service issues, and limited availability of EFVs in the market
5. Positive image for carrier / transporter

Thanks for your attention

Questions?

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