

MICHELIN – 2030 LAST MILE DELIVERY MARKET Scenarios and modeling results for China

October 14th, 2013



Prepared for Mr. Erik Grab

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Agenda

Freight last mile delivery 2030 scenarios – China	3
2030 market modeling – China	12
Appendix	
<i>Models Key Assumptions</i>	28
<i>Models detailed results – China</i>	37
<i>Details on Segments</i>	45
<i>Reminder – Last Mile Delivery Trends</i>	57

Section #1

Freight last mile delivery 2030
scenarios – China

Reminder – Overview of Chinese urban mobility patterns



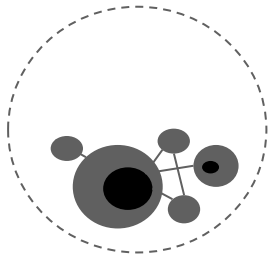
	I. Hub & Spoke	II. Scattered mid size cities	III. Sprawling megacities
Driver	<ul style="list-style-type: none"> • Favoured by central government in order to achieve higher energy / resources efficiency, and protect arable land • Strict environment regulation 	<ul style="list-style-type: none"> • Encouraged by central government in order to improve living conditions and develop Central & Western China • Moderate environment regulation 	<ul style="list-style-type: none"> • Central government unable to prevent local governments from acquiring land from farmers and then reselling it to real estate promoters • Moderate environment regulations
Urban form	<ul style="list-style-type: none"> • Development around one megacity • “Hubs”: Vertical housing • “Spokes”: mid-to-big-size cities with lower density, equal city services and (even better) living conditions 	<ul style="list-style-type: none"> • No megacity in the region • Smaller cities with good public services • Lower city population density 	<ul style="list-style-type: none"> • Sprawling megacities, with vast suburb area • Non development of smaller cities as megacities drain out all resources
People mobility	<ul style="list-style-type: none"> • High share of public transport: metro in “Hubs”, Tram / bus / BRT for “spokes” & suburbs • People may live in one city and work in another city, commuting with High speed train • Emergence of EV & city cars 	<ul style="list-style-type: none"> • Mostly ICE vehicles • People live and work in the same city. • Marginal public transport: Tram / bus / BRT • Limited development of EV & city cars 	<ul style="list-style-type: none"> • Mostly ICE vehicles • A few EVs in city centre • Marginal public transport: Metro in city centre, Tram / bus / BRT in suburbs • People live in suburbs and work in the city centre.
Freight mobility	<ul style="list-style-type: none"> • Strong growth of rail – truck mix • Goods consolidated in warehouses in suburbs + smaller ones downtown • Last mile delivery by E-trucks, and 2/3 wheelers 	<ul style="list-style-type: none"> • Traditional delivery model • Direct delivery by trucks • Some last mile delivery with 2-3 wheelers or E-trucks in city centers 	<ul style="list-style-type: none"> • Some rail – truck mix delivery • Goods consolidated in warehouses in suburbs + smaller ones downtown • Last mile delivery by E-trucks, and 2/3 wheelers

Reminder – Alternatives on urbanization patterns

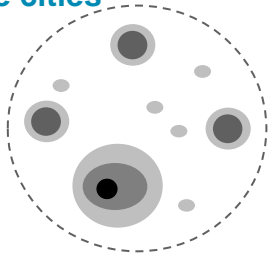
Three scenarios are plausible at country level



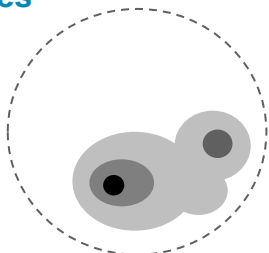
I. Hub & Spoke



II. Scattered mid size cities



III. Sprawling cities



Scenario 1: Regulated Hubs & Spokes development

11 regions

- Shanghai
- Guangzhou-Shenzhen
- Chongqing-Chengdu
- Shenyang-Dalian
- Taiyuan
- Harbin-Changchun
- Beijing-Tianjin
- Xi'an
- Wuhan
- Nanchang
- Nanning

Scenario 2: Mosaic of urbanization patterns

6 regions

- Shanghai
- Guangzhou-Shenzhen
- Chongqing-Chengdu
- Shenyang-Dalian
- Taiyuan
- Harbin-Changchun

Scenario 3: Sprawling urbanization

1 region

- Shanghai

5 regions

- Jinan-Qingdao
- Fuzhou-Xiamen
- Zhengzhou
- Changsha
- Kunming

5 regions

- Jinan-Qingdao
- Fuzhou-Xiamen
- Zhengzhou
- Changsha
- Kunming

2 regions

- Jinan-Qingdao
- Fuzhou-Xiamen

5 regions

- Beijing-Tianjin
- Wuhan
- Xi'an
- Nanchang
- Nanning

13 regions

- Beijing-Tianjin
- Wuhan
- Xi'an
- Nanchang
- Nanning
- Guangzhou-Shenzhen
- Chongqing-Chengdu
- Shenyang-Dalian
- Taiyuan
- Changsha
- Harbin-Changchun
- Kunming
- Zhengzhou

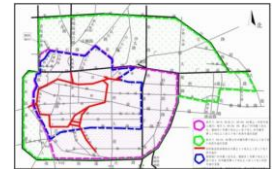
Note: * Regions in the between of different models; Sources: Oliver Wyman analysis

Scenarios China – Emerging trends

Emerging trends are observed today in Chinese cities prefiguring tomorrow's freight delivery patterns



- **Municipalities attempt to monitor urban growth**, by restricting access to rural migrants (Hukou), investing in housing, ...
 - Current Chinese cities are expected to double their size in the next 20 years
- **Increasing environmental regulation nationwide**, impacting particularly mega-regions :
 - Euro 5 restrictions in Beijing, Euro 4 in other cities
 - Truck traffic > 8T prohibited from 6 am to 11 pm within Beijing 5th circle road
- **Development of connectivity and associated new technologies:**
 - In-car or plug-in technologies enabling better traffic information, journey planning etc.
 - Better tracking of traffic by municipalities enabling better congestion management
- Multiplication of **freight mutualization initiatives** by public and private logistics providers, as costs efficiency is a key issue for shippers
 - E.g.: outsourcing of the Venetian Resort, Macao, deliveries to DHL, to consolidate deliveries to all stores and restaurants
- Expansion of **new drop-off and pick-up places** in most mega cities
 - Development of locker boxes in dense areas by dedicated players such as Sposter in Chengdu
- Evolution of freight vehicle mix **towards cleaner vehicles**
 - Shift in logistics providers' fleet mix towards clean vehicles (Ultra Light Vehicles, E-trucks): e.g. of SF-Express's new 3-wheelers
 - Emergence of dedicated last mile delivery providers, with cleaner fleet, such as City-100 in Beijing
- Emergence of **multimodality pilots for freight deliveries**, including first thoughts on combined freight/people transport systems



The intensity and scope of development of these different emerging trends will differ in our last mile delivery scenarios for China

Scenarios China – Differentiating principles

Public authorities capacity to monitor urban development will mainly design the Chinese last mile delivery scenarios



Regulated Hub and Spoke Logistics

- **Strict monitoring of cities development by the local and central government**, leading to the Hub & Spoke configuration for most cities
- Dense and vertical Hubs centralize key economical activities, **including logistics centers for the whole area**
- **High public voluntarism to organize the city logistics**, demonstrated in:
 - **Strict city access restriction and pollution taxation**, to ensure efficiency and low pollution in very dense areas
 - **Infrastructures investments** to enhance traffic: charging stations, rail / river infrastructures encouraging intermodal solutions, ...
 - **Public ITS investment** to improve traffic conditions
 - **High subsidies to switch to cleaner vehicles**
- **Development of “Long-haul to last mile delivery” players**, integrating in their fleet a large share of E-trucks and Ultra Light Vehicles

Space-Intensive Logistics

- **Limited monitoring of cities expansion**, leading to cities sprawling around, forming relatively low density mega regions
- **Limited traffic regulation outside of city centers and higher distance** push private stakeholders to invest in freight efficiency solutions:
 - **Mutualization of freight at several levels**, from cross industry consolidation to city center grouping/ungrouping, to improve transport's efficiency
 - **Massive private investments in Supply Chain ITS**, to improve trucks routing, goods tracking and loading
- **In city centers, regulation pushes the development of last mile delivery providers**, with smaller and cleaner fleets

Scenarios China – Differentiating principles

Early weak signals are observed in 2012 that could drive to both scenarios



Regulated Hub and Spoke Logistics

- Hub & Spoke development of Shanghai



	City centre	Urban area
Population in MM	47,4	142,3
Density ¹	3 631 /km ²	

- **Verticalization of the city**, with limited development of the housing outside of inner suburbs
- **Strict environmental regulation**, limiting access in city center for polluting vehicles
- **Limited reform to Hokuu in Hubs in order to monitor urban population growth in the suburbs**, and better control traffic growth

1. 2010 figures, density of municipality
Source: Oliver Wyman analyses

Space-Intensive Logistics

- Sprawling development of Beijing



	City centre	Urban area
Population in MM ¹	62,0	186,1
Density	1 300 /km ²	

- **Sprawling urbanization**, with extensive construction of housing in suburbs
- **City center access restriction**, with truck traffic forbidden during peak time within the 6th circle road
 - Reinforcement of the city center environmental regulation with the 2013-2017 Clean Air Action Plan
- **Limited regulation outside of city center**, as rampant urbanization is inefficiently monitored

Scenarios China – Overview

Synthesis of China Freight Last Mile Delivery Scenarios



Synthesis of China scenarios

Increase of restrictions for freight delivery

E.g.: LEZ, night deliveries, ...

Development of new dedicated freight delivery areas in cities

E.g.: Specific lanes, bays, lockers

Development of freight consolidation

E.g.: outside of city center platforms, ...

Increase of new vehicles in the freight vehicle mix

E.g.: E-LCV, Ultra Light Vehicles, ...

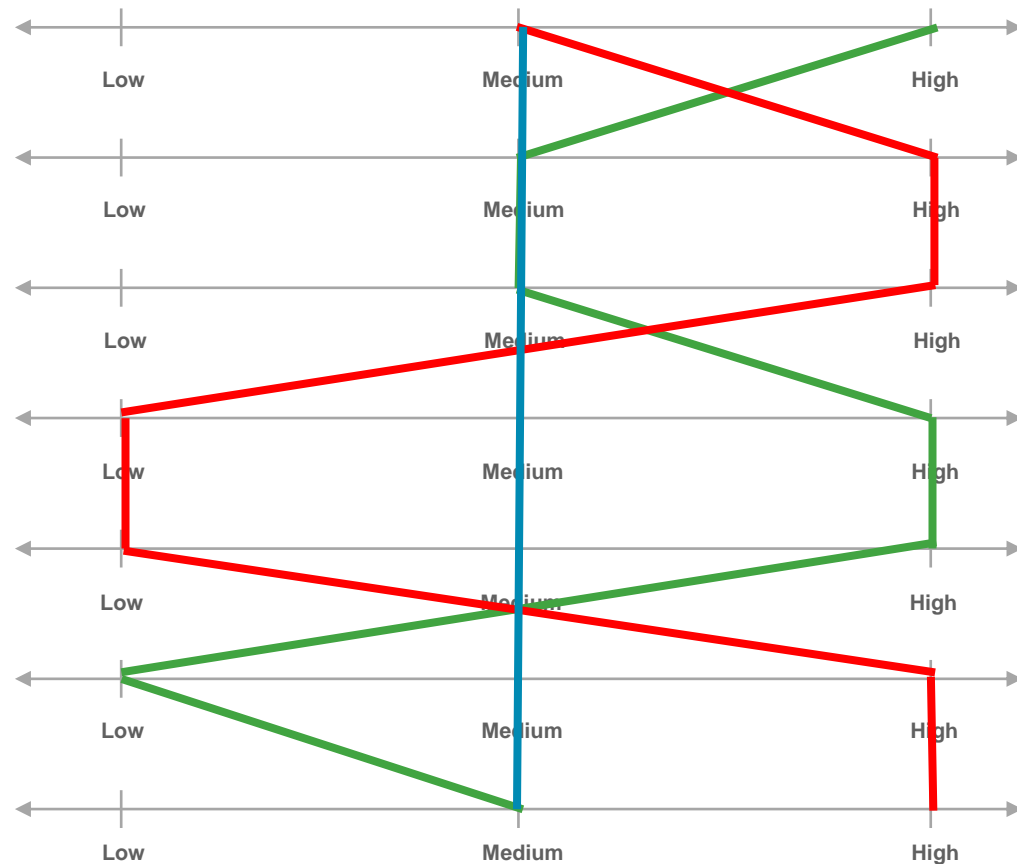
Development of freight transport multimodality solutions

E.g.: river, rail, ...

Increase of new delivery service providers market share

Development of telematics solutions in last mile logistics

- Regulated Hub and Spoke Logistics
- Space-Intensive Logistics
- Mosaic of logistics patterns



Source: Oliver Wyman analyses



1 Last Mile Delivery in China – Hub & Spoke Cities

In Hub & Spoke cities, strict regulation limits inner city traffic and pushes green transport modes

Strict environment regulation applied to the whole city

50% of urban population living in LEZ areas, with strict traffic regulation (loading/unloading, night deliveries, ...)

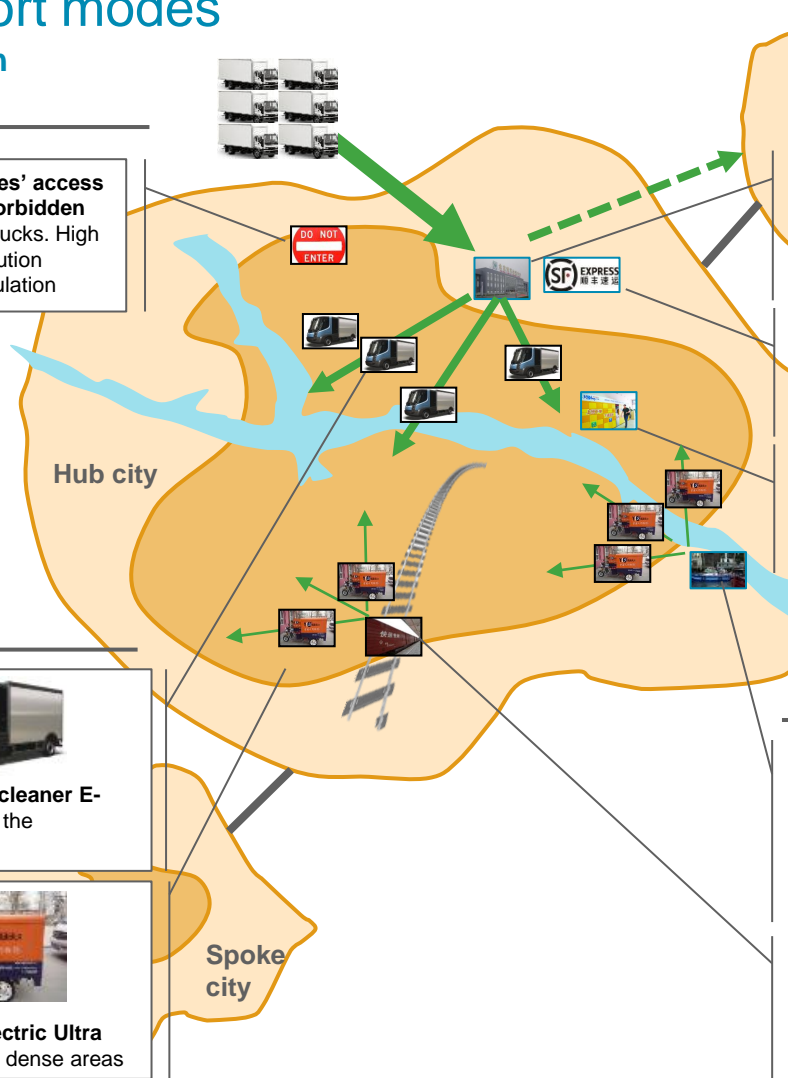
17K person/km² in average in mega cities

Evolution of fleet mix pushed by regulation

50% of light trucks in the urban truck fleet¹

25% of Hybrid & E-truck in sales

6% of total urban freight is transported via Ultra Light Vehicles¹



Higher consolidation of freight traffic



65% of average load factor, thanks to high monitoring and large consolidation platforms

Development of intermodal solutions, pushed by local governments



10% of total urban freight is transported via multimodal solutions¹

- Freight flow
- Urban area
- City center

1. In ton-km
2. Density defined as: urban population/ build-up area
Note: In 2012, average population density in megacities is 13,8 person/km²; Light trucks represent 30% of total freight, Ultra Light Vehicles: 3%, Intermodal: 0%. Average load factor: 40%
© Oliver Wyman
Source: Oliver Wyman analyses



2 Last Mile Delivery in China – Sprawling Cities

In Sprawling cities, space and lower density enable the development of consolidation solutions and the circulation of larger trucks

Lower density cities with limited regulation outside of city center

11,2K
person/km² in
average in mega
cities

**No unloading
10 am – 6 pm**
City access restrictions
limited to **off-peak and
night hours limitation**

P
Municipalities enhance
trucks circulation in town
by **organizing dedicated
space**

**Deployment of traffic
management
solutions** by
municipalities to tackle
congestion issues

Development of new delivery
business models and new players
in restricted city centers

5% of last mile
delivery providers
market share,
specially covering
restricted city
centers

**城市100 共促
联盟**
New last mile
delivery providers
in dense restricted
areas

Limited traffic regulation and higher
distances push private stakeholders to
invest in freight efficiency measures

**Advanced
telematics
solutions** used by
logistics providers
to monitor trucks
efficiency

**Logistics
platform center
in city center** to
group / ungroup
freight

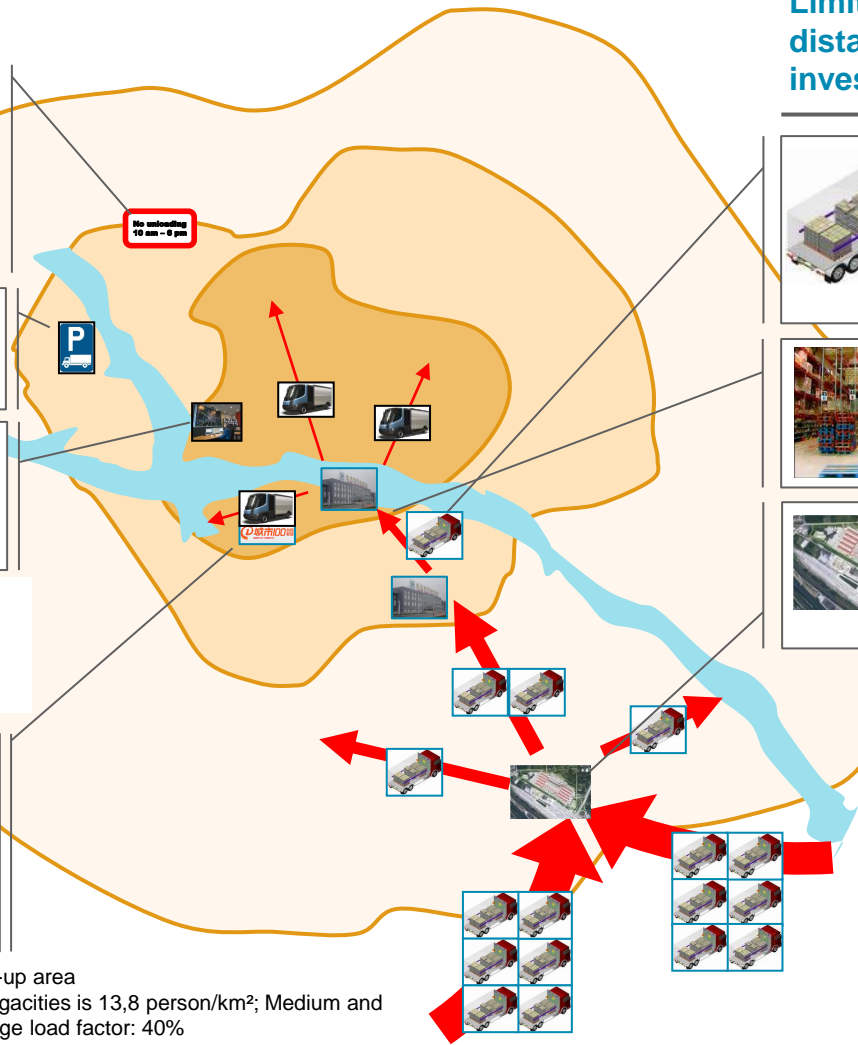
**Cross-industry
consolidation
centers in
periphery of
cities**

4Bn \$
invested annually
in **ITS solutions**, to
improve the supply
chain efficiency

55% of average
load factor, thanks
to cross industry
consolidation

50% of medium
and large trucks in
the urban truck
fleet¹, as space is
available and
restrictions are low

→ Freight flow
Urban area
City center



1. In ton-km
2. Density defined as: urban population/ build-up area
Note: In 2012, average population density in megacities is 13,8 person/km²; Medium and large trucks represent 65% of total freight, average load factor: 40%
Source: Oliver Wyman analyses
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Section #2

2030 market modeling – China

Last Mile Delivery Modeling – Modeling principles

The modeling of each scenarios rely on 5 factors, that will vary regarding regulation status, technological progress, freight delivery efficiency etc.



Tonnage in tons

- **Based on economical factors** such as urban population, GDP per segment, segments mix, etc.

- **Limited variation per scenario** as uncertainties on economic growth in China are limited

Source: Oliver Wyman analyses



Mileage in km

- **Based on:**
 - **City size:** the larger the city, the higher the distance to drive
 - **Segments:** different delivery patterns per segment

- **Variation by scenario linked to the different city sizes and freight routing optimization capacity**



Vehicle category

- **6 categories:**
 - Small vans (<3,5T)
 - Small trucks (3,5T to 6T)
 - Mid-duty trucks (6T to 16T)
 - Heavy-duty trucks (>16T)
 - Ultra Light Vehicles
 - Rail / river
- **Based on the current vehicle mix per segment**

- **Variation of fleet evolution by segments linked to different regulations by scenario**



Energy mix

- **3 categories:**
 - EV
 - xHEV
 - ICE
- **Based on a utility analysis of each engine type per vehicle category, regarding the following factors:**
 - TCO / km
 - Average speed
 - Comfort reliability
 - Ease of use
 - Range of action

- **Variation of the utility of each engine type by scenarios**



Load factor

- **Based on the observed current average**

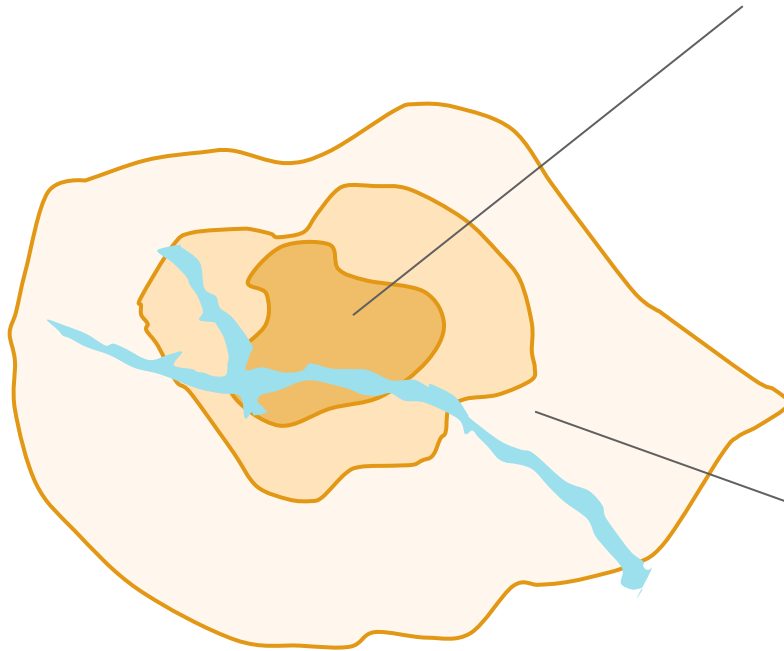
- **Variation by scenario regarding the consolidation efficiency**

Last Mile Delivery in China – Overview by City Type

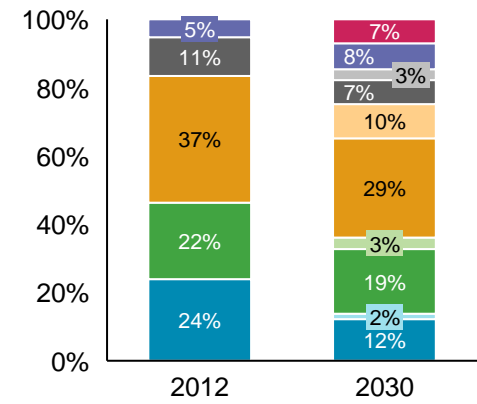
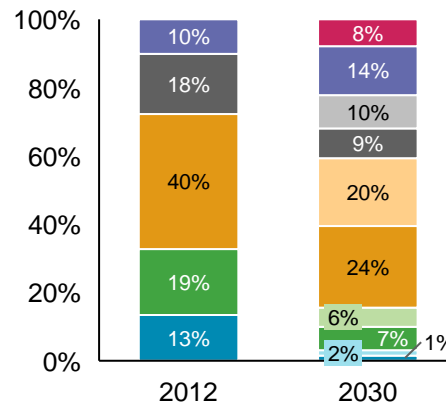


The different patterns of deliveries have a major impact on the vehicle mix, differentiated between City Center and Urban Area

Last mile delivery breakdown by city type, vehicle category and engine types in 2030
China, in BN ton-km



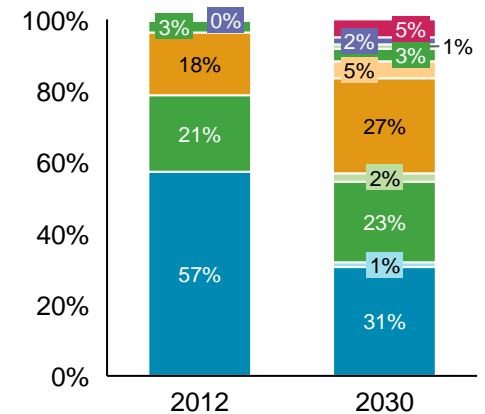
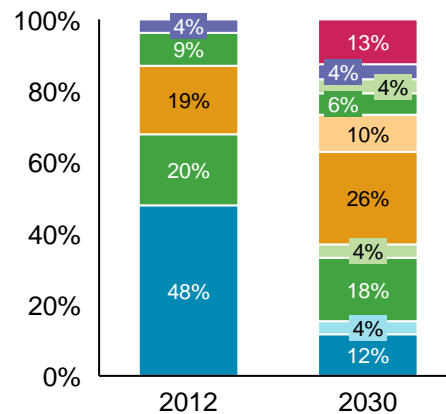
City centers



Hub & spoke

Sprawling city

Urban Area



Hub & spoke

Sprawling city

Source: Oliver Wyman analysis

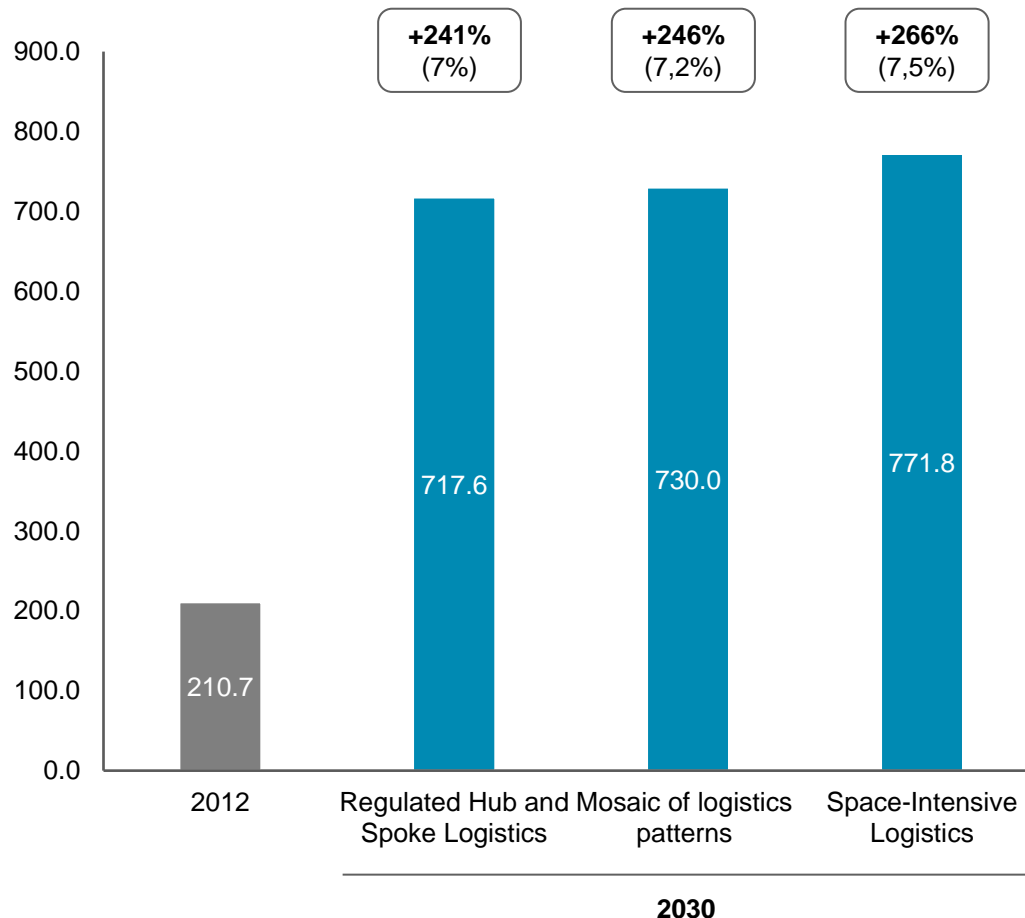
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Last Mile Delivery Scenarios in China – Overview



The different evolution of the Chinese cities along these city types will define different volumes of last mile delivery traffic

Urban last mile delivery volumes per scenario and growth China, in BN ton-km, growth and (CAGR)



Source: Oliver Wyman analysis

Main insights

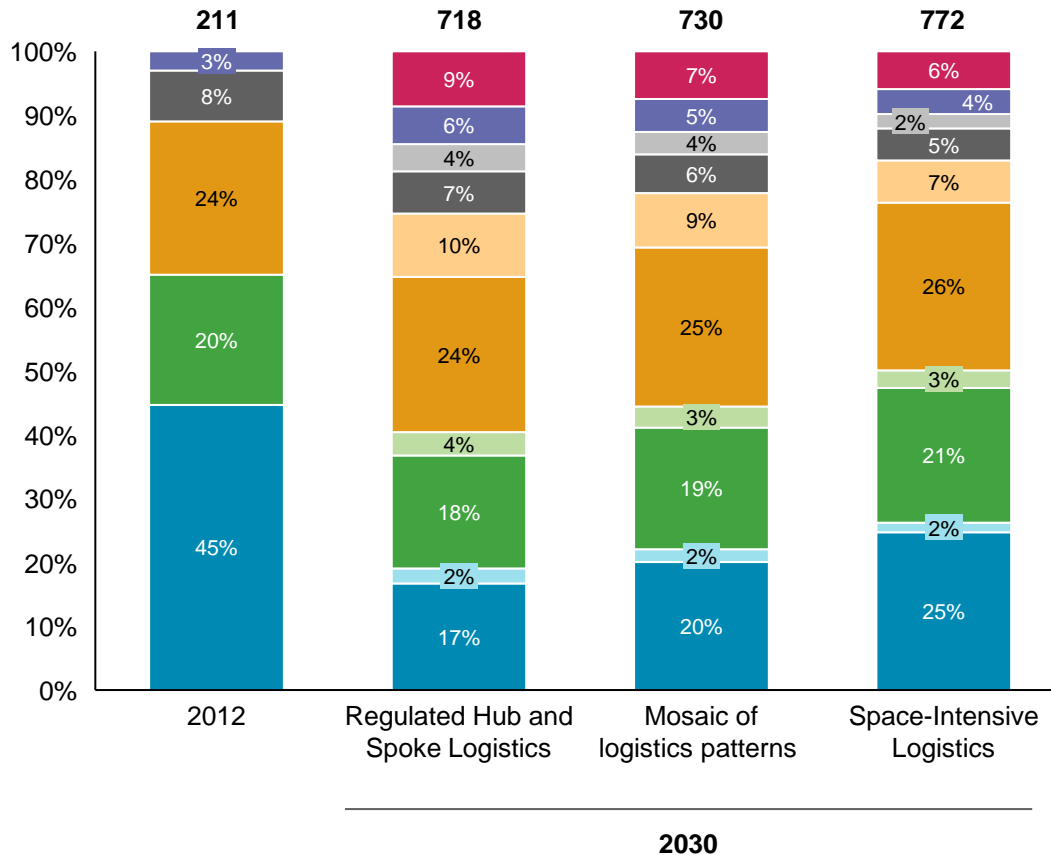
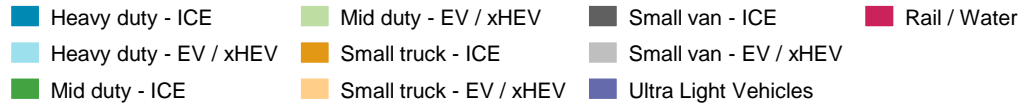
- High growth of urban freight logistics, pushed by fast growing urban population (+58% by 2030, i.e. + 380 MM inhabitants) and GDP growth (7,1%)
- **Regulated Hub and Spoke Logistics**
 - **Mainly Hub and Spoke cities**
 - **Strict monitoring of cities** development by the local and central government, and strict environmental regulation to improve quality of life
 - **Freight efficiency** is thus one of the main public concerns
- **Space-Intensive Logistics**
 - **Mainly Sprawling cities**
 - **Limited monitoring of cities expansion**, leading to cities sprawling around, forming relatively low density mega regions
 - The available space is favorable for the development **new space-intensive business models** (bigger trucks, mutualization, etc)
- **Mosaic of urbanization patterns**
 - Different regions choose diverse urban development patterns

Last Mile Delivery Scenarios in China – Overview

Breakdown of scenarios by vehicle categories and engine types



Freight traffic breakdown by vehicle categories and engine types China, in BN ton-km



Main insights

- **Drastic change in urban freight fleet in Hub & Spoke cities**, pushed by public voluntarism and regulation
 - **65% load factor** thanks to encouraged consolidation
 - **20% of EV and xHEVs** in total freight traffic
 - **Reduction of HDVs in the urban fleet**
 - **Emergence of alternative freight transport solutions** such as rail and barges
 - **Development of Ultra Light Vehicles to access dense areas:** 6% of total freight traffic
- **Efforts focused on the improvement of traffic in Sprawling cities:**
 - **55% load factor** thanks to ITS investments by private stakeholders and incentives by public authorities (space allocation, ...)
 - **13% of EV and xHEVs** in total freight traffic, to access restricted city centers
 - **Lower decrease of average fleet weight, as space is available:**
 - Lower HDV decrease outside of city centers
 - Lower Small Vans ratio vs. Small Trucks
- **Slight changes in the urban freight business model of Mid-Size cities**, in line with continuous efforts to have a cleaner urban freight fleet
 - **50% load factor** as smaller city size allows direct deliveries

Source: Oliver Wyman analysis

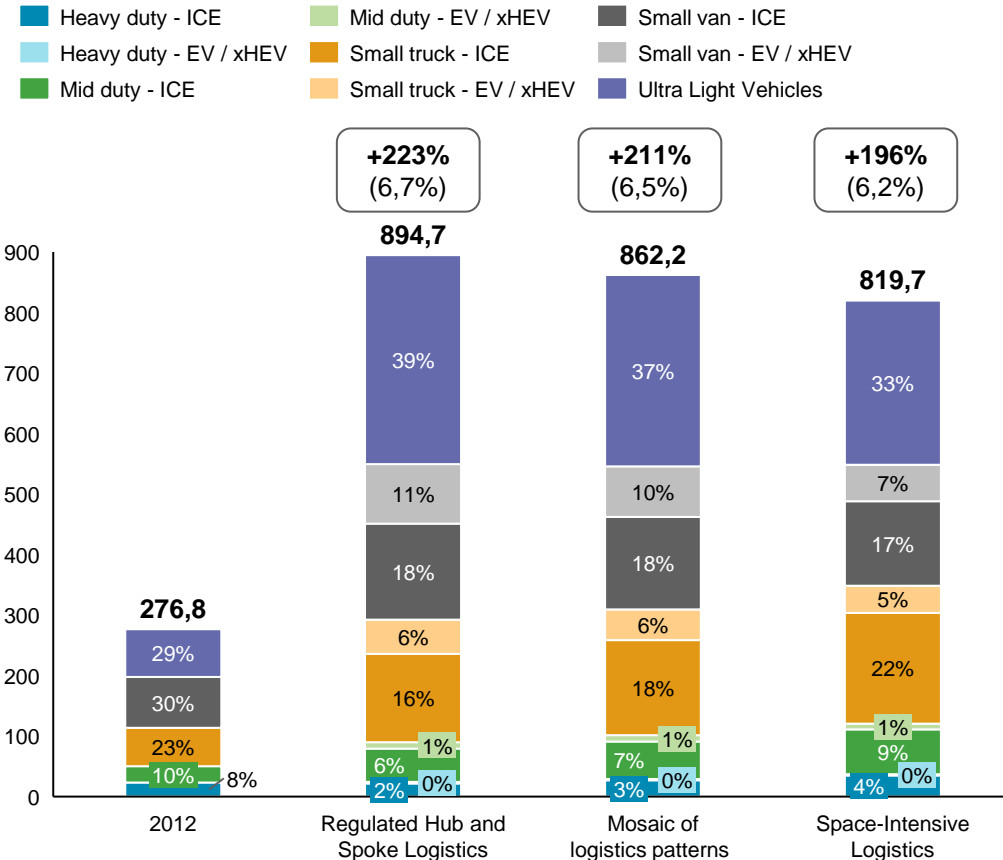
© Oliver Wyman

Last Mile Delivery Scenarios in China – Overview



In scenario #1, the shift towards lighter vehicles will have a significant positive impact on the total mileage of urban freight transport

Urban last mile delivery total mileage by vehicle type and growth China, in BN vehicle km, growth and (CAGR)



Main insights

• Regulated Hub and Spoke Logistics

- Regulation pushes providers to shift towards **lighter vehicles** to enter the city centers : 45% of the total traffic is done with trucks lighter than 6 tons
- Increase in **Ultra Light Vehicles market share**: 6% of total freight traffic
- The shift in vehicle mix towards these lighter vehicles has a positive impact on the total freight mileage
- **Higher load factors and move to rail / water** offset part of the vehicle kilometers' growth: 6,7% CAGR

• Space-Intensive Logistics

- Higher distances due to sprawling cities, compensated by:
 - Relatively lax environmental regulations outside of city centers and available space **limit the shift towards lighter trucks**: 40% of the total traffic
 - High load factors in Sprawling cities (55%) pushed by public incentives, and investments in ITS to improve intelligent trucks routing improve freight efficiency
- As a result distance in vehicle kilometers increases at a comparatively low pace: 6,2% CAGR

Source: Oliver Wyman analysis

2030

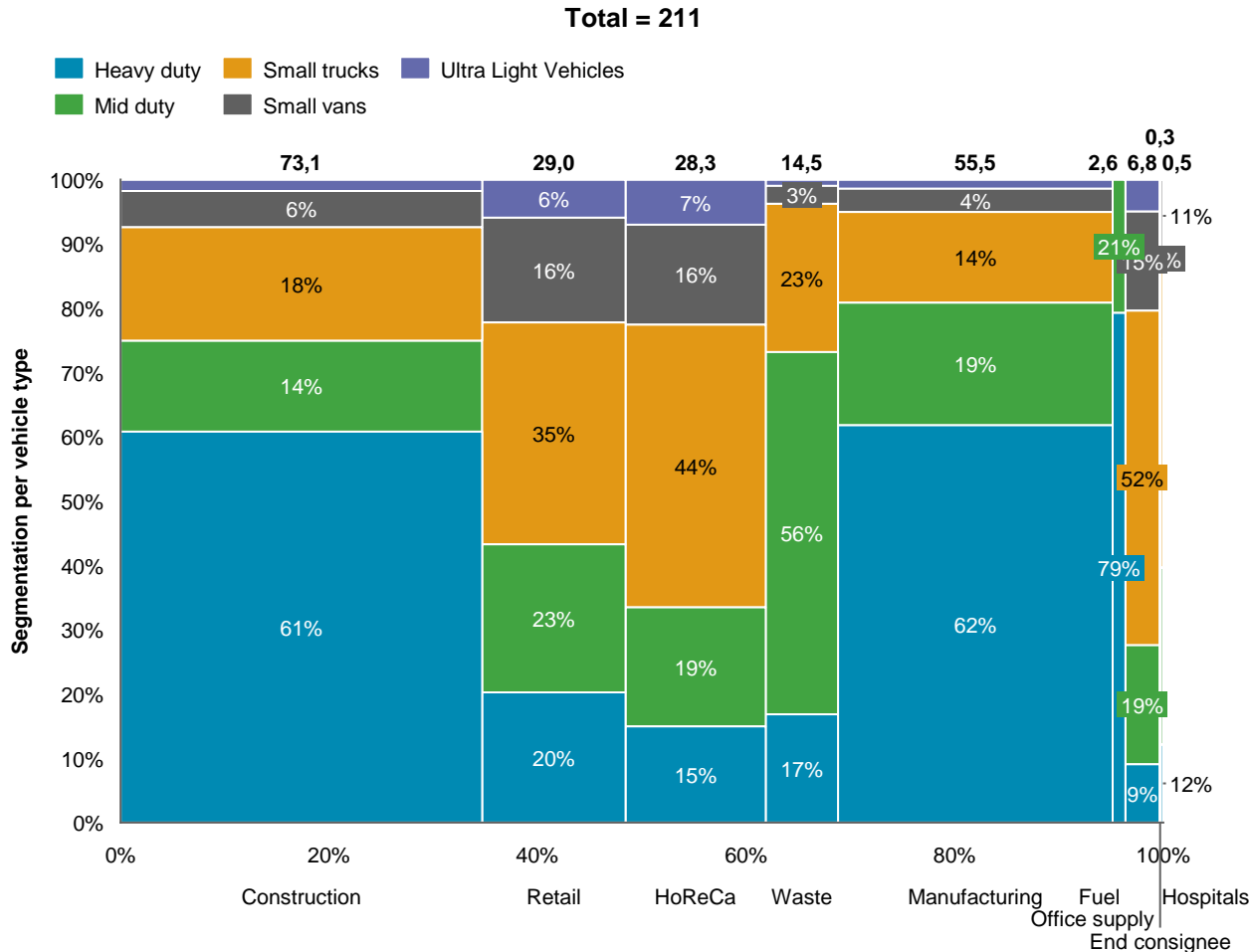
Baseline 2012 (1/3)

Breakdown by segment and vehicle category in 2012



Last mile delivery breakdown by segment and vehicle category China, in BN ton-km

Key assumptions



- **652 MM urban population in**
 - 190 MM living in Hub & Spoke cities
 - 214 MM living in Mid-size cities
 - 248 MM living in Sprawling cities
- **Vehicle split varies by segment**
 - Heaviest vehicles generally used in Construction, Manufacturing, Waste and Fuel
 - Lighter vehicles used in End-Consignee, Retail, Office supply and HoReCa
- **Avg. length of last mile dependent on city type and segment**
 - Hub & Spoke: 60 – 100 km
 - Mid-size: 45 – 75 km
 - Sprawling: 65 – 115 km
- **See details of sectors in Appendix**

Source: National Bureau of Statistics; Oliver Wyman analysis

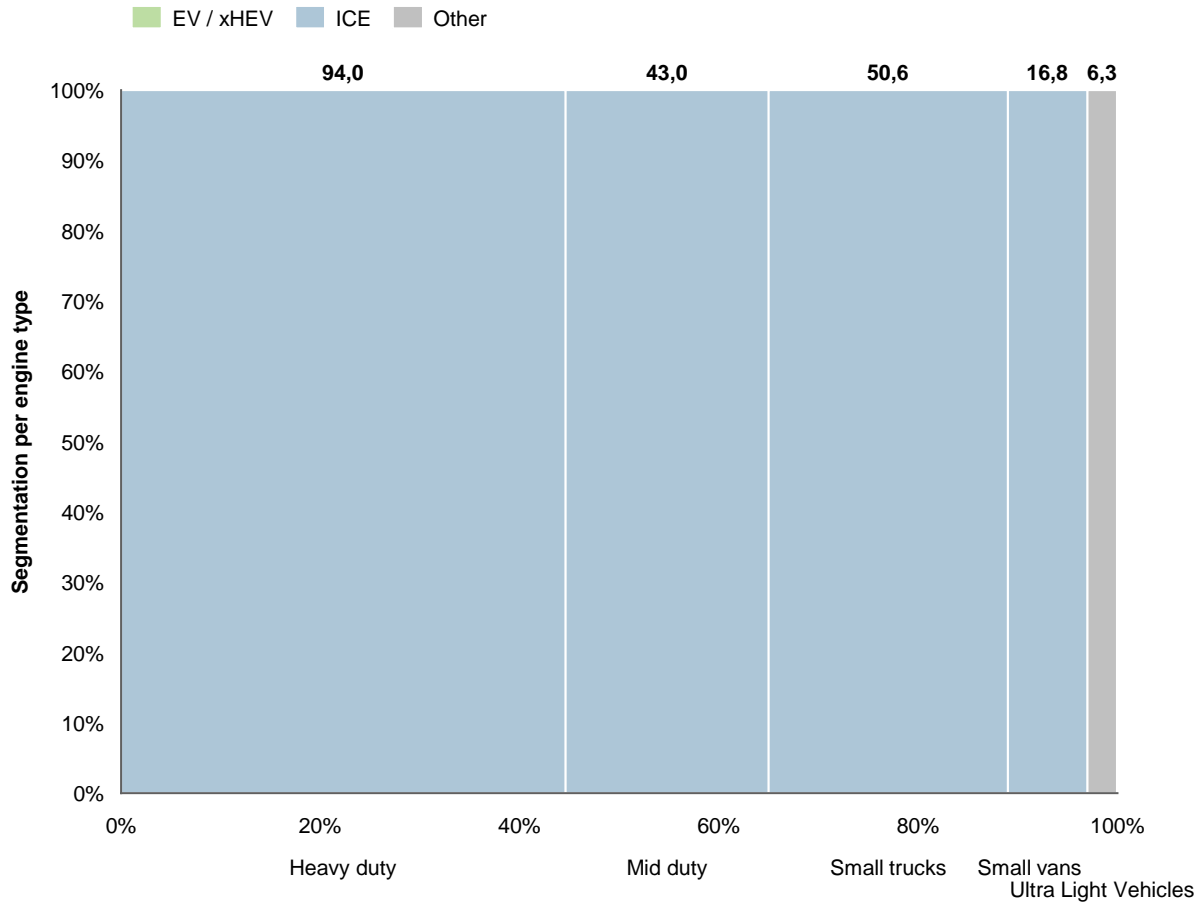
Baseline 2012 (2/3)

Breakdown by vehicle category and engine type in 2012



Last mile delivery breakdown by vehicle category and engine type China, in BN ton-km

Total = 211



CV classifications

Type

Illustration

Small van
(<3,5T)



Small truck
(3,5-6T)



Mid duty truck
(6T-16T)



Heavy duty truck
(>16T)



Source: Oliver Wyman analysis

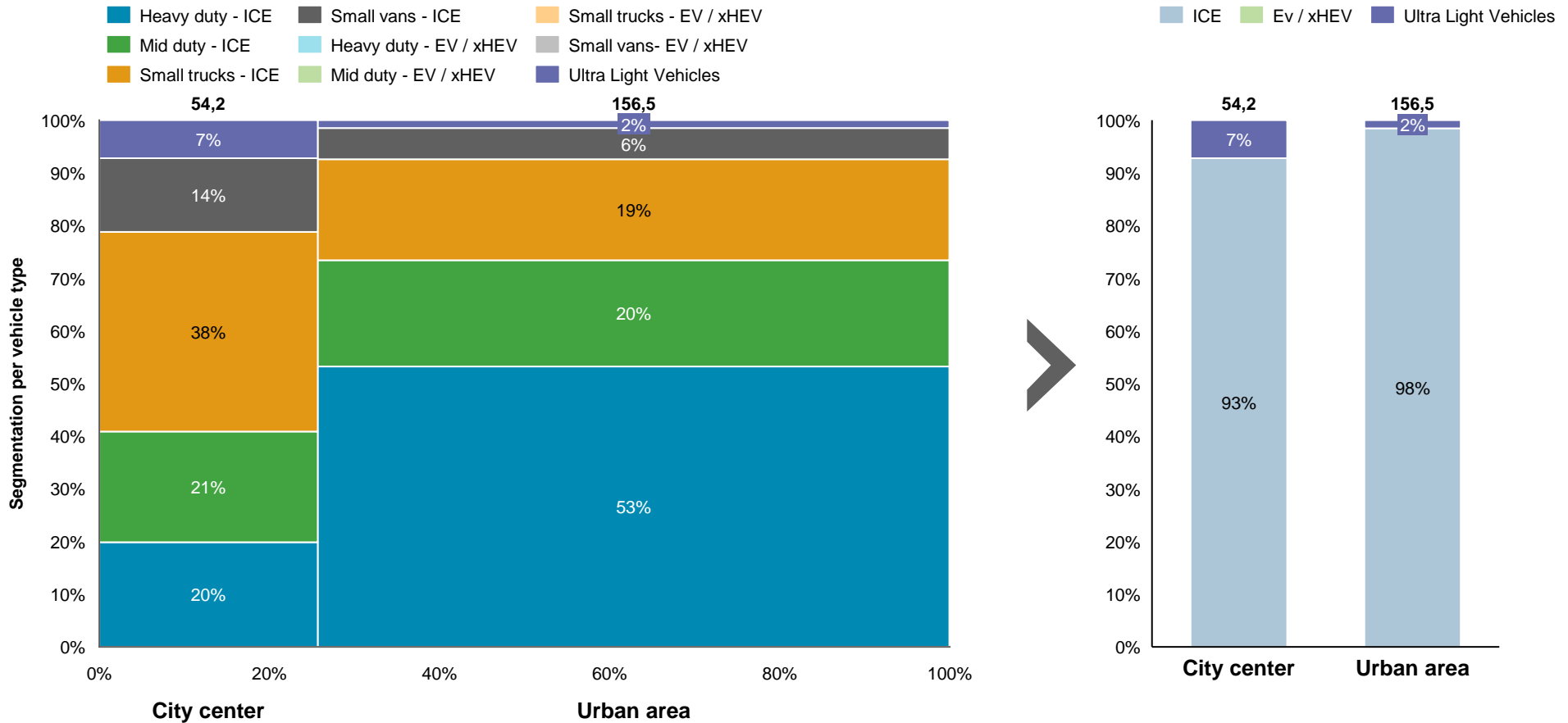
Baseline 2012 (3/3)

Breakdown by vehicle category and city area in 2012



Last mile delivery by vehicle category, engine type and city area China, in BN ton-km

Total = 211



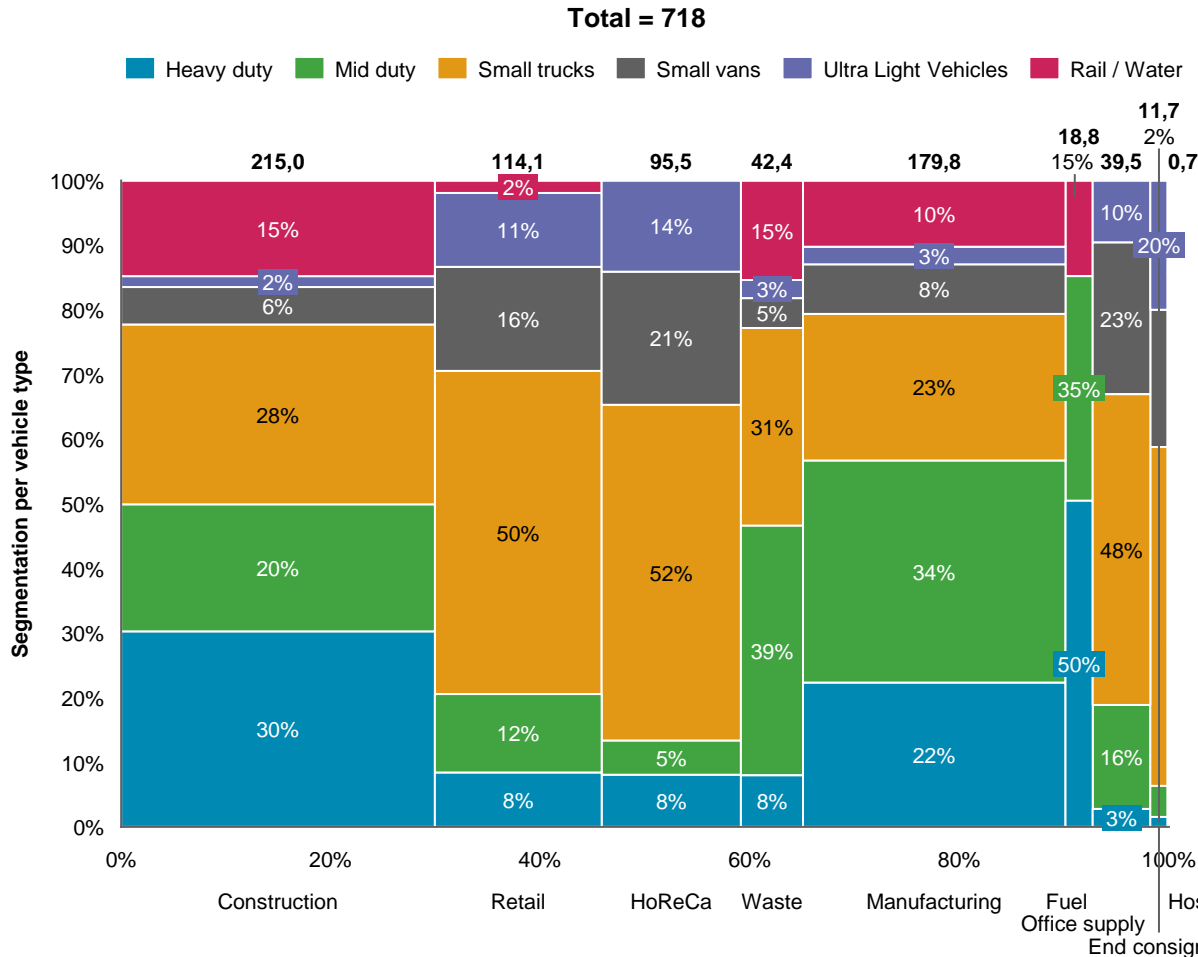
Source: Oliver Wyman analysis

1 Scenario 1: Regulated Hub and Spoke Logistics (1/3) Breakdown by segment and vehicle type in 2030



Scenario #1: Last mile delivery breakdown by segment and vehicle category
China, in BN ton-km

Main insights



- **Growth of last mile freight traffic less pronounced than in other scenarios** due to stricter monitoring by Municipalities of the freight traffic and its impact on the environment and congestion
 - Urban last mile delivery expected to increase by a CAGR of 7,0%

Most impacted segments

- **Construction, Waste and Manufacturing:**
 - Decrease in HDV market share, as they're restricted in city centers and replaced mainly by intermodal solutions (mainly for bulk deliveries)
- **Retail & HoReCa**
 - Most HDVs are replaced by better loaded Small trucks and Small Vans
 - Better mutualization outside of city center pushes the share of Smaller Trucks higher, compared to Small vans
 - Development of Ultra Light Vehicles for city centers and home deliveries
- **End Consignee**
 - Shift to lighter vehicles – small trucks, small vans and Ultra Light Vehicles – more adapted to city logistics

Source: Oliver Wyman analysis

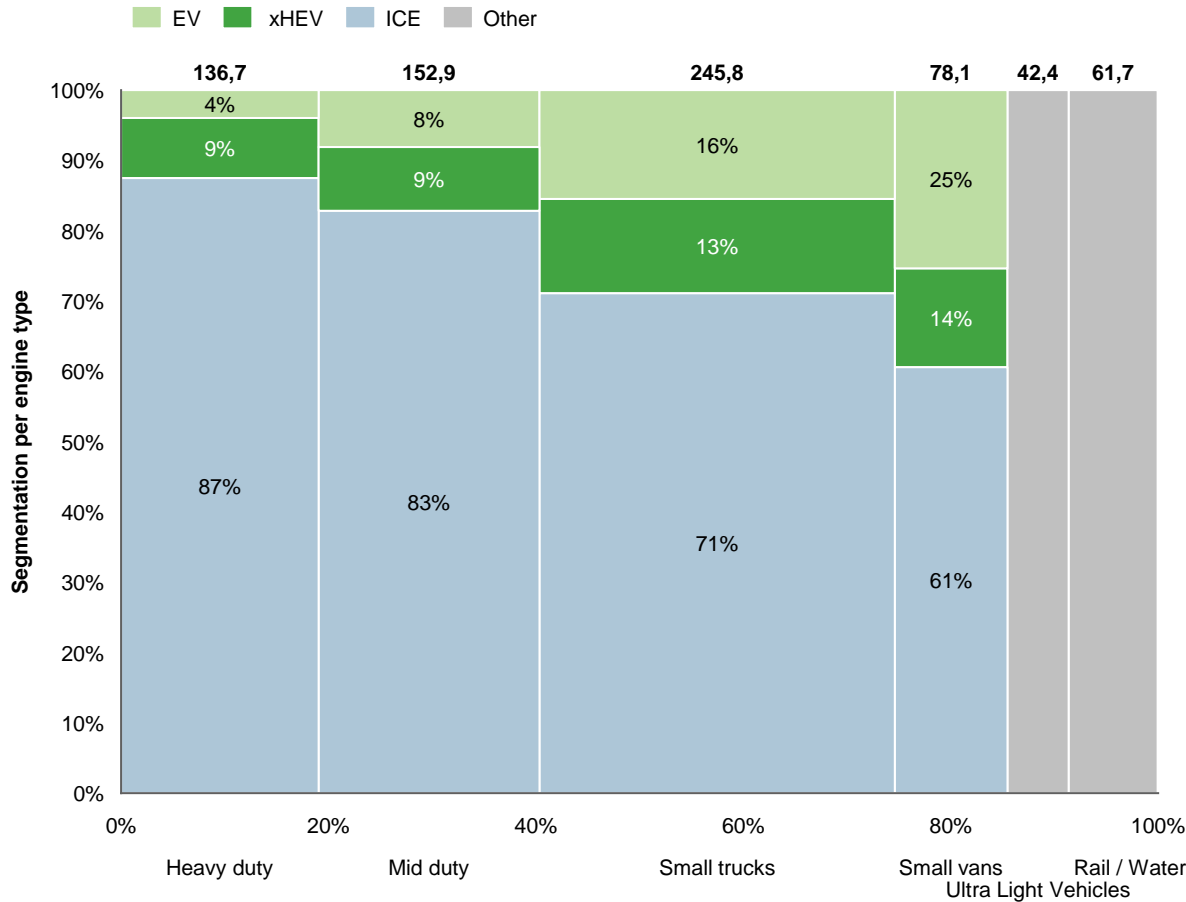
1 Scenario 1: Regulated Hub and Spoke Logistics (2/3) Breakdown by vehicle category and engine type in 2012



Scenario #1: Last mile delivery breakdown by vehicle category and engine type

China, in BN ton-km

Total = 718



Main insights

- **Development of E-trucks pushed by the strict environmental regulation and development of LEZ mainly in city centers**
 - 25% of Hybrid & E-truck in sales
 - 20% of total ton.km traveling in cities is performed with an Electrical or Hybrid vehicles, mainly in city centers
- **~9% of total ton.km travels in cities through new intermodal solutions such as trains / barges**
- **~6% of total ton.km travels in cities through electrical Ultra Light Vehicles, mainly in city centers**

Source: Oliver Wyman analysis

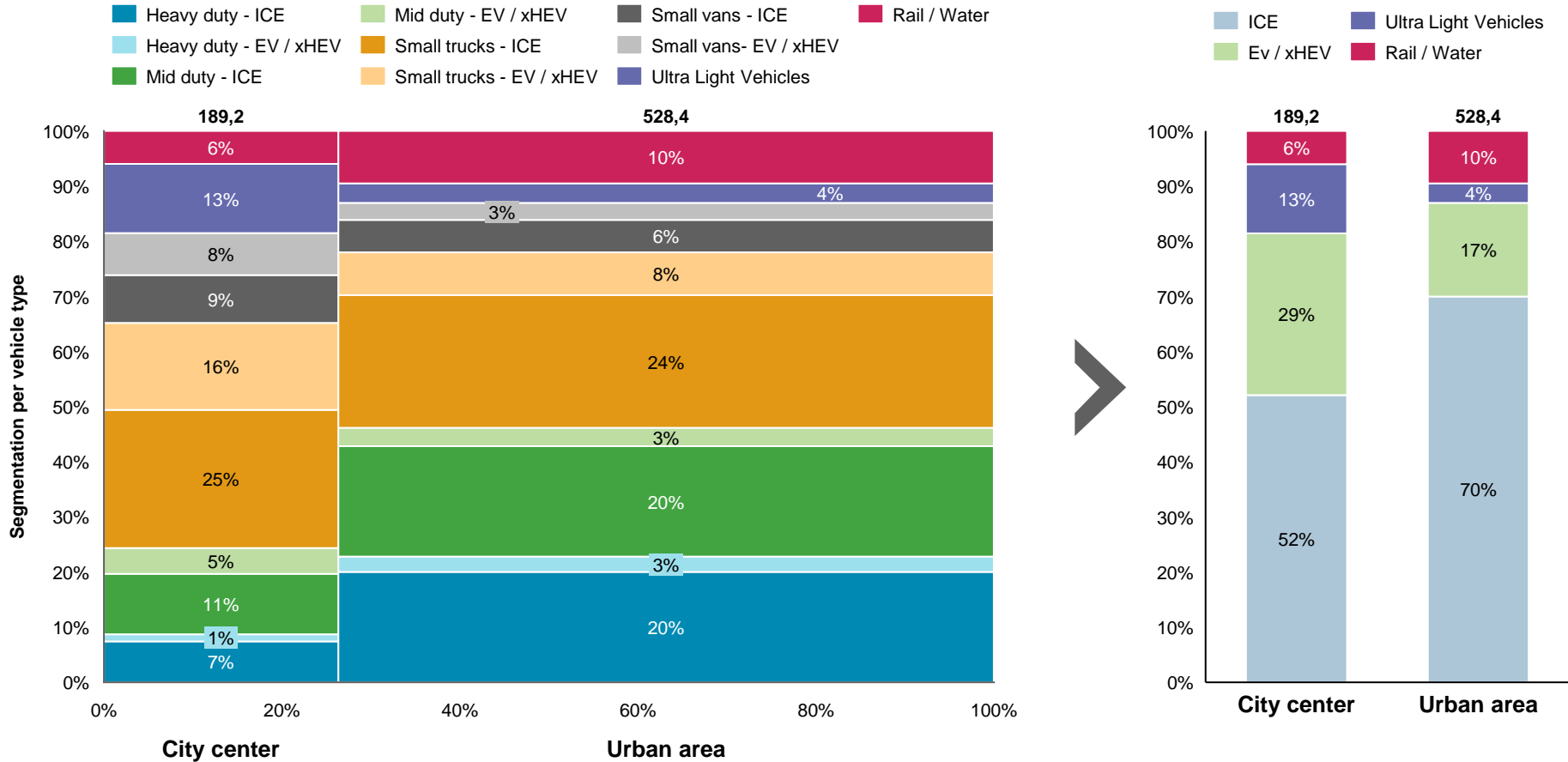
1 Scenario 1: Regulated Hub and Spoke Logistics (3/3)

Breakdown by vehicle category, engine type and city area in 2012



Scenario #1: Last mile delivery by vehicle category, engine type and city area China, in BN ton-km

Total = 718

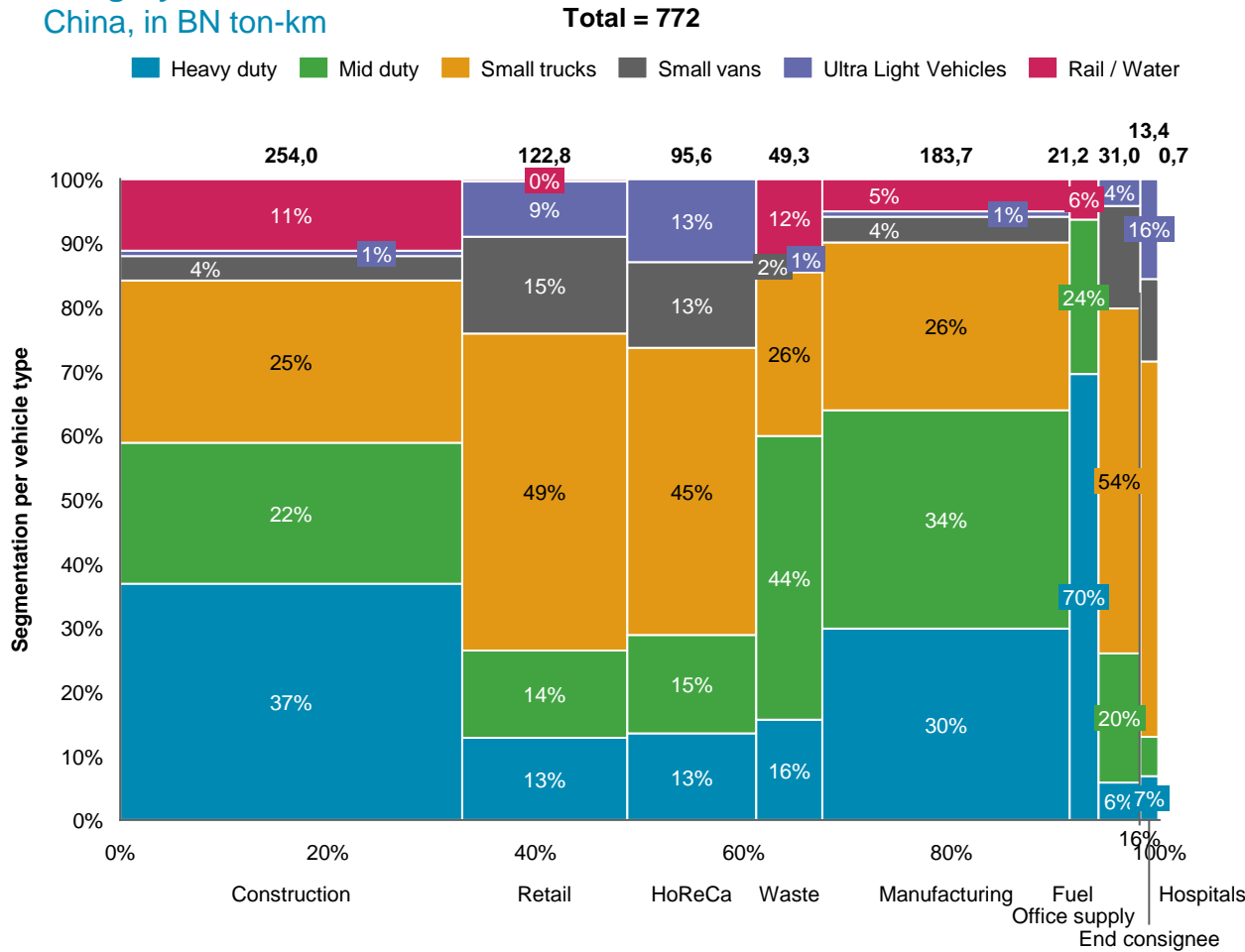


Source: Oliver Wyman analysis

3 Scenario 3: Space-Intensive Logistics (1/3) Breakdown by segment and vehicle type in 2030



Scenario #3: Last mile delivery breakdown by segment and vehicle category China, in BN ton-km



Source: Oliver Wyman analysis

Main insights

- Urban last mile delivery is expected to **increase by a CAGR of 7,5% to 772 Bn ton.km**, pushed up by higher mileage due to larger sprawling cities

Most impacted segments

- Construction, Waste and Manufacturing:**
 - Development of housing in suburbs limit the decrease of HDVs in the Construction fleet mix
 - Emergence of intermodal solutions to replace HDVs in dense areas
- Retail & HoReCa**
 - Better mutualization at different level pushes the share of better loaded lighter trucks
 - Higher ration of Small trucks compared to small vans, linked to higher distances
 - Development of Ultra Light Vehicles to supply city centers and dense areas from inner-city platforms
- End Consignee**
 - Shift to lighter vehicles – small trucks, small vans and Ultra Light Vehicles – more adapted to city logistics

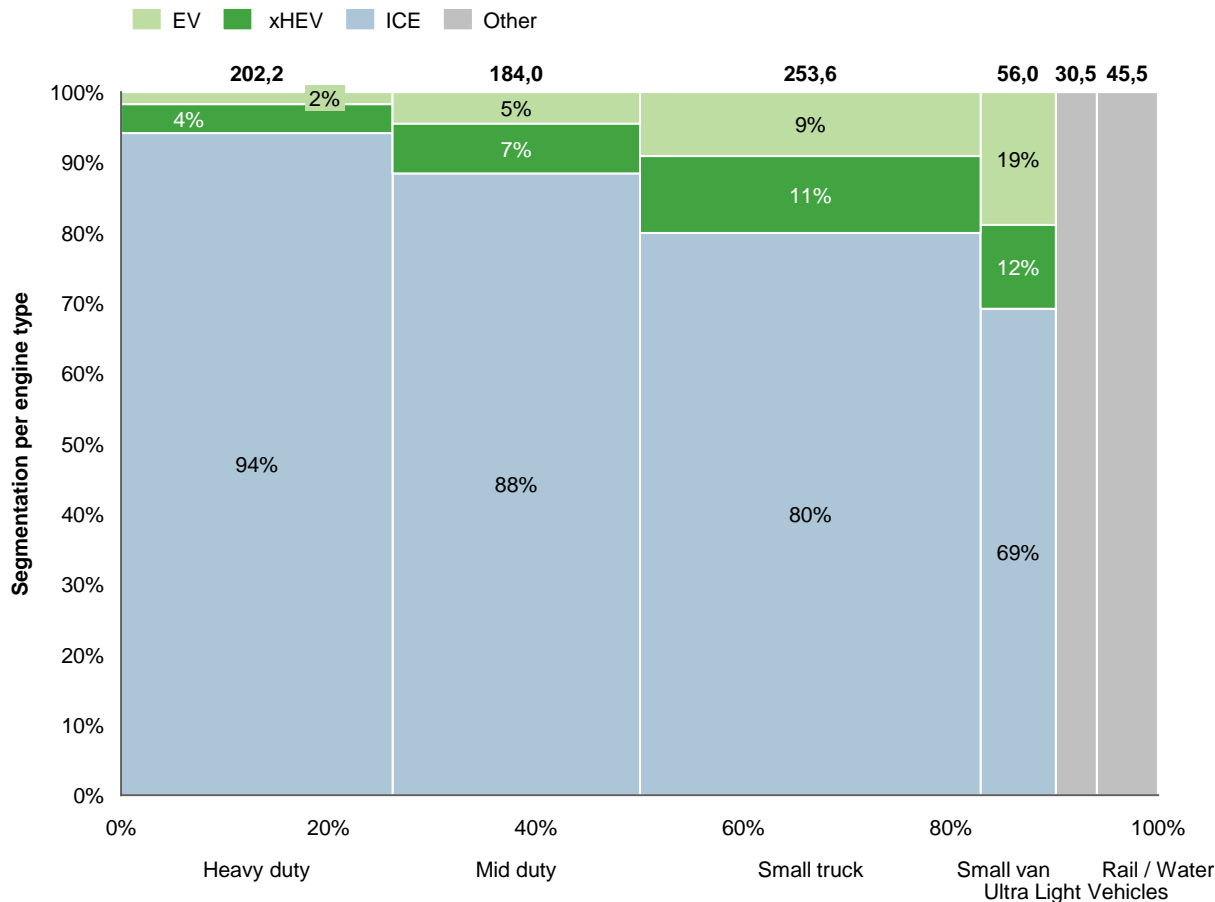
3 Scenario 3: Space-Intensive Logistics (2/3) Breakdown by vehicle category and engine type in 2012



Scenario #3: Last mile delivery breakdown by vehicle category and engine type

China, in BN ton-km

Total = 772



Main insights

- **Breakthrough innovations in batteries and high public incentives** allow the large deployment of EV technologies in freight vehicles:
 - **15% of Hybrid & E-truck in sales in 2030**
 - **13% of total ton.km** traveled in cities is performed with an Electrical or Hybrid vehicles, particularly pushed by light trucks
- City centers access restrictions and connectivity enhancement helps developing **intermodal solutions as well**
 - **6% of total ton.km** in cities traveled with rail / river solutions

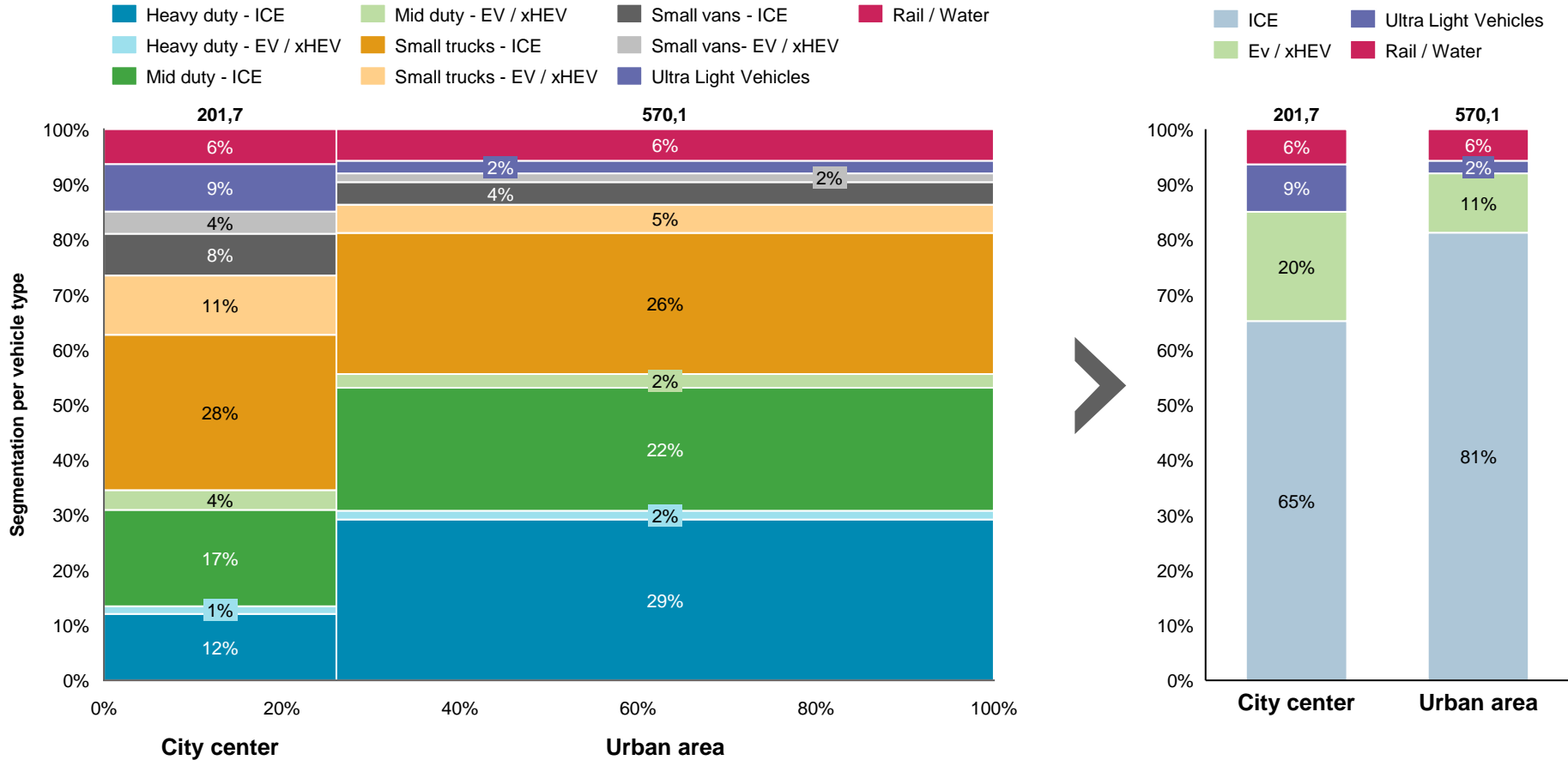
Source: Oliver Wyman analysis

3 Scenario 3: Space-Intensive Logistics (3/3) Breakdown by vehicle category, engine type and city area in 2012



Scenario #3: Last mile delivery by vehicle category, engine type and city area China, in BN ton-km

Total = 772



Source: Oliver Wyman analysis

Major trends and impacts on the Chinese Scenarios



Trends	Scenario #1: Regulated Hub and Spoke Logistics	Scenario #3: Space-Intensive Logistics
Stricter City regulation <ul style="list-style-type: none"> • Access restrictions • Taxation on pollution • Night / off-peak deliveries 	<ul style="list-style-type: none"> • - 40% of HDV / MDV market share increase in the total freight traffic • - 60% of HDV market share decrease in city centers • 29% of E-trucks' market share in city centers 	<ul style="list-style-type: none"> • - 32% of HDV market share decrease in city centers • 20% of E-trucks' market share in city centers
New logistics patterns <ul style="list-style-type: none"> • Mutualization inside city centers • Mono-industry consolidation • Cross-industry consolidation • New drop-off / pick up points 	<ul style="list-style-type: none"> • + 65% of average load factor • + 43% of Small trucks' market share increase in the total freight traffic • 9% of intermodal solutions' market share increase in the total freight traffic 	<ul style="list-style-type: none"> • + 40% of average load factor • + 28% of MDVs and Small Truck market share increase in the urban area freight traffic • - 10% of Small vans market share decrease in the total freight traffic • 6% of intermodal solutions' market share increase in the total freight traffic
New delivery services providers	<ul style="list-style-type: none"> • + 40% of Small Vans market share increase in the total freight traffic • + 100% of Ultra Light Vehicles market share increase in the total freight traffic as "Long-haul to last mile delivery" providers expand 	<ul style="list-style-type: none"> • + 20% of Ultra Light Vehicles market share increase in city centers, as last mile dedicated providers expand
New consolidation areas	<ul style="list-style-type: none"> • ~ x5 number of logistic platforms, outside of city centers 	<ul style="list-style-type: none"> • ~ x15 number of logistic platforms, outside and inside of city centers

Note: Market share defined as part of the total ton.km
 Source: Oliver Wyman analysis
 © Oliver Wyman

Appendix #1

Models Key Assumptions

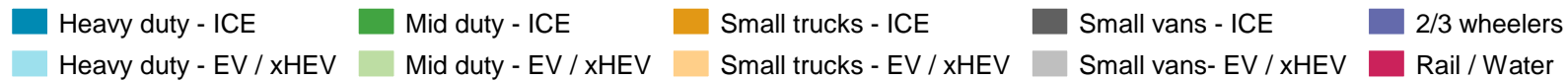
Last Mile Delivery Scenarios in China – Overview by City type



These different patterns of deliveries have a major impact on the vehicle mix, differentiated between City Center and Urban Area

Last mile delivery breakdown by city type, vehicle category and engine types in 2030

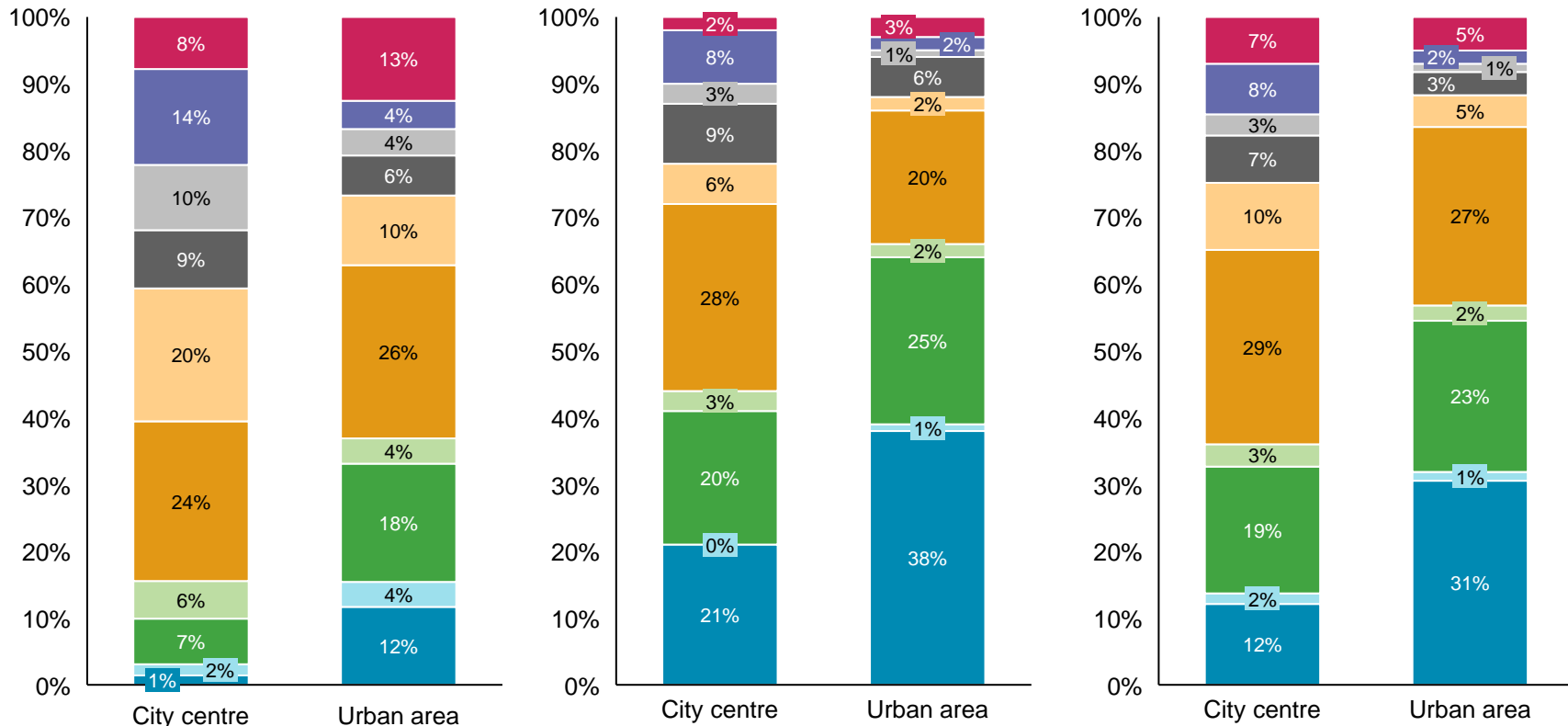
China, in BN ton-km



Hub & Spokes

Mid-Size cities

Sprawling cities



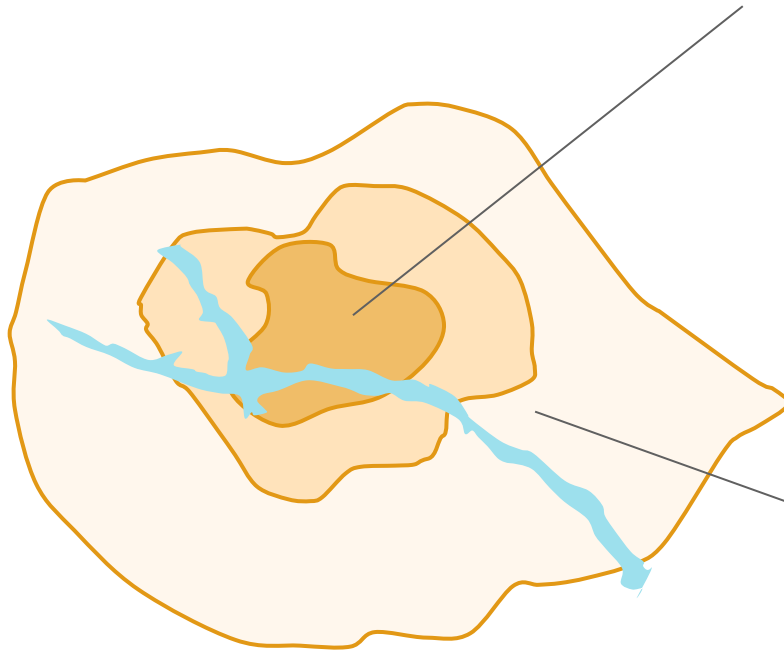
Source: Oliver Wyman analysis

Last Mile Delivery in China – Overview by City Type

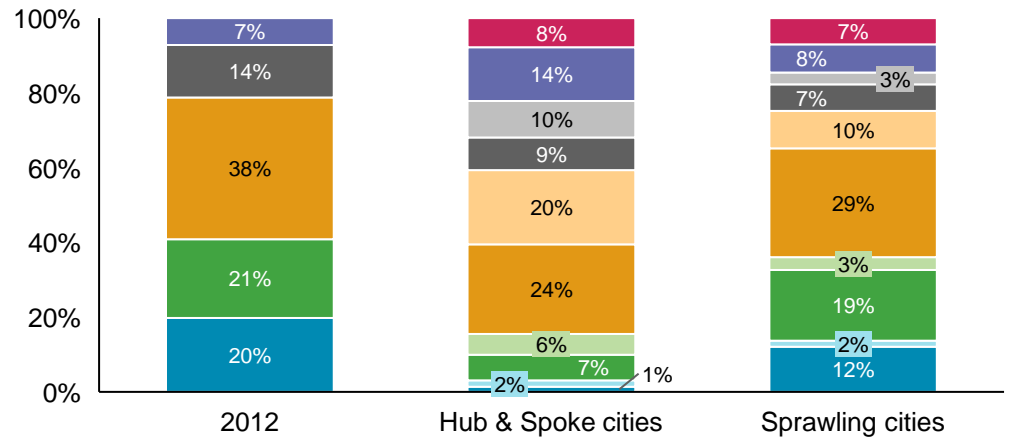


These different patterns of deliveries have a major impact on the vehicle mix, differentiated between City Center and Urban Area

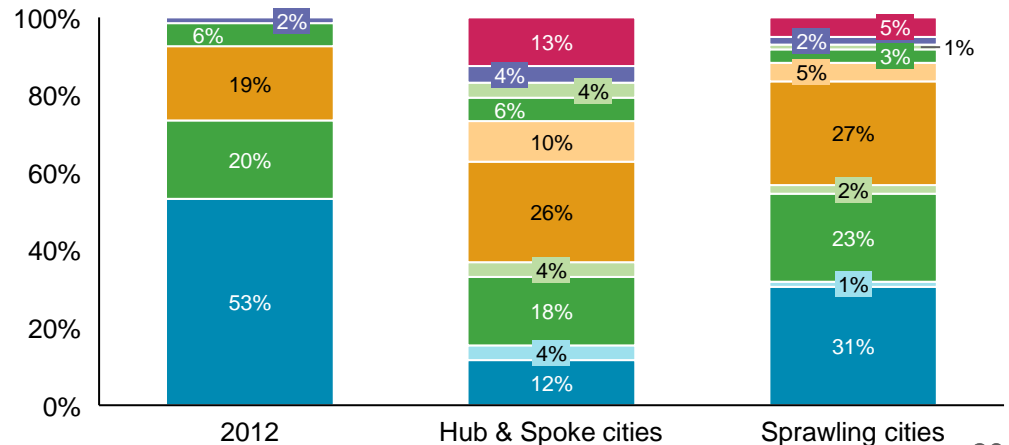
Last mile delivery breakdown by city type, vehicle category and engine types in 2030
China, in BN ton-km



City centers



Urban Area



- Heavy duty - ICE
- Heavy duty - EV / xHEV
- Mid duty - ICE
- Mid duty - EV / xHEV
- Small truck - ICE
- Small trucks - EV / xHEV
- Small van - ICE
- Small van- EV / xHEV
- Ultra Light Vehicle
- Rail / Water

Source: Oliver Wyman analysis

Key assumptions – Urban Geography in China

We assume 25% of population lives city center and 75% in urban areas, and an average length of last mile 2 times higher in urban areas than in city center

Hub & Spoke (e.g. Shanghai)



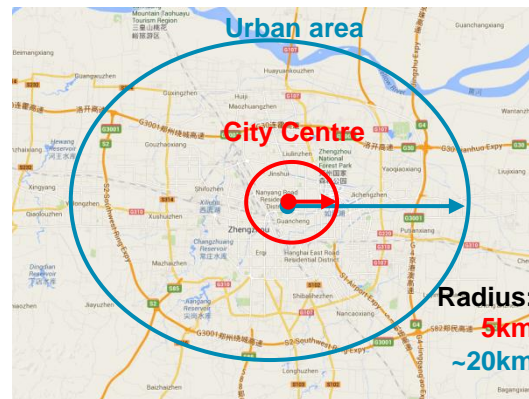
Total population in each city type (MM)

	City centre	Urban area
Population	47,4	142,3

Average length of urban last mile (km)¹

Destination	Distance in city centre	Distance in urban area
City centre	11-23	45-75
Urban area	0	45-75

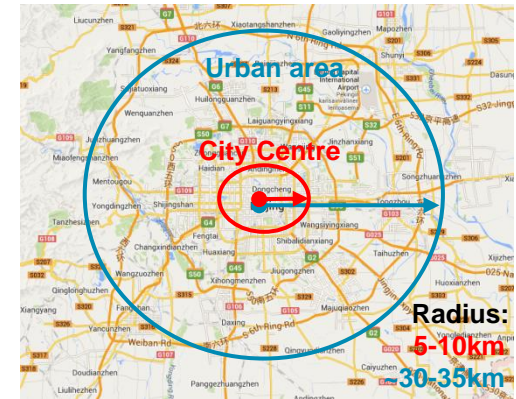
Scattered Mid-size (e.g. Zhengzhou)



	City centre	Urban area
Population	53,6	160,7

Destination	Distance in city centre	Distance in urban area
City centre	8-14	30-63
Urban area	0	30-63

Sprawling (e.g. Beijing)













	City centre	Urban area
Population	62,0	186,1

Destination	Distance in city centre	Distance in urban area
City centre	11-23	45-75
Urban area	0	45-75

1. Taking into account that in urban areas an air-distance of 1km will result in a road distance of >1km, also taking into account multiple stops for the delivery. In Hub&Spoke
Source: Phase 1 results, Google maps, Oliver Wyman analysis

Key assumptions – Urban fleet

Truck classification

	Western Europe / Asia	NAFTA		
Ultra Light Delivery vehicles	< 0,5t Non electrical Electrical			 
Small vans	< 3,5t	≤ 2,8t ¹ — Class 1: 0 – 6 000 pounds		
Small trucks	3,5t ≤ x < 6t	≤ 6,4t ¹ — Class 2: 6 001 – 10 000 pounds Class 3: 10 001 – 14 000 pounds		
Medium-weight trucks	6t ≤ x < 16t	≤ 15t ¹ — Class 4: 14 001 – 16 000 pounds Class 5: 16 001 – 19 500 pounds Class 6: 19 501 – 26 000 pounds Class 7: 26 001 – 33 000 pounds		 
Heavy trucks	≥ 6t — Chassis / with bodies ≥ 16t — Tractors	> 15t ¹ — Class 8: > 33 001 pounds Chassis/ with bodies Tractors		   

1 1 US pound = 0.454 kg
 Source: Oliver Wyman analysis

Key assumptions – Urban fleet

Factors used in calculation from ton-km to km are varied by vehicle categories and city types

Factor	Vehicle type	2012	Hub & Spoke	Mid-Size cities	Sprawling cities
Avg. maximum load	Heavy duty	10,0 t	10,0 t	10,0 t	10,0 t
	Mid duty	5,0 t	5,0 t	5,0 t	5,0 t
	Small trucks	2,0 t	2,0 t	2,0 t	2,0 t
	Small vans	0,5 t	0,5 t	0,5 t	0,5 t
	Light delivery vehicle	0,2 t	0,2 t	0,2 t	0,2 t
Load factor	Across vehicles	40%	65%	50%	55%

Source: TFL, Oliver Wyman analysis

Key assumptions – Common drivers across segments

Drivers	City type	2012	Scenario 1 Value (CAGR)	Scenario 2 ³ Value (CAGR)	Scenario 3 Value (CAGR)
Urban population (MM) ¹	Hub & Spoke	189,8	657,8 (7,2%)	436,3 (5,1%)	138,5 (-1,7%)
	Mid-Size cities	214,2	372,4 (3,1%)	348,5 (2,8%)	196,2 (-0,5%)
	Sprawling cities	248,2	0	217,4 (-0,7%)	695,6 (5,9%)
Avg. length of urban last mile (km) ²	Hub & Spoke	City center	20	20	
		Urban area	75	80	
	Mid-Size cities	City center	15	15	
		Urban area	55	60	
	Sprawling cities	City center	20	20	
		Urban area	75	95	

1. Based on projected urban population growth of 2,57%

2. Avg. length of urban last mile expected to increase together with the increase of urban area sizes, mainly in Retail and HoReCa categories, as share of home deliveries increases

Source: stat.gov.cn, National population census 2010, World bank; Google maps, Oliver Wyman analysis

Key assumptions – Segment by segment drivers (1/3)

Segment	Drivers		Hub & Spoke Value (CAGR)	Mid Size Value (CAGR)	Sprawling Value (CAGR)	Rationale
End- consignees	# of parcels per capita p.a.	2012	1,1	1,1	1,1	Growth projections based on past trend
		2030	28,4 (+20%)	28,4 (+20%)	28,4 (+20%)	
	# of press per capita p.a.	2012	14	14	14	Past trend
		2030	14 (0%)	14 (0%)	14 (0%)	
HoReCa	# of hotel nights per capita p.a.	2012	3,0 / 0,3	1,0 / 0,1	2,0 / 0,1	Past trend Increase of consumption
		2030	6,1 / 0,6 (4%)	2,0 / 0,2 (4%)	4,1 / 0,2 (4%)	
	# of restaurant / catering meals per capita p.a.	2012	550 / 350	450 / 300	500 / 300	Slightly increasing trend, depending on
		2030	657 / 419 (1%)	538 / 359 (1%)	598 / 359 (1%)	

City centre / Urban area

Source: State Post Bureau, China National Statistics Bureau, CEIC, Oliver Wyman analysis

Key assumptions – Segment by segment drivers (2/3)

Segment	Drivers		Scenario 1 Value (CAGR)	Scenario 2 Value (CAGR)	Scenario 3 Value (CAGR)	Rationale
Retail	Food / drinks per capita cons. p.a. (RMB)	2012	5 423	5 423	5 423	Annual growth of 8-9% in consumer spending, minus inflation of 4-5% results in inflation adjusted consumption growth of 4%
		2030	10 985 (4%)	10 985 (4%)	10 985 (4%)	
	Clothing / shoes per capita cons. p.a. (RMB)	2012	1 659	1 659	1 659	
		2030	3 361 (4%)	3 361 (4%)	3 361 (4%)	
	Furniture / household per capita cons. p.a. (RMB)	2012	3 126	3 126	3 126	
		2030	6 333 (4%)	6 333 (4%)	6 333 (4%)	
Waste	Weight of waste per capita p.a. (kg)	2012	548 / 365	438 / 329	548 / 329	1. Stricter regulation on waste 2. Change in line with past trends 3. Change in line with past trends
		2030	900 / 600 (+2,8%)	772 / 579 (+3,2%)	965 / 579 (+3,2%)	
Fuel	Fuel used in urban areas per capita p.a. (kg)	2012	239	239	239	Based on current trend in China adapted to city type
		2030	782 (+6,8%)	837 (+7,2%)	837 (+7,2%)	

Source: China National Statistics Bureau, Tradingeconomics, Worldbank, EIA, Oliver Wyman analysis

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