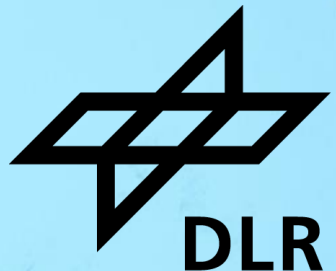


AN ADAPTIVE FLEET TRANSFORMATION FRAMEWORK APPLIED TO CARGO BIKES AND LIGHT ELECTRIC VEHICLES. EXPERIENCES FROM A LONG-TERM TRIAL IN GERMANY

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Agenda

-  Background: cycle logistics in Germany
-  Fleet transformation framework
-  Participating companies and vehicles
-  Vehicle usage
-  Experiences & success factors
-  Costs
-  Outlook



ELECTRIC CARGO BIKE

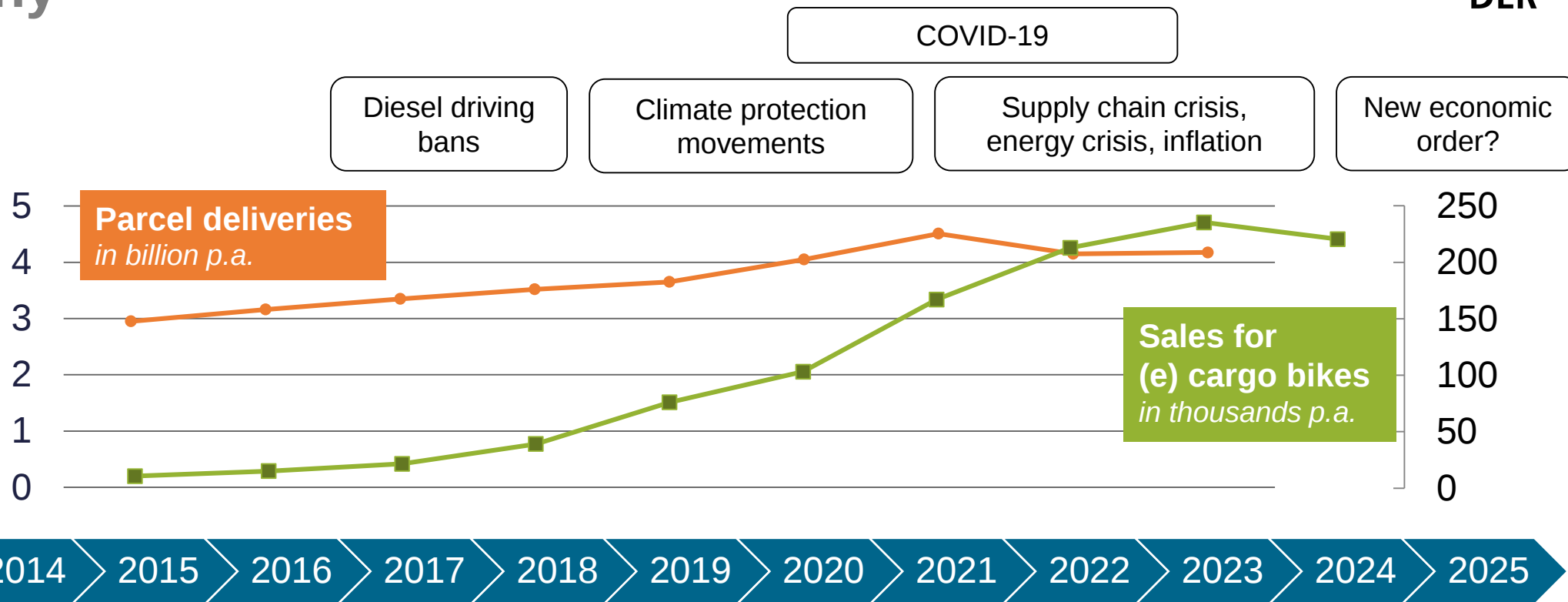


**LIGHT ELECTRIC VEHICLE
(LEV)**

Framework conditions for cycle logistics in the last 15 years in Germany



EC-Whitebook 2011:
essentially CO₂-free
city logistics by 2030



Occasional time-limited programs at municipal or state level	Federal: Only for large cargo bikes >1,000l (35cbf)	Federal: For all models up to 25% or €2,500 (\$2,700)	Abrupt discontinuation	Resumption up to 25% or €3,500 (\$3,800)
Cargo bike purchase premium programs (for commercial use)				€100 (\$110) bn f. climate protection until 2038

More than a decade of applied research on cargo bikes (1/2)



Source: DLR

Project *Ich ersetze ein Auto*

- 125,000 courier shipments
- Demonstration of feasibility for substituting car trips



Source: Johannes Gruber

Project *TRASHH*

- Spotlight on municipal city cleaning
- Partner: Hamburg's city cleaning



Project *WIV-RAD*

- Evaluation of substitution potential

Scenario	Shiftable trips	Shiftable mileage
S1 conservative assumptions	8 %	1 %
S2 increased willingness-to-use	13 %	2 %
S3 long-term maximum potential	23 %	4 %

Source: Gruber/Rudolph (2016): Schlussbericht WIV-RAD

Project *FCCP (Fuel-Cell Cargo Pedelec)*

- Development of H₂ fuel-cell system
- Tests in UK, France, and Germany



Source: DLR

More than a decade of applied research on cargo bikes (2/2)



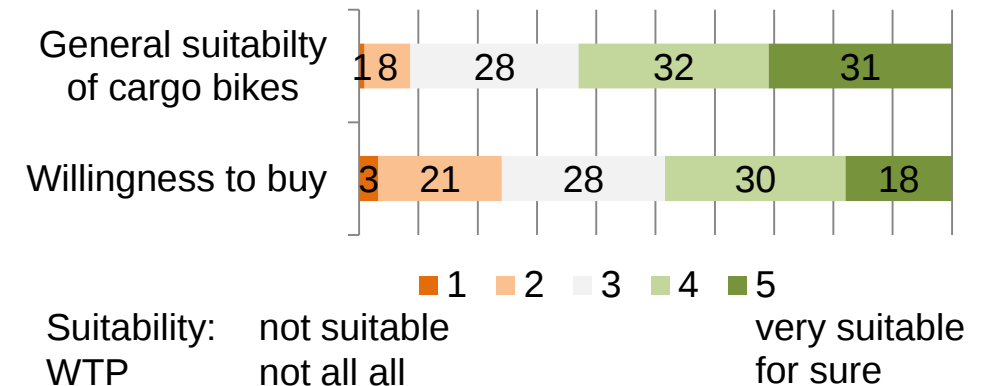
- Europe's largest public trial with 152 vehicles and 750 participating companies
- 3 months trial duration
- 32% of companies purchased own cargo bike trial



 **Key drivers:** soft factors & operative advantages

 **Key barrier:** cost

Project “Ich entlaste Städte”

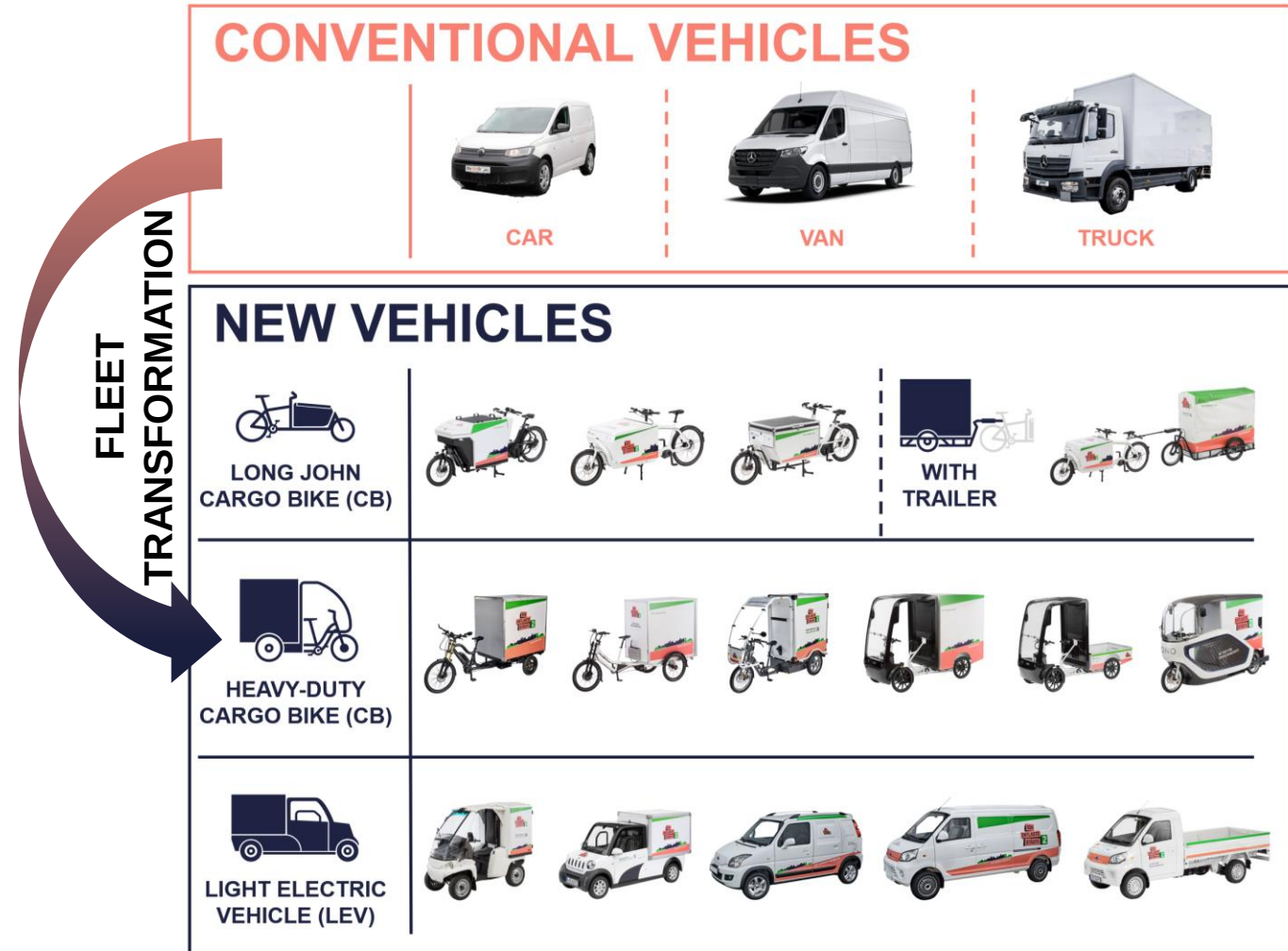


2012 > 2013 > 2014 > 2015 > 2016 > 2017 > 2018 > 2019 > 2020 > 2021 > 2022 > 2023 > 2024 > 2025

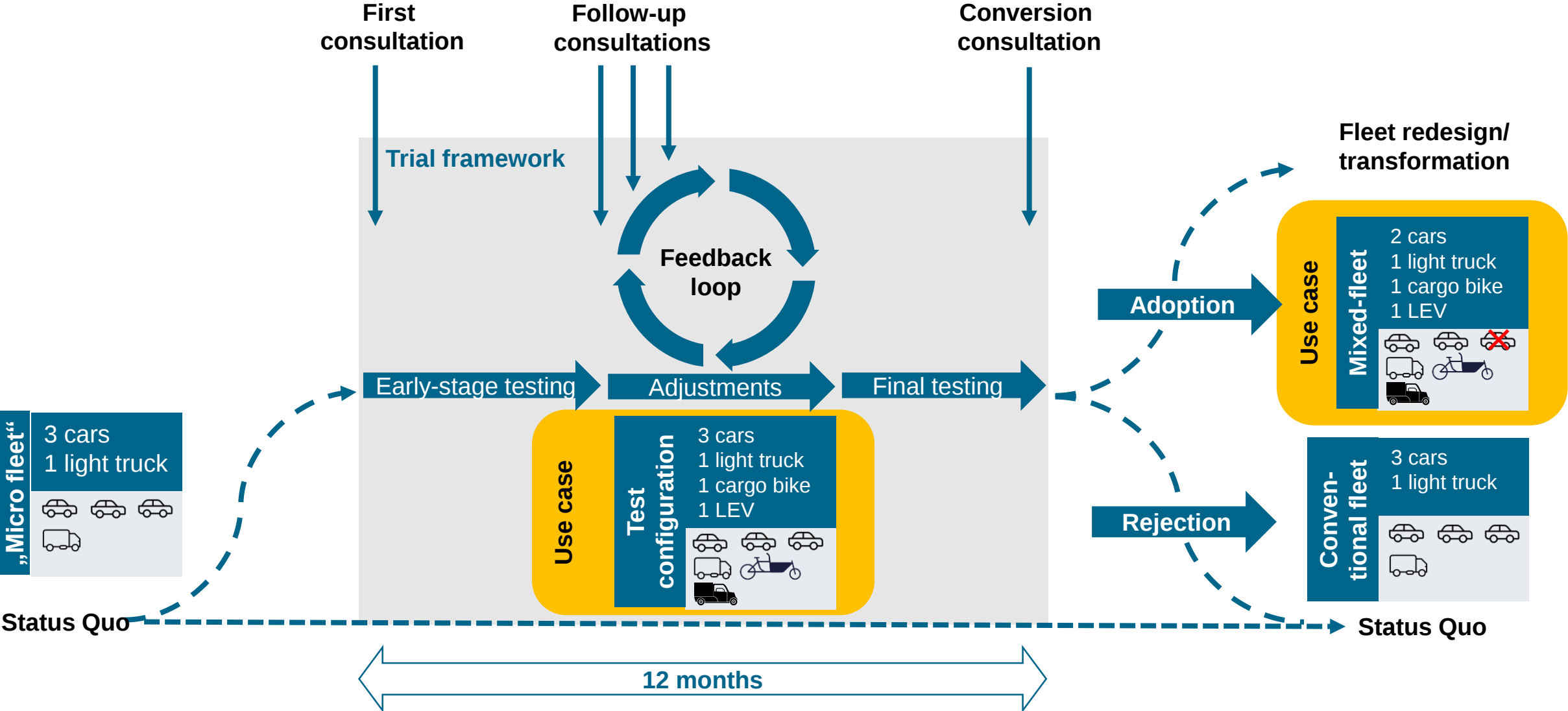
*Project „Ich entlaste Städte 2“
ongoing, see next slides*

Necessity of a new approach: remaining challenges

- Substantial share of **unsuccessful integration attempts**
- Seasonal/weather impacts → longer trial time
- Expanding adoption to traditional (craft) businesses
- Advancements of **small electric vehicle market**
 - **Electric cargo bikes**, considered “bicycles”, no license and insurance needed
 - Long John (2-wheeler)
 - Heavy-duty (3/4-wheeler)
 - **Light electric vehicles** license and insurance needed
 - L6e: max. 6 kW, 45 km/h (28 mph)
 - L7e: max. 15 kW, 90 km/h (56 mph)



Adaptive long-term framework to support fleet transformation



Diverse fleet catering different needs of participants

45+ VEHICLES

40+ COMPANIES

GEN 1
2023/24

GEN 2
2024/25

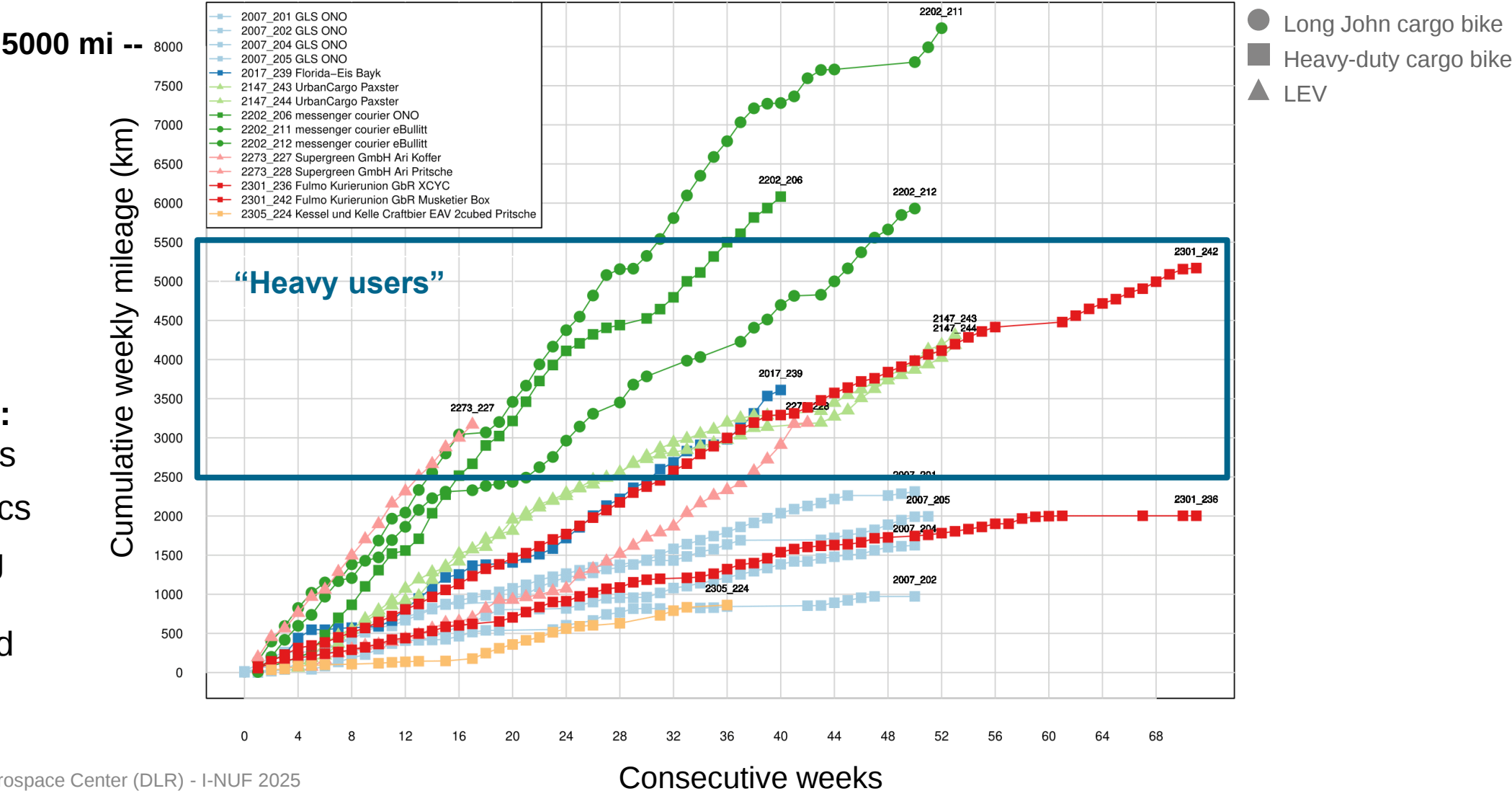
- **10x craft businesses** (e.g. metal construction, woodworking, painter)
- **9x logistics s.p.** (e.g. food delivery, parcel delivery)
- **13x service providers** (e.g. facility management, tree care)
- **5x municipal agencies** (e.g. waste disposal, energy supplier)
- **3x non-profit, other** (e.g. association)

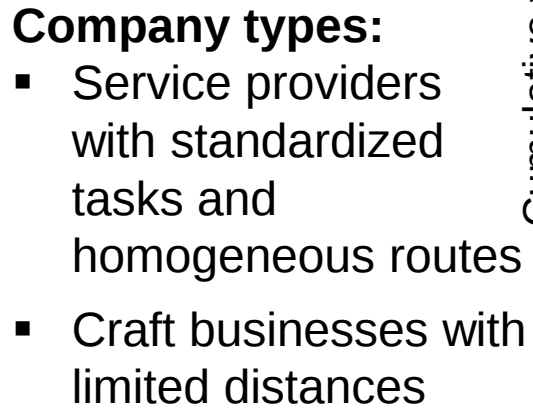


Classification based on vehicle use (1/2)



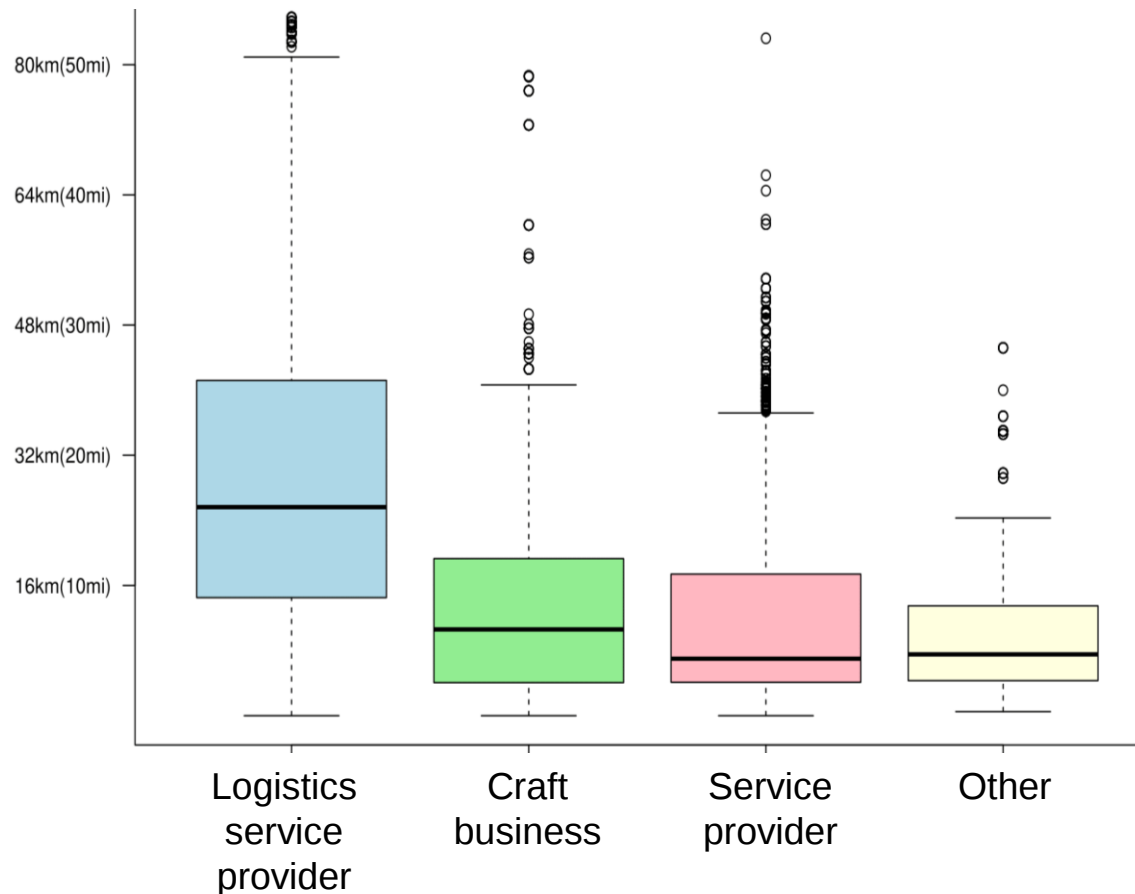
- Company types:**
- Parcel logistics
 - Courier logistics
 - Manufacturing companies (self-organized logistics)





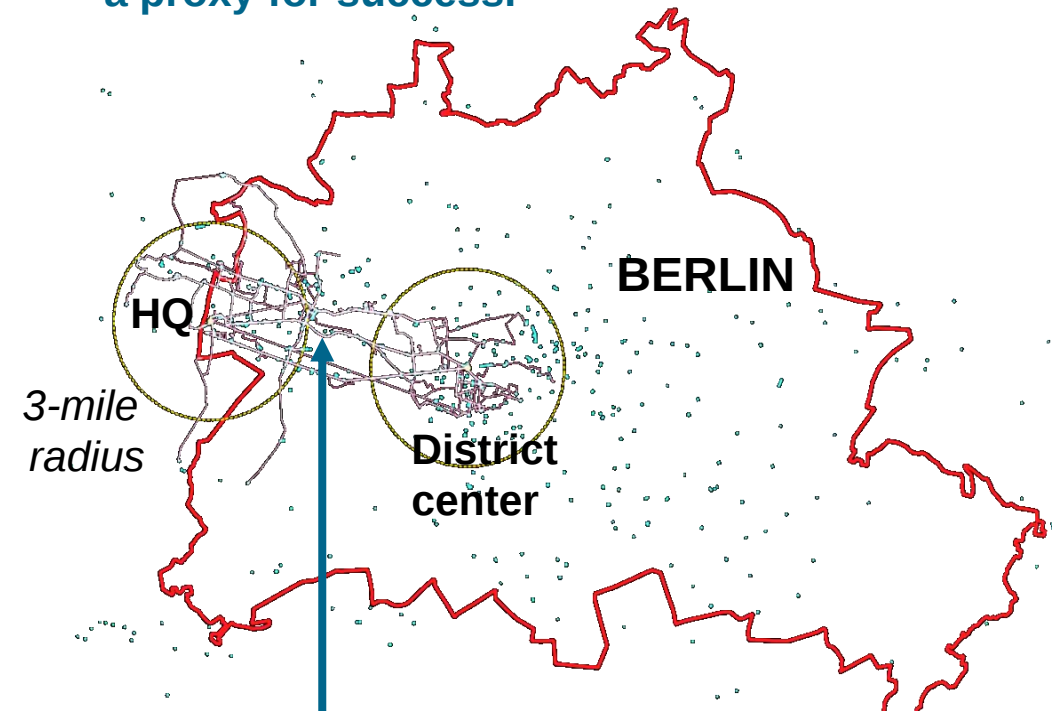
Vehicle usage: quantity and quality of cargo bike mileage

DAILY MILEAGE BY BUSINESS SECTOR



TRAJECTORIES OF ICE CREAM MANUFACTURER

- High mileage can be (but doesn't have to be) a proxy for success.



- Long inwards/outwards routes (~10mi) reduce cargo bike competitiveness

Experiences in typical business sectors (1/2)

	PARCEL DELIVERY	ICE CREAM MANUFACTURER	SERVICE PROVIDER: MGMT OF WATER METERS	SERVICE PROVIDER: FACILITY MGMT	CRAFT BUSINESS: PLUMBING
Company name	GLS	Florida-Eis	Castillo	3B	AA-Abfluss
Stop type	Many standardized stops	Heterogenous	Many standardized stops	Several stops (customer visit)	Fewer, longer stops (customer visit)
Sustainability goals vs. reality	<i>"Conservative" meets clear advantages</i>	<i>"Progressive" meets everyday challenges</i>	<i>"Progressive" meets clear advantages.</i>	<i>"Conservative" meets clear advantages.</i>	<i>"Conservative" meets clear advantages.</i>
	  	  	  	  	  

Experiences in typical business sectors (2/2)



	PARCEL DELIVERY	ICE CREAM MANUFACTURER	SERVICE PROVIDER: MGMT OF WATER METERS	SERVICE PROVIDER: FACILITY MGMT	CRAFT BUSINESS: PLUMBING
Company name	GLS	Florida-Eis	Castillo	3B	AA-Abfluss
Challenges	Subcontractor's lack of know-how → new cycle logistics contractor	Payload insufficient → specialized bike needed	-	Implementation of a top-down decision in various departments	-
Outcome	Expansion of business together with new contractor	Vehicle procurement, potential for hub solution	Very advantageous use case: replacement of car	Advantageous use case: new business	Advantageous use case: replacement of light truck
Success factors (selection)	• Restructuring of operations • Local traffic conditions • Easy maintenance	• Payload requirements (<300kg / 660lb) • Corporate environmental goals	• Recruiting of staff without license • Parking flexibility	• Dedicated contact persons ("caretakers") • Rider training	• Flexibility for staff without license

Success factors are diverse and complex:
Classification of factors is ongoing.

Vehicle cost assessment: a complex situation

Challenges of comparative calculations

- Type of vehicle integration (see next slide)
- Context specificity
- Hidden costs or not considered welfare economic aspects
- Uncertain data, e.g. on vehicle durability

Low priority for companies

- Limited knowledge of cost parameters
- Relevance of "pure" vehicle TCO versus other KPI
- Reliance is given to existing solutions in uncertain times

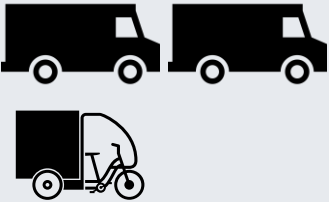
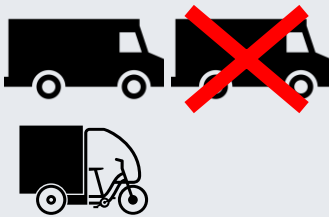
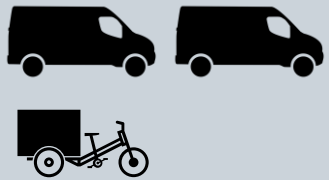
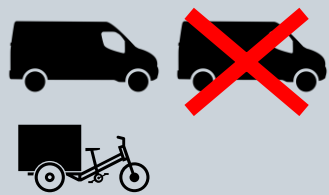
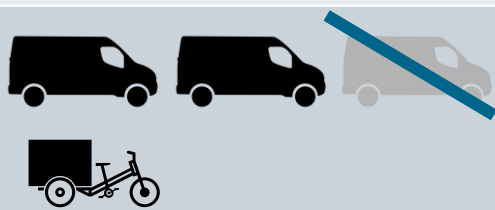
Dynamic macro environment

- Volatile battery prices, vehicle taxes, CO₂ costs
- High cost pressure, global economic uncertainties



“XL LEV” for home delivery of German supermarket chain (REWE) → purchase price ~ \$40,000!

Scenarios for operational fleet transformations

	STATUS QUO	SCENARIO 1: EXPANSION OF THE EXISTING FLEET	SCENARIO 2: SUBSTITUTION OF ONE VEHICLE	SCENARIO 3: PREVENTION OF NEW AQUISITIONS*
Splitting into “micro fleets”	2 cars	2 cars 1 cargo bike	1 car 1 cargo bike	2 cars +1 car 1 cargo bike
Use case  parcel logistics				
Vehicle costs	€27,500 (\$30,000) p.a.	+25% (w/o funding) +13% (w/ funding)	-4% (w/o funding) -13% (w/ funding)	-17% (w/o funding) -25% (w/ funding)
Use case  craft business				
Vehicle costs	€11,200 (\$12,000) p.a.	+20% (w/o funding) +16% (w/ funding)	-15% (w/o funding) -17% (w/ funding)	-20% (w/o funding) -23% (w/ funding)

*base: 3 cars

Driving transformation with the adaptive framework!

Fleet restructuring is complex.

Our adaptive fleet transformation framework enables us to:

- Understand various organizational transformation processes and outcomes
- Identify and classify success factors beyond the scope of individual business sectors

Ongoing actions:

- Creation of a self-assessment survey for companies
- Tackling challenges in cost calculations with real-world data



Thank you for your attention!



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