Potentials of electric freight vehicles in combination with urban consolidation centres for last-mile delivery

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Development of the urban road freight transport

- Urban freight transport activities of courier express parcel (CEP) service doubled between 2000 and 2017 – increasing transport demand for the future expected
- In addition to increased CO2 emissions, special attention in cities paid to: air pollution, traffic noise and traffic jams

Alternative Technologies:
Electric Mobility

New logistic concepts:
Urban Consolidation Centres (UCC)

Analysis of the influences of last mile freight consolidation on the total cost of ownership of conventional and battery electric trucks

Left picture: https://www.electrive.net/2018/09/24/elektro-transporter-die-stadtreiniger-kommen/
Right picture: https://logistik-heute.de/news/letzte-meile-studie-zu-micro-hubs-14471.html

Outline

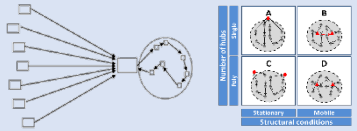
- Methodology
- Use case definition
- Use case results
- conclusion

Methodology: use-case analysis

To analyse requirements, potentials and economic feasibility of battery electric trucks operated in an urban consolidation centre for the last mile delivery in urban area

Defined Transport task
(fleet size , driving data)

Electric freight vehicle characteristics



Logistic concepts characteristics

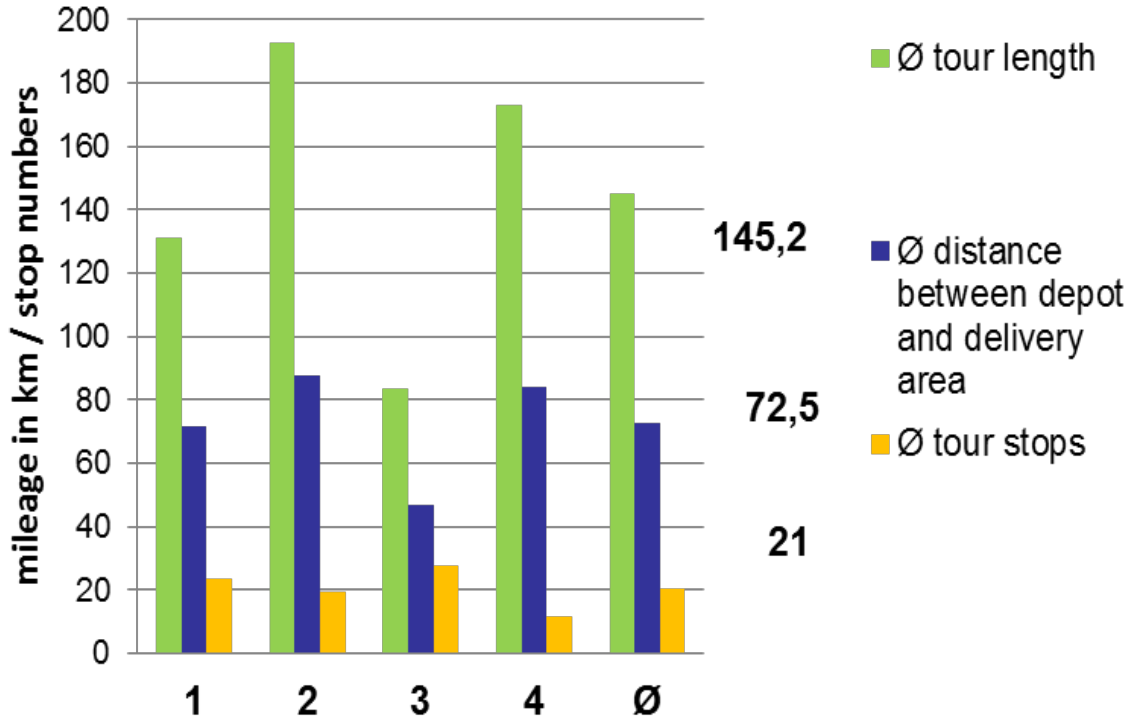
Use-Case Analysis

1. Defining the case studies using variations of vehicle concepts and logistics concepts
2. Evaluating of fleet TCO for the considered transport task
3. Comparing the use-case results

Defining the transport task

Fleet monitoring, route tracking to define transport tasks

- *Four diesel vans up to. 3.5 GVW*
- *1 week in operation in Berlin city traffic* (October 2019)
- *GPS data (speed-time profiles), daily mileage, tank level, operating times downtimes, etc.*



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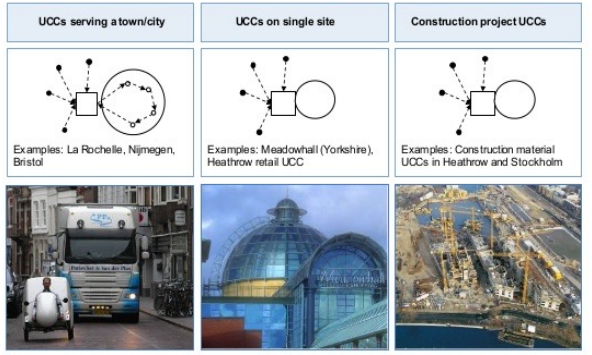
Characterizing the urban consolidation centre



- **30 cases** in which the influences were described quantitatively

Characteristics logistics center

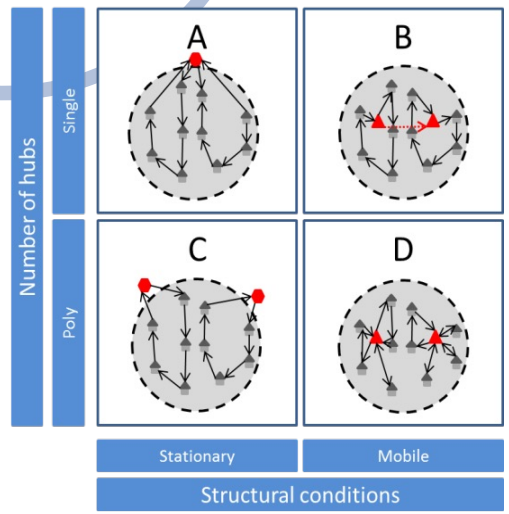
delivery area

- **22 cases** in which the UCC was described in detail

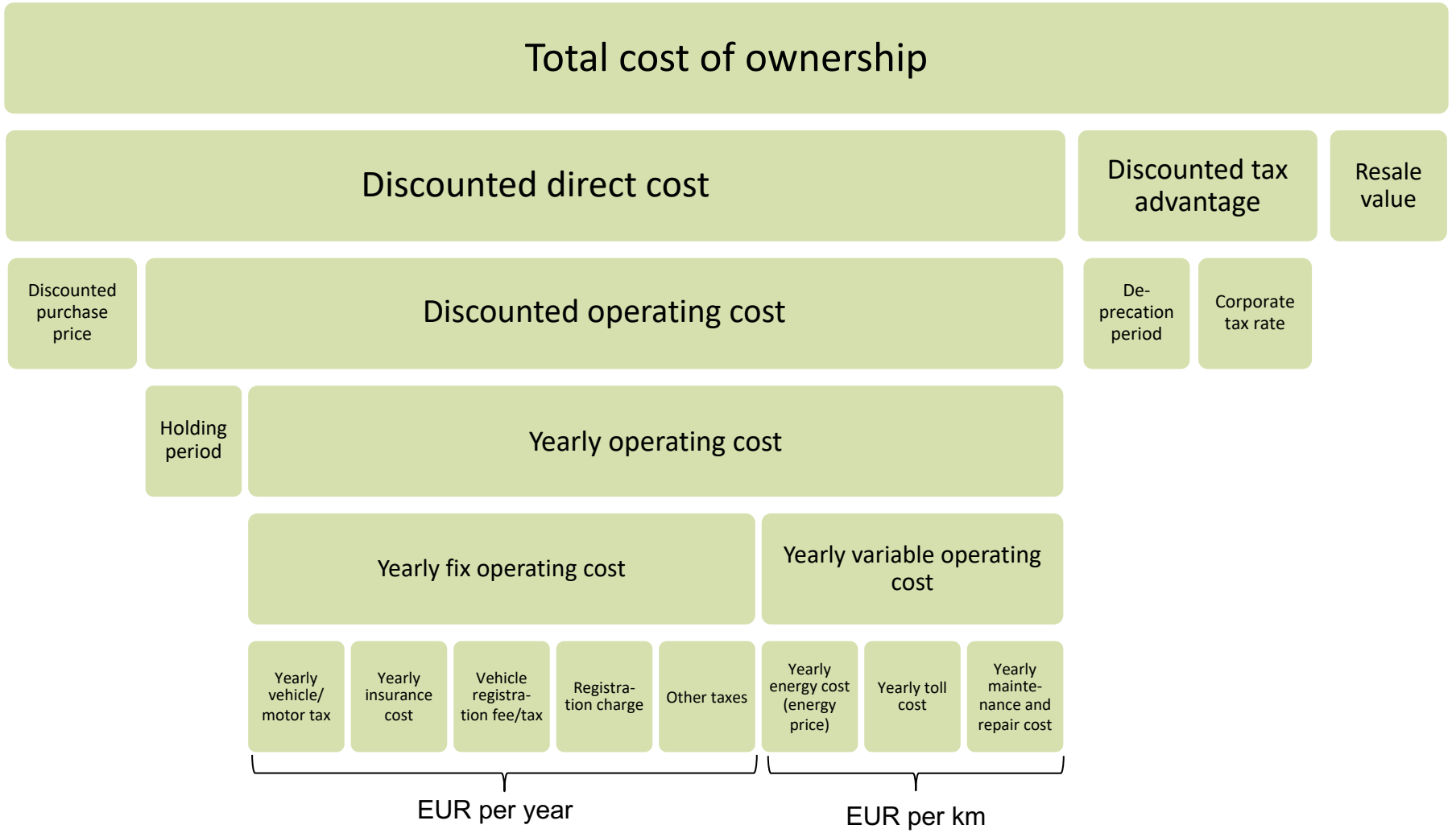
- **18 cases** in which the destribution of goods in urban area was consolidated

Data availabiltiy

Case Nijmegen



Methodology: Fleet total cost of ownership



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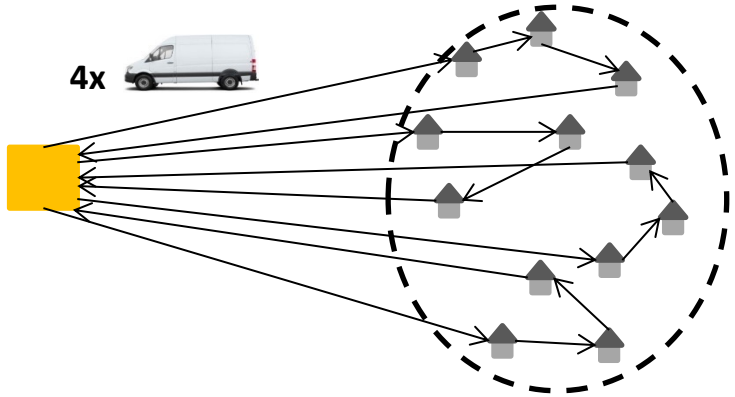
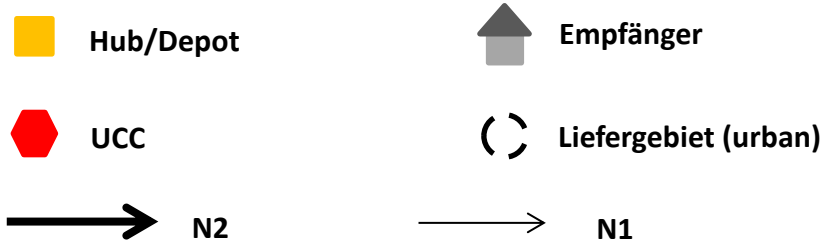
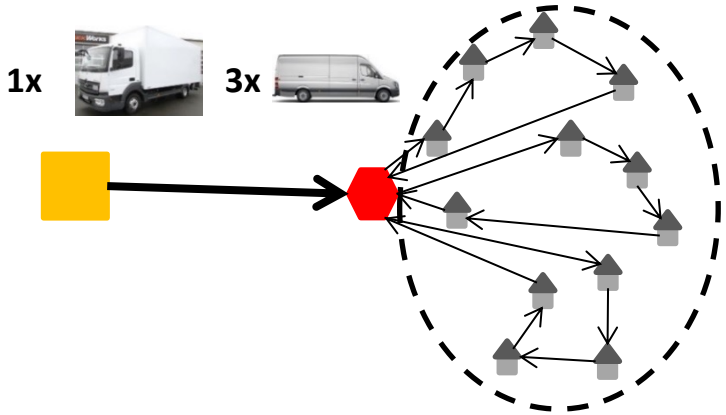
Use-case definition

Traditional Delivery Concept

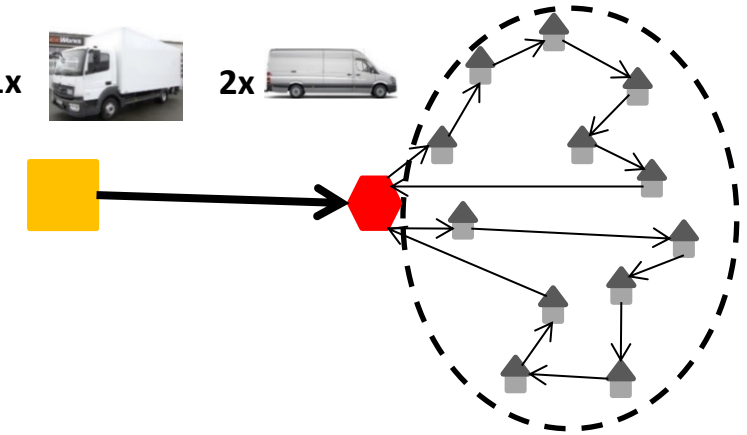




Urban consolidated delivery concept with UCC



Urban consildation and route optimization



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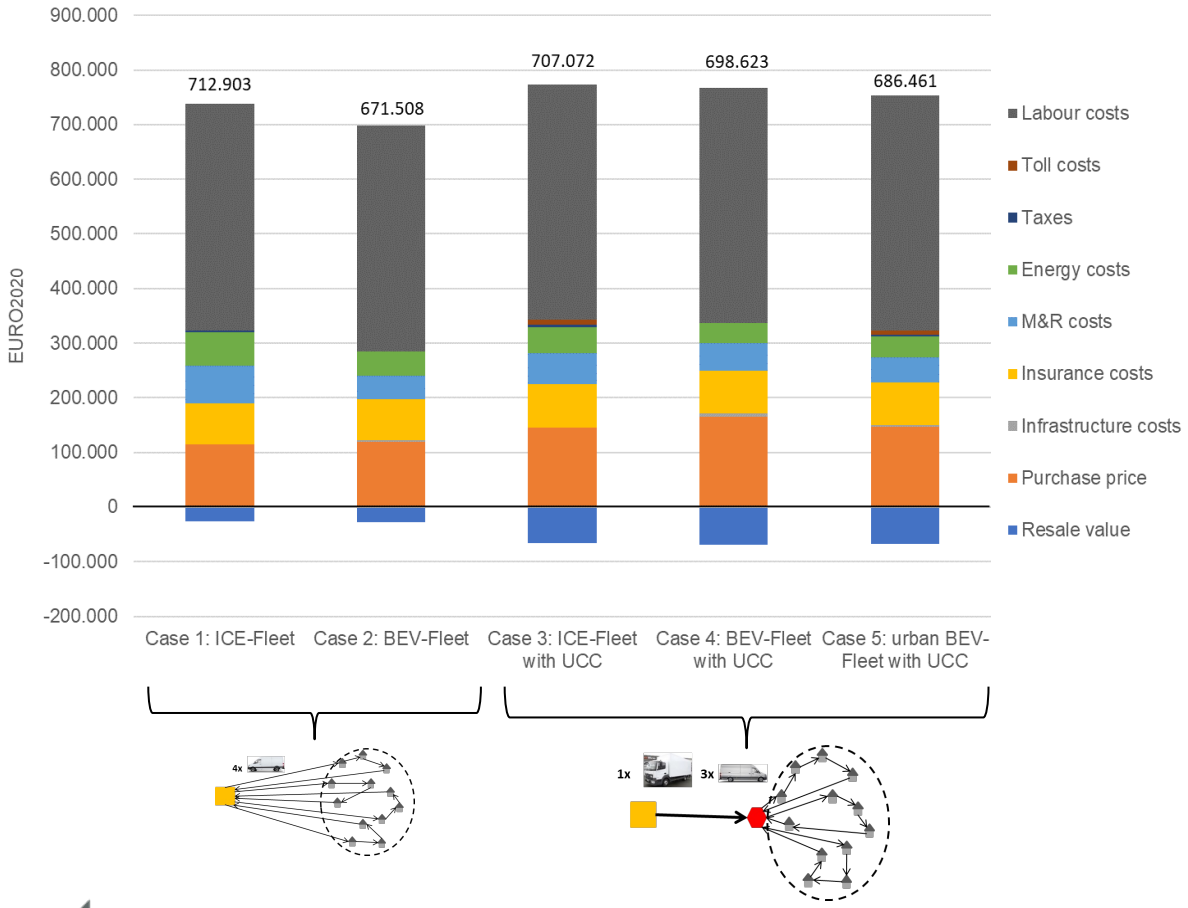
Use-case definition

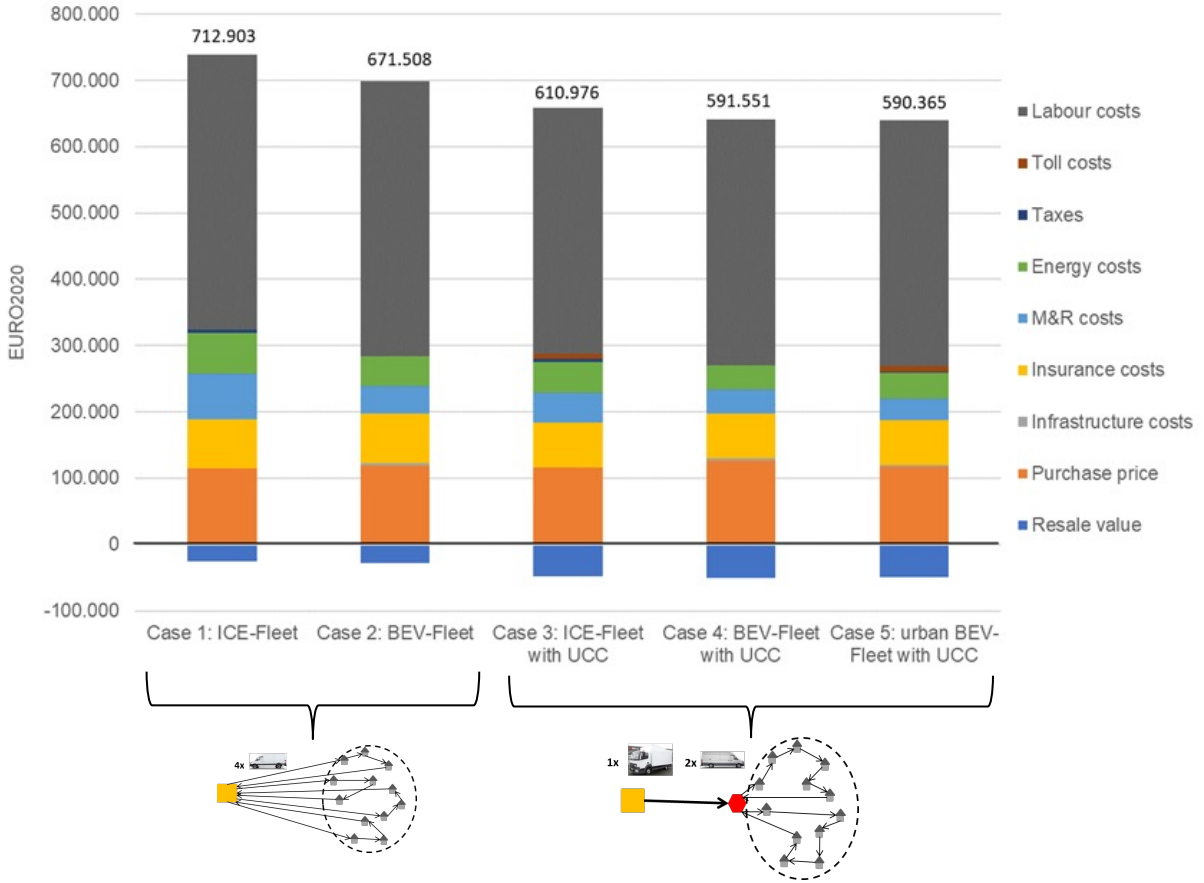
	Transport task		Powertrain of fleet vehicles		
	Hub-to-hub route: average daily mileage/average daily payload	Last-mile route: average daily mileage/average daily payload	ICE-Fleet	BEV-Fleet	Mixed Fleet
Traditional Transport	145,2 km/ 621 kg		Case 1	Case 2	-
Urban Consolidation centre (simulated)	72,5 km/2484 kg	94,6 km/828 kg	Case 3.1	Case 4.1	Case 5.1
Urban consolidation centre + Tour optimization (simulated)	72,5 km/2484 kg	141,9 km/1242kg	Case 3.2	Case 4.2	Case 5.2

Results

Urban consolidated delivery concept with UCC



Urban consolidation and route optimization



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Conclusion

- The described approach shows that through the data recording and analysis of real driving data and the use case analysis suitable delivery concepts for the last mile delivery can be derived.
- The analysis shows that already today battery-electric light duty vehicles have reached TCO parity compared to conventional diesel.
- The analysis focuses on a purely economic evaluation of the potential. Other aspects influencing the operation of the vehicles were not considered in the evaluation. Like higher range requirements for the vehicles for other transport tasks.
- However, the simulative approach shows a suitable way to identify concrete applications for zero-emission vehicles in urban road freight transport.

Thank you!

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