The carriers' carrier consolidation approach in sustainable urban logistics: Trials, benefits and future growth

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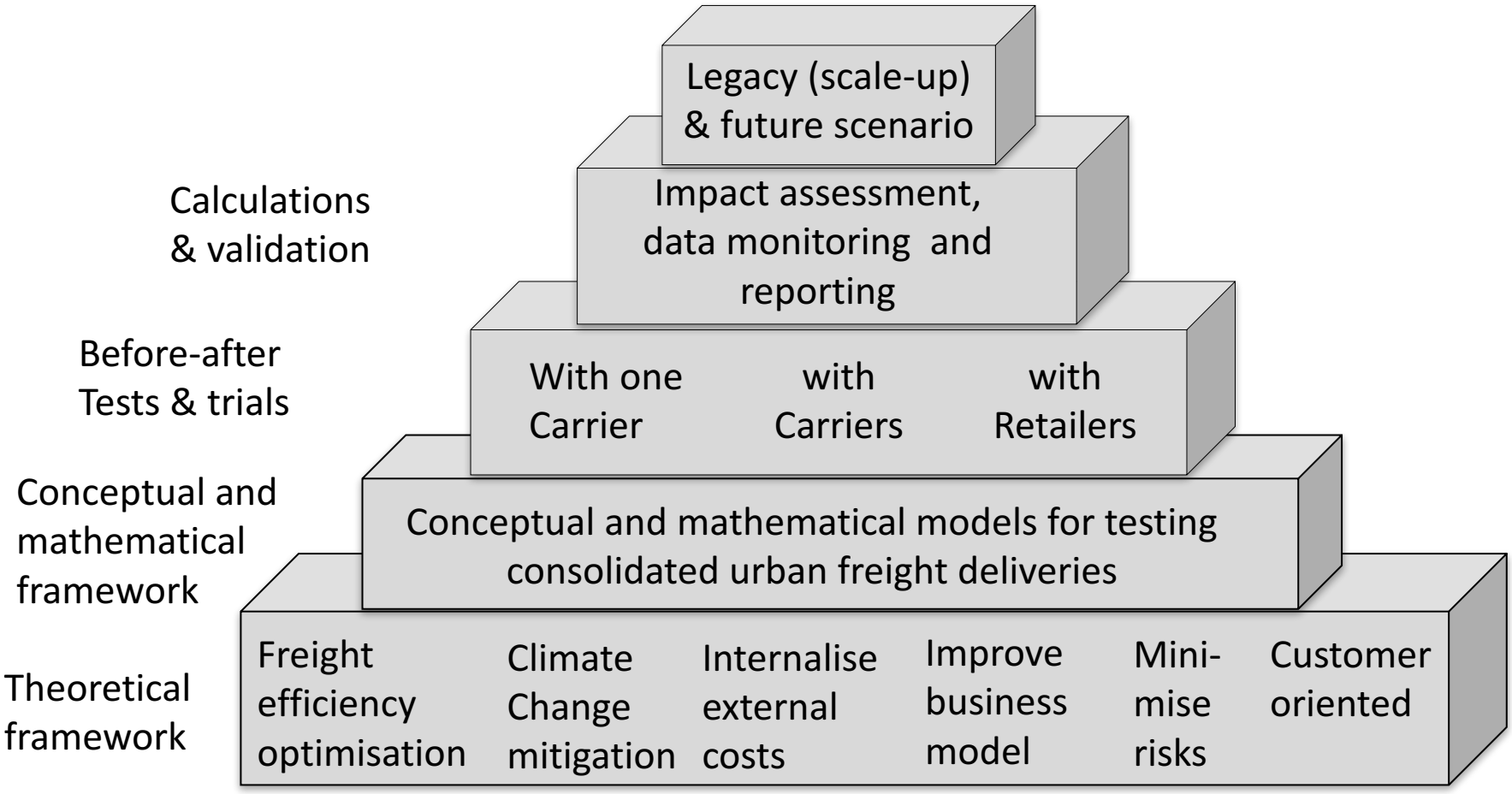
Hypotheses and Lead Questions

- Following hypothesis and questions build the starting point of this study:
  - How to scale-up the use of electric vehicles instead of diesel vans to reduce air pollutants and carbon emissions?
  - Is the carriers' carrier approach to parcel deliveries business reducing the total freight distance for retail and e-commerce clients, by changing from outer London depots to centrally located logistics distribution centres in London?
  - Is there a difference in consolidating deliveries of carriers and retail clients into one single van delivery trip to reduce the number of vehicle movements, associated congestion and air pollution?

Hypothesis, questions & objectives

- Initial **hypothesis**: The aim of this study was to demonstrate the benefits for public sector and private business, which are occurring when using a carriers' carrier approach to grow consolidation and electric vehicles in city centers
- The study assessed the potential for:
  - re-timing of e-commerce B2C activity, away from peak hours
  - re-routing of journeys away from the most congested roads and pollution hot spots
  - improving the logistics efficiency (time and distance per parcel)
  - reduction in emissions (CO_2, diesel particulates, NO_X)
- **Objective** of this study is to verify/falsify this hypothesis and answer the **question**: what are the benefits for public sector and private business, which are occurring when using a carriers' carrier approach to grow consolidation and electric vehicles in city centers

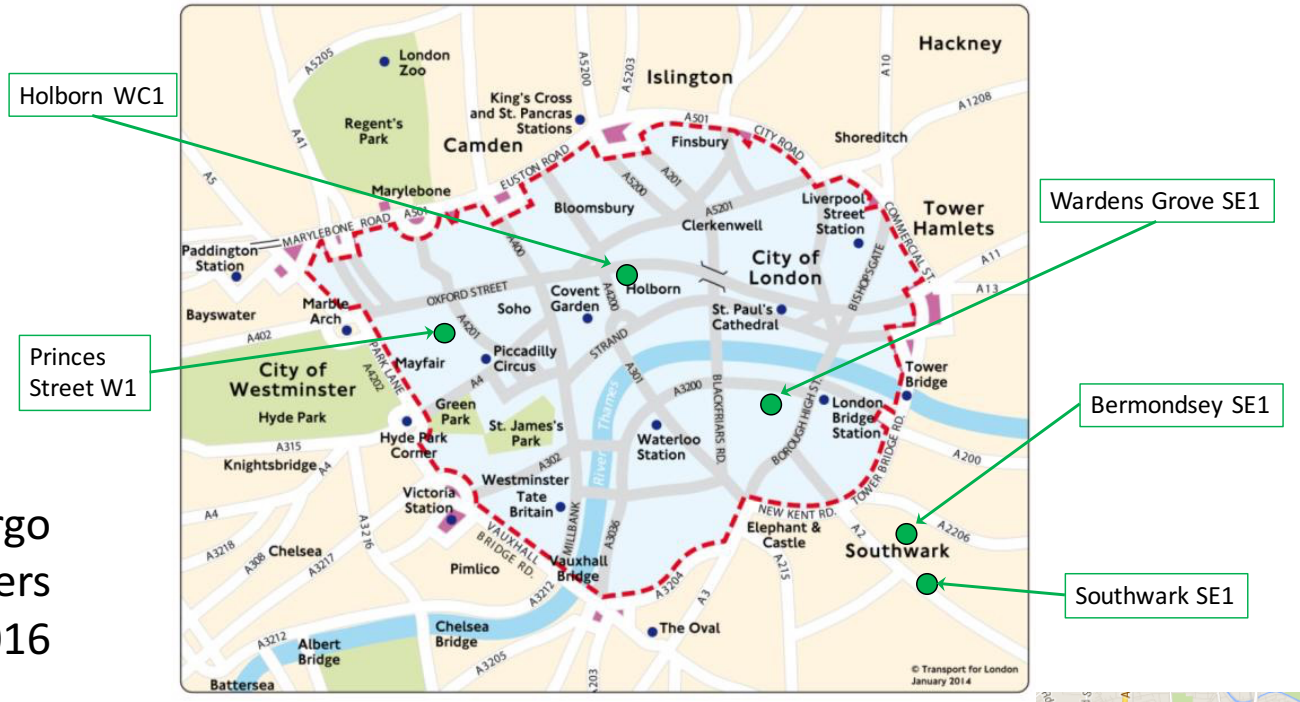
Approach and Methods



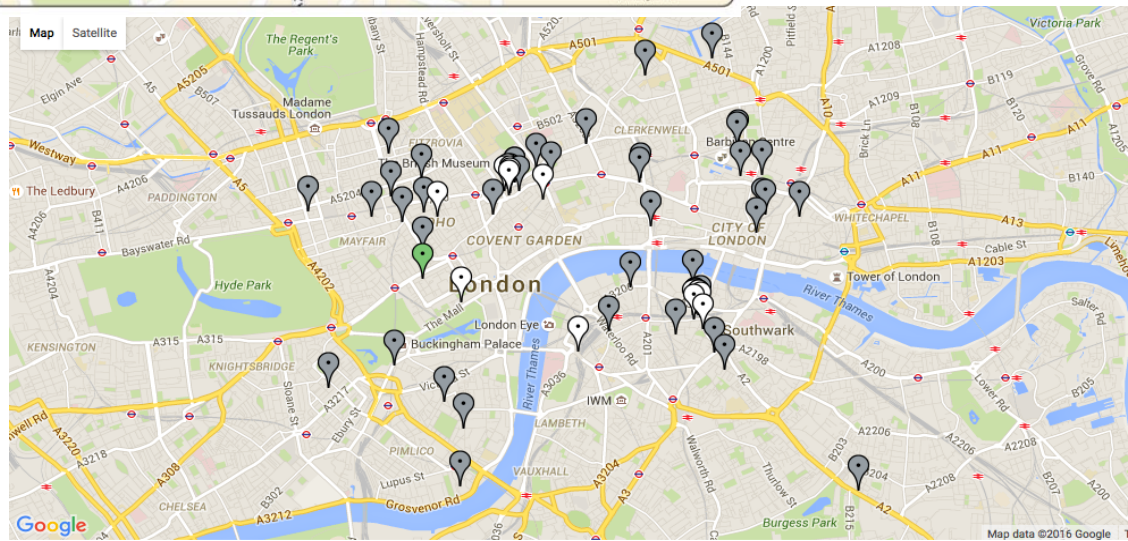
Selection of businesses

- The London parcels delivery business **Gnewt Cargo** tested electric vehicles and logistics consolidation in Central London during the one-year trials from 1st July 2015 to 30 June 2016.
- The customers were carriers and retailers, paying the same price per parcel than for other subcontractors
- Carriers:
  - Hermes
  - TNT UK
  - DX
- Retailers:
  - Farmdrop (Food e-commerce)
  - Emakers (e-commerce delivery business)
  - Spicers (leading uk wholesale office suppliers)

Central London Delivery Area



Location of Gnewt Cargo urban distribution centers used in 2015-2016

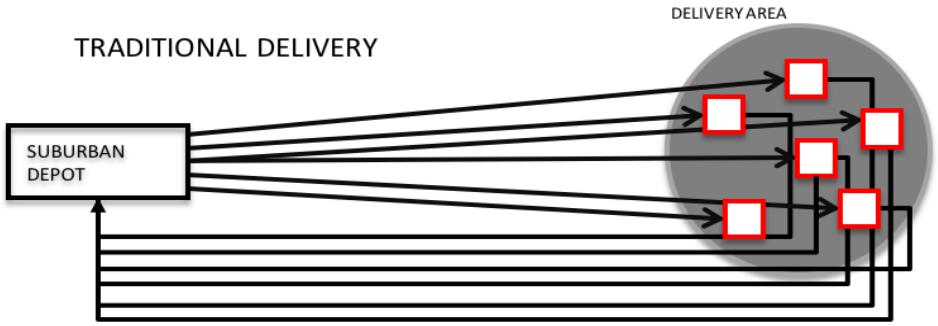


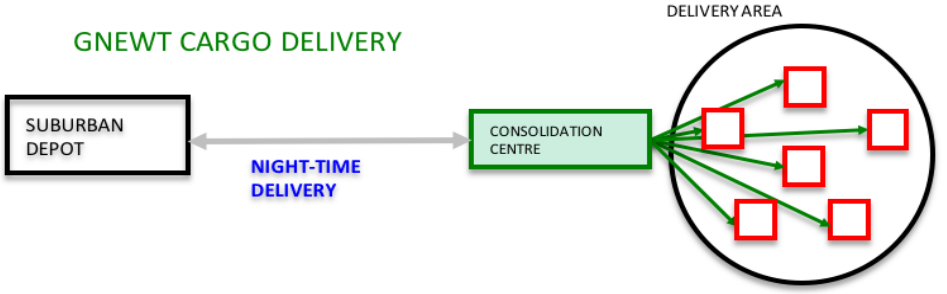
Typical geolocation of 100% electric delivery fleet on an average day

Trial: parcels delivery business

Gnewt Cargo in Central London

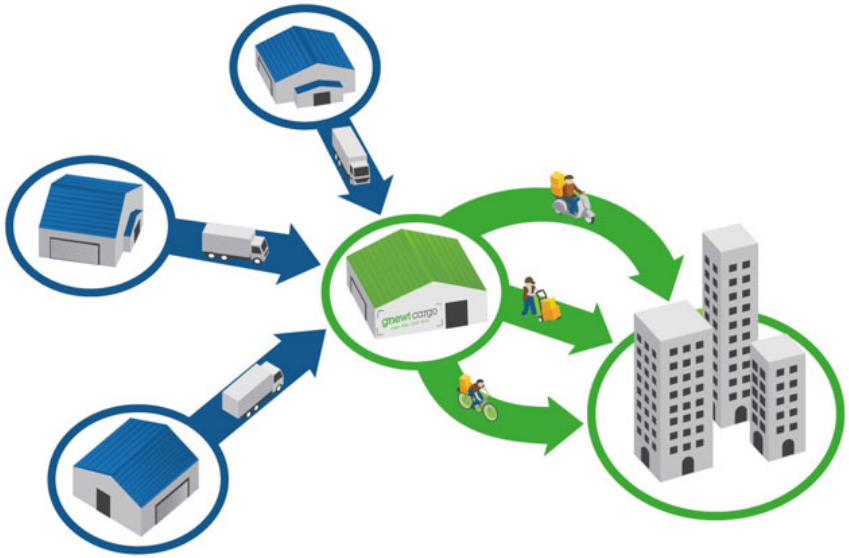
A last-mile logistic provider using a 100% ELECTRIC fleet
and centrally located urban logistics consolidation centers





Market Size

Over
100
electric
vehicles
fleet



Delivered over
2,634,000
items 2016
zero emission

Business Performance & Citylogistics Indicators

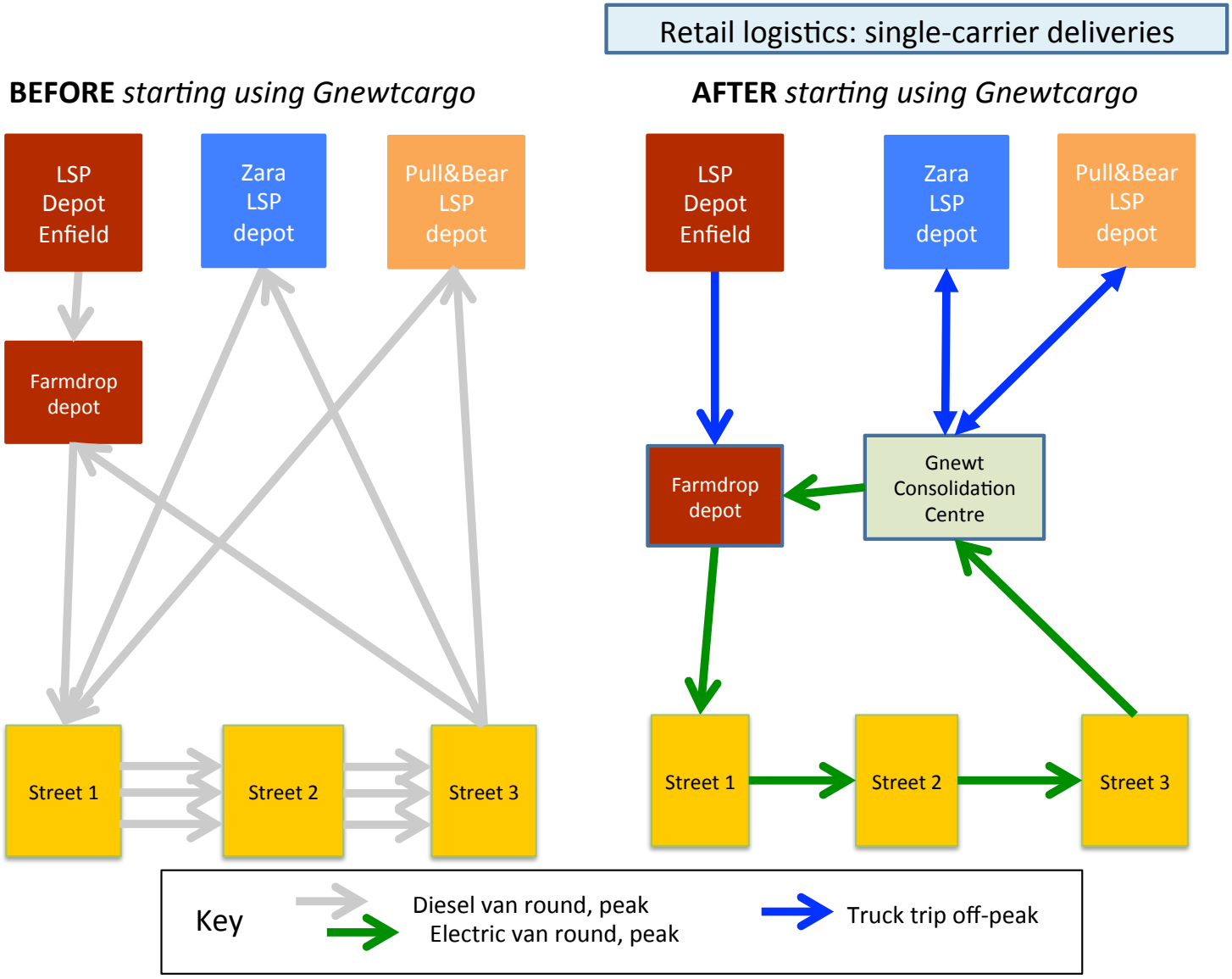
KPI, Business & Citylogistics Efficiency Data for Client A, July 2015 - June 2016

Total parcels delivered	2,005,728
Average parcels delivered per week	38,572
Average parcels per van per day	151
Maximum parcels/van/day	668
Minimum parcels/van/day	1
Total miles driven	148,545
Average miles per van per day	11
Average metres per parcel	119
Average completion	87%
Total driver working time in minutes per parcel	6

Results: Main benefits

- **the carrier's carrier approach**, by which the operator carries parcels for different carrier customers;
  this makes a difference in terms of logistics efficiency, high load factor, much shorter distance per parcel, much better performance in time and costs per parcel, when compared to a distribution system for a single client.
- **the use of the city centre depot as base for a fleet of electric vehicles**;
  this lowers emissions because it replaces polluting diesel trucks and vans with zero emission vehicles for all trips to the final recipients of the parcels, located in the most polluted areas of the city centre.
- **the use of diesel trucks at night** to bring the parcels to Central London during a low traffic, low emission time;
  this solution completely avoids the usual peak traffic time in the mornings on the congested arterial roads towards city centre.

Logistics distribution model, case 1



Logistics distribution model, case 1

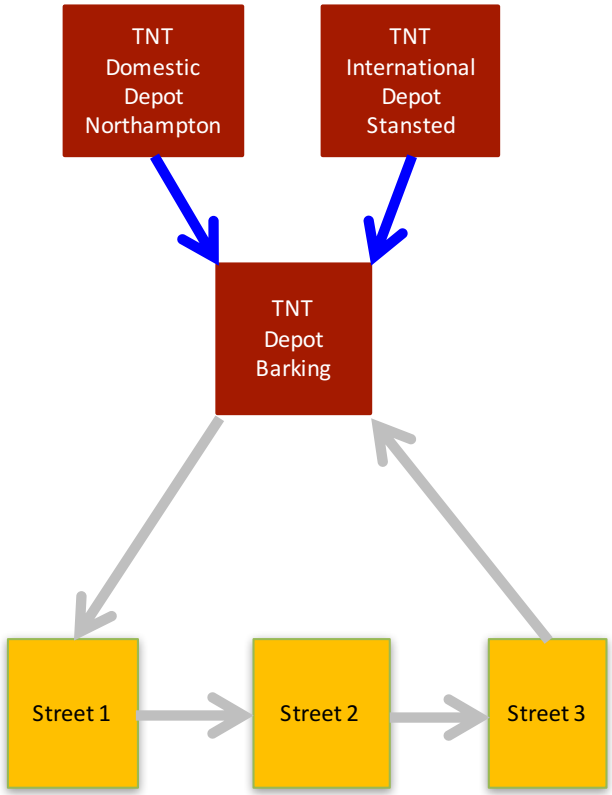
Energy use analysis of the Client B demonstration with and without Gnewt Cargo

		Without Gnewt: Diesel van	With Gnewt: Diesel truck	With Gnewt: Nissan eNV200	With Gnewt: Total	Without-With reduction %
Distance	km	16436	595	14054	14649	**11**
Electric energy used	kWh			2473		
	kWh/km			0,176		
Conversion factor	goe/kWh			85.984523		
Total period	litres	1479	112		112	**92**
Conversion factor	goe/litre	845	845			
Total energy use	kgoe	1250	95	213	307	**75**
Results energy per km	goe/km	76	159	31		**90**
Results energy per parcel	goe/parcel	97	7	16	24	**75**

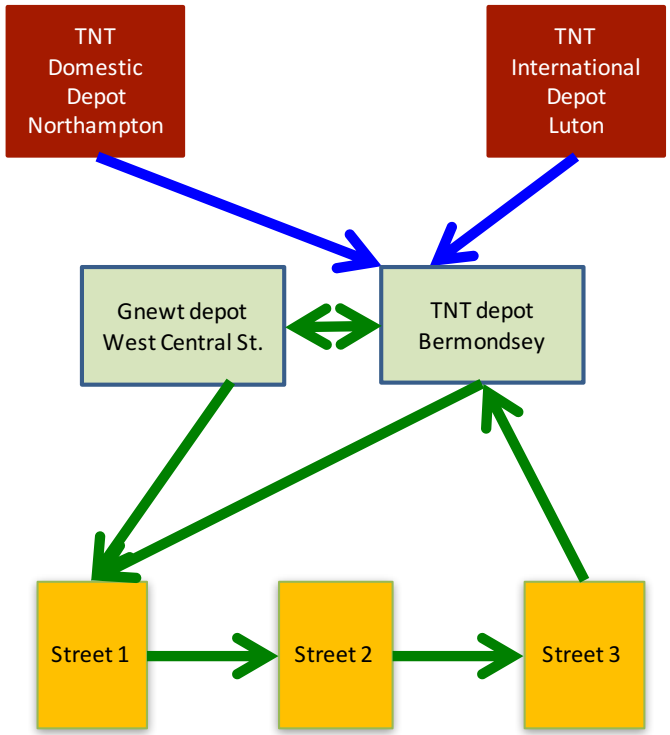
Logistics distribution model, case 2

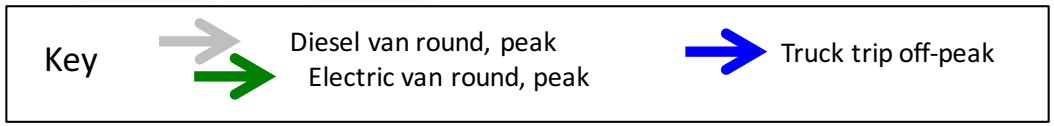
Carrier logistics: single-carrier deliveries

BEFORE *starting using Gnewtcargo*



AFTER *starting using Gnewtcargo*



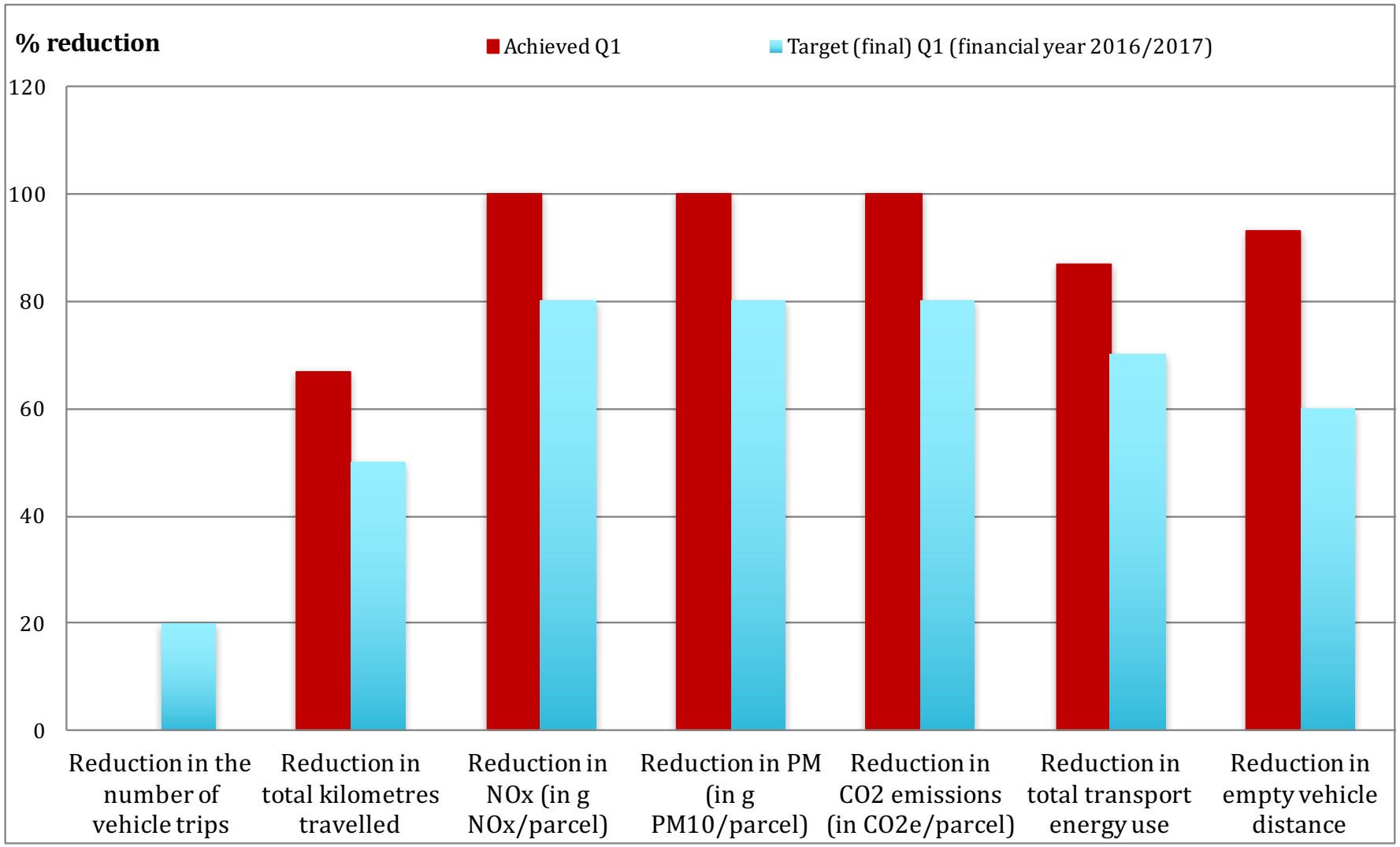


Distances	Miles	Km
Average TNT delivery round per day *before*	73	117
Average Gnewt Cargo delivery round per day *after*	16	26

Logistics distribution model, case 2 distance analysis

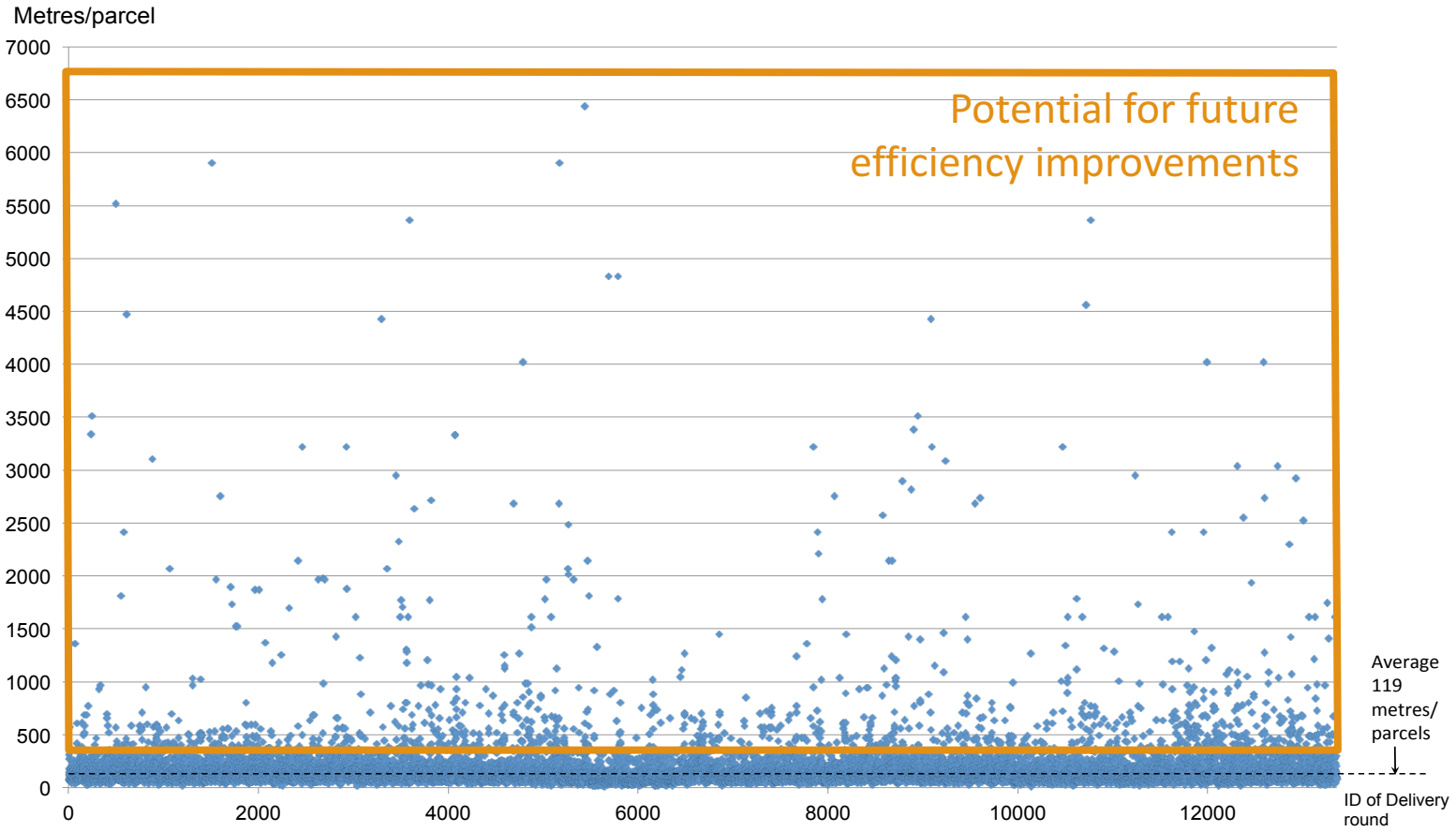
April 2016	Parcel units	Miles	Km	Km/ parcel
Gnewt Cargo (TNT international) delivery journeys	21,211	3,519	5,663	
Average Gnewt (TNT international) delivery distance				0,267
Total TNT domestic deliveries	30,089	15,315	24,647	
Average TNT domestic distance				0,820
Difference in %		77	77	67

Logistics distribution model, case 2
Overall analysis of efficiency & benefits



Business & Citylogistics Efficiency KPI: Metres per parcel delivered

1st July 2015 – 30 June 2016 (n = 13,358)
one point = average distance in metres per parcel for one delivery round =
one driver, one van, one full working day, 7 days/week, full day distance,
only paid (successful deliveries and collections) units counted



Business & Citylogistics Efficiency KPI: Completion rate

1st July 2015 – 30 June 2016 (n = 13,358)
one point = average distance in metres per parcel for one delivery round =
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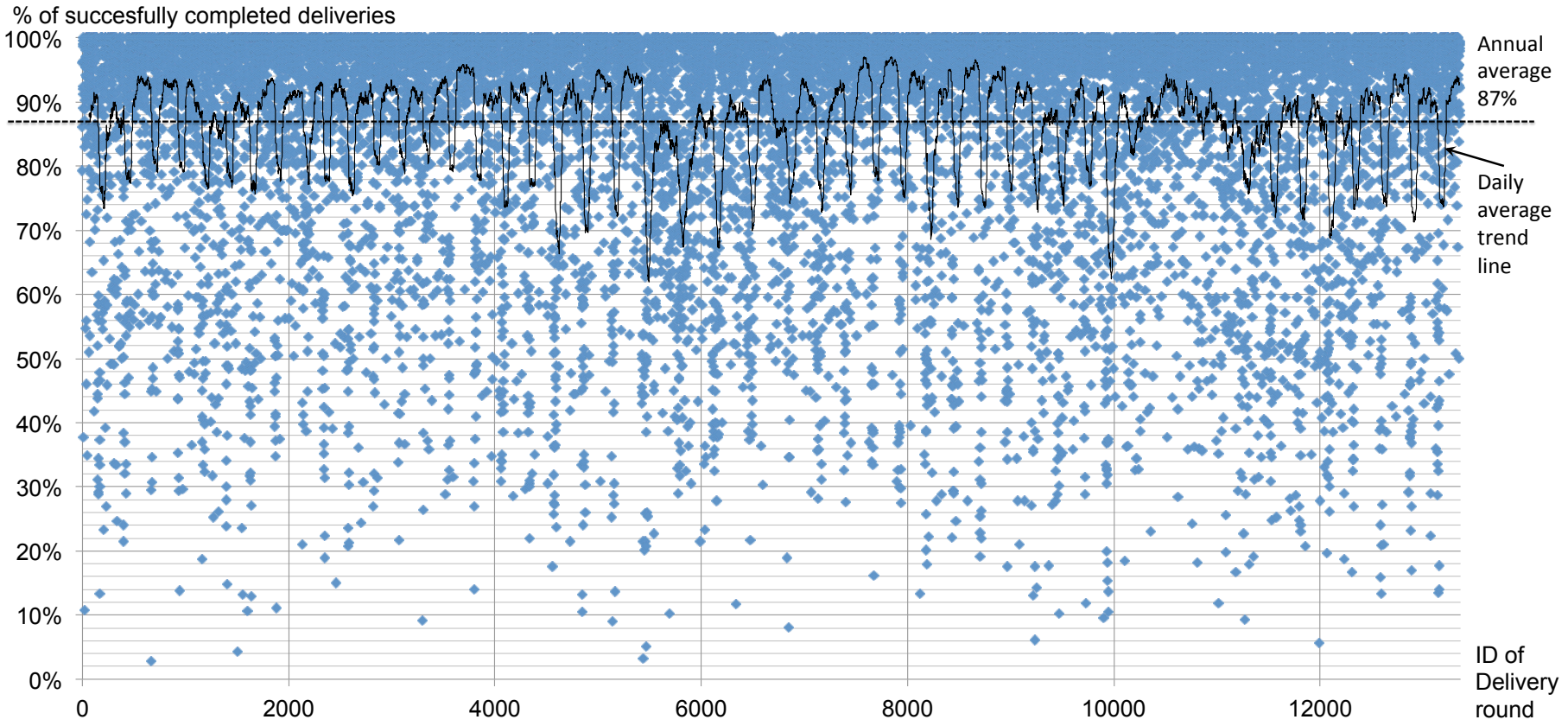
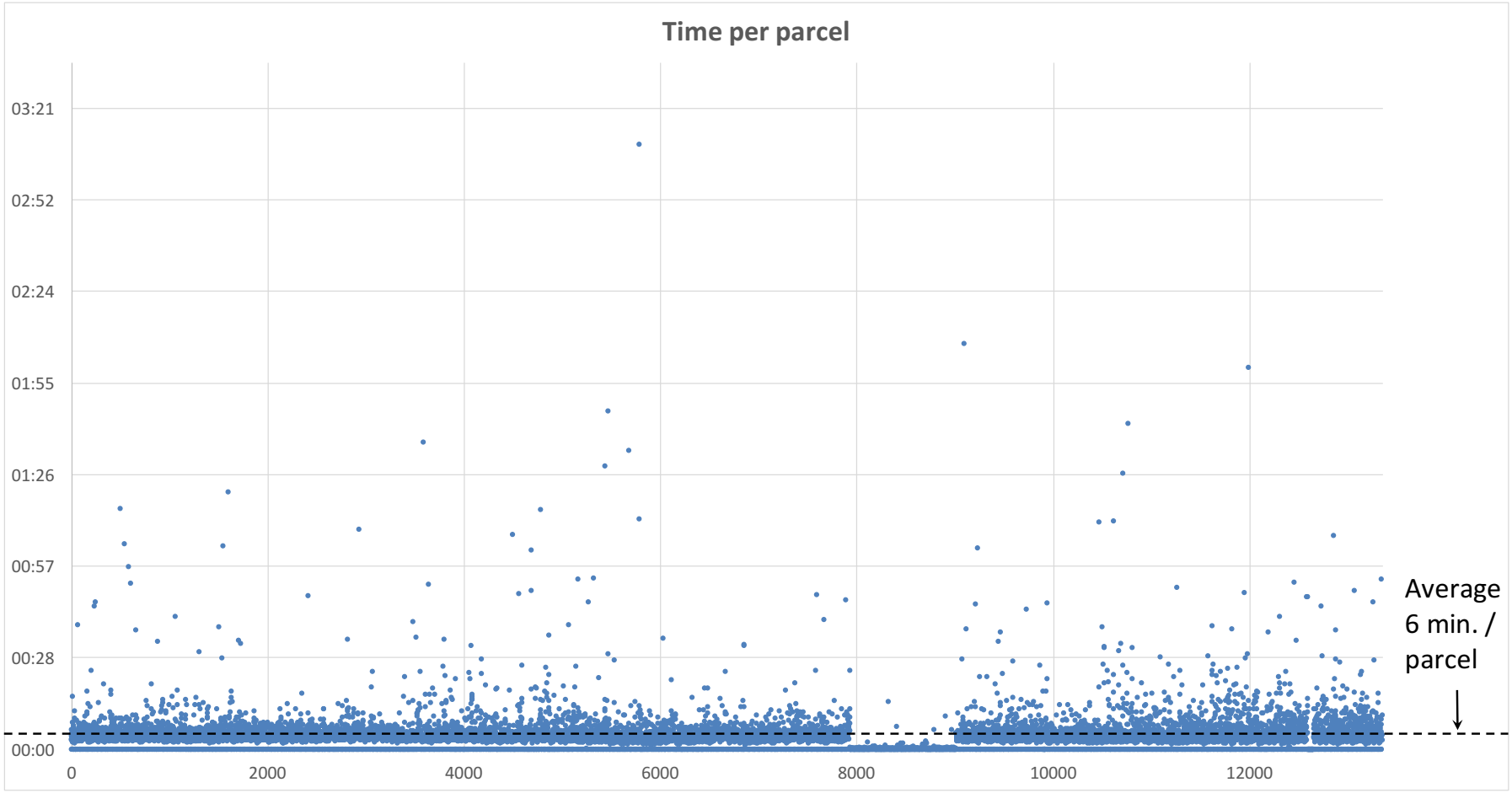
only paid (successful deliveries and collections) units counted



Business & Citylogistics Efficiency
KPI: Working time per parcel

1st July 2015 – 30 June 2016 (n = 13,358)
one point = average distance in metres per parcel for one delivery round =
one driver, one van, one full working day, 7 days/week, full day distance,
only paid (successful deliveries and collections) units counted



Discussion

- Hypotheses verified?
- Questions answered?
- How other papers compare?

Final re-considering of initial project hypothesis, questions & objectives

- Initial **hypothesis**: Is it possible to scale-up the carriers' carrier business model to obtain a better efficiency of urban distribution?

In theory yes

- **Objective** of this study was to verify/falsify this hypothesis and answer the **question**:
  - what could be the **future upscaling of urban distribution centers and electric vehicle use** ?
  - Using one specialist carrier and a fully market oriented business approach

Concluding remarks

Résumé:

- **Trials:** different business models were tested, corresponding to the different types of potential future clients
- **Results**: On most cases tested the distance driven are shorter, the emissions reduced, the daytime traffic decreased, the overall time spent per parcel decrease
- **Limitations:**
  - In one example, it was possible to reduce tailpipe emissions to zero. Only the lifecycle emissions of electric vans production and road surface dust &PM emissions remain.
  - It remains a very difficult business environment for an independent subcontractor, and to increase the market share

How other papers compare?

- Overview, review & prospective papers were essential otherwise the trials would have been meaningless
- No literature on testing different clients and business models benefiting citylogistics efficiency with an approach of real business trial data?
- Findings of this research obtain a distance reduction between 11% and 67%
- Decision makers and modelling authors working with assumptions (such as Rizet et al 2014) find an increase in total distance and costs due to smaller capacity vehicles and additional loading/unloading activities

Approaches required in future

- Work together with research, industry and public authorities to:
  - Find suitable, central consolidation centre locations at prices lower than the real estate market
  - Further test different business models with different clients, different cities
  - Introduce bigger electric vans and trucks
  - Obtain good quality before-after data