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# GREEN LAST MILE EUROPE REPORT 2023



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# EXECUTIVE SUMMARY

# EXECUTIVE SUMMARY

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The activities of the global population are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels (IPCC, 2018). According to a 2021 study published in Climate Dynamics, global warming is likely to cross a danger threshold of 1.5°C between 2027 and 2042 if it continues to increase at the current rate. This may be expected to have serious implications for the increased incidence of extreme weather events.

In 2022, the European CEP market volume reached almost 16,5 billion parcels (Data source: Effigy Consulting).

The CEP industry is being propelled by the expansion of e-commerce, which is, in turn, fuelled by customers demand for more affordable products in the face of inflation, initially generated by COVID19 and now, the Russian invasion of Ukraine.

This has led to a dramatic increase in the number of parcel related vehicles on the streets and to the carbon footprint associated with them. Estimates from UPIDO suggest that the carbon footprint linked with e-commerce parcel delivery can be as high as 5.5 million metric tonnes in 2032 and it is for this reason that this is a matter of great relevance in the battle

to protect our planet. More importantly, we could potentially reduce this carbon footprint by over 91% in just a decade, or to put it more visually, save over one forest the size of the Black Forrest in this time.



# EXECUTIVE SUMMARY

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## SUMMARY

In this context, it is important that, thanks to the foresight and support of Parcel Pending by Quadient, Sameday and Swipbox, we have been able to, once again, take a close look at the green Last Mile from the perspective of operators and market stakeholders. E-commerce currently represents over 70% of European CEP volumes and is considered by many experts to be more sustainable than bricks & mortar shopping.

Last mile delivery and packaging are responsible for 40 % of all e-commerce emissions and, unfortunately, as was the case last year, despite continued communication activities by many stakeholders regarding their green policies, our feeling is that unfortunately much of this is "greenwashing" and that few players, especially amongst carriers, are really making headway in creating a green last mile.

On a more positive note, some large operators, notably DPD Group as well as several larger local heroes in the such as PostNord, Posten Norge, InPost, bpost, Posti and Evri are genuinely seeking to "walk the talk" in the green last mile.

There is also a large group of smaller, younger and dynamic companies such as bloq.it or Smartmile which are seeking to address this area albeit their impact is more limited by the coverage that presently have.

Some larger organisations are beginning to choose SBTi measures and procedures to ensure the quality and credibility of their sustainable achievements (and to secure themselves from green washing accusations).

This year's data shows that the actions of players across the logistics industry are being noticed, but that no major CEP players are currently owning this space in a way that could drive brand differentiation for them. Moreover, just 13% of Logistics brands have a strong consumer profile in the area of sustainability according to Kantar's research.

Fortunately, customers are becoming more demanding about sustainability in the logistics and last mile process, with recent research showing that almost 80%\* of customers choose eco-friendly deliveries when having such an option but are still not willing to pay for it.

\* Ecommerce Delivery Benchmark Report 2023

# EXECUTIVE SUMMARY

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## SUMMARY

In general, customers assume that retailers and logistics companies should take care of this issue, which demonstrates the need for stakeholder education, given the many cost-free “green” options available to consignees such as OOH or consolidation of orders. Sustainability has, nevertheless, become an important element (circa 10%) of brand value according to Kantar.

Due to a lack of comparative data or independent audits, it is hard to fully evaluate individual projects, albeit from our research we have been able to identify key areas of opportunity and where the quick wins are, as well as the longer term potential for a greener last mile.

So what is the right way forward? To achieve significant (net zero) sustainable results, our experts have concluded that all stakeholders must be active and included – retailers, delivery companies, consumers, local authorities, governments and regulators.

While EVs appear to have a key impact in creating a green last mile, the infrastructure which will allow them to be used at scale is still being developed.

For now, education of all last mile stakeholders continues to be a major opportunity in achieving better and more ecological delivery via shipping less air, driving responsible consumer patterns or ordering parcels when and where the consignee can really collect them.

For the above to work well, development of efficient and proximate OOH networks and other forms of last mile consolidation such as urban consolidation points and nano hubs are needed. This will lead to aggregated parcel flows being delivered near to the consignee and allowing for 100% (or close to this) first time delivery rates. Experience from developed OOH markets has shown that this can reduce the carbon footprint by up to  $\frac{2}{3}$  in urban areas and even more in rural ones. Fortunately, achieving increased OOH delivery is quite realistic, in Poland, a highly developed OOH market, InPost NPS for locker delivery has grown to an incredible 94 and the overwhelming majority of customers consider parcel locker delivery to be the most eco-friendly.

# EXECUTIVE SUMMARY

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## SUMMARY

Cargo bikes are becoming increasingly popular as a sustainable alternative to traditional delivery vehicles in dense urban areas. In fact, a simulation model was used to compare the delivery processes of a logistics service provider using either conventional diesel-powered vehicles or cargo bikes in combination with a micro-hub in a large German city. Results showed that the use of cargo bikes resulted in significant reductions in CO<sub>2</sub> emissions (circa 65.5%) and operational costs (circa 38.6%).

Finally, while futuristic projects such as robotic autonomously guided vehicles or drone delivery will be developing, they are not expected to have effect, at scale, in the nearest years.

Unfortunately, without legislative action providing a carrot for those already inclined to "go green" and a stick for those who are not ready to act, we do not see the green last mile developing fast enough. It is the role of NGOs and carriers and other stakeholders to impress upon local and national governments, the need for action that is timely and effective.

For the sake of future generations, we sincerely hope that this will be the case.

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# DEFINITIONS



# TERMS & DEFINITIONS

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## Definitions and abbreviations used in the report

■ AGV	Automated Guided Vehicle
■ APM	Parcel locker
■ BOPIS	Buy Online, Pickup In Store
■ B2C	Business to Consumer
■ B2B	Business to Business
■ C2C	Consumer to Consumer
■ C2X	Consumer to anyone
■ CEE	Central Eastern Europe
■ CEP	Courier Express Parcel
■ CO <sub>2</sub>	Carbon dioxide
■ CO <sub>2</sub> e	CO <sub>2</sub> equivalent
■ COD	Cash on Delivery
■ CoE	Centre of Excellence
■ CWM	Come With Me function
■ CX	Customer Experience
■ DEFRA	Department for Environment Food & Rural Affairs
■ D2D	Door to Door delivery
■ ESG	Environmental, Social and Governance
■ EV	Electric Vehicles
■ GHG	Greenhouse Gas
■ IDM	Interactive Delivery Management

# TERMS & DEFINITIONS

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## Definitions and abbreviations used in the report

- KPI Key Performance Indicator
- LAST MILE Leg of a journey comprising the movement of goods from a distribution centre to a final destination
- LBG Liquefied Bio Gas
- LME Last Mile Experts
- OOH Out Of Home
- NGO Non-Governmental Organisation
- NOx Nitrogen Oxides
- NPS Net Promoter Score
- Paczkomaty® Reserved name for InPost parcel locker
- PMO Project Management Office
- PPP Public Private Partnership
- PUDO Pick Up And Drop Off Location
- SLA Service Level Agreement
- UAV Unmanned Aerial Vehicle
- UN DESA United Nations Department of Economic and Social Affairs

# TERMS & DEFINITIONS

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## Terms used in the report

- SBTi Scientific Based Target initiative provides companies with a framework to set targets that are aligned with the goal of limiting global warming to well below 2°C above pre-industrial levels. As part of this framework, companies are required to set targets for their Scope 1 and 2 emissions.
- Scope 1 emissions Scope 1 covers emissions from sources that an organisation owns or controls directly – for example from burning fuel in our fleet of vehicles (if they're not electrically-powered).
- Scope 2 emissions Scope 2 are emissions that a company causes indirectly when the energy it purchases and uses is produced. For example, for our electric fleet vehicles the emissions from the generation of the electricity they're powered by would fall into this category.
- Scope 3 emissions Scope 3 encompasses emissions that are not produced by the company itself, and not the result of activities from assets owned or controlled by them, but by those that it's indirectly responsible for, up and down its value chain. An example of this is when we buy, use and dispose of products from suppliers. Scope 3 emissions include all sources not within the scope 1 and 2 boundaries.

# WHAT IS THE LAST MILE?

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The term “Last mile” has been borrowed from the telecommunications industry, where it describes the difficulty of connecting user’s homes or businesses to the main telecommunication network.

Our definition of the “last mile”, in logistics, covers all of the parcel flows from the moment an item leaves the outbound ramp at a manufacturer’s/ retail/e-commerce warehouse. This can actually involve the “first mile” to a carrier logistics facility, the “middle mile” between various hubs and depots, and the last mile from the local delivery facility to the end consignee.

The last mile is important because it is critical for any retail/e-commerce customer experience as an item that is undelivered, damaged or late is arguably the most important service failure on the part of the merchant. Moreover, based on LME, our internal research and calculations, the last mile makes up some 30-60% of all supply chain costs for B2C parcels and, more relevant to this report, is a key element of the carbon footprint created by e-commerce B2C parcel flows.



# GREEN LAST MILE VS SUSTAINABLE LAST MILE

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Green Logistics, although not having a clear or legally defined meaning, is commonly understood to focus on economic return with a concurrent positive effect on the environment. Sustainability, is a broader, forward-looking concept that considers the needs of society, the environment, and economic benefits all at once. In this report, we generally use the term "green," but many of the projects we discuss are actually more aligned with the idea of sustainability.

The importance of environmental sustainability is growing for many consumers, who are increasingly choosing services and products with lower environmental impact, even if they are not the most cost-effective options. This trend is particularly prevalent in the Nordic region. Some businesses have come to realise the financial benefits of sustainability, especially as the effects of climate change become increasingly evident. Legislative and policy decisions are also beginning to promote sustainability, such as the implementation of low and zero emission zones in cities, the phasing out of combustion cars, and the promotion of walking in "15-minute city models".\*

\* "15 minute city model" refers to a planning concept where essential services, amenities, and places of work are located within a 15-minute walking or cycling distance from people's homes.

Global human activities are believed to have caused approximately 1.0°C of global warming above pre-industrial levels (Intergovernmental Panel on Climate Change, 2018). According to a 2021 study published in *Climate Dynamics*, global warming is likely to cross the threshold for dangerous warming of 1.5°C between 2027 and 2042 (2018 studies showed a time frame of 2030 – 2052). This could result in increased incidents of extreme weather and threats to biodiversity, posing a significant threat to human life.

The United Nations Framework for the Convention on Climate Change (UNFCCC) and the Paris Accord, with its nationally determined contribution (NDC) targets, are among the international treaties beginning to influence national legislation and policy to meet these challenges.

Also the EU has implemented a number of regulations and laws aimed at reducing greenhouse gas emissions and promoting sustainability. These include the EU Emissions Trading System, the Renewable Energy Directive, and regulations on energy efficiency and eco-friendly products.

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## ABOUT THE AUTHORS AND PARTNERS

# LAST MILE EXPERTS



## Our focus drives Your **SUCCESS!**

*Very few consultancies are so specialised and hence our motto*

**Last Mile Experts is a specialist CEP and E-commerce last mile consultancy.**

Our team have joint experience of several hundred years and are supported by partnered specialists throughout the globe, who help us deliver industry best practice in even the most focused areas.

In addition to the above, we have relationships with many key suppliers of hardware and software for route optimisation, sortation or tracking and control.



# WHAT WE DO AT LAST MILE EXPERTS



At Last Mile Experts, we support our clients to develop, deliver and sustain competitive advantage across a number of critical business areas but focusing on Courier Express Parcel and e-commerce last mile:

- Business operating models including cross-border
- General or specific operations solutions
- Hardware and software selection and contract negotiation
- People and organisational development
- Research and benchmarking
- Support in negotiating the best SLAs and commercial terms
- Strategic as well as operational pricing and product portfolio management

## **Mergers & acquisitions**

including market reviews, pre-deal due diligence and post-deal advisory

## **E-commerce/ Amazon**

and the last mile

## **Out of Home delivery**

options including APM's and HUB's (lockers) and PUDO's (access points).

## **Strategic planning and commercial proposition**

## **Interim / turnaround management**





# CO-AUTHOR - LAST MILE EXPERTS MANAGING PARTNER



## MAREK RÓŻYCKI



### Experience in courier industry

- Financial Controller - DHL Express Poland
- Financial Controller - DHL Express Poland 1990
- Founder, Masterlink Express (now DPD Polska) 1991
- Turnaround CEO Masterlink Express 1999-2004
- CEO CEE, DPD 2004-2006
- CEO CSEE DPD 2006-2013
- VP Amazon Logistics Europe 2014-2015
- Deal Advisor SB Member Pekaes SA 2015-2017
- Deal Advisor SB Member Advent/InPost S.A 2016-2017
- Deal Advisor SB Advisor Urgent Cargus S.A. 2017-2019
- Board Advisor Trendyol Turkey 2020-2022
- Board Advisor eMag/Sameday Romania 2020-
- Board Advisor Nova Poshta Ukraine 2022-

### Achievements

- Created leading domestic CEP carrier in Poland (DPD Polska)
- Successful turnaround of 10+ BU's
- Developed the most homogenous road based parcel network in CSEE
- Tripled DPD CSEE revenue from 2006-2013, with industry beating ROS
- Conceived and implemented IT4EM (ERP for several DPD markets)
- Part of start up team for Amazon Flex, Fresh and Prime Now
- Participated in creating the successful post acquisition restructuring plan for InPost
- Supported implementation of OOH strategy for Trendyol (TR) and eMag/Sameday (RO,HU,BG)

### Summary

Entrepreneurial ex-regional CEO with multicultural experience; a courier express parcel, restructuring and last mile e-commerce background.

A team builder with a strong industry network who has operated in various CEP markets, especially Poland, with a proven track record of success even in very challenging circumstances.

### Selected Projects

- Complete nationwide PUDO/locker implementation plan in CEE
- Restructuring of some 10 CEP businesses
- Launch of fuel surcharge throughout DPD CSEE
- Launch of PUDOs 16 countries
- IT4EM/IDM capability at DPD CSEE
- Helped acquire or sell over 10 CEP businesses

# CO-AUTHOR LAST MILE EXPERTS PARTNER



## MIREK GRAL

### Experience in courier industry

- Operations Supervisor, Oversea Courier Services 1992-1996
- International Operations Manager, M.S. Stolica 1996-2003 (GSA for Airborne Express, FedEx, Aramex/ GDA, Net Express)
- Founder, COO of MACS brokerage & freight forv. 1998-2004
- Key Account Manager, Frans Maas Polska 2004
- International Operations Manager, M.S. Stolica 2004-2005
- Industrial Engineering Manager, UPS Polska 2005-2010
- PM, UPS NE District 2010-2011
- Industrial Engineering Manager, UPS EMEA Region 2011-2013
- Outside Service Providers Manager, UPS Polska 2013-2014



- PM, Central Hub construction, UPS Polska 2014-2015
- COO, UPS Polska 2015-2019
- PRO Partner Last Mile Experts, CEP consultant 2020-2021
- Partner, Vice President Last Mile Experts 2021 -

### Achievements

- OCS, Airborne Express, FedEx and Aramex (GDA) next day international services implementation across the Poland
- Full operational and IT integration of UPS and acquired M.S. Stolica
- UPS Nordics HQ and Stockholm package centre relocation
- UPS stage one integration with acquired Kiala B2C company
- UPS Poland central hub construction and distribution network redesign
- UPS Poland best operational performance worldwide

### Selected Projects

- Co-founder of Polish Express Carriers Forum
- GSE contracts with Airborne Express, FedEx and Aramex
- UPS Polska integration with M.S. Stolica and complete distribution network redesign
- Launching UPS intercontinental flights via Warsaw airport
- First stage of Kiala B2C/PUDO business merge with UPS network
- Renegotiations of Polish UPS Outside Service Providers service agreements with new SLA implementation
- UPS Poland feeder & hub's network redesign
- BREXIT operational set up redesign for UPS Poland.
- Subject matter expert during few DD's in CEE CEP market

### Summary

More than 30 years of experience in CEP industry supported by cooperation with the largest players on the international market.

Leader and Team player with organisational and planning skills followed by experience of work abroad with multinational/ multicultural environment and time critical projects.

# CO-AUTHOR LAST MILE EXPERTS PARTNER



## GREG KRUPA



### Experience in courier industry

- KN Air (Subsidiary of Kuhne and Nagel) – Customer service supervisor 1992 - 1994
- FedEx Country Manager – Masterlink Express 1994-1997
- Regional Operations Director – Masterlink Express 1997-1998
- International Operations Department Director – Masterlink Express (Owner Posten AB/ GeoPost) 1998-2005
- International Department Director DPD Polska and VP in Air Cargo Poland 2005-2014
- Administrative Director DPD Polska 2005 – 2014
- Partner Last Mile Experts, CEP consultant 2016 –
- PPM, Central Hub construction, DPD Polska 2010 - 2012

- Creating a network of over 1000 Pickup/ Drop off facilities in Poland

### Achievements

- Together with my operational team granted Circle of Excellence – FedEx award for best operational performance in the world .
- As ACP Vice President/Operations Manager, first restructured and then developed the company from a mid size, loss making, customs agency into one of the largest Freight Forwarders in Poland (c. 100 MPLN turnover, 8 % ROS)
- Member of Masterlink Express restructuring team (after two years, the company showing a loss at the level of 50% of its turnover, started to yield profit). The success achieved thanks attention to costs, quality and sales processes
- Over 20 % reduction of international service costs per parcel within two years from takeover

### Selected Projects

- Introduction of international courier services in Poland for Chronopost and DPD
- GSE contracts with Pony Express, New Silk Road and others.
- Board member of Polish Express Carriers Forum
- Purchase, integration and development of Air Cargo Poland (one of the largest Polish air freight forwarders and custom agencies)
- Building or adaptation of over 60 operational depots and Hubs
- Creation of several International delivery networks including Baltic Logistic System (Posten AB) and Road to Russia (DPD Polska)

### Summary

Has over 30 years of experience in the CEP industry and has a proven track record of success, even in challenging circumstances. Collaborated with the largest players in the international market, demonstrating strong leadership skills and the ability to work effectively as part of a team. With exceptional organizational and planning skills, they have overseen a variety of time-critical projects. In addition to technical expertise, has extensive experience working in a multinational/ multicultural environment, adapting seamlessly to diverse cultures and customs.

## OUR PARTNERS

# PARCEL PENDING BY QUADIENT



Quadiant is a global leader in smart locker solutions for residential, retail, carrier, commercial, and university clients. With nearly 75 million packages delivered through Parcel Pending by Quadiant lockers annually, Quadiant's fast-growing global locker network delivers a safe, secure, and on-demand experience for parcel deliveries and returns.



Millions of users rely on Quadiant's vertical-, location-, and carrier-agnostic parcel locker solutions. The company's parcel network now encompasses circa 18,000 locations around the world, with new units being deployed across North America, Europe, and Japan.

Parcel Pending by Quadiant smart locker solutions are currently used to support a wide range of business needs, with partners including major global carriers (e.g., Yamato Transport and Sagawa in Japan; Relais Colis in France; DPD, DHL, and Evri in the UK; DHL in Sweden; Purolator in Canada), retailers (e.g., Lowe's Home Improvement in the US and Canada; FNAC, Auchan, and Decathlon in France), residential housing providers (the US leader in multifamily and growing in the UK and France), higher education institutions (e.g., University of Pittsburgh and University of Alabama in the US; University of Northampton in the UK), and commercial property developers and managers.

By focusing on three key solution areas, Intelligent Communication Automation, Parcel Locker Solutions and Mail-Related Solutions, Quadiant helps simplify the connection between people and what matters. A €1.02 billion company with a direct presence in 26 countries and services sold in c.80 countries, Quadiant is the driving force behind the world's most meaningful customer experiences.

## OUR PARTNERS

## SAMEDAY



Sameday is the leading Romanian B2C parcel carrier company, providing a full range of delivery services and operating the largest automated parcel machines (APM) network in Romania, Hungary and Bulgaria. With a strong customer-centric focus, throughout its 15 years of operation, Sameday continually innovates and uses technology to create new



opportunities for people, communities and industries. Accordingly, Sameday is this year's logistic sector champion and registered the highest growth across all pillars, improving its overall CX Score by 0.39 points compared to last year, according to The Romanian 2022 Customer Experience Report developed by KPMG in Romania. This is the result of the brand's commitment to investing in solutions that translate into reduced time and effort among customers and increased convenience.

Source: [https://assets.kpmg.com/content/dam/kpmg/ro/pdf/2022/CCE\\_REPORTS\\_2022.pdf](https://assets.kpmg.com/content/dam/kpmg/ro/pdf/2022/CCE_REPORTS_2022.pdf)

The Romanian courier company aims to reinvent the day-to-day delivery experience and uses technology to develop a delivery infrastructure and services that open new ways for their partners' and employees' growth. Being the result of e-commerce, last-mile, and technology teams working together, Sameday benefits from the perfect combination that enables them to create value for their customers and offer correct business solutions to their clients' needs. Their determination in pursuing a vision of creating a customer-centric technological last mile is the cornerstone, a delivery experience that unites Eastern European countries. After entering the Hungarian market in 2020, Sameday launched services in 2022 also in Bulgaria aiming to offer cross-border delivery services with the same facility as domestic delivery. Sameday is a company that has seen constantly double-digit growth since joining the eMAG Group, a Naspers company, in 2017. This is due to the development of the business through the expansion of the easybox network, which has now exceeded 4500 lockers at the regional level.

## OUR PARTNERS

SWIPBOX



SwipBox was founded in 2012 based on the idea of thinking about last mile from a different perspective. This thinking quickly proved successful, with parcel lockers giving end users more freedom in terms of picking up their parcels, while also reducing the courier carbon footprint by consolidating deliveries.



Since then, we have continued to focus on innovation, user-friendliness and sustainability, and in 2019 we launched our app-operated, battery-driven Infinity parcel locker.

### **Energy-efficient and highly recyclable**

The Infinity locker has an extremely low power consumption. In fact, over a 10-year period it only uses the same amount of energy as brewing a pot of coffee. The low power consumption is the result of a power-optimised chip and an extremely energy-efficient design, which ensures that the locker only uses power when an end user or courier is connected to it through an app.

Efficiency has also been thought into the hardware construction. In fact, the SwipBox Infinity parcel locker has been designed for disassembly, with 98.8% of materials easily disposed of in standard waste fractions.

### **SwipBox – innovative company with a focus on the user experience**

SwipBox is focused on creating the world's best user experience for delivering and picking up parcels using parcel lockers. Through a combination of intuitive network management software and hassle-free, app-operated parcel lockers, SwipBox delivers maximum convenience to logistics providers, retailers and end users alike.

The company is headquartered in Denmark and has additional offices in Pakistan, Poland and Australia. Together they have thousands of SwipBox parcel lockers in 30+ countries. In 2022 alone, SwipBox partners installed more than 15,000 Infinity parcel lockers, proving the simplicity of installation.

# CONTRIBUTOR



**José Anson,  
UPIDO Founder**

José Anson is founder of UPIDO (Unlimited Parcel Intelligence & Data Outreach). He holds a PhD in economics from the University of Lausanne (Switzerland) and made a career as an economist in international organisation including the World Bank, the World Trade Organization and the United Nations. He currently leads economic and big data research at the Universal Postal Union. He is known for having developed the methodology for the Integrated Index For Postal Development (2IDP) which ranks the best postal services in the world every year.

Jose is the author of numerous scientific publications in peer-reviewed economic journals in the area of international trade, development economics and postal economics, and his research is extensively cited by other economists.

UPIDO provides delivery intelligence-as-a-service continually monitoring e-commerce and the CEP industry evolutions in more than 100 countries. Thanks to proprietary machine learning algorithms, it has produced highly reliable B2C parcel volumes, predictions and forecasts, enabling parcel and postal companies to anticipate better in the new delivery normal resulting from the Covid-19 crisis. UPIDO predictions have been used to prevent delivery failures, better plan the holiday season, anticipate major shifts in online consumer behaviour, and design the next generation delivery services with artificial intelligence. Thanks to its accurate online shoppers' demand prediction, UPIDO brings timely insights to unleash greater lifetime value creation for all e-commerce ecosystem players. UPIDO also strongly supports postal and parcel companies to leverage their unique data assets and better serve customers in their country and worldwide.

# CONTRIBUTOR

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Fiaz Gul,  
Postal Strategy and Transformation Expert

## **Fiaz Gul**

Fiaz Gul is an independent postal strategy and last-mile expert currently based in the United Kingdom. He has worked for ten years at Pakistan Post where he has delivered as area manager of ninety delivery and booking post offices. He has also worked as head of international mail at the Lahore Office of Exchange for four years where he delivered a customer-driven transformation project and got short-listed for World Post and Parcel Award 2021 in the customer service category. Fiaz has also designed and delivered projects such as Same Day Delivery (SDD), EMS Plus (International Mail), and Automation of Booking, Transmission and Delivery of mail at Post Offices.

Fiaz has great experience in people management, training and motivation. He has led around 700 employees as area manager and head of international mail at Lahore OE. He is also an author and writer. Recently, he has authored "21st Century Business Strategy for Posts in Developing Countries" and "Customer Driven Transformation of Lahore OE."



# CONTRIBUTOR



**Johan Peeters,**  
owner of  
**Fishermen**

Johan Peeters is a seasoned professional with over ten years of experience in driving positive change. His expertise has earned him a reputation as a go-to consultant for sustainable last-mile services.

For the bpost group he delivered an innovative concept for emission-free parcel delivery that has already earned the Environmental Achievement of the Year award (2021), and is featured in the World Economic Forum's toolbox for decarbonizing urban ecosystems. Verified results from the University of Brussels (VUB-MOBILISE) have shown that his approach is not only sustainable but delivers real benefits to cities worldwide.

His commitment to making a positive impact on the world is evident in his work. His ability to bridge cooperation between industry leaders, government officials, and local inhabitants has produced a vast amount of applicable insights that can be put to work for cities all over the world.

# CONTRIBUTOR



Kantar is the world's leading marketing data and analytics company. We have a complete, unique and rounded understanding of how people think, feel and act; globally and locally in over 90 markets. By combining the deep expertise of our people, our data resources and benchmarks and our innovative analytics and technology, we help our clients **understand people** and **inspire growth**.



**Graham Staplehurst,  
Thought Leadership  
Director**

Graham Staplehurst is the global brand strategy expert on Kantar's BrandZ project. He consults with an array of clients drawing on experience from a wide range of blue-chip companies including FMCG, automotive, telecoms.

And finance with branding, advertising, media and communications issues. Also contributes regularly to Kantar thought leadership on brand & communications topics.

**Jonathan Hall,  
Managing Partner, Sustainable  
Transformation Practice**

Jonathan Hall is the Managing Partner of Kantar's Sustainable Transformation Practice, leading the team, solution development, thought leadership and business management for all of our client work in the social and environmental space across the world.



**Will Simpson,  
Client Director**

Client Director in the Postal and Logistics Unit. Will has researched the postal industry for many years and worked with major logistics players including Royal Mail, IPC, Canada Post and Australia Post. He helped launch JICMAIL, a currency for the direct mail industry proving the efficacy of direct mail advertising.

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# BACKGROUND TO THE REPORT

# BACKGROUND TO THE REPORT

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Based on data from Effigy Consulting, the European market for Courier, Express, and Parcel (CEP) is projected to experience a 9.1% decline in volume in 2022 when compared to 2021. This decline is expected to result in around 16.5 billion parcels, down from 18.148 billion in 2021. The CEP industry's previous rapid growth, fuelled by COVID 19 enhanced e-commerce, has come to a sudden halt due to inflation and general uncertainty resulting from the war in Ukraine, though it still surpasses pre-COVID levels. Additionally, there is a possibility of a general business slowdown and potential economic crises in 2023 that could impact the growth of the European parcel market, although the extent of the effect remains increasingly uncertain and dependent on various factors. As a result of this new market reality, some CEP players may be hesitant to introduce new sustainable initiatives unless they align with cost-saving measures.

Our report focuses on the impact of the last mile on the environment and aims to identify key trends and initiatives targeted at addressing this growing environmental issue. We seek to understand the underlying causes of the carbon footprint and assess the future impact on the environment, assuming no action is taken or the use of best-in-class Green Last Mile projects.

The CEP market is served by a mix of carriers, including national postal operators and commercial carriers

or parcel locker operators. In recent years, faster delivery times and the need for localised stock have become increasingly relevant. Consumers are becoming more aware of the sustainability related consequences of the last mile and expect the stakeholders of the process to adapt their activities to alleviate the impact.

LME has extensive knowledge of this market and has already shared various studies and reports in the public domain. Along with our partners, we aim to provide an initial status report on an area that is widely discussed, but where few significant initiatives are currently visible. We have directly contacted all key operators and used industry media and business social media (especially our sister business, the Last Mile Prophets) to gather project submissions. This has resulted in 22 varied projects across several markets that cover various aspects of the last mile including two cases covering future potential development.

One of the most significant and disappointing findings is the prevalence of "greenwashing", across the board. Few players have a coherent and effective green last mile strategy and can truly "walk their green talk." However, some businesses are taking this issue seriously, and other stakeholders, particularly local authorities and governments, are becoming actively involved in monitoring and controlling the environmental impact of the last mile.

## What can you find in this report?

- The report covers green last mile initiatives from all Logistics & CEP organisations who have shared information about their green initiatives on the European arena as well as selected other projects that we have been able to identify with desk research or in expert interviews.
- We also seek to identify the most promising initiatives and to extrapolate what their impact could be if they were to be implemented on a wider scale.

## What are the sources and methodology?

The main sources for the report are:

- Extensive desk research on the CEP market covering company press releases, websites and other sources.
- Use of UPIDO's advance internet search algorithm outcomes to estimate CO<sub>2</sub> emissions in 27 EU countries plus Norway, Switzerland and the UK.
- Published information on the environmental impact of the CEP last mile.
- Interviews with senior-level expert contacts in the market.
- LME's own, in depth, expert knowledge.
- Verification by subject matter experts including the Last Mile Experts team and Jose Anson (UPIDO), Muhammad Fiaz Gul, Graham Staplehurst (Kantar), Jonathan Hall (Kantar), William Simpson (Kantar) and Johan Peeters (Fishermen) have been made to confirm our data and conclusions.
- Where the actual or published data is not available, we have made estimations based upon our market knowledge.

## Who will benefit from our report?

The report is intended for:

- Owners and operators of CEP networks.
- Online retailers.
- Governmental departments and local authorities.
- Investors in these businesses.
- Market regulators and policymakers.
- Journalists and editors of newspapers and magazines.
- Analysts, consultants and other stakeholders.

## Projects & Case Studies

All business cases have been described by the solution owners and have not been subject to any modifications by Last Mile Experts.

Both the content and the vocabulary used in the descriptions come from the authors and owners of the projects.

Last Mile Experts do not bear civil and legal liability for possible inaccuracies and errors in project descriptions.

# NOTES TO THE REPORT

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- It has been very difficult to obtain concrete carbon emissions data from companies who do not generally provide detailed or current data.
- Data has been obtained from contributors to the report, publicly available sources and from commercially available sources. The data published represents the latest information available from these sources at the time we carried out our research.
- The authors have reviewed company websites and publications or news items. Moreover, we have conducted numerous interviews (CEO's or senior-level CEP experts and data & research consultancies) to develop our core knowledge and understanding of the environment. Finally, we have used the Last Mile Experts team's own market "know how" and expectations for future developments.



Prepared with the support of:



# GREEN LAST MILE TOPOLOGY

# GREEN LAST MILE TOPOLOGY

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## Projects generally fall into 3 key categories:

**1****Operational:**

where the last mile is made greener due to operational efficiency (i.e. shorter routes and better first time delivery), eco driving as a result of driver training and monitoring or simply by using less polluting vehicles such as EVs or cargo bikes.

**2****Infrastructural:**

where infrastructure allows for consolidated collections or deliveries as is the case with PUDO, lockers or urban consolidation points or where the logistics infrastructure itself, is greener due to investment in solar cells, heat exchange pumps or simply better heat insulation.

**3****Administrative:**

where the carbon footprint is "offset" by planting trees or where emissions are monitored and controlled by local or central government and then charges are applied to discourage the most damaging carriers. In some cases this could even lead to a complete ban on certain vehicle/engine types in a given geography.





# GREEN LAST MILE TOPOLOGY



Source: Otto-von-Guericke University Magdeburg

## Operational

- Low emission vehicles
- Eco driving
- Route optimisation
- Interactive Delivery Management



Source: Parcel Pending by Quadient

## Infrastructural

- Out-of-home delivery
- Consolidation points
- Green facilities



Source: Photo: Marco Verch <https://www.flickr.com/photos/30478819@N08/51093903935>

## Administrative

- Auditing
- Carbon offset

# GREEN LAST MILE TOPOLOGY

E-commerce sellers are the biggest generators of parcels in Europe, and therefore, the largest contributors to greenhouse gas emissions in this sector. According to Effigy Consulting, in 2021, European e-commerce (B2C and C2X) accounted for 13.3 billion parcels, representing over 73% of the total European CEP parcel volume. As of 2022, the percentage remains at a similar level.

According to the DPDgroup, the transportation of a parcel causes an average of 0.6 kg of CO<sub>2</sub> emissions, which amounts to a total of almost 8 million tonnes in 2021 and circa 7,2 million tonnes (estimated volume

decrease of circa 10% B2C & C2X shipments in 2022 vs 2021) in 2022 of CO<sub>2</sub> emissions all over Europe, due to online shopping alone.

However, other research by Oliver Wyman (figure 1) shows that compared to offline shopping, e-commerce has a positive environmental impact as it results in an average 2,3 (from 1.5 up to even to 2.9) times fewer greenhouse gas emissions. Although e-commerce relies on delivery vans, they reduce car traffic by four to nine times more than they generate. Moreover, e-commerce uses less land than physical retail, considering logistics, selling space, and parking.

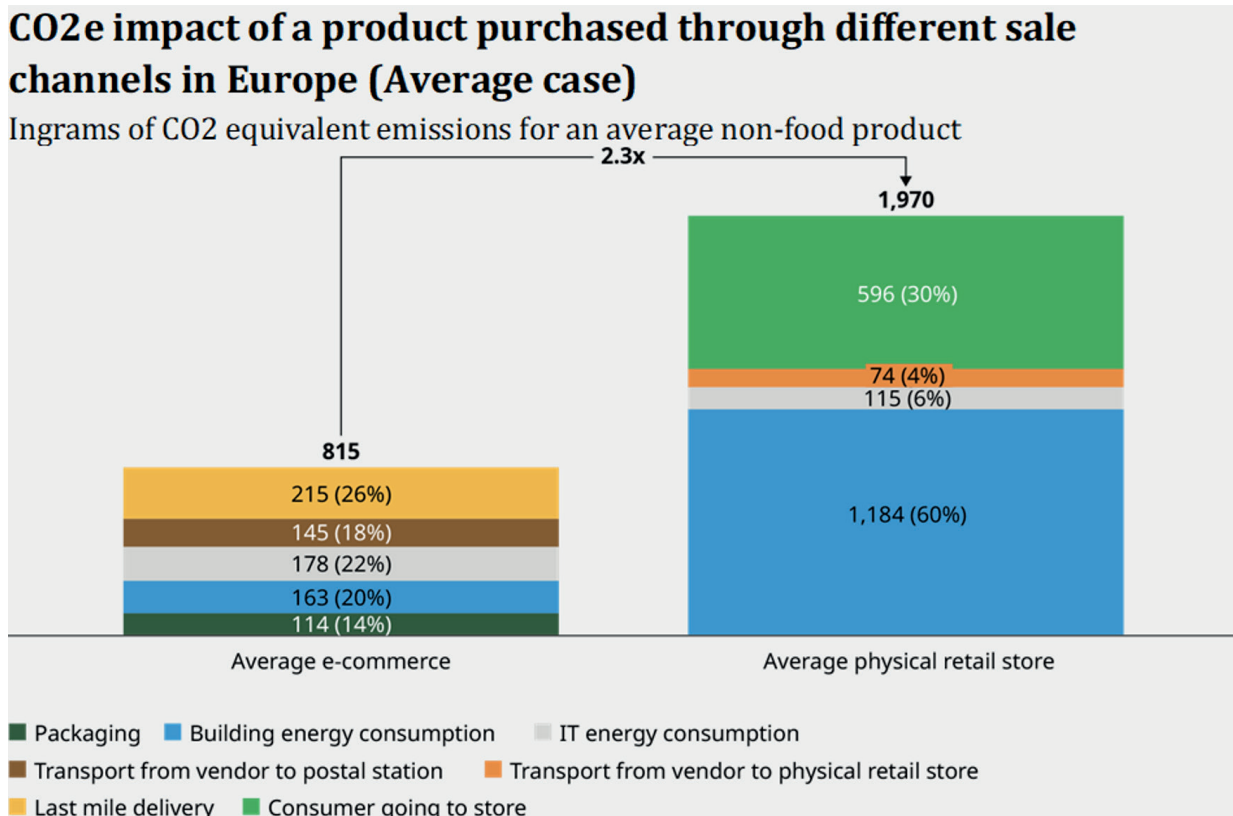


Figure 1 – CO<sub>2</sub>e impact of a product purchased through different sales channels in Europe  
Source: Oliver Wyman analysis

# GREEN LAST MILE TOPOLOGY

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Even though there appears to be a clear sustainable advantage of online over bricks & mortar shopping in Europe, we have to strive to further reduce the generated CO<sub>2</sub>e emissions.

The last mile delivery and packaging contribute up to 40% (figure 1) of the e-commerce delivery CO<sub>2</sub>e impact and therefore, carbon emission reduction projects in these areas can provide significant sustainable gains.

Sustainability has become an important issue for many customers and consumers in the logistics sector. The growing awareness of environmental challenges and their impact on society has led to an increasing demand for companies to adopt sustainable practices in their operations. Customers and consumers are now more inclined to purchase products and services from companies that demonstrate a genuine commitment to sustainability.

Moreover, companies that prioritise sustainability are seeing a significant increase in their brand value. Consumers are becoming more aware of the environmental and social impact

of their purchasing decisions, and they prefer to support brands that align with their values. Companies that invest in sustainable practices and initiatives are likely to attract and retain customers who value environmentally conscious products and services. Further details on this topic can be found in a dedicated chapter prepared by Kantar.

The Metapack Ecommerce Delivery Benchmark Report 2023 also indicates that factors such as delivery costs and eco-friendliness are gaining importance, while the significance of speedy and convenient delivery is declining. This suggests that despite the current economic slowdown and the fact that more people have financial concerns, sustainability should not be compromised, but rather improved.

The same report also finds that sustainability is playing an increasingly significant role in shaping purchasing decisions. Nearly 4 out of 5 (79%) consumers worldwide prioritise having eco-friendly delivery choices when making online purchases, marking a rise from 74% the previous year.

# GREEN LAST MILE TOPOLOGY

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In line with consumers' rising sustainability expectations European CEP organisations are increasingly introducing science-based sustainability targets in order to demonstrate the effectiveness of their actions and avoid accusations of greenwashing. The Scientific Based Target initiative (SBTi) has almost 4800\* participating companies, with a significant representation from the European CEP market, including Austrian Post, bpost, Correios de Portugal, Deutsche Post, GeoPost/DPDgroup, Hrvatska Posta, InPost, La Poste, Posten Norge, Posti Finland, Post NL, PostNord, Royal Mail or Swiss Post\*. Science-based targets are described as a clearly defined plan for businesses to reduce their greenhouse gas (GHG) emissions in order to mitigate the severe effects of climate change and ensure the continued growth of the business. These targets are classified as 'science-based' when they align with the most recent climate science findings and aim to achieve the objectives of the Paris Agreement, which includes keeping the increase in global temperatures to well below 2°C above pre-industrial levels and making efforts to limit the temperature increase to 1.5°C.

The process for companies to establish science-based targets to reduce greenhouse gas emissions involves five steps: making a commitment, developing the target, submitting it for validation, communicating it to stakeholders, and disclosing annual progress reports. This process ensures that the targets are credible and based on the latest scientific findings.

Companies with approved science-based targets are achieving significant reductions in greenhouse gas emissions, with a collective 12% reduction in scope 1 and 2 emissions in 2020, resulting in a total decrease of 29% between 2015 and 2020. SBTi-approved companies have surpassed their peers within their countries in reducing emissions. Although an annual 4.2% reduction is required for 1.5°C alignment, SBTi-approved companies have achieved a linear rate of 8.8% scope 1+2 reductions per year\*. However, 28% of companies have not disclosed any public information on progress towards their targets, highlighting the need for harmonised reporting.

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\*Source: SBTi <https://sciencebasedtargets.org/companies-taking-action>

# GREEN LAST MILE TOPOLOGY

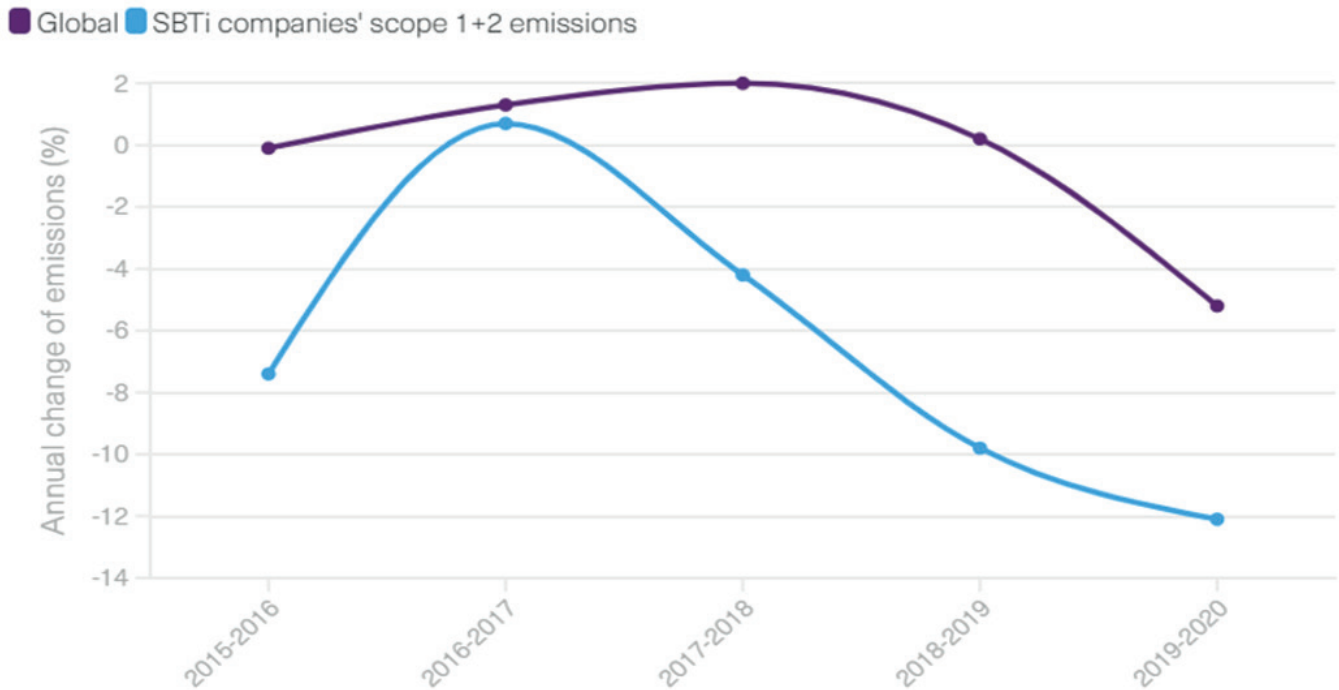


Figure 2: Gross scope 1 and 2 emissions' change rate from companies with approved targets vs. the global economy (2015-2020)  
Guidance Source: SBTi Progress Report 2021

Figure 2 shows scope 1 emissions and scope 2 market-based emissions, where available. As per the Greenhouse Gas Protocol scope 2 guidance, if a company's market-based data was not available, location-based data was used to represent the lowest-granularity market-based data and still the SBTi led projects show significantly better reduction results.

In conclusion, the introduction of science-based sustainability targets by European CEP organisations

demonstrates a commitment to reducing greenhouse gas emissions and mitigating the effects of climate change. The process of establishing science-based targets ensures that these targets are aligned with the latest scientific findings and are credible. The impact of science-based targets on reducing greenhouse gas emissions is significant, and the need for harmonised reporting is essential to ensure transparency and accountability in achieving these targets.

# GREEN LAST MILE TOPOLOGY

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**//// PARCEL PENDING®**  
by Quadiant

Benoit Berson, Chief Solution Officer PLS,  
Parcel Pending by Quadiant

As a company deeply committed to Corporate Social Responsibility and environmental protection, we are proud to sponsor this year's Green Last Mile report. Conducting our business in an ethical and responsible manner is a core value of our company and we believe it is essential for sustainable growth and success.

Our proven experience and scale in the parcel locker business globally have led us to believe that our Parcel Locker Solutions are a key component for making the e-commerce last mile more sustainable. Our solutions contribute to reducing fuel usage and CO2 emissions with less trucks in circulation, cost optimisation for retailers and carriers, and convenient 24/7 availability for consumers.

The early and wide adoption of our parcel locker solutions, in the US and Japan in particular, confirms their relevance as a key differentiator in a growing e-commerce market. Furthermore, our open network of Parcel Pending by Quadiant lockers is attracting more and more players who are interested in diversifying their delivery offer. Our highlighted project with Relais Colis within Carrefour stores is a powerful example of how our solutions make life easier for our partners and their customers while paving the way for a greener delivery process.

We hope that readers will find the Green Last Mile Report 2023 informative and insightful in how businesses can contribute to making e-commerce delivery more efficient and environmentally friendly in the years to come.

# GREEN LAST MILE TOPOLOGY

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So why are lockers and PUDOs so effective? Today, with the exception of home office which took root after COVID19, people are generally not at home to receive deliveries during the working day, when most carriers deliver. One of the most comprehensive reviews of actual first time delivery failure rates (Edwards et al., 2009) shows that failure can vary considerably, ranging from around 2% to an incredible 50%. Whilst the data is now quite old, new research from Which.co.uk? found that failed deliveries remain a key issue. This is in part due to carriers' varied policies regarding signature on delivery or leave safe options (safe place or leave with

neighbour). This is compounded by the fact that the vast majority of B2C parcels don't fit in a standard domestic letterbox.

In fact, the Which? report (2019) found that 24% of couriers did not actually follow customer instructions, probably due to poor process communication or lack of time on the carrier side.

Moreover, just 32% of consumers reported that everything 'went to plan' with the delivery.

Deliveries failed for a number of reasons including:

- 29% of deliveries arriving earlier than expected.
- 17% of deliveries arriving later than expected.



# GREEN LAST MILE TOPOLOGY

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Late or failed deliveries are a significant source of frustration for customers and can have severe repercussions for businesses, impacting their reputation with consumers. Moreover, customers are increasingly finding indirect ways to voice their complaints, which can prove especially detrimental to eCommerce companies. In fact, when asked about reasons for delayed deliveries over the past year, 41% of consumers blamed the retailer, while 32% faulted the courier.\*

Remedies for these service failures often carry financial penalties for the retailer, but negative reviews and complaints can be even more costly. A significant number of customers, including 12% who leave bad online reviews and 9% who complain on social media, are willing to publicly air their grievances. The impact of negative feedback on brand reputation cannot be overstated, especially considering that 93% of consumers read reviews before making a purchase. Even just three negative reviews can deter almost 6 in 10 potential customers (59%). It's important to keep in mind that even customers who remain silent, without leaving negative feedback, may still decide not to return.

In 2020, the average first-time delivery failure rate was 7% in Germany, and 6% in the UK, costing an average of €14.69, and £11.60 per failed delivery\*.

In conclusion, late or failed deliveries can have significant negative consequences for both customers and businesses. Customers may become frustrated and voice their complaints through negative online reviews and social media posts, which can damage a business's reputation and deter potential customers. The financial impact of these service failures can also be substantial, with penalties for retailers and the average cost per failed delivery being relatively high. As such, it is crucial for businesses to prioritise effective delivery management and seek to minimise the occurrence of late or failed deliveries to maintain positive customer experiences and preserve their reputation in the market. Keeping with the focus of this report, first time delivery also reduces the carbon footprint due to elimination of return driving and processing by couriers.

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\*Source: Fixing Failed Deliveries report by Loqate



# GREEN LAST MILE TOPOLOGY

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Where Delivery attempts fail, customers often have to go to a local depot to pick up their parcels after missed home deliveries, as couriers typically make only two, three delivery attempts before requiring a customer to collect the package. However, research by Edwards et al. (2009) revealed that the distance to collect a parcel from a depot is directly linked to the total carbon dioxide emissions produced. Even the shortest average distance of 15km, representing a trip from the city centre to the suburbs to collect a package, generates a total of 3,113g CO<sub>2</sub> when driving a car and 1,340g CO<sub>2</sub> when using public transportation. The trip to the local depot accounts for the majority of CO<sub>2</sub> emissions associated with failed deliveries.

Although this distance may vary for carriers with a dense OOH network, failed deliveries often result in the package being returned to a depot that can be several kilometres away from the recipient.

Accordingly, minimising emissions from failed delivery and personal consumer travel to depots or even returns to sender is crucial for reducing the environmental impact of failed deliveries and achieving important sustainability benefits. Furthermore, reliable delivery is highly valued by customers in e-commerce, as noted by Vakulenko et al. (2019). While new developments in delivery technology such as IDM can improve success rates, they can also negatively affect parcel consolidation and routing efficiency if not used well, especially when customers are able to select their own delivery windows instead of accepting push notifications from carriers based on optimised routes or when an automatic leave safe/at a proximate OOH location option is not available.

# GREEN LAST MILE TOPOLOGY

Parcel lockers and pick-up/drop-off points (PUDOs) are fixed "B2B-like" locations, generally with good visibility, parking, and extended opening hours, which allows for simpler and more efficient routing strategies. Moreover, APMs and PUDOs significantly reduce the number of failed deliveries. Last Mile Expert's estimates show that first-time delivery success rates are usually above 99% for most items (excluding cash on delivery or "seller push" products that may not have been explicitly requested by the consignee). Using some postal terminology "slipper distance"\* (ca 350m\*\* in an urban area) is key for customer centric and effective delivery in the last mile and this is why in places where a dense and, proximate

OOH network exists, amongst others in Sweden, France, United Kingdom, Poland, Hungary, Finland, Czech Republic, Belgium or the Baltic States, these options are highly regarded by consignees.

In fact, Kantar research from 2022 showed that the NPS for InPost parcel locker delivery in Poland was an incredible 94, beating all other parcel delivery methods. At the same time NPS for shipping via an InPost locker reached 81 - a 6% increase year over year.

The survey also shows that 85% of online shoppers consider Parcel Lockers to be the most eco-friendly delivery option.

\*bpost term \*\* Based upon research from Posten Norge

## Comparison of Last Mile Delivery Modes

	Attended Delivery	Drop box/ Delivery box	Smartlock/ Controlled Access	APM (locker)	PUDO/ Access Point
Last mile served by	Carrier	Carrier	Carrier	Consignee	Consignee
Consignee present	Yes	No	No	No	No
Items Shipped	All	CEP/Pantry*	CEP/Pantry/ Fresh	CEP/Pantry/ Fresh** (size restricted)	CEP/Pantry/ Fresh** (size restricted)
First Time Delivery Success	High	Insignificant***	Insignificant***	Insignificant***	Insignificant***
Delivery time Window	Fixed carrier push/ Customer Pull****	Carrier operating hours	Carrier operating hours	Carrier/ location hours	PUDO hours
Collection times	NA	24/7	24/7	24/7/location hours	PUDO hours
Consignee retrieval time	None	Minimal	Minimal	Subject to APM location rules	Subject to PUDO location rules
Drop off time	Long	Minimal	Minimal	Subject to APM location	Subject to PUDO location
Capex/Parcel	Medium	Low	low	Medium/Low*****	Low/Medium
Delivery cost/Parcel	High	Medium	Medium	Lowest*****	Low
Operations issues	Failed delivery, low parcels per stop	Need for suitable size/density of boxes and access	Customer security concerns*****	Customer travel to location	Customer travel to location
Carbon reduction vs D2D	NA	Moderate	Moderate	Highest****	High

This table is based upon one developed by BESTUFS.net with modifications and updates by Last Mile Experts.

\* Pantry = non perishable groceries

\*\* Fresh availability is subject to chill chain requirements being met

\*\*\* Unless COD or push sell item

\*\*\*\* Generally for fresh or "white gloves"

\*\*\*\*\* Where locker use is optimised

\*\*\*\*\* Can be mitigated with cameras

Figure 3: Comparison of Last Mile Delivery Modes  
Source: Last Mile Experts

# GREEN LAST MILE TOPOLOGY

These charts from a recent InPost report by the TOR Consulting team show the operational differences and resulting carbon footprint for home delivery and out of home (APM) delivery in a nice and easy to understand format.

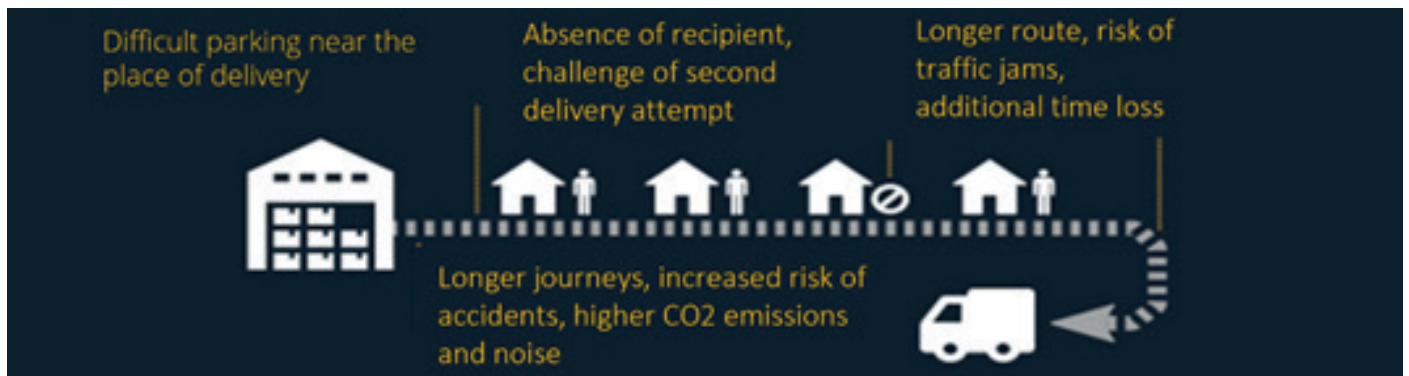


Figure 4: Comparison of Last Mile Delivery Modes – home delivery.  
Source: TOR, Parcel locker machines report

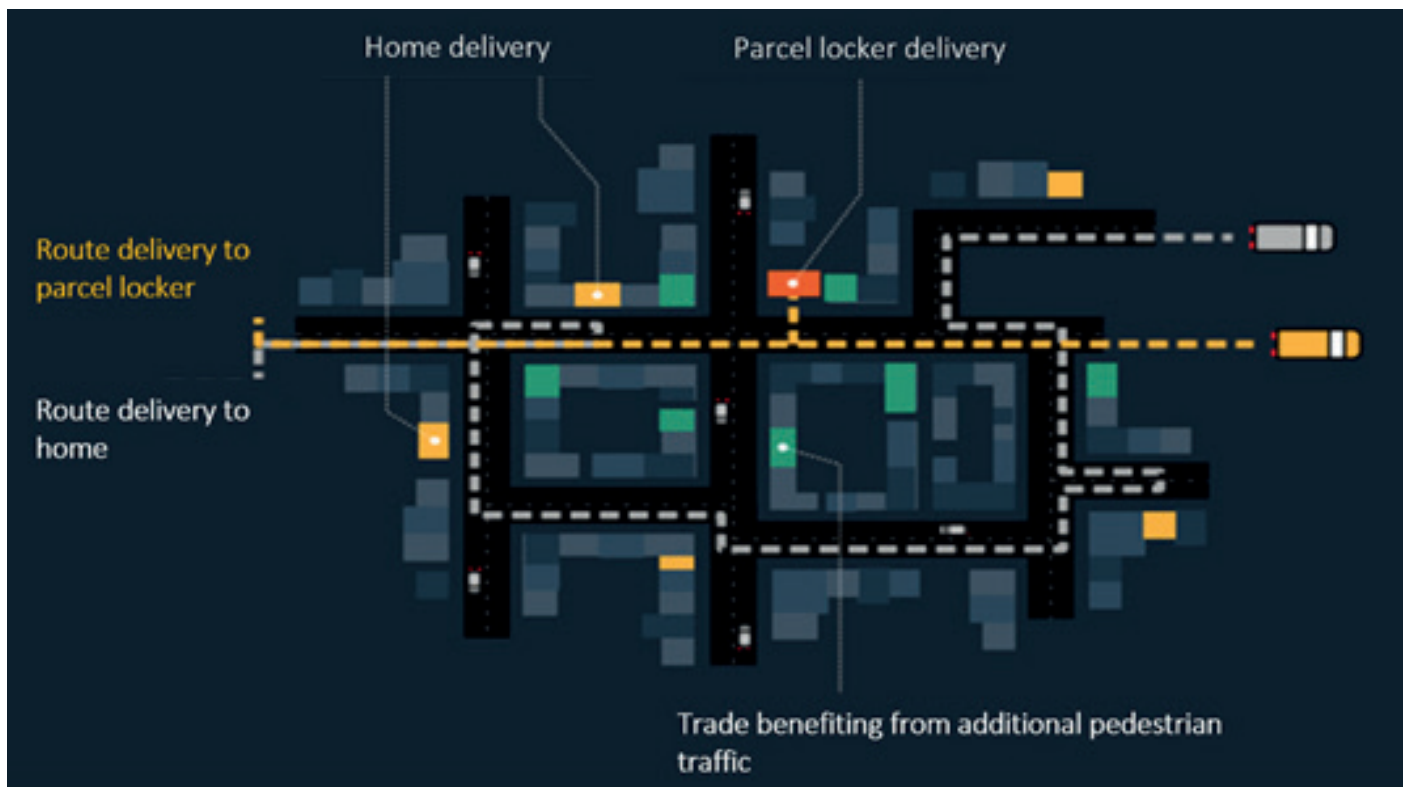


Figure 5: Comparison of Last Mile Delivery Modes – parcel locker vs. Home delivery.  
Source: TOR, Parcel locker machines report

# GREEN LAST MILE TOPOLOGY - POLAND

Due to its having the largest number of APM's in Europe, it is worth drilling down in Poland. According to the latest survey, by Gemius, InPost Paczkomaty® remains the top choice for delivery among online shoppers, with 81% reporting that they use this service most frequently. In contrast, only 43% of e-consumers opt for home or work delivery by courier. The survey also confirmed InPost's dominance in the overall courier delivery sector, with DPD and DHL following behind. Among the eco-friendly delivery options, parcel locker delivery was the most popular (67%), followed by delivery to a PUDO point (49%) and

delivery via BOPIS (48%). However, only 38% of respondents considered home or work delivery by a courier as eco-friendly. The most important issue related to ecological forms of delivering goods, as perceived by respondents, is the use of environmentally friendly packaging (65%). Second on the list is the possibility of using reusable packaging (53%). The issues of carbon footprint (33%) and transportation by electric vehicles (25%) are perceived as less important by those surveyed. Interestingly, choice of delivery option is not seen by consumers to be an issue, which only confirms the need for consumer education.

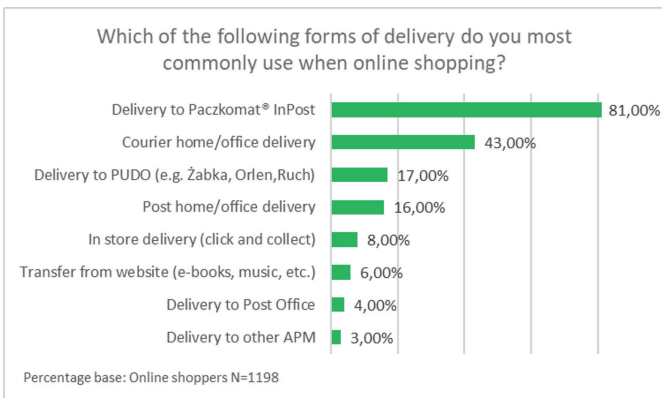


Figure 5: Delivery preference survey results

Source: Gemius, E-commerce w Polsce 2022

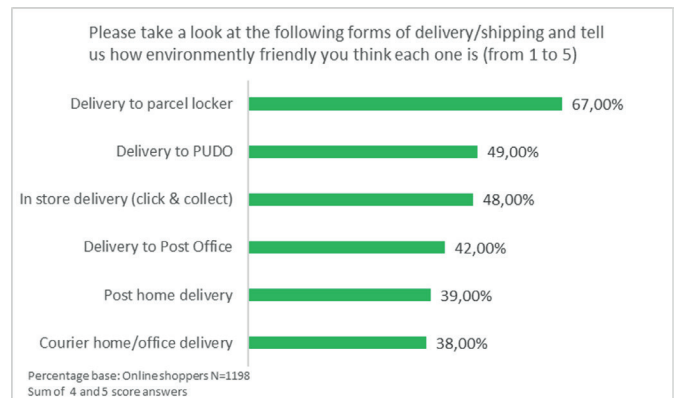


Figure 6: Eco-friendliness perception of delivery

Source: Gemius, E-commerce w Polsce 2022

# GREEN LAST MILE TOPOLOGY

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Urban micro hubs are compact logistics centres located within cities that enable efficient and sustainable delivery of goods. These hubs act as a bridge between the larger distribution centres and the final delivery destination, reducing the number of vehicles required to make deliveries and therefore minimising the carbon footprint. By consolidating deliveries in a single location, urban micro hubs optimise the use of vehicles, which reduces traffic congestion and lowers emissions. Additionally, since these hubs are located in urban areas, they allow for last-mile deliveries to be made via cargo bikes, electric cargo bikes or electric vehicles, further reducing emissions and improving sustainability. Overall, urban micro hubs are an innovative and practical solution to the challenges of delivering goods in urban areas, offering increased efficiency, sustainability, and reduced environmental impact. This is especially the case if they are „shared“ by several carriers.

In early 2023, a study was conducted to explore emerging trends in urban logistics. The study specifically focused on two concepts, Urban Consolidation Centres (UCCs) and Micro Hubs, and analysed the requirements of various stakeholders in urban logistics such as manufacturers, retailers, and logistics service providers. The results of the survey indicated that approximately 70% of companies envisage using

urban logistics solutions like UCCs and Micro Hubs in the near future, as these concepts offer a competitive edge.

However, new concepts must be understood by central and local government so that municipal regulations strengthen them and support success. The primary challenges and risks associated with implementing these concepts include education, coordinating efforts, costs and potential fluctuations in consumer buying habits.

The previously mentioned cargo and electric cargo bikes are becoming popular for last-mile delivery in urban areas due to their sustainability benefits and agility in the urban environment. A simulation model of a large German city showed that using cargo bikes with a micro-hub resulted in CO<sub>2</sub> emission savings of 65.5% and cost savings of 38.6%. However, implementing micro-hubs beyond the pilot stage is still hindered by several barriers.

The solution proposed is the use of urban-friendly nano-hubs, a modular design concept that enables the large-scale implementation of small transshipment hubs for cargo bike swap bodies within the delivery areas.

More details on this matter can be found in a chapter prepared by Dr Tom Assman from Otto-von-Guericke University Magdeburg.

# GREEN LAST MILE TOPOLOGY

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Are parcel locker deliveries really more eco-friendly than direct Home delivery?

Let's take a closer look. Most available research shows that if all courier transport moved to proximate and efficient parcel lockers, it would be possible to reduce CO<sub>2</sub> emissions by up to 2/3 in urban areas and even more in rural ones. Of fundamental importance is distance, and in a market like Poland where the average distance from the parcel machine or PUDO to the customer's home is „slipper distance" or about 350m in urban areas and where the access point is always „on my way" the risk of a dedicated car trip is mitigated.

According to the Green Generation report, 37% of respondents reach parcel machines walking. Moreover, according to the same survey, 62% of customers take out their parcels "on their way", for example when returning from work, traditional shopping or walking. Some people are also willing to choose a bike (or electric scooter), certainly better for the environment, because cyclists had 84% lower CO<sub>2</sub> emissions from all daily travel than non- cyclists and life cycle CO<sub>2</sub> emissions decreased by 14% for each additional cycling trip\*\*.

Having stated that APMs and PUDO's have the highest CO<sub>2</sub> reduction rate of all forms of delivery, it is worth highlighting the rationale for the development of OOH networks towards agnostic networks, which, being open to any logistics operator, show even greater potential for reducing emissions at the last mile. The popularity of parcel machine deliveries is one of the main drivers for the development of these networks.

Supporting the above, the SwipBox Kontaktfri study demonstrated a direct correlation between the number of parcels delivered to lockers and the potential CO<sub>2</sub> savings, highlighting the effectiveness of the locker concept. In this particular case, where SwipBox lockers that are located in close proximity to end-users for 12 parcels are delivered per stop (versus a typical number of just over 1 for home delivery), the potential savings could reach 63%, while with 24 parcels, the savings could increase up to 82%.

*\*Green Generation 2021", Mobile Institute, in partnership with Allegro and Lukaszewicz-ILiM.*

*\*\*Transportation Research Part D, Volume 93, April 2021, 102764*

Prepared with the support of:



# WHY IS THE GREEN LAST MILE RELEVANT TODAY?

# IMPACT OF E-COMMERCE ON THE LAST MILE

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## Introduction

The following sections bring together a collection of articles written by Green experts in and around the field of sustainable last mile delivery. The aim of these articles is to share a range of views on the challenges and opportunities facing the last-mile delivery sector, with a focus on promoting sustainable solutions for the environment and local communities.

The first article, "The Impact of E-commerce on Local Communities: Challenges and Opportunities for Sustainable Delivery Solutions" discusses the impact of e-commerce on local communities and the challenges faced in the "last mile" delivery process, particularly in urban areas. It highlights the negative impacts of delivery traffic on urban areas and how e-commerce companies can invest in sustainable delivery solutions.

The second article, "The Benefits of Sustainability: Helping Consumers Do the Right Thing", The article discusses the importance of sustainability for the logistics and postal industry, and how companies that incorporate sustainable practices into their business model are more likely to perform better financially and recover quicker from crises.

The third article, "Designing a Greener Roadmap for Last-Mile Deliveries in London and Other Large Urban Centres in Europe", focuses on the development of a greener roadmap for last mile deliveries in large urban centres such as London. The article discusses the challenges faced by delivery companies in implementing sustainable solutions and provides insights into the development of a roadmap for greener last mile deliveries.

The fourth article discusses the growing use of micro -hubs and cargo bikes for last-mile logistics in urban areas due to their sustainability and cost-effectiveness, and introduce the proposal of modular and urban-friendly nano-hubs.

Overall, these articles help build a comprehensive view of the challenges and opportunities facing the sustainable last mile delivery sector and offer practical solutions for promoting sustainability in the last-mile.



# IMPACT OF E-COMMERCE ON THE LAST MILE

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## **The Impact of E-commerce on Local Communities: Challenges and Opportunities for Sustainable Delivery Solutions**

**By Johan Peeters.**

Logistics is a crucial aspect of the modern-day business world, as it plays a pivotal role in the efficient delivery of goods to customers. However, logistics can also have a significant impact on local communities, particularly in the area of the "last mile" delivery. In this article, we will explore the impact of e-commerce on local communities, the trend towards urbanisation in Europe, and how logistics can contribute to a healthier and more livable society.

The growth of e-commerce has brought many benefits to consumers, including convenience, choice, and accessibility. It has revolutionised the way we shop, making it easier and more convenient than ever to buy what we need from the comfort of our homes.

However, it has also created new challenges for local communities, particularly with regards to the "last mile" delivery. The last mile refers to the final step of delivering a package to the customer and can be complex and costly due to factors such as crowded city streets, limited parking, and navigating complex building access codes.

Studies have shown that increased delivery traffic can have negative impacts on urban areas, such as air pollution, congestion, and road maintenance. In turn, local taxpayers are often left to bear the costs of these impacts. For example, a 2019 study by the European Environmental Agency found that the rapid growth of e-commerce and last mile deliveries are contributing to increased traffic congestion in urban areas and increasing emissions from delivery vehicles. The exact contribution of consumer movement to emissions related to parcel delivery in Europe is not widely reported. However, the transportation sector is a major contributor to greenhouse gas emissions globally and is a significant source of air pollution in urban areas. The increase in e-commerce and last-mile deliveries has contributed to the growth of delivery traffic in urban areas.

# IMPACT OF E-COMMERCE ON THE LAST MILE

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Furthermore, e-commerce companies often use local delivery contractors and subcontracted delivery services to complete the last mile, which may not have the resources to invest in sustainable delivery solutions, such as electric vehicles, bike delivery, and congestion pricing. As a result, cities are forced to introduce new regulations to manage delivery traffic, such as restrictions on delivery times and access to certain areas, which can be difficult to enforce and the cost of implementation is often also borne by local taxpayers.

It is important for e-commerce companies to consider their role in reducing the burden on local taxpayers by investing in sustainable delivery solutions and working with cities. A 2020 study by the World Bank found that cities can work with e-commerce companies to encourage sustainable delivery practices and share the costs of implementation, leading to a win-win scenario for both parties. By investing in solutions such as consolidated delivery via urban consolidation points or OOH points, electric vehicles and bike delivery, e-commerce companies can reduce their environmental footprint and support local communities.

Cities can also play a role in encouraging sustainable delivery

practices. By working with e-commerce companies to share the costs of implementation, cities can ensure that the benefits of online retail are shared by all. For example, the city of Amsterdam has been working with e-commerce companies to implement bike delivery and reduce the number of delivery trucks on the road, resulting in reduced traffic and improved air quality.

The trend towards urbanisation is another important factor to consider when looking at the impact of logistics on local communities. According to the United Nations Department of Economic and Social Affairs (UN DESA), approximately 74% of the European population lived in urban areas in 2018. This is a significant increase from previous years, and reflects the growing trend towards urbanisation in the region.

Urbanisation brings with it a range of challenges, including increased traffic, pollution, and pressure on infrastructure. As more people move to cities, the demand for goods and services increases, leading to more delivery vehicles on the road and greater congestion. This is particularly true for the last mile delivery, where vehicles have to navigate busy urban streets and find parking in areas where space is limited.

# IMPACT OF E-COMMERCE ON THE LAST MILE

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To address these challenges, cities are increasingly turning to sustainable transportation solutions, such as electric vehicles, bike delivery, and public transport. These solutions not only reduce the environmental footprint of logistics but also contribute to a healthier and more liveable society. For example, the city of Copenhagen has implemented a range of sustainable transportation initiatives, including a bicycle superhighway network and a new metro line, which have helped to reduce traffic congestion and improve air quality.

In addition to sustainable transportation, out-of-home solutions such as locker and pick-up points can provide customers with more convenient and flexible delivery options and can reduce the costs associated with door-to-door delivery. The convenience for the customer depends on their individual preferences and needs. Door-to-door delivery provides the benefit of delivery directly to the customer's location, which can be convenient for those who are unable to leave their homes or who have limited mobility. On the other hand, out-of-home delivery solutions, such as pickup points or locker systems, can be more convenient for those who are not at home during regular delivery hours or who live in a location with

limited access for delivery vehicles. Where dense and efficient networks exist, these solutions also have the potential to reduce the carbon footprint of the delivery process by reducing the number of delivery vehicles on the road. Something the city of Mechelen has shown by setting up an Ecozone in which both a dense network of out of home solutions is combined with emission free delivery vehicles and cargo bikes.

## **Conclusion**

E-commerce has brought many benefits to our lives, but the last mile delivery has created challenges for local communities. By considering the impact of their delivery practices and working with cities, e-commerce companies can ensure that the benefits of online retail are shared by all, reducing the burden on local taxpayers and contributing to a more sustainable future. Logistics plays a crucial role in building a sustainable and healthy society, and by investing in sustainable delivery solutions, e-commerce companies can make a positive impact on our environment and our communities.

# IMPACT OF E-COMMERCE ON THE LAST MILE

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## **The Benefits of Sustainability: Helping consumers do the right thing**

**By Graham Staplehurst, Jonathan Hall & Will Simpson**

At Kantar, we say we are now living in an 'era of disruption'. This is set against the preceding period, known to economists as 'the Great Moderation', where a stable world nursed the development of certain types of businesses – generally those suited to stability and certainty. Nowadays, moderation is in the rear-view mirror and disruptions come thick-and-fast, forcing companies to embrace agility and change, or else disappear.

And of course, the biggest disruption of them all – climate change – looms now larger than any. It gives a vital imperative for action.

The carbon footprint of the logistics and postal industry is large and well documented. It is an energy intensive industry closely linked to economic activity, moving goods and communication around to facilitate trade. And the last mile in particular offers sustainability challenges in the sudden dispersal of routes and potentially bespoke nature of each

delivery event. It is said to account for 53% of shipping costs and it makes a significant contribution to the industry's carbon footprint.<sup>1</sup> Innovation in this area is essential, and soon.

Looking across the industry, many companies are recognising the importance of climate change. Our proprietary BrandZ dataset suggests sustainability is more important to logistics brand equity in the minds of consumers than it is in other sectors. However, beyond a few companies, we also have evidence that, while actions are being taken, few single companies are owning this space in a way that could drive sustainable growth for them and their brands.

### **Sustainability business models offer significant benefits.**

For businesses that get it right – that understand their responsibilities, act and are seen to act – there are huge financial benefits.

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<sup>1</sup> Accenture, *The Sustainable Last Mile: Faster, Greener, Cheaper* (2021)

# KANTAR'S ESG IN LOGISTICS INSIGHT

For 25 years, Kantar's BrandZ database has tracked 20,000 brands across 522 categories and in 51 markets worldwide. Its brand valuations have been verified time and again against the financial outcomes of brands and the companies that own them. As a resource, it gives unrivalled insight into how brands build, maintain and lose value.

And what we see is that a company's reputation around sustainability, driven by genuine action and investment (rather than greenwashing!) is becoming an increasingly important indicator of brand equity. As a rule of thumb, Corporate Reputation explains about 10% of a brand's value, with

sustainability being now the most important aspect of this. In short, our data proves that businesses which build the ideas of the relevant sustainable development goals (SDG) created by the EU into their business model perform better financially and, crucially, are more resilient in times of crisis, recovering quicker once the dust settles.

To put this into hard numbers, our latest analysis shows that those brands which ranked highly across measures pertaining to sustainability in the eyes of consumers and business buyers grew substantially, even outstripping the average of the world's top 100 brands in 2022 vs. 2021 (See chart).

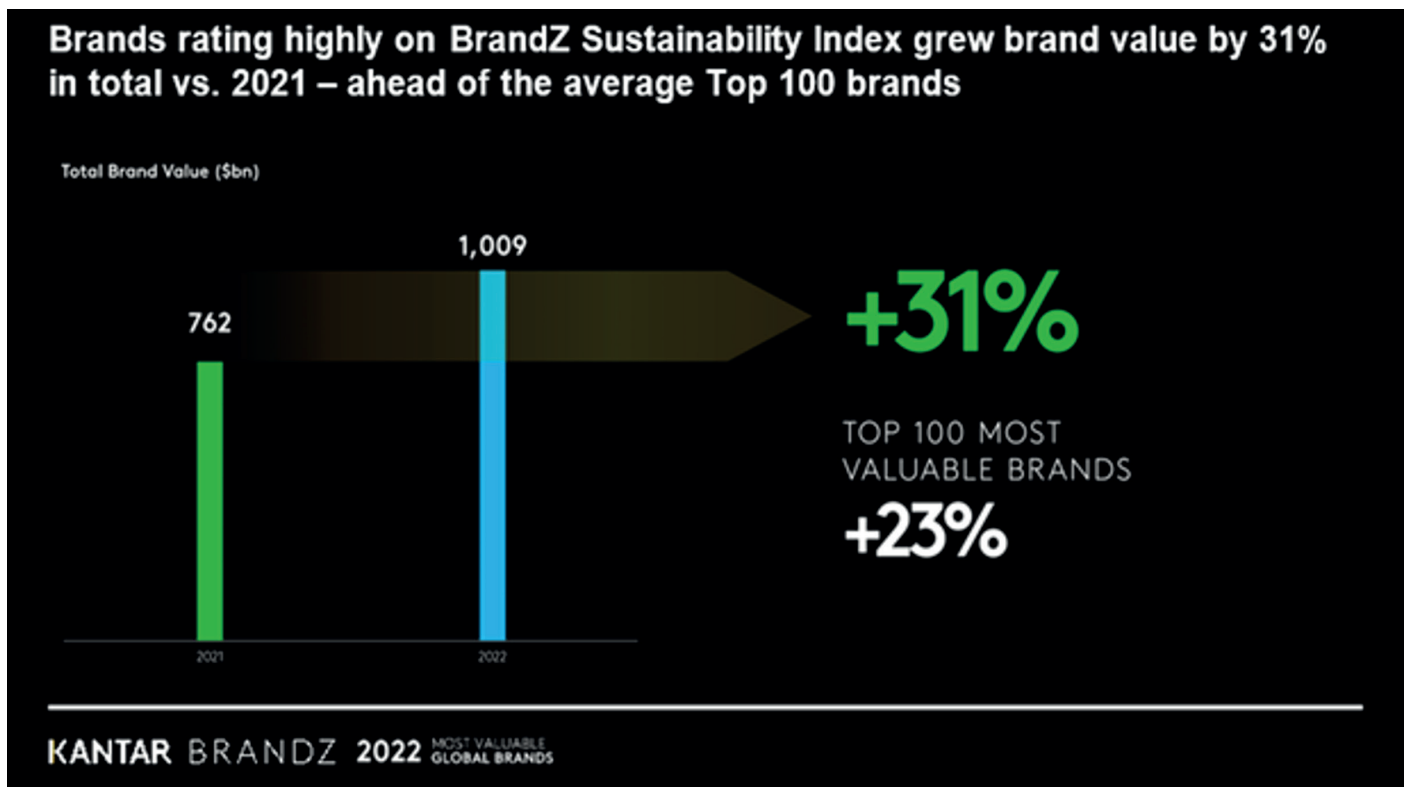


Figure 1: BrandZ Sustainability Index change 2021/2022

Source: Kantar

# KANTAR'S ESG IN LOGISTICS INSIGHT

In a sense, being clear on sustainability is becoming the table stakes for business – especially as regulation in this area is implemented around the world. But more than that, there is a huge opportunity here that should be grasped. Nowhere is this truer than in the logistics industry.

## The value-action gap.

As always, the basis of that value growth comes from consumers – the key question: where are they choosing to spend their dollars? Kantar's Sustainability Sector Index 2022 found that 97% of consumers are prepared to make changes to their lifestyle to live more sustainably. Some do, but many others struggle to put these wishes into action. For instance, 68% believe sustainable products come at a premium and 65% say that the increased costs of living prevent them making the choices they would like to. Cutting these numbers by social grade and income type shows clearly, those with financial flexibility are more likely to choose premium sustainable options;

those with less, find it harder. The point here is not that consumers are not telling the truth, it is that both perception and action are part of the equation. At Kantar, we call this the value-action gap. This tension between how consumers would ideally act and how they actually do helps identify barriers, either mental or physical, that stop them. In this gap, there are significant benefits to be reaped for those brands that remove frictions and help consumers act in the way they would like to. For the logistics industry, that would be offering sustainable delivery options at a competitive price. And indeed, climate issues are seen as an area that consumers the world over identify as businesses' responsibility. And by a large margin! Over two-thirds (67%) believe businesses should take action on the climate, while the next issue – pay and working conditions – are claimed as part of businesses' purview by less than half consumers (47%).<sup>2</sup>

Whose responsibility is it to help solve/tackle this issue? Businesses...

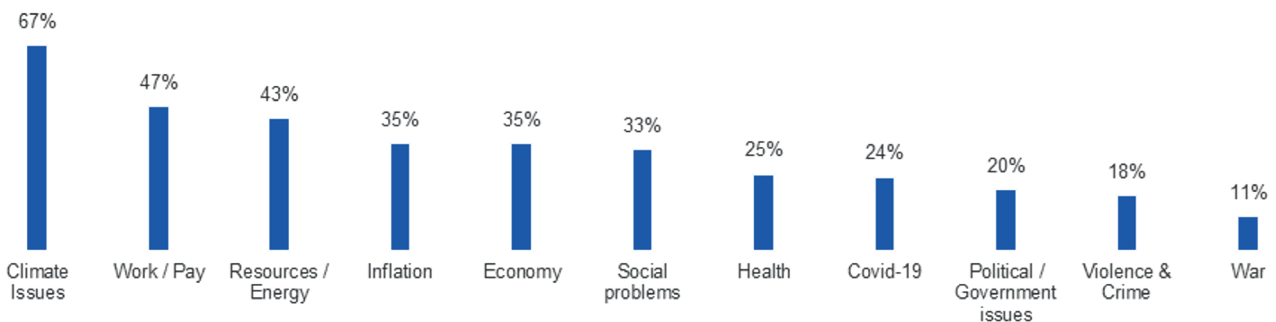


Figure 2: Consumer expectations towards Businesses' responsibilities

Source: Kantar

<sup>2</sup> Kantar's Global Issues Barometer – Wave 2, April 2022, Q5a. Whose responsibility is to help solve/tackle this issue?

Base: Total (19 countries)

# KANTAR'S ESG IN LOGISTICS INSIGHT

## So, what does our BrandZ data tell us about the logistics industry?

For our BrandZ data, our modelling approach relates the perceptions of brands in the minds of customers to the choices they make in buying decisions – which brands are they preferring and how much they are willing to pay for them. Looking across our recent Logistics studies, we can compare delivery companies with other categories, among both B2B and B2C brands, in terms of the influence that sustainability has on brand equity. On average, the importance of sustainability is higher for Logistics brands than for other categories. It's still not the most critical factor but its influence has been growing over time. Sustainability helps brands as both a hygiene factor - for many customers it's something to check off and be satisfied with - and also as a differentiator for a few specific brands.

**BrandZ data reveals that just 13% of Logistics brands have a strong consumer profile in the area of sustainability. The brands that have successfully promoted their sustainability credentials tend to be smaller businesses, but not all of them.**

One of the biggest with a positive profile is Lotte Logistics, the leader in South Korea. The company has a full scale ESG program and has a great reputation for treating employees and their partners well. DHL in Europe is also well regarded and has a

particular focus on its environmental responsibility – aiming to reduce its carbon footprint and “striving for clean operations and climate protection”. From within the industry, one would be forgiven for being amazed at this 13%! Surely it must be higher!

In recent years, some of the largest delivery companies have developed well-integrated and impactful ESG programmes and industry bodies such as UPU and IPC have been active in promoting the ambitions and achievements of the industry:

- For national posts, collective yearly CO2 emissions were reduced by 34% in 2021 compared to 2008<sup>3</sup>
- Between 2012 and 2021, posts have doubled the share of alternative fuel vehicles (from 12% to 24% of the postal fleet). Electric vehicles account for 17% of the postal fleet.<sup>4</sup>
- By 2021, 34% of the energy used in postal buildings comes from renewable sources. By 2030, posts aim to reach 75%.<sup>5</sup>
- The carbon savings offered by a well-functioning PUDO/Open-locker network<sup>6</sup>
- Replacing old sorting infrastructure with newer, more efficient models
- The generation by many companies of clean energy on site to run their operations

The list goes on as the industry has already made huge investments in this space. So, what explains the low penetration with the public?

3,4,5 <https://www.ipc.be/news-portal/general-news/2022/09/16/07/37/green-postal-day-2022>

6 <https://business.inpost.co.uk/press/inpost-partner-with-transport-for-london-to-deliver-dozens-of-new-parcel-collection-lockers-across-capital/>

# KANTAR'S ESG IN LOGISTICS INSIGHT

## Sustainability: Swords and Shields

At Kantar, we use a “swords and shields” framework to classify sustainability business investments. At a category level, this framework helps our clients understand what plays are necessary - a hygiene factor, or a shield – and which are genuine “big bets” around sustainability that can be used to differentiate their brand in their category and drive a competitive advantage.

Although more research is needed, one trend that may be classed as a shield is becoming clearer – the electrification of delivery fleets. It remains an incredibly important step, indeed, without it brands will not be seen to meet fundamental consumer requirements. Strides must continue to be made in this area, not least as regulation on combustion engines across Europe will come into force over the next decade or so, but also as it is predicted to offer operational savings over the long-term. However, as every major brand (at least

in the UK) is purchasing alternative fuel and electric vehicles, this action alone will not necessarily give them the winning edge over their competitors in consumers' minds.

That said, it is also true that sustainable investments made by carriers in the UK (as one national example among the countries we monitor) are being seen by consumers to some extent. The majority of brands that we track have seen their sustainability index increase since we started measurement in 2017 but none are running away from the pack.

The biggest winner here is DHL with an increase of 36. Closely following are DPD, FedEx and UPS who all saw 30 points of improvement. Royal Mail, with its superior brand salience and “feet-on-the-street” delivery model has the highest sustainability index, although it dropped slightly between 2020 and 2023.

Kantar BrandZ Sustainability Index: UK carrier market



Figure 3: UK Sustainability Index: UK Carrier market

Source: Kantar



# KANTAR'S ESG IN LOGISTICS INSIGHT

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In summary, Kantar's BrandZ data confirms the growing relevance of sustainability to the Logistics industry. This trend should not be ignored, and brands should continue to look to leaders and innovators in this area to see what can be achieved. Regulation is coming to force sustainable initiatives, but more than this, consumers expect you to take action and will reward those businesses that make their own sustainable aspirations a genuine possibility for them.

Further, the data underlines that the actions of players across the logistics industry are being noticed, but that no major players are currently owning this space in a way that could drive brand differentiation for them. Each company should be asking themselves: "can we go faster with our sustainable strategy and implementation?" If so, they may be able to cement their sustainability credentials with consumers and reap the benefits this will bring.

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Kantar, the world's leading data, insights and consulting company has a number of products and services to help operators and marketers in the logistics industry drive sustainability and value for their brands. In writing this article, we have drawn on three specific offers:

- **Kantar's Sustainable Transformation Practice** brings together expertise and assets from across Kantar to support organisations, both commercial and public, in the definition activation and measurement of sustainability strategie

We are dedicated to leveraging our human understanding expertise to identify how to move citizens and consumers on the journey from Value to Action.

- **Kantar BrandZ** ranks the most valuable brands in the world and shows you how to become one of them.

It is the world's largest, consumer focused source of brand equity insight, which also powers our proprietary brand valuation methodology. Kantar BrandZ brings you industry leading brand valuations, along with research from the world's most extensive brand equity study: Over 4 million consumer interviews covering 19,250 brands across 522 categories in 51 markets.

- **Our Specialist Logistics and Postal unit:** In the challenging world of post and logistics, tap into Kantar's expertise to help grow your business, improve your network, and gain visibility of your entire journey. Our suite of innovative insight tools combines operational and consumer data to give our clients the insight they need to make key business decisions.

If you would like to discuss any of the ideas in this report, please contact: [postandlogistics@kantar.com](mailto:postandlogistics@kantar.com)

# MUNICIPAL GREEN LAST MILE INITIATIVES

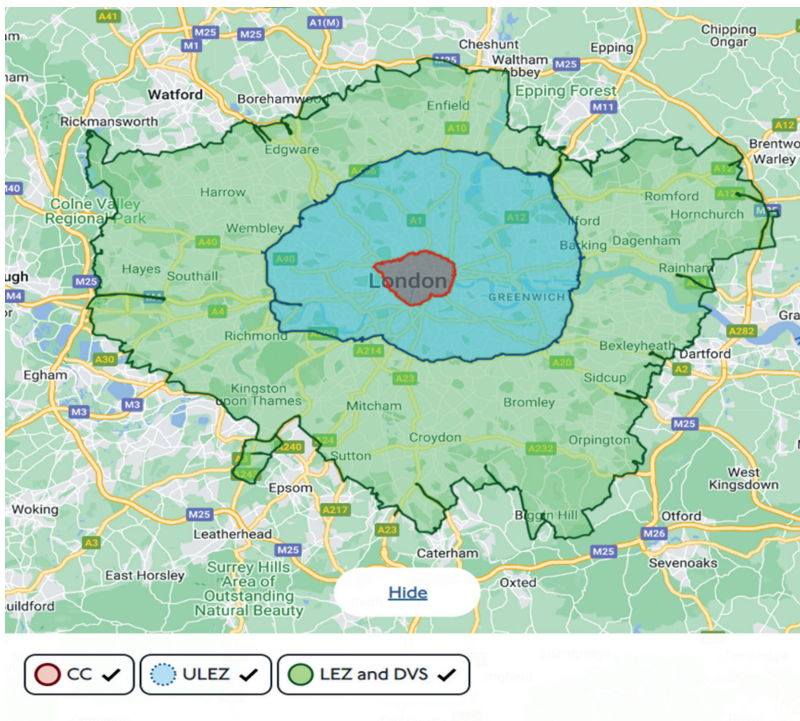
## Designing a greener roadmap for last-mile deliveries in London and other large urban centres in Europe

By Muhammad Fiaz Gul and José Anson

### I. Greening the last mile in London : introduction and current situation

Green last-mile strategy is a priority not only for many Courier Express and Parcel (CEP) companies but also for governments worldwide. In this regard, the Greater London Authority

(GLA) has implemented various policy interventions to reduce emissions by public and freight transport. GLA has taken both evolutionary and revolutionary measures in its three-tier emission reduction strategy. Before diving into these measures, let us look at some demographics of London. Greater London is made up of 32 boroughs and the City of London, with a total population of around 9 million people. Each borough has roughly 270,000 inhabitants, and London is divided equally between houses and apartments.



To provide a clean and eco-friendly environment to Londoners, GLA has introduced economic and environmental tools like the congestion charge in Feb 2003 (Centre for Public Impact, 2016), Low Emission Zone (LEZ) in 2008, and the world's first 24-hour Ultra Low Emission Zone (ULEZ) in 2019 (TFL, 2022). These eco-friendly measures have been extended across London since their introduction, with the ULEZ expanding to cover all London boroughs from 29 August 2023. Therefore, GLA is extensively promoting low-emission transport.

Figure 1: Map of Greater London  
Source: electrictwo.com

# MUNICIPAL GREEN LAST MILE INITIATIVES

This has had a significant impact not only on existing parcel delivery companies in London but also on new entrants in the last-mile market. Presently, large last-mile operators like Royal Mail, DPD, Evri, Amazon, DHL, FedEx, Yodel, UPS, and Whistl all have a presence in London. Royal Mail still has the largest 40% share of last-mile deliveries. According to industry expert Alan Barrie, out of more than 27,000 delivery vehicles that enter London daily to deliver parcels, 9,000 are from Royal Mail alone. Despite current strikes posing a threat to Royal Mail's position, it continues to dominate the last-mile delivery market, not only in London but also in the United Kingdom. Hence, in green last-mile delivery, Royal Mail leads the way in London. The combined fleet of 27,000 vans serves around 3.5 million addresses in Greater London, where, prior to the pandemic, 500 million parcels were delivered. Since then, around 700 million parcels have been delivered by this fleet, and it is expected to reach 1 billion parcels by 2030.

Royal Mail has a massive strategic advantage over its competitors in terms of green last-mile delivery. With a fully

developed network of distribution centres (DC) supported by delivery offices in London and a postie-network of 90,000 (ESG Report, 2022), it retains 30% of the parcel market share by volume, followed by Amazon with 17%, Evri 13%, DHL 8%, DPD, UPS, and Yodel with 6% each (Pitney Bowes Parcel Shipping Index, 2022). Most of these posties are deployed in London and are the main source of lowering emissions for Royal Mail. Currently, with an electric fleet of 1,588 (although DPD is ahead of Royal Mail in terms of fleet transition), Royal Mail is the most eco-friendly last-mile operator in London, with an average of 205gCO<sub>2</sub>e per parcel compared to the industry average of 300-500gCO<sub>2</sub>e per parcel (ESG Report, 2022). Other industry players, such as DPD and Evri, are actively searching for micro hubs, but it will take time for them to catch up with Royal Mail. DPD has established its first all-electric micro hub on Vandon Street in Central London, with a second hub in Shoreditch and plans to build six more in London. Micro hubs are important because they reduce stem time, saving time and fuel and increasing efficiency in last-mile delivery.



DPD's 5,000 square foot all-electric depot on Vandon Street in Central London is powered by two 7.5-ton all-electric vehicles, with final mile deliveries made by seven electric vans capable of making 120 stops a day. These vehicles are further supported by eight micro electric vehicles for delivering parcels in areas close to the depot. These micro vehicles can make 60 stops per charge per day. DPD's facility, with the help of around 18 vehicles, delivers.

Figure 2: All Electric 5,000 sq ft Depot DPD on Vandon Street, Central London  
Source: Authors:

# MUNICIPAL GREEN LAST MILE INITIATIVES

2,000 parcels a day in Central London, serving an area of two square miles in Westminster.

London has a network of colourful „street furniture“ parcel lockers, with Amazon leading the way with a network of around 6,500 lockers and InPost with around 4,500-5,000 lockers. Presently, this locker network is not carriers-agnostic, and each company is using it for its own parcels. UPS is apparently trying to catch up with

Amazon and InPost, but at a slow pace but the entrance of Parcel Pending (Quadiant) with its agnostic lockers will be a potential positive disruptor. If Royal Mail is able to deal with its internal issues and enters the race for parcel lockers, it will be challenging for its competitors to beat Royal Mail in terms of green deliveries. The different colours of parcel lockers reflect how different carriers use them as a physical differentiator from other industry players.



Figure 3: Lockars locker London  
Source: Authors:



Figure 4: Amazon locker London  
Source: Authors:



Figure 5: InPost locker London  
Source: Authors:



Figure 6: Amazon locker London  
Source: Authors:

# MUNICIPAL GREEN LAST MILE INITIATIVES

Despite concerns over the environmental impact of last-mile deliveries, Londoners still overwhelmingly prefer the convenience of receiving parcels at home. One key issue is a lack of awareness among consumers about the negative

externalities associated with home deliveries, such as increased CO2 emissions and congestion. In fact, a recent survey found that the vast majority of online shoppers were unable to find information about the carbon footprint of their deliveries.



Figure 7: Zedify e-cargo bike  
Source: Authors:



Figure 8: Ryde e-cargo bike  
Source: Authors:



Figure 9: urb-it e-cargo bike  
Source: Authors:

This lack of transparency limits consumer choice, as many carriers do not offer out of home (OOH) delivery options, which could help reduce emissions and alleviate congestion. Instead, consumers are often forced to choose the cheapest and most convenient delivery option available to them, without considering the broader social and environmental costs. To encourage more sustainable choices, greater transparency and education around delivery emissions and alternative delivery options are needed.

Many eco-carriers are operating in London, such as Zedify, Hived, Stuart (part of GeoPost/DPDgroup), Urb-it, and Ryde. These smaller industry players use a mix of zero-emission last-mile transport, such as e-bicycles, tricycles, and electric vehicles, for delivering parcels in deep urban areas like London. They are scaling up their zero-emission parcel delivery network, not only in London but also in other UK cities.



Figure 10: Hived e-cargo bike  
Source: Authors:

# LONDON GREEN LAST MILE INITIATIVES

## II. Survey on greening the last mile in London

Our survey has revealed that the majority of customers still prefer home delivery as their last-mile option, as opposed to greener alternatives such as parcel lockers or parcel shops. Of the customers surveyed who regularly shop online, 53% preferred home delivery, while 47% preferred green options for receiving their parcels. Interestingly, of the 47% who preferred green options, 23% chose parcel

lockers as their preferred method of delivery.

Despite home delivery continuing to dominate as the preferred last-mile option in London, the fact that different green options together make up around 50% of the last-mile options is a positive development. It suggests that customers are becoming increasingly aware of greener alternatives, and are willing to adopt them as part of their shopping habits.

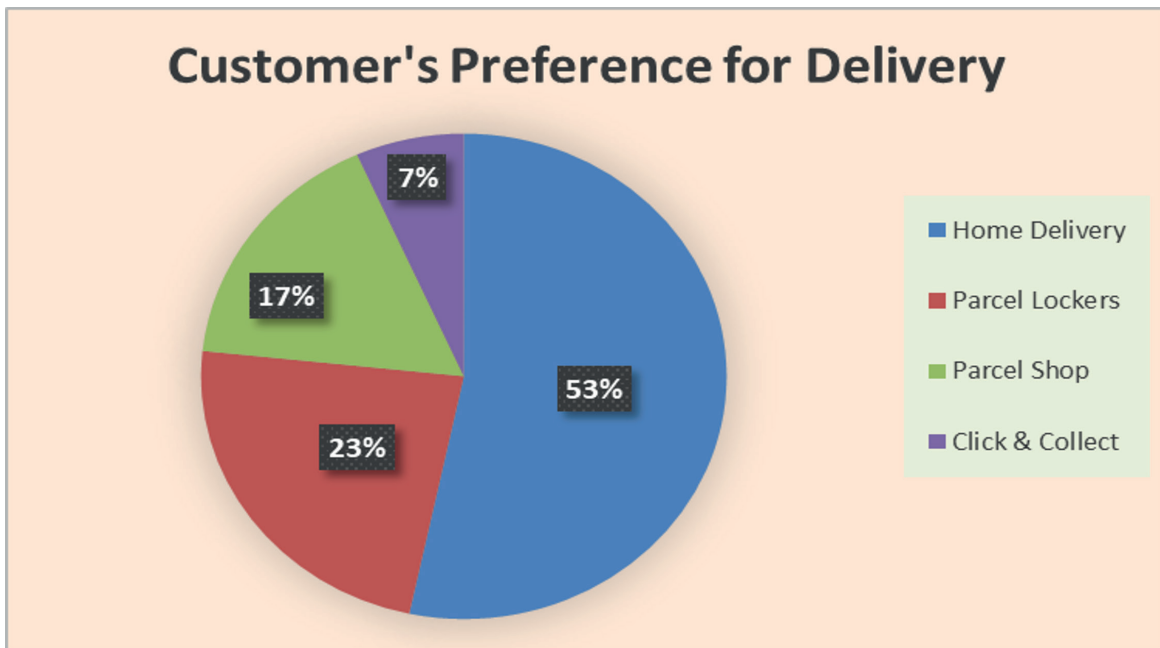


Figure 11: Customers delivery preferences  
Source: Authors:

The results of our survey asking customers about their preference for home delivery versus greener last-mile options were surprising. The overwhelming reason for choosing home delivery was convenience. 47% of respondents cited the presence of a family member at home as the main reason for choosing this option, while

20% preferred not to travel to collect their parcel. The distance to parcel lockers or shops was another significant factor influencing customers' choices. Therefore, it is essential to consider the location and density of parcel lockers to promote eco-friendly last-mile options in London.

# MUNICIPAL GREEN LAST MILE INITIATIVES

Interestingly, the survey also revealed that parking was becoming a real problem, particularly in central London, and was increasingly becoming a hurdle to using parcel shops or lockers for parcel collection. Additionally, 3% of respondents noted that even if the parcel shop or locker was within walking distance, it was difficult to collect bulky parcels and recommended using these options for smaller e-commerce deliveries.

Overall, convenience is the primary factor that attracts customers to choose home delivery over greener options. However, a significant reason for the preference for less green options is the lack of awareness about CO<sub>2</sub> emissions per home delivery. All respondents agreed that retailers or small stores should provide information about emissions per packet to customers at the online checkout. Interestingly, almost all respondents also indicated that they would choose greener last-mile delivery options if given the choice.

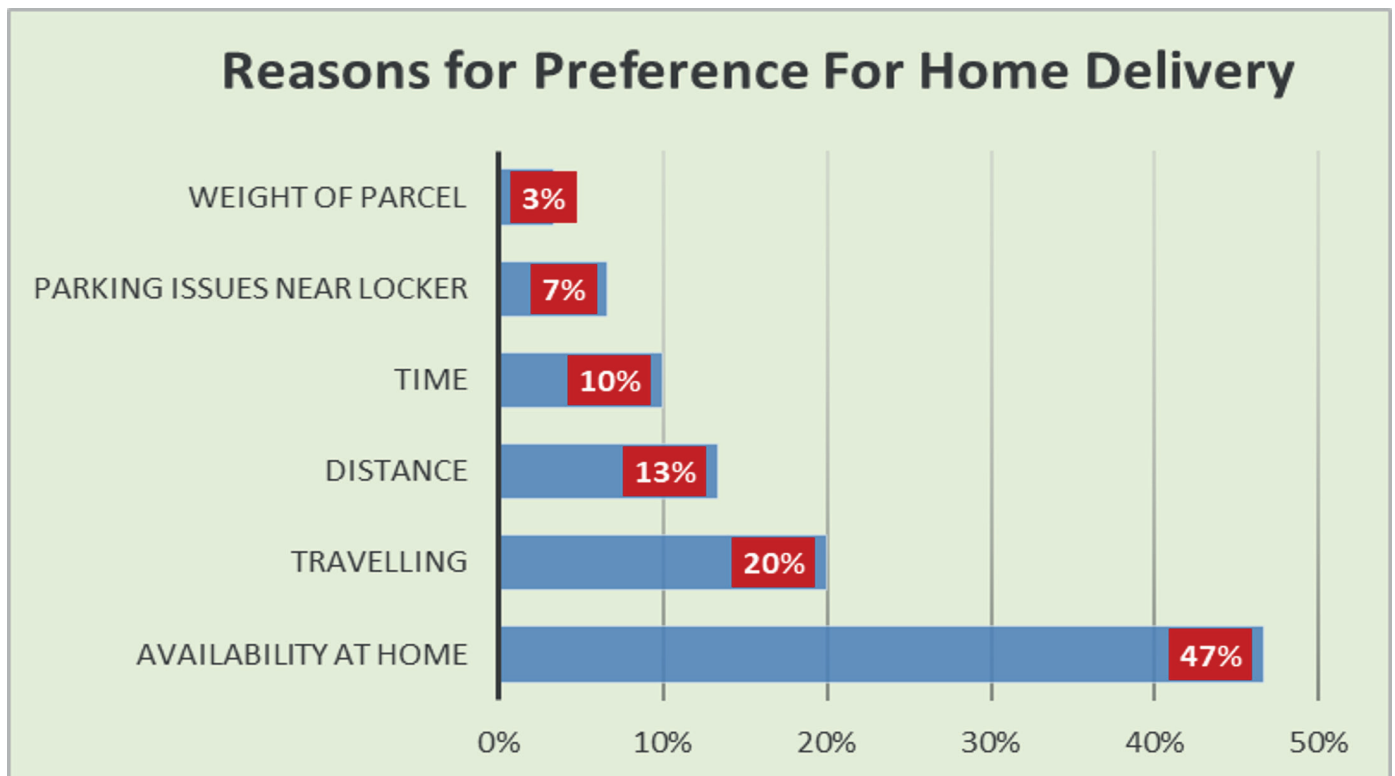


Figure 12: Home delivery preference reasons  
Source: Authors:

# MUNICIPAL GREEN LAST MILE INITIATIVES

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## III. Current delivery sustainability policy and business model failures in London

The policy of reducing last mile delivery carbon emissions through micro-hubs systems is still failing in London for several reasons.

Firstly, the implementation of micro-hubs requires significant investment in infrastructure and technology, which can be a barrier for smaller carriers and may slow down the pace of adoption by larger companies.

Secondly, the lack of carrier-agnostic parcel lockers means that customers have limited options for collecting their parcels from a convenient location. This pushes customers towards home deliveries, which increases the number of delivery vehicles on the road and thus increases carbon emissions.

Thirdly, customers are still not well informed about the environmental impact of home deliveries, and many are not yet willing to change their behaviour to adopt more environmentally-friendly options such as out of home (OOH) delivery or using smaller eco-carriers.

Finally, the lack of convenient and easily accessible OOH delivery points, such as lockers or shops, makes it difficult for customers to choose this option. This requires a significant effort from industry players, as well as from Transport for London (TfL), to build the necessary infrastructure and educate customers about the benefits of OOH delivery.





# MUNICIPAL GREEN LAST MILE INITIATIVES

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## IV. Encouraging stronger collaboration in the last mile in London

To foster collaboration between all last-mile delivery stakeholders and reduce delivery emissions in London, the following steps could be taken:

1. Encouraging transparency: Providing clear information on carbon emissions for all delivery options to online buyers would allow them to make informed decisions and choose the greener options, which would create market pressure for carriers to reduce their carbon footprint.
2. Coordinated planning: Collaboration between local authorities, carriers, and retailers could lead to coordinated planning of delivery routes and times, reducing unnecessary travel and making deliveries more efficient.
3. Promoting public transport: Encouraging the use of public transport and active travel modes, such as cycling and walking, for deliveries in the city centre could reduce congestion and emissions from vehicles.
4. Developing infrastructure: Developing infrastructure such as micro-hubs, cycle lanes, and secure parcel lockers could support the transition to greener delivery options and make them more feasible for carriers, or offering free or subsidised locations for green last mile infrastructure.
5. Incentivising green delivery: Offering financial incentives for carriers to adopt low-emission vehicles or use micro-hubs could encourage the adoption of greener delivery options.
6. Collaboration among industry players: Collaboration between industry players, such as sharing delivery routes and infrastructure, could reduce competition and improve efficiency, reducing emissions from the sector as a whole.

These measures, if implemented effectively, could foster collaboration among all last-mile delivery stakeholders, reduce delivery emissions in London, and create a greener, more sustainable city.

# MUNICIPAL GREEN LAST MILE INITIATIVES

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## **V. Limiting factors hindering a stronger collaboration in the last mile in London**

There are several factors that may be limiting collaboration for greener last mile delivery in London. One possible factor is the competitive nature of the industry, as each carrier may be more focused on gaining market share and increasing profits rather than collaborating with other players to reduce emissions. Additionally, there may be a lack of incentives or regulations that encourage collaboration and emissions reduction.

Another factor may be the high costs and challenges associated with implementing sustainable last mile delivery solutions. For example, building micro-hubs and developing alternative delivery networks can require significant investments in infrastructure, technology, and human resources. These costs may be prohibitive for smaller carriers or new entrants to the market.

Furthermore, the fragmented nature of the industry and the diversity of delivery models used by different carriers can make it difficult to standardise and implement sustainability measures across the entire sector. Additionally, the complex logistics and geographic challenges of delivering parcels in a densely

populated city like London can make it difficult to implement more sustainable delivery models, particularly in areas with narrow streets and limited parking options.

## **VI. Possible solution to foster stronger collaboration in the last mile in London**

One solution to foster collaboration for greener last-mile delivery in London could be to establish a public-private partnership (PPP) between the government, industry players, and other stakeholders. The PPP could work towards a common goal of reducing carbon emissions in last-mile delivery by implementing sustainable practices and technologies, such as micro-hubs, electric vehicles, and alternative delivery methods.

The government could provide incentives, subsidies, and regulatory frameworks to encourage industry players to adopt sustainable practices and technologies. Industry players, on the other hand, could share their expertise, data, and resources to achieve the common goal. Other stakeholders such as customers, community groups, and environmental organisations could provide feedback and support to ensure that the PPP is transparent and accountable.

# MUNICIPAL GREEN LAST MILE INITIATIVES

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By working together, the PPP could overcome the barriers that currently limit collaboration for greener last-mile delivery in London, such as the lack of trust, conflicting interests, and financial constraints. The PPP could also leverage the strengths and opportunities of each stakeholder to achieve a more sustainable and efficient last-mile delivery system.

Ultimately, the success of the PPP would depend on the commitment, cooperation, and leadership of all stakeholders involved.

## VII. The role of tech in supporting the governance of a greener last mile in London

There are various technologies that could support the establishment and governance of a PPP aimed at reducing delivery emissions in London. Here are a few examples:

1. **Data Analytics:** Advanced data analytics can be used to gather and analyse data related to delivery patterns, traffic congestion, and air quality in London. This data can be used to inform decision-making and measure the impact of the PPP over time.
2. **Internet of Things (IoT):** IoT sensors can be deployed throughout London to monitor air quality and traffic congestion. These sensors can provide real-time data to stakeholders and help to inform decision-making.
3. **Digital Platforms:** Digital platforms can be used to facilitate collaboration between stakeholders, provide real-time data, and streamline communication.
4. **Electric Vehicles:** Electric vehicles are an important technology for reducing delivery emissions. The PPP could provide incentives for companies to switch to electric vehicles and establish a network of charging stations throughout London.
5. **Micro Hubs:** Micro hubs can help to reduce delivery emissions by reducing the distance that delivery vehicles need to travel. Technologies such as autonomous vehicles and drones could be used to transport parcels between micro hubs and final delivery points, further reducing delivery emissions.

Overall, a combination of these technologies and others could be used to support the establishment and governance of a PPP aimed at reducing delivery emissions in London.

# MUNICIPAL GREEN LAST MILE INITIATIVES

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## **VIII. London : reason for a lack of a PPP approach for better governing the last mile**

There could be several reasons why such a PPP model has not been implemented yet in London:

1. Lack of political will: The government and local authorities may not have the political will to initiate and support such a large-scale PPP.
2. Coordination challenges: The coordination challenges between different stakeholders could be significant. The involvement of multiple agencies and private sector partners could create coordination challenges, which may delay or hinder the implementation of the PPP.
3. Funding: Setting up a PPP on such a large scale would require significant investment. Securing funding for such an initiative could be a challenge, especially if the financial benefits of the PPP are not clear.
4. Resistance to change: There may be resistance to change among traditional delivery companies that have been using conventional delivery models for years. They may be hesitant to adopt new delivery technologies or share infrastructure or data with other stakeholders.

5. Regulatory barriers: Existing regulations may hinder the implementation of a PPP. There may be legal barriers to sharing data or implementing new delivery technologies, which could pose significant challenges to the success of the PPP.

## **IX. Benefits of a greener last-mile delivery system through a PPP approach in London**

The benefits of successfully implementing a PPP for greener last-mile delivery in London could be significant.

Firstly, it would help to reduce the carbon emissions associated with last-mile deliveries in London, which would be an important step towards achieving the city's overall emissions reduction targets. This would also help to improve air quality in the city, which has been a longstanding issue in London.

Secondly, it could help to improve the efficiency and reliability of last-mile delivery operations, which would benefit both the businesses that rely on these deliveries and the consumers who receive them. This could be achieved through the use of new technologies such as shared logistics platforms and data analytics, which could help to optimise delivery routes and reduce the number of delivery vehicles on the road.

# MUNICIPAL GREEN LAST MILE INITIATIVES

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## **X. Trading-off the benefits and costs of a greener last mile in London**

The benefits of successfully implementing a PPP for greener last-mile delivery in London, such as reduced carbon emissions, improved air quality, and reduced traffic congestion, can indeed outweigh the costs. However, it is important to note that the costs and benefits of any policy or initiative depend on the specific details and circumstances of the implementation.

While the costs of implementing a PPP for greener last-mile delivery in London may be high, the long-term benefits of reduced carbon emissions and improved air quality can have significant positive impacts on public health, the environment, and the economy. Furthermore, the potential cost savings from reduced congestion and more efficient delivery routes can also provide economic benefits.

Therefore, it is important to carefully consider and weigh the costs and benefits of any proposed policy or initiative, and to ensure that it is implemented in a way that maximises its potential benefits while minimising its costs and potential negative impacts.

## **XI. Commitment of London's authorities and delivery stakeholders for a greener last mile**

There is evidence that many relevant authorities and delivery companies in London are aware of the importance of reducing emissions in last-mile delivery and are taking steps towards this goal. For example, the Transport for London (TfL) has implemented a number of initiatives to encourage the use of low-emission vehicles in the city, such as the Ultra Low Emission Zone and the Low Emission Bus Zones. Additionally, some delivery companies are exploring the use of electric and other low-emission vehicles in their fleets, and some have established micro-hubs in order to reduce the environmental impact of last-mile delivery.

However, there is still a long way to go in terms of achieving significant reductions in emissions from last-mile delivery in London. The challenges and barriers to collaboration and coordination that we discussed earlier in this conversation continue to hamper progress, and there may also be a lack of understanding or awareness among some stakeholders about the potential benefits of working together to reduce emissions.

# MUNICIPAL GREEN LAST MILE INITIATIVES

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## **XII. Benchmarking London and other big cities in Europe and the world**

Paris has also been facing similar challenges with last-mile delivery emissions, but the city has been implementing several measures to address the issue. For example, the city has implemented low-emission zones, where only vehicles meeting certain emission standards are allowed to operate. Paris has also been promoting the use of cargo bikes and electric vehicles for last-mile deliveries. In addition, the city has been working with private companies to establish urban consolidation centres, where goods are consolidated before being delivered to their final destinations, reducing the number of delivery vehicles on the road. Overall, while Paris still faces challenges in reducing last-mile delivery emissions, the city has taken proactive steps towards achieving greener last-mile delivery.

New York City is also facing similar challenges with last-mile delivery emissions. According to the New York City Department of Transportation, trucks account for 7% of the city's total emissions, and that number is expected to increase. The city has taken some steps to address the issue, such as implementing a congestion pricing plan, expanding the use of cargo bikes for deliveries, and establishing a commercial loading zone program

to better manage curb-side space for deliveries. However, like London and Paris, there is still a need for greater collaboration and innovation among all stakeholders to achieve significant reductions in delivery emissions.

Both Amsterdam and Berlin have made significant progress towards sustainable last-mile delivery. In Amsterdam, the city government has established a zero-emissions zone in the city centre, where only electric vehicles and cargo bikes are allowed to operate for last-mile delivery. The city has also invested in a network of parcel lockers, which are open to all carriers and promote the use of sustainable delivery options. Additionally, Amsterdam has implemented regulations requiring all new buildings to include delivery storage and loading infrastructure, to reduce congestion and emissions caused by delivery vehicles.

In Berlin, the city government has established a pilot project called "Distributed City Logistics", which aims to reduce emissions and congestion by consolidating deliveries and using cargo bikes and electric vehicles for last-mile delivery. The project is a collaboration between the city government, delivery companies, and other stakeholders, and has shown promising results in reducing emissions and improving efficiency.

# MUNICIPAL GREEN LAST MILE INITIATIVES

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Both Amsterdam and Berlin have demonstrated a strong commitment to sustainable last-mile delivery and have implemented policies and initiatives that promote collaboration between stakeholders.

Nevertheless, many big cities around the world are still struggling to address the challenges of last-mile delivery and reduce delivery emissions. Some of the cities that are lagging behind in this area include:

1. Delhi, India: The rapid growth of e-commerce in Delhi has led to a surge in delivery vehicles, resulting in high levels of air pollution and traffic congestion.
2. Jakarta, Indonesia: With a population of over 10 million, Jakarta is one of the most congested cities in the world, and the high volume of delivery vehicles on its roads exacerbates the problem.
3. Lagos, Nigeria: Lagos is one of the fastest-growing cities in Africa, but its transport infrastructure has struggled to keep up, leading to high levels of congestion and air pollution.
4. Sao Paulo, Brazil: As one of the largest cities in South America, Sao Paulo has a significant last-mile delivery sector that is struggling to adapt to the city's complex geography and infrastructure.
5. Los Angeles, USA: Los Angeles has one of the highest rates of car ownership in the world, and the large number of delivery vehicles on its roads is exacerbating the city's air pollution and traffic congestion problems.

Overall, many other cities around the world are grappling with the challenges of last-mile delivery, and there is a growing recognition that collaboration and innovation will be needed to address these challenges in a sustainable way.

# MUNICIPAL GREEN LAST MILE INITIATIVES

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## **XIII. The role of climate finance in easing the adoption of a greener last mile**

Innovative funding mechanisms could be introduced to support the transition towards greener last-mile delivery. For example, one possibility could be the use of green bonds, which are debt securities issued to fund environmentally friendly projects. Companies or governments could issue green bonds specifically for last-mile delivery projects that aim to reduce carbon emissions. Another possibility could be the introduction of carbon pricing schemes, where companies that emit carbon are required to pay a fee for every ton of CO<sub>2</sub> they release. The revenue generated from these fees could be used to fund projects aimed at reducing carbon emissions, including last-mile delivery projects. Additionally, public-private partnerships could leverage public funds or infrastructure to support the transition towards greener last-mile delivery, while also encouraging private investment in these projects.

## **XIV. Time horizon for achieving the goal of green last mile deliveries**

Achieving net-zero last-mile deliveries in major cities will depend on various factors such as the level of

collaboration between stakeholders, the adoption of new technologies, the availability of funding, and the regulatory environment. It is difficult to predict an exact time horizon for this goal, as it will vary from city to city.

However, some cities have set ambitious targets for achieving net-zero emissions. For example, London has set a target to become a zero-carbon city by 2050, which includes reducing emissions from the transport sector. Paris has set a goal to become carbon-neutral by 2050, and New York City has a target to achieve carbon neutrality by 2050 as well. Other cities around the world are also setting similar targets.

While these targets are ambitious, achieving net-zero last-mile deliveries will require significant effort and investment from all stakeholders involved. It will require continued innovation in technology, strong collaboration between delivery companies, regulators, and local authorities, and a sustained commitment to reducing emissions from the transportation sector.



# MUNICIPAL GREEN LAST MILE INITIATIVES

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## **XV. Next key priorities for decarbonizing the last mile**

To achieve net-zero last-mile deliveries in major cities faster, several actions can be prioritised:

1. Strengthen collaboration among stakeholders: Collaboration among different stakeholders such as local authorities, delivery companies, and customers is essential to achieve the net-zero goal. It is important to establish partnerships and involve all parties in developing and implementing solutions for greener last-mile deliveries.
2. Invest in sustainable transport infrastructure: Governments can invest in sustainable transport infrastructure such as cycle lanes, electric charging stations, micro-hubs or OOH (PUDO & APM) locations. This can provide delivery companies with the necessary resources to switch to low-carbon transport modes and reduce emissions.
3. Encourage the use of electric vehicles: Electric vehicles can significantly reduce carbon emissions in last-mile deliveries. Governments can incentivise the use of electric vehicles by providing tax breaks, subsidies, and grants to delivery companies to invest in low-carbon vehicles.
4. Promote alternative delivery

methods: Encouraging alternative delivery methods such as cycle deliveries, cargo bikes, and electric-assisted vehicles can significantly reduce carbon emissions in the last-mile. Governments can support delivery companies in adopting these methods by providing training and equipment.

5. Introduce low-emission zones: Governments can introduce low-emission zones in city centres to restrict the use of high-emission vehicles. This can help to reduce emissions from last-mile deliveries and encourage delivery companies to switch to low-carbon vehicles.
6. Educate customers: Customers play an important role in achieving the net-zero goal. Educating customers about the environmental impact of deliveries and encouraging them to choose low-carbon delivery options can help to reduce emissions in the last-mile.

By prioritizing these actions, we can achieve net-zero last-mile deliveries in major cities faster and contribute to a more sustainable future.

Moreover, out-of-home delivery could play a significant role in reducing last-mile delivery emissions. This delivery model allows customers to pick up their orders from a designated location instead of receiving them at their doorstep and has very high first time delivery success.

# MUNICIPAL GREEN LAST MILE INITIATIVES

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By consolidating multiple deliveries in one location, out-of-home delivery can significantly reduce the number of delivery vehicles on the road, leading to lower carbon emissions. Moreover, out-of-home delivery can also promote active modes of transportation such as walking or cycling, which can further reduce emissions.

In addition, out-of-home delivery can also improve the efficiency of delivery operations, as it can be easier to plan and optimise deliveries to a few central locations compared to a large number of individual home addresses.

Overall, implementing and promoting out-of-home delivery options can be an effective strategy to reduce last-mile delivery emissions and improve the sustainability of urban logistics.

## **XVI. Conclusion**

In conclusion, it can be stressed that achieving net-zero last-mile deliveries in major cities will require a concerted effort from all stakeholders, including policymakers, delivery companies, consumers, and technology providers. It is important to recognise that this is not just an environmental issue but also a social and economic issue, as the impacts of last-mile deliveries go beyond just carbon emissions. Therefore, it will be important to balance the needs of different stakeholders and consider the trade-offs between environmental, social, and economic outcomes when designing and implementing solutions. Collaboration, innovation, and a long-term perspective will be key to making progress towards sustainable last-mile deliveries.



# NANO-HUB STUDY



## Nano-hubs for cycle logistics as an urban-friendly alternative to micro-hubs

### The urban last mile challenge

The efficient and reliable last mile in cities is the key to satisfy nearly 80% of Europeans and to compete on costs and sustainability. The latter getting strong momentum over the last years since cities, citizens, businesses and politicians aim to tackle climate change and increase quality of life through better air and less fossil-fuelled, heavy delivery vehicles. The ongoing dynamic growth of e-commerce and the resulting increase in urban deliveries add to the challenge by adding new transportation demand to overused urban transportation systems.

One trendy and straightforward solution is the implementation of cargo bikes for the very last mile. However, this approach has two drawbacks currently. Firstly, micro-hubs within the dense and mostly expensive city are needed. Affordable space is scarce and a major barrier for implementation. Secondly, cargo bikes improve the tour efficiency, but quite often this is not enough to outbalance the introduction of the micro-hub. We therefore propose the combination of two new approaches to overcome those challenges and take a step towards 100% carbon neutral last mile deliveries.

## Automated and autonomous cargo bikes for the last mile

Autonomous vehicles are the current trend to solve the last mile issue and improve efficiency. Delivery robots can already be seen on some campuses and sidewalks. That the latter gets overcrowded when all parcel should be delivery by them is obvious.

Autonomous vans are an alternative, but don't solve the problem of being too heavy for the delivery task and still needing to drive in congested roads. Both technologies also generally require human guidance, don't deal with the issue of the consignee not being at home, and do not provide a solution for one distinct delivery challenge: How to provide the best service and deliver the delivery to the doorstep of the comfortable and lazy customer?

At our lab we therefore strive for a very useful alternative, the automated cargo bike. As vehicle it is the perfect vehicle to fill the gap between delivery robot and van, as non-automated vehicle proof around Europe. Automated means that it knows two modes, the manual drive and the automated drive. We call the latter come-with-me function (CWM). In manual mode every delivery person can drive it like a conventional cargo bike, allowing to bridge longer distances also along arterial roads, on the tour fast.

# NANO-HUB STUDY

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During the actual delivery the delivery person can switch on the CWM-mode. This aims to improve the efficiency between stops close to each other, as in dense urban districts. In CWM mode, which we currently develop, the cargo bike starts to act similar to a dog, being able to follow (figure 2), driving in parallel or parking itself in a secure space. All this is commanded via speech and the delivery person can take parcels out to the box while walking. From our first investigations those functions minimise idle times of

the delivery person and can increase tour efficiency by 20%.

Besides the strong gain in efficiency CWM-cargo bikes benefit logistics operators in two ways:

- Saving costs while keeping the delivery person in operation allowing good service and complex interactions with consignees.
- It improves the tour but does not change the entire logistics systems. It is therefore easy and fast to implement.



Copyright: ONOMOTION

Figure 1: Onomotion ecargo bike

Source: Otto-von-Guericke University Magdeburg

# NANO-HUB STUDY

## Nano Hubs as enabler for next generation deliveries.

Deploying micro hubs for last mile logistics is challenging since space is scarce, expensive, mostly not available at an optimal location and cities struggle to provide public space for micro-hubs. Distances to the delivery area can get comparably long, negatively effecting tour efficiency, especially if a cargo bike can perform multiple tours a day.

Swappable containers for cargo bikes are becoming widely used. They enable more efficiency through preloading them at the conventional, suburban, hub of the logistics operator. From there they will be shipped to the delivery areas and can be mounted on the cargo bike without any further need to handle parcels. This, in theory, makes space for parcel handling in micro-hubs unnecessary. Thus, you can shrink it a facility designed for the pure focus to store the containers securely between delivery from the hub and takeover for the cargo bike.

The new facility is coined nano-hub (figure 2). Its size equals more the size of commonly known boxes for outdoor one-family garbage cans than a garage (-complex), as micro-hubs do. It is therefore way easier to distribute them in a delivery area, e.g. in backyards, on parking lots, at the edge of a delivery zone. Thus, cargo bike riders can

swap container fast and start the tour directly in the delivery area improving the tour efficiency (figure 2). In a case study we investigated the effect of such nano-hubs. We defined a total of three scenarios. The first scenario represents the parcel delivery with diesel-powered vans (light-duty vehicles, LDV). The starting and ending point for a delivery tour is an urban hub on the outskirts of the city.

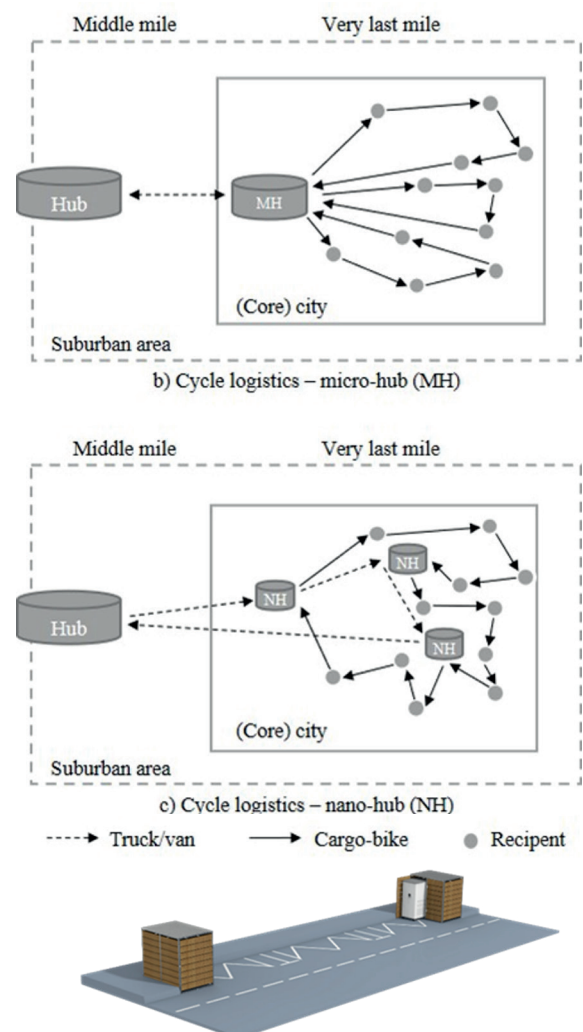


Figure 2: Micro-hub and Nano-hub operating models  
 Source: Otto-von-Guericke University Magdeburg

# NANO-HUB STUDY

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Delivery robots can already be seen on some campuses and sidewalks. That the latter gets overcrowded when all parcels should be delivered by them is obvious. Autonomous vans are an alternative, but don't solve the problem of being too heavy for the delivery task and still needing to drive in congested roads. Both technologies also do not provide a solution for one distinct delivery challenge: how to provide the best service and deliver the delivery to the doorstep of the comfortable and „lazy“ customer?

In the second scenario, parcels are delivered by cargo-bikes with a micro-hub in the city centre serving as starting and ending point of each delivery tour. The feeder traffic is handled by diesel-powered trucks (heavy-duty vehicles, HDV). In the third scenario, parcels are also delivered by cargo-bikes. However, the starting and ending points are a total of ten nano-hubs, which are distributed throughout the entire delivery area.

The results are pretty clear. The conventional cargo-bike approach (cargo-bike and micro-hub) reduces the total distance from 131km to 77km a day. Through the nano-hubs even 21km more total distance can be saved. This results in a time gain of 25,3% (nano-hub to micro-hub). Subsequently operational costs can be reduced by 46%. The effect on externalities is even stronger with reduction of 64% of external costs.

## Summary - Nano-Hubs

Especially for last-mile delivery in dense urban areas, cargo bikes are gaining popularity as a sustainable alternative to overcome motorised delivery vehicles' traffic, environmental and economic disadvantages. To quantify the benefits of cargo bikes for last-mile logistics, we have implemented a simplified simulation model representing the delivery processes of a local logistics service provider in a large German city operating either conventional diesel-powered delivery vehicles or cargo bikes in combination with a micro-hub located in the city centre. For our use case, the utilisation of cargo bikes resulted in CO<sub>2</sub>-emission savings of roughly 65.5 % and operational cost savings of around 38.6 %.

However, while some parcel service providers show that they are successfully testing different micro-hub concepts, several barriers (e.g., lack of space, costs, integration in the surrounding environment) prevent the implementation beyond pilot status. Hence, our work also aimed to overcome these barriers by introducing nano-hubs as an urban-friendly alternative to micro-hubs. In particular, we proposed a modular design concept that considering urban planning restrictions and logistical processes, enables the large-scale implementation of small transshipment hubs for cargo bike swap bodies within the respective delivery areas.

# NANO-HUB STUDY

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The simulation of this concept has shown that the CO<sub>2</sub> savings are comparable to those of the micro-hub concept. However, due to its locational advantages and the resulting decrease in tour lengths and durations, the nano-hub concept enables additional economic benefits, i.e., operational cost savings of roughly 46 % compared to conventional delivery vehicles. This is particularly relevant for CEP service providers as last-mile delivery is considered not cost-effective. Overall, nano-hubs, therefore, contribute to further establishing cycle logistics processes in urban areas and thus reduce delivery-related drawbacks to the environment, traffic, and quality of stay.

## Conclusion

The green last mile future is unclear but firstly can be shaped by good technologies and secondly reveals some possible scenarios already today. We perceive, that there will be a need for human centric delivery in the future and we also, to our best knowledge, think that cargo bikes will play a vital role in that. In this brief outlook we described to approaches how we can make last mile deliveries more efficient. Automated cargo bikes with CWM-function will make life for delivery persons easier and save time between stops. Nano hubs are a means to fully utilise them by providing the necessary transshipment facilities, well spread of the delivery area, by reducing times to drive between hubs and actual delivery area. The combination of both can reduce total kilometres by more than 50% and delivery time even more.

## Acknowledgment

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Details about nano hubs can be read in: Kania M, Rolf B, Assmann T, Zadek H (2022). The smaller, the better? Nano-hubs for cycle logistics as an urban-friendly alternative to micro-hubs. Logistics Journal : Proceedings, Vol. 2022. CWM-cargo bike here: <https://www.aura.ovgu.de/Projekte/EAASY+System.html>

Prepared with the support of:



# PARTICIPANTS OF THE REPORT



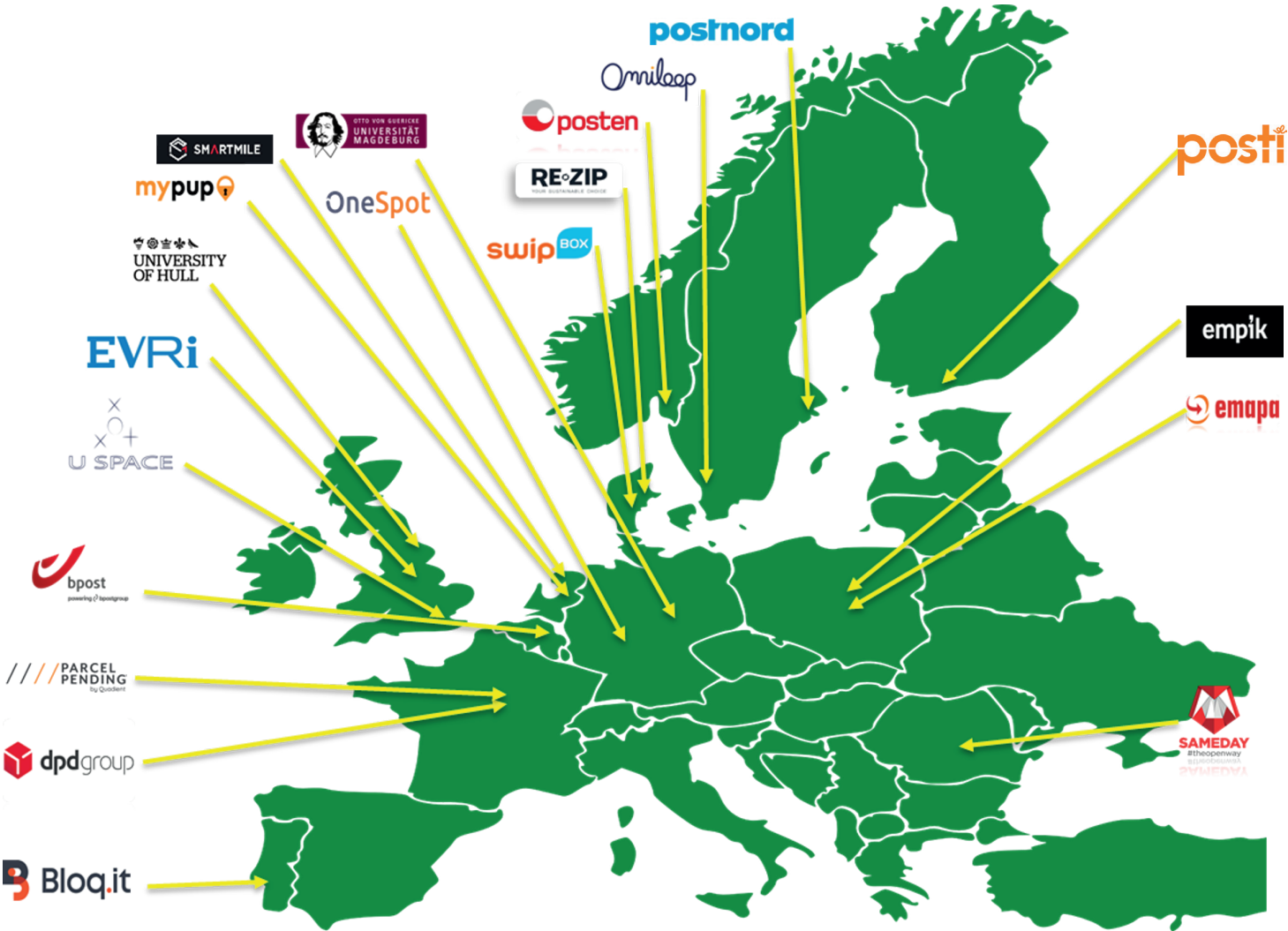
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---

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- **FRANCE:** Parcel Pending by Quadient, 42-46 Av. Aristide Briand, 92220 Bagneux
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# PROJECTS MAP



Prepared with the support of:



# REVIEW OF INITIATIVES

# PROJECT TYPES

As presented in the Green Last Mile topology, projects can fall into various buckets and range from simple “quick wins” to more complex, longer term projects that require partnerships (often private-public) in order to succeed.

The reduction of package usage, optimisation of delivery routes, and replacement of combustion engine vehicles with alternative energy sources are among the quick win Green last mile initiatives.

Many organisations have declared to be in the process of implementing fossil-free or emission-free delivery projects, but only a handful of them decided to share the details of their implementation in this report. These initiatives and commitments, often from industry leaders highlight the growing importance of sustainability in the last-mile delivery sector and the potential for significant impact in reducing emissions.

We have also received cases on innovative methods of last mile delivery that are at the development phase which can be found in a

separate section on future development.

Nonetheless, we maintain that consumer and operator „green” education and OOH-agnostic networks, which we predict will dominate the future of the last-mile ecosystem, are the most effective approach to improving delivery efficiency and reducing emissions. The latter stance is supported by The Future of the Last-Mile Ecosystem report by the World Economic Forum. The biggest impact can be made through the consolidated collection or delivery of parcels, with lockers or PUDOs playing a crucial role.

Despite our efforts and requests, we have unfortunately not received any support and project descriptions from many of the large carriers, especially those with US roots, that publicly claim to be active in this area. For this reason, the number and scope of projects described is limited, albeit increased from last year. We sincerely hope that the next edition of our report we will be able include many more examples of interesting and varied green initiatives and projects.



# BELGIUM



## BPOST



### Summary

#### Setting the scene:

bpost's ambition is to reach **net-zero emissions by 2040** and reduce **55% emissions by 2030** compared to 2019 in own operations. 100% zero emission last mile by 2030.

Decarbonisation goes beyond a green fleet. bpost objective is to:

1. Reduce km's driven
  - Less transport = less emissions = less pressure on cities and more clean air.
2. Make drive km's greener
  - By electrification of our fleet and use of bike trailers.
3. and compensate in the meantime what we can't eliminate yet.

Ecozone is an answer to the city's biggest challenges of today: how to improve both air quality as liveability in our cities.

An Ecozone combines all these elements: a (part) zip code where parcels, mail and newspapers are 100% emission free delivered. In Ecozones, bpost combines fewer kilometres driven with greening the vehicle fleet. As a result, we not only focus on emission-free mobility, but also on behavioural changes on multiple levels. An Ecozone consists out of 3 important pillars:

- a shift towards zero emission (vehicle & PUDO).
- a shift towards soft mobility.
- a shift towards consolidation.



Figure 1: Ecozone description  
Source: bpost

## ECOZONE DEFINITION

Model based on bike-trailers, parcel lockers, microhubs & integrated rounds



Figure 2: Ecozone definition  
Source: bpost

## Introduction

The ecozone is a new model of sustainable urban delivery based on 3 pillars:

1. Emission-free mobility: delivery by e-vans and cargo bikes.
2. A dense network of PUDO points accessible on foot from home or work (400m): parcel distributors, parcel points, post offices.
3. Local services for local communities.

By combining these 3 pillars, we will reduce the number of kilometres travelled, which will improve, in urban centres:

1. Air quality by reducing CO2 and fine particle emissions.
2. Quality of life by reducing noise, congestion and damage to urban infrastructure.

3. The development of local services by relying on a national and local structure.
4. A guarantee of sustainable employment.

**bpost has the most dense network of PUDO points in Belgium, with 2800 PUDO points of which 700 are lockers.** bpost is present in every city or municipality, but also in rural areas.

A dense PUDO network is important, to be close to the consumer. Being close, means convenient, but also more sustainable. It allows bpost to reduce CO2 emissions in order to achieve sustainability targets (by less failed deliveries and consolidation of volume). The chance that a parcel is picked up by foot or bike is higher and as a result we have less CO2 emissions.

## Methodology

Sustainable logistics is a “and” story



4A model to transform toward sustainable logistics.  
Cathy Macharis, VUB-MOBI



Figure 3: Bpost ecozone methodology

Source: bpost

## Results

The Mobilise research cell of the Vrije Universiteit Brussel (VUB) monitors the sustainability impact of the Ecozones. It takes into account all aspects: CO2 emissions, air pollution, noise pollution, kilometres driven, traffic disruption and damage to the road surface.

In Mechelen VUB Mobilise recorded an overall sustainability gain of 32%.

- 123 ton less CO2 emission. (97% less CO2 emissions, 77% less particulate matter)
- Ecozone is more than lowering CO2, it has a positive impact of -32% on the social cost. (the cost the society pays) for example: traffic jams and noise reduction, 4 out of 5 inhabitants collected their parcel by foot/ bike. Resulting in 164 fewer kilometres travelled per day with delivery vans and 49% fewer decibels.

**bpost ambition is to have zero-emission delivery in 25 Ecozones by 2025 and cover 50% of parcels:**

- End 2022, bpost will have 9 Ecozones. (15 zip codes).
- End 2023, bpost will have 19 Ecozones (good for 45 zip codes).

**On top our efforts are being recognised: Ecozones won already several awards:**

- 2021: "Environmental Achievement Award" of Parcel and Postal Technology International.
- 2022: 3 BeCommerce Awards (Logistics, Innovation and the Jury Award).

## Ecozone positive impact on our ecological footprint of 97%

VUB mobilise VUB Results CO2 emission for parcel delivery

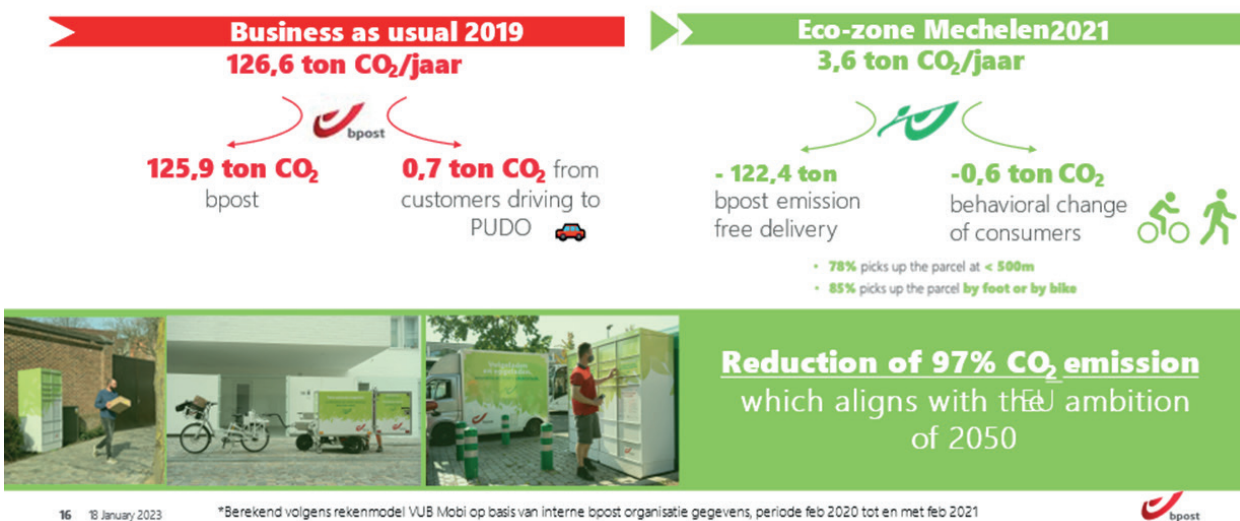


Figure 4: Ecozone ecological footprint impact  
Source: bpost



# Sustainability gains



Results from the VUB analyse:  
Ecozone Mechelen



Standard operating model

\*Berekend volgens rekenmodel VUB Mobi op basis van interne bpost organisatie gegevens, periode feb 2020 tot en met feb 2021

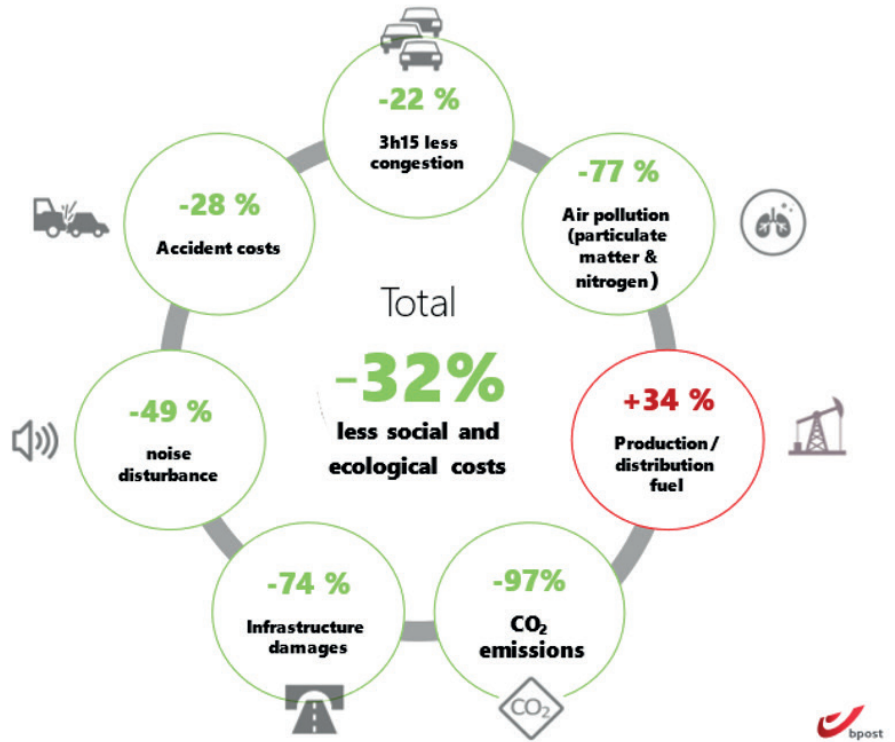


Figure 5: Sustainability gains  
Source: bpost

# DENMARK



## RE-ZIP APS

**RE-ZIP**  
YOUR SUSTAINABLE CHOICE

### Summary

The European Green Deal, extended producer responsibility, and ESG report compliance, as well as a focus on consumers, all point in the same direction: a change is needed in e-commerce packaging to address the huge amounts of packaging waste and carbon footprint. Previous examples of this include bottle recycling, the ban of single-use straws, and fees on plastic shopping bags in grocery stores. Next up is e-commerce packaging.

RE-ZIP has developed a circular concept using foldable cardboard boxes and bags that can replace current single-use cardboard boxes and bags, reducing packaging waste

by, by 3-6 times and the equivalent of up to 80% CO<sub>2</sub>. End-users can easily choose RE-ZIP at the web shop's checkout for a small fee, in return for a much larger voucher upon returning the RE-ZIP. To return the RE-ZIP, end-users simply use the RE-ZIP app to locate the nearest drop point (such as parcel shops, lockers, or mailboxes). For the convenience of the end-users, the RE-ZIP is returned by scanning the QR code on the packaging and dropped off in order to receive their reward. This creates a circular loop that adds value for web shops, customers, customers, PUDO's, and not least the environment.



Figure 1: RE-ZIP packaging and app  
Source: RE-ZIP

## Introduction

**Problem:** More than 200 billion parcels are shipped worldwide, generating approximately 200 billion pieces of single-use packaging trash. While recycling is better than using virgin materials to a certain extent, the carbon footprint (CO<sub>2</sub>) of recycling is not reduced due to the heavy and energy-intensive nature of recycling processes.

**Solution:** Simply REUSE the same packaging several times before RECYCLING it. This can save up to 80% CO<sub>2</sub> compared to using the best recycled single-use packaging. Our solution involves using ordinary cardboard with a patented folding method, replacing traditional cardboard boxes and plastic bags. This approach is sustainable from the very first circulation and helps to reduce waste and environmental impact.



Figure 2: RE-ZIP packaging circulation vs single use packaging circulation  
Source: RE-ZIP

## Methodology

RE-ZIP provides reusable packaging to web shops based on a unique circular model that creates value for all stakeholders in the e-commerce loop. When online shoppers choose RE-ZIP as an alternative to single-use packaging at check-out, they are rewarded with a voucher to the webshop when they return the RE-ZIP packaging at a drop point. The packaging is then returned to a RE-ZIP hub, where it is cleaned and redistributed to another web shop.

RE-ZIP has developed a partner model for postal operators and CEP's around the world to integrate the circular concept in to their current infrastructure. Via RE-ZIP's Manager system, patented packaging, and utilizing existing sales platform, PUDO's for drop-points and reverse logistics a RE-ZIP Partner will quite fast and easy be able to offer RE-ZIP reusable packaging to their customers (webshops) and online shoppers.

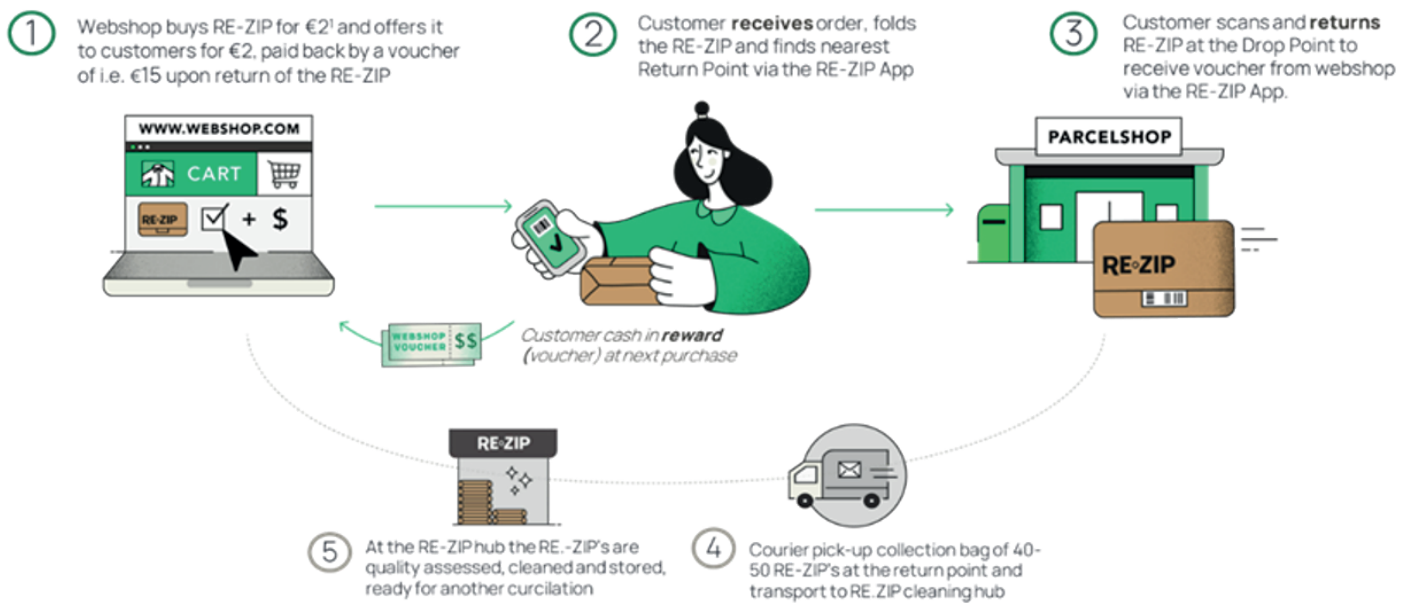


Figure 3: RE-ZIP operating model  
Source: RE-ZIP

## Results

The concept has been tested and is live in 4 countries, and it will be available in more countries in 2023. Saving up to >80% of CO<sub>2</sub> and reducing waste by 2-10 times per piece of packaging, the potential savings are huge.

In 2022, approximately 20 tons of CO<sub>2</sub>eq and 13 tons of water and waste were saved, and we expect to increase these savings to more than 26.000 tons of CO<sub>2</sub> and +17.000 tons of water and waste, respectively, by 2025 as we onboard partners and shops in various countries.

## Learnings

IT'S ALL ABOUT THE RETURN RATE!  
By using ordinary recycled cardboard, RE-ZIP is able to save significant amounts of waste and CO<sub>2</sub> based on REALISTIC return rates. The return rate is the heart of any circular system, and therefore the reusable/circular item should be designed to match realistic

return rates. Previous projects involving end-users have shown a return rate of up to 70-80% when effective, which means an average of 3-5 circulations per packaging. Therefore, believing that reusable packaging will ever reach 10, 20 or 50 circulations is close to utopia.

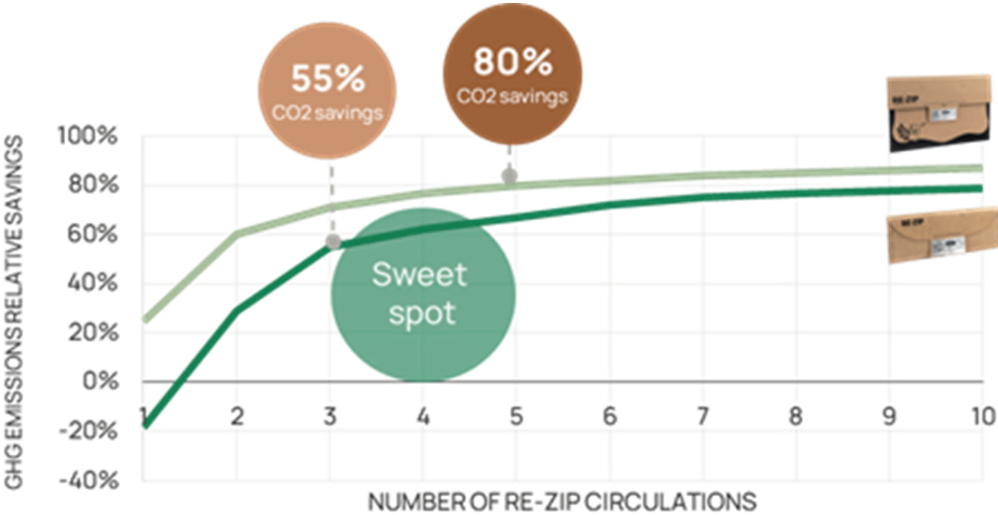


Figure 4: RE-ZIP packaging return rate calculation  
Source: RE-ZIP

All data documented in the Life Cycle Assessment is calculated by Deloitte.

# DENMARK



## SWIPBOX



### Summary

In collaboration with their partners, SwipBox facilitates the roll out of more than 30,000 Infinity parcel lockers around the world, with many new countries on the way this year. These lockers, with an innovative ecosystem, aim to increase convenience and reduce the hassle of delivery for consumers and delivery companies. The lockers are easy to install, require minimal maintenance, and can be integrated into existing infrastructure or buildings, offering flexibility in installation and mobility. Additionally, they have an energy-efficient, lean design, making them affordable and easy to use in any location. They are also recyclable, reducing their environmental impact.

### Introduction

The Infinity parcel lockers were designed to revolutionise the last-mile delivery process for consumers and delivery companies by using apps rather than touch screens for all interactions – from the factory to the end user. Communication with the locker is done via Bluetooth, eliminating the need for a internet connection. With no screen or internet

Not only do the Infinity parcel lockers improve the parcel delivery process, but they also operate on batteries, using minimal energy.

The successful rollout of the Infinity parcel lockers highlights the importance of continued investment in sustainable solutions that can contribute to a greener future for all. Consumers and delivery companies alike have reported high levels of satisfaction with the lockers, emphasising their ease of use and convenience.



Figure 1: SwipBox office

Source: SwipBox

connection, the locker uses so little power that it can run on batteries – which even come with a 10-year warranty. The Kontaktfri study (see below) showed that lockers can result in a 25% reduction in CO<sub>2</sub> emissions and upwards compared to conventional home delivery methods, providing a promising eco-friendly alternative to last-mile deliveries.

While we cannot control the final leg of the delivery journey, from the locker to the consumer's home, the impact on emissions from this can be minimised by locating lockers near end users, thus encouraging sustainable methods of transportation such as walking, electric vehicles, or trip-chaining (combining package pickup with errands).

Altogether, Infinity parcel lockers are a cost-efficient, sustainable, and flexible solution that outperforms existing locker options on the market. Additionally, the lockers boast a high level of recyclability, with the material able to be split into 99% recyclable components, further reducing the environmental impact.

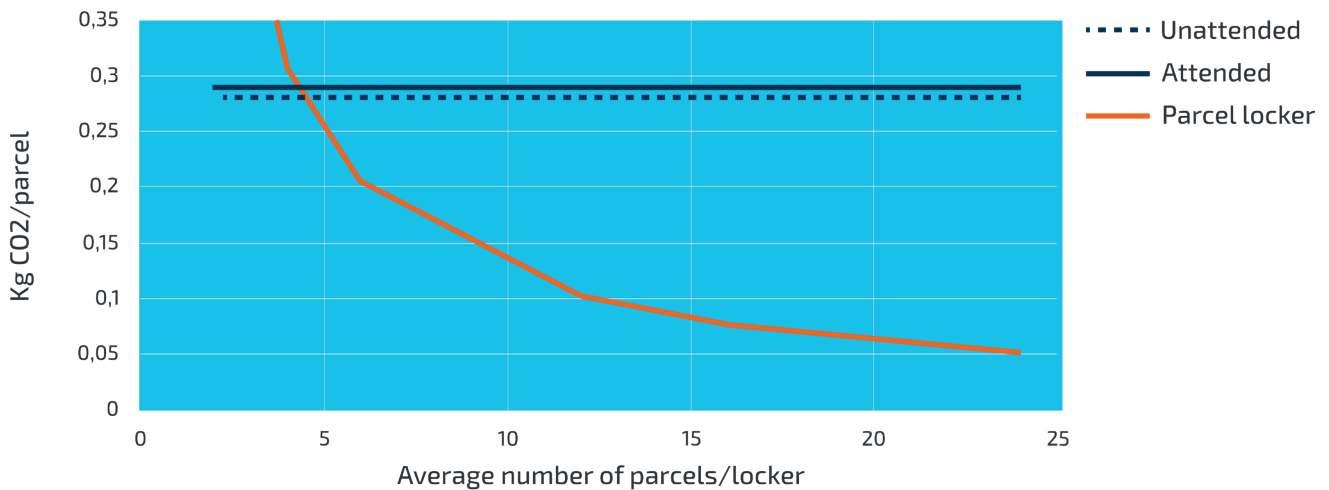


Figure 2: Average number of parcels per locker

Source: SwipBox

## Methodology

The effectiveness of the Infinity parcel lockers was evaluated through a comprehensive study that consisted of two parts: In-house studies and a pilot study in Norway (Kontaktfri).

In-house studies were conducted to evaluate the design and performance of the Infinity parcel lockers. The studies involved end-user surveys to gather feedback on the usage and satisfaction with the lockers. The analysis of the lockers was done to assess their design and performance in the rollout.

Kontaktfri is a pilot project funded by the Norwegian Research Council with PostNord as the project leader. The study focuses on developing contact-free solutions for last-mile delivery by piloting the SwipBox Infinity parcel locker network and a new offering for signature-free home deliveries. The aim of

the study is to gain knowledge about which delivery solutions for e-commerce are the most sustainable for society.

The study compared different solutions for last-mile delivery, including attended and unattended home deliveries, and parcel lockers. A calculation model was used to analyse the cost and environmental impacts of each solution and whether the customer would collect their parcels in an environmentally friendly way. The findings showed that parcel lockers are more efficient than home deliveries from both a cost and environmental point of view and that customers are willing to make an effort for more environmentally friendly deliveries. The study provides a framework for simulating cost and CO2 emissions for different last-mile delivery solutions, including customers' final leg.

## Results

Our proof of concept showed that rolling out Infinity parcel lockers is cost-effective and that the lockers can be placed almost anywhere, making them a versatile solution for last-mile delivery. In addition, SwipBox – in cooperation with customers – have already successfully completed 11 fast rollouts, further demonstrating the feasibility and practicality of the solution. In short, the Infinity parcel locker has the potential to revolutionise the delivery process for delivery companies.

**Savings:** The Kontaktfri study found that the Infinity parcel lockers were highly favoured by customers and were energy efficient, with a lower carbon footprint compared to conventional home delivery methods. Implementing a strategically located network of Infinity lockers presents an opportunity to reduce costs and carbon emissions, making the delivery process more sustainable.

### Convenience equals high satisfaction:

End-user satisfaction with Infinity parcel lockers increased from 93% to 97% over time, i.e. more pickups meant higher satisfaction. An analysis of end-user comments showed that the lockers were seen as “perfect,” “easy,” and “fast,” leading to good impressions and high satisfaction among customers.



Figure 3: SwipBox parcel locker

Source: SwipBox

## Learnings

The Kontaktfri study shows that with an increase in the number of parcels delivered to the lockers, there is a corresponding increase in potential CO<sub>2</sub> savings, proving that the Infinity concept – convenience through user-friendly, low-energy parcel lockers close to end users – works. For instance, with 12 parcels delivered per stop, the savings could be as high as 63%, and with 24 parcels, the savings could be as much as 82%.

The ease of installation, low energy consumption, and reduced maintenance needs of the Infinity parcel lockers also contribute to their sustainability by requiring

fewer resources, in turn reducing the carbon footprint and making the Infinity parcel lockers a responsible and sustainable option for the delivery process.

In conclusion, the Infinity parcel lockers offer a promising alternative for last-mile deliveries, promoting sustainability and reducing the environmental impact of e-commerce, while also providing cost savings to both the consumer and delivery companies. Additionally, the utilisation of sustainable methods of transportation such as walking, electric vehicles, or combining errands can further minimise the total emissions.



# FINLAND

## POSTI GROUP OYJ



### Summary

To make Posti's target to transport fossil-free tangible and to be able to widen the 100% fossil-free delivery areas, the company crafted a green vehicle roadmap to transfer its whole own fleet to be fossil-free. The roadmap includes a plan to take into use thousands of new electric, biogas, and hydrogen vehicles

within the next eight years. The objective, now extended until 2030, has been transformed into a concrete and financially viable plan that will facilitate our transition to a sustainable transportation fleet.



Figure 1: Posti electrical delivery van

Source: Posti



Figure 2: Posti bio fuel truck

Source: Posti

### Introduction

Companies are setting ambitious emission reduction targets to answer the social and commercial demand. That applies to Posti, a leading delivery and fulfilment company in Finland, Sweden, and Baltics. The company has set a short-term target to have zero scope 1 & 2 emissions and 100% fossil-free road transportation by the end of 2030 and have net-zero emissions through all scopes by 2040.

Both goals are approved by the Science Based Targets initiative and the net-zero emission goal was approved by SBTi as the first logistics company in the world.

Companies frequently lack a tangible and comprehensive action plan to achieve their goals, often limited to the next fiscal year. Posti aimed to rectify this issue.

## Methodology

We gathered a group of experts from across the organisation including sourcing department, business groups, finance, and sustainability, and set to work in order to come up with a long-term roadmap that shows how the company can be 100% fossil-free in all transportation within the next eight years (end of 2022 until the end of 2030).

The group mapped current fleet, current and upcoming transportation technology and calculated a business case for each vehicle class and technology: when the technology is feasible so that it can be taken into production

and when it will be financially sensible compared to other existing technologies.

The entire calculation was consolidated into an investment plan and a roadmap that encompasses eight distinct vehicle categories, ranging from 26-ton heavy trucks to sub-3.5-ton vans. The plan also incorporates a diverse range of power modes, such as compressed and liquefied biogas, hydrogen, and electricity.

The plan was presented and approved by the Board of Directors in the fall of 2022.

## Results

For the first time, a major logistics company, (Posti and its subcontractors, drive more than 200 million kilometres per year) has an economically viable and approved roadmap to transform its own fleet to be fossil-free within a short period of time.

According to plan, Posti intends to procure a few thousand electric vans and several hundred delivery trucks running on electricity and biogas over the following eight years. Additionally, the plan also includes purchasing hundreds of heavy-duty trucks that utilise biogas, electricity, or hydrogen as their power source. The ultimate procurement quantities and vehicle types chosen will be influenced

by advancements in fleet technology. Already this year (2023) Posti will acquire more than 150 „clean“ vehicles. The number of eVans, for example, will grow from 200 to 300, number of eTrucks from one to ten, number of LBG trucks from 19 (fall of 2022) to 33 and so on.

The number of parcels delivered fossil-free is growing fast and Posti is able to, for example, to widen its 100% fossil-free home parcel delivery from Helsinki to four other major Finnish cities.

In 2023, the work continues with a subcontractor roadmap.

## Learnings

Emission goals are not enough – companies need concrete plans of actions to prove that it's possible to reach the goals. With these plans, companies can communicate consumers factual changes – like 100% fossil-free delivery areas – rather than use vague, generic green claims that can easily be interpreted as greenwashing.



Figure 3: Posti truck

Source: Posti

# FRANCE



## DPDGROUP



### Summary

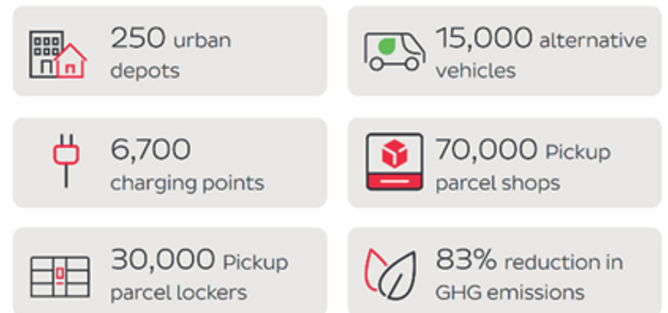
We have the ambition to deliver exclusively low emission to 350 cities in Europe (cities of at least 50,000 inhabitants) by 2025. Below, is

a compilation of key activities to achieve our goals.



Figure 1: DPDgroup 2025 low emission goals in 350 cities  
Source: DPDgroup

Our **expanded ambition** for low-emission delivery in 350 European cities by 2025:



### Introduction

In 2020, when we set out our ambition to have low-emission delivery solutions operating in Europe's 225 largest cities, it wasn't without challenges. With the support of our Business Units, the answers were resoundingly positive, and we found ourselves ahead of target.

In 2021, spurred on by our early success, we increased our ambition to have low-emission vehicles operating in 350 cities of over 50,000 inhabitants.

## Methodology

This continuous improvement is the result of a team effort and strong best-practice sharing among the company's Business Units.

Aware of the need to positively transform our impact on the environment, the efforts quickly exceeded our expectations.

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## Results

As of today, we deliver exclusively low emission to just over 90 cities in Europe. Our fleet of low-emission vehicles has rapidly grown to over 8,000. These low-emission vehicles can be identified by their distinctive livery, which will become an even more familiar sight on European roads over the coming years.

**Example:** DPD UK / 100% electric deliveries in Oxford.

Oxford has become the first UK city where all of DPD UK's deliveries can be classified as low emission. A fleet of 40 electric vehicles now deliver more than 15,000 parcels a week across the city, representing a significant step towards DPD UK's Vision 25 goal of achieving emission free deliveries in 25 UK cities by 2025.

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## Learnings

We may be an international company, but our strength lies in the deep knowledge and understanding we have of the local markets we operate in. By getting behind a common, coherent and ambitious commitment,

our business units have built unstoppable momentum that is driving us to positively contribute to making cities across Europe better places to live.

# FRANCE



## DPDGROUP



### Summary

GeoPost/DPDgroup's Air Quality Monitoring Programme provides air quality data that allows cities to build on their knowledge of existing pollution hotspots to identify the root

causes. This data can help empower policy changes for the benefit of all citizens – and helps citizens make informed decisions.



Figure 1: DPDgroup electric van  
Source: DPDgroup



Figure 2: Air quality diagnosis map  
Source: DPDgroup

### Introduction

GeoPost/DPDgroup has forged a unique partnership with Pollutrack to enable precision air quality monitoring at scale. Pollutrack is a leading provider of mobile tracking systems for fine particles (PM 2.5) which is

particularly relevant for urban air pollution. This information can be seen by users and local authorities, giving important information for decision making processes.

## Methodology

Geopost/DPDgroup fits our delivery vehicles, urban depots and Pickup points with Pollutrack next generation laser sensors. These sensors count particles every second and transmit data 5 times per minute, street by street and at breathing level. The resulting 'air quality diagnosis' is displayed digitally

over high-resolution maps in real time. The initiative gives citizens the ability to access an air quality diagnosis at their doorstep and gives city officials the opportunity to efficiently tackle their air quality issues by making data-based decisions on how to implement mitigation plans and new traffic regulations.

## Results

The initiative gives citizens the ability to access an air quality diagnosis at their doorstep and gives city officials the opportunity to efficiently tackle their air quality issues by making data-based decisions on how to implement mitigation plans and new traffic regulations.

### Success story: the example of DPD Portugal

Lisbon authorities used data measured by Pollutrack to design their new low emission zone. The PM 2.5 pollution hotspots identified enabled objective decision-making to improve air quality in Lisbon for all its citizens.

## Learnings

After a minimum of one month of PM 2.5 tracking, GeoPost/DPDgroup will share preliminary air quality insights with city authorities through an analysis report performed by Pollutrack experts. The report will include the following elements:

- Overview of the areas covered, and the quantity of data collected by the air quality monitoring system.
- Daily and weekly variations compared with WHO recommendations and with geographic heterogeneity observed.
- Significant hotspots identified near sensitive areas (nurseries, schools, hospitals, retirement homes, etc...).
- Air quality index maps and benchmarking with other major European cities who are part of our Air Quality Monitoring Programme.
- Preliminary conclusions and recommendation.

# FRANCE



## PARCEL PENDING BY QUADIENT



### Summary

This project involves a partnership between three French-based leading companies - Quadient, Carrefour, and Relais Colis - which centres around Parcel Pending by Quadient smart lockers.

Leading retailer Carrefour and out-of-home parcel delivery network specialist Relais Colis have joined forces many years ago, to enable consumers to deposit and retrieve parcels in over 1,000 stores belonging to the retailer. Due to a considerable increase in Carrefour's parcel volumes since the onset of the pandemic, they aimed to reduce staff time allocated to parcel management to enhance their in-store operations.

As part of the project, by the end of 2024, Carrefour aims to offer a thorough and hybrid set-up that includes lockers and in-person pick-up services, while also maintaining a parcel delivery counter. More specifically, 250 Carrefour stores will be equipped with Parcel Pending by Quadient Lite lockers, easy to install, move and maintain lockers that don't require technical or electrical fittings. Additionally, 100 stores will be outfitted with Parcel Pending standard lockers, which will be made available for use by Relais Colis and other carriers.



Figure 1: Carrefour and Relais Colis parcel locker

Source: Quadient

## Introduction

As a signatory of the Climate Pledge committed to neutrality by 2040, Relais Colis has been pursuing an efficient decarbonisation policy for years, including renewing its vehicle fleet, last-mile delivery by bicycle, rail/road routes, print-free options, eco-drive training, and energy optimisation. In January 2023, they implemented a new AI-based tool to collect, analyse, and manage all actions, define optimisation paths, and ensure transparency towards e-merchants and consumers. Parcel lockers play a key role in contributing to their carbon neutrality objective.

Responding to the growing demand for convenient package deliveries and merchandise returns, as well as the corresponding operational costs, Relais Colis and partner Carrefour decided to implement Parcel Pending by Quadient smart lockers

contactless, and sustainable way to deliver and retrieve packages helping consolidate parcel fulfilment and returns, simplify first and last-mile deliveries, and reduce the pressure on their teams and resources.

Using parcel volume data for each Carrefour store, Relais Colis identified which stores were more often saturated to prioritise installing parcel lockers. Self-service smart lockers increase the parcel capacity of each store, absorb surges, and provide more choice and comfort to consumers, especially when combined to staffed pick-up and drop-off points. Carrefour also aimed to optimise store space, mutualise Relais Colis and other carrier's deliveries, and reduce the overall delivery carbon footprint compared to home delivery by adopting hybrid or locker-only set-up technology based on volumes.

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## Methodology

Carrefour and Relais Colis turned to Quadient to implement self-service lockers, so stores could better absorb surges in demand and provide consumers with a convenient, secure, and contactless way to drop-off and collect their packages. Quadient recommended two locker types, Standard and Lite models, both flexible and scalable solutions. The Standard model features a modular design with a user-friendly interface in the main unit that uses a touchscreen and barcode reader, while Lite lockers are compact and self-powered units that are easy to install, move, and maintain. These lockers use a mobile app and Bluetooth technology to operate, and their design eliminates electronic components to reduce energy consumption.

By leveraging these open locker solutions in different ways, stores can maximise available space and simplify parcel fulfilment and returns based on volumes and resources in each location. The first method, called "colocalisation," allows the carrier to use all available compartments and box sizes at a given locker location to deliver parcels. Oversized or overflow parcels are accepted at the store's staffed welcome counter. In the second method, a "locker-only" solution, all parcels are exclusively stored in the lockers so staff is not required to attend customers during the pick-up.



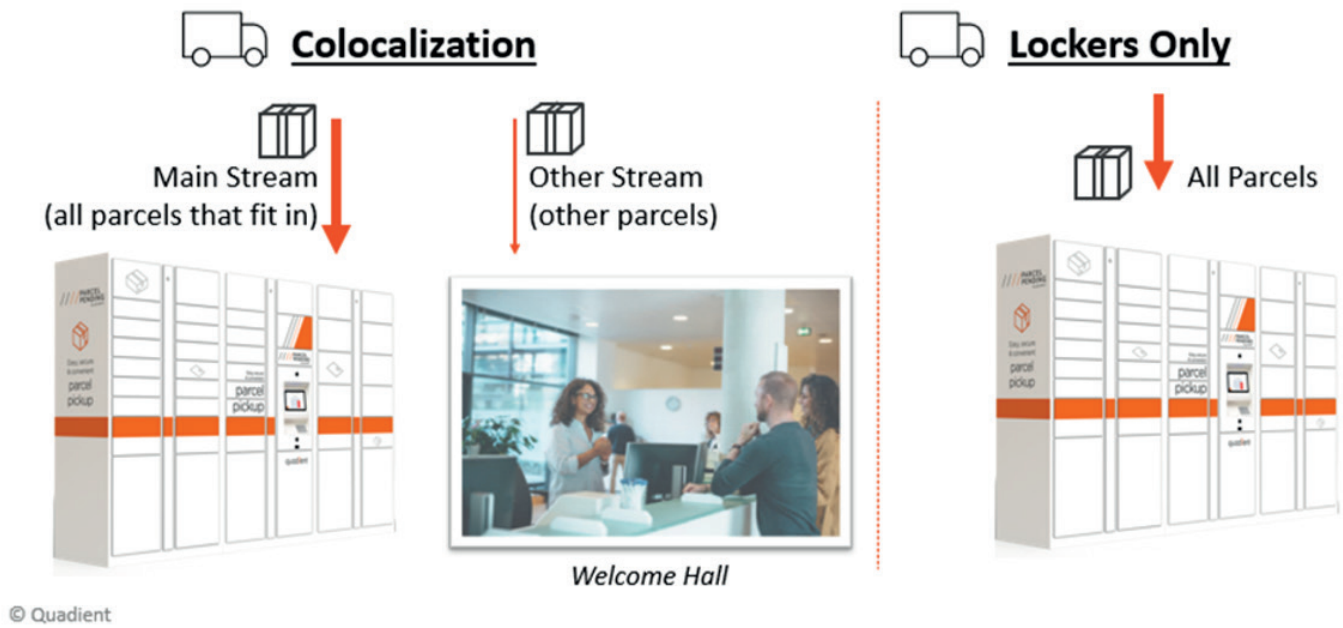


Figure 2: Types of service

Source: Parcel Pending by Quadient

## Results

Carbon emission reduction varies based on factors such as distance, vehicle type, efficiency, customer preference, or location. With a vast majority of French online shoppers preferring home delivery, offering green delivery options through parcel mutualisation, electric vehicles or low-energy consuming technologies can significantly contribute to environmental sustainability. This approach aligns with Relais Colis' commitment to carbon neutrality by 2040 and Carrefour's goal to reduce their environmental impact by adopting sustainable practices. Parcel lockers help optimise resource allocation, reducing the number of delivery vehicles required and improving efficiency. The lockers also reduce manual handling of parcels and free up staff time for more valuable tasks.

By absorbing the flow of deliveries and return parcels using less physical space and enabling customers to combine parcel drop-offs with retail visits, the lockers further reduce the number of trips made, resulting in lower carbon emissions and a positive environmental impact. Relais Colis pickup points managing from 50 to 100 parcels a day, there are as many trips saved for each of the Carrefour stores offering the service. These environmental benefits are amplified combining Carrefour's footprint in dense urban areas and receiving over 1.3 million visitors a day, and Relais Colis' strategy focused on enhancing the customer experience and optimizing delivery efficiency to achieve carbon neutrality, making it a win-win for all involved.

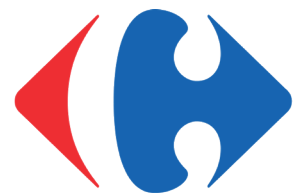
## Learnings

This partnership offered significant advantages for both Relais Colis and Carrefour, including the ability to centralise parcel collections and returns in an automated pickup point, reduce costs, and contribute to Relais Colis' environmental sustainability goals. The addition of 250 Parcel Pending by Quadient Lite lockers in stores by the end of 2024 allows Carrefour to optimise sales surface space, while the installation of 100 Parcel Pending standard lockers in carrier-agnostic mode provided an additional solution for other partners. Ultimately, this solution streamlines the delivery and retrieval process for all parties involved, providing an optimised user experience.

This unique project helped us get feedback from store personnel who highlighted great ways of working improvement, as they didn't feel overwhelmed by large parcel volumes and customers were comfortable using the solution with no assistance. By expanding the parcel lockers concept to 350 stores will help Carrefour and Relais Colis respond effectively and rapidly to the volume's growth trend, driven by permanent shifts in consumer behaviour in the French market landscape in recent years.



relais colis



Carrefour

# GERMANY



## ONESPOT

### Summary

OneSpot aims to lead the way in sustainable city logistics by establishing an infrastructure for the last mile. With its bike-delivery and urban real estate network, the startup provides holistic micro fulfilment systems for various supply chain-intensive industries including eCommerce, gastronomy, and facility management. OneSpot leverages advanced tech-integrations and front-end interfaces to offer custom solutions for various last mile use cases and industry pain points. Customers enjoy decarbonised deliveries

in the last mile that arrive on demand or at a selected 30-minute time slot. OneSpot's hyperlocal hubs also reduce the number of small parcel shipments and minimise packaging waste. Instead, OneSpot receives the products from its customers in bulk shipments and can deliver them package-free. Additionally, the startup fosters local partnerships to treat collected products or materials and make them fit for redistribution, contributing to a circular economy.

### Introduction

The facility management industry faces a common challenge of efficiently delivering materials to properties and collecting used ones. OneSpot was approached by facility management company, WISAG, to tackle this issue through its micro fulfilment system. The client required a solution to supply properties with cleaning materials, all within a limited 45-90 minute window when cleaning staff is on

site. Previously, customer service managers spent 5 hours each week making these deliveries via car, leading to traffic congestion, parking difficulties, and urban CO2 emissions. OneSpot's solution aimed to take over the entire logistics and material management process, freeing up the managers' time and reducing fuel emissions.

### Methodology

OneSpot approached the facility management challenge by taking over the stock of 30 customer properties in Frankfurt and managing the material flow. Scheduling software was deployed to allow customer service managers to schedule 30-minute delivery slots in coordination with the cleaning staff. OneSpot integrated laundry partners

to ensure the cleaning of materials for their redistribution. Routing software was utilised to communicate accurate arrival times for the smooth exchange of used materials with new ones on site. This approach provided a more efficient, sustainable, and time-saving solution for the client's logistics needs.

## Results

The pilot was a success. OneSpot has created a novel logistics solution for the facility management industry by delivering and collecting cleaning materials by bike for 30 properties of WISAG facility cleaning in Frankfurt. In the meantime, the solution has been adopted in Cologne and as of January 2023, 500 deliveries have been made, decarbonising the company's operations and saving valuable time for the customer service managers. The integration of OneSpot into the daily work of the customer service

managers and cleaning staff has been smooth and fast. Managing director at WISAG, Marc Preußner, recognises a real advantage in the cooperation with OneSpot, with plans for all of Germany. In Frankfurt alone, WISAG estimates at least 300 properties suitable for supply, yielding annual CO<sub>2</sub> savings of 6.5 tons. The potential is even greater in larger cities. OneSpot plans to expand its delivery areas to Berlin next and offer on-demand deliveries of consumables and hygiene products for WISAG and other facility management firms.



Figure 1: Pick up by courier  
Source: OneSpot



Figure 2: Onespot courier  
Source: OneSpot

## Learnings

OneSpot's collaboration with WISAG facility cleaning services in Frankfurt demonstrates the effectiveness and scalability of its micro fulfilment system. The project highlights the significant impact that a hyperlocal, eco-friendly delivery solution can have on reducing urban traffic congestion, CO<sub>2</sub> emissions, and streamlining operations. OneSpot's solution not only met the client's logistics needs but exceeded their expectations, freeing up valuable time for customer service managers and improving the overall customer experience. This

case study demonstrates the potential for OneSpot to replicate its successful model across cities in Europe, leading to further environmental benefits and driving the shift towards sustainable city logistics. Additionally, OneSpot's approach to the entire life cycle of cleaning products, including their cleaning and redistribution, serves as a model for circular economy practices in the facility management industry. OneSpot's partnership with WISAG is just the beginning of a journey towards a greener and more sustainable future.

# GERMANY



OTTO-VON-GUERICKE  
UNIVERSITY  
MAGDEBURG



## Summary

Same day delivery, but not at home? – It needs an extra trip. Stuck in traffic because delivery vehicles block the road? – It adds to congestion. Both, cities and their inhabitants are facing those problems. Yet, it even worsens as the number of parcel deliveries rises steadily. The project Paket-KV-MD<sup>2</sup> aims to solve these problems by establishing an innovative hub-and-spoke system, piloted for the city of Magdeburg.

The core is the urban hub which firstly consolidates in- and outbound flows and secondly distributes the flows to spokes, micro-hubs, from where cargo bikes do the actual delivery and parcel lockers are served. In order to make this system more flexible the

project developed a new micro hub designed for parking lots (e.g. figure 1) and also mobile parcel lockers (figure 2) fitting on a cargo bike.

The hub-and-spoke system is operated by Biberpost (a subsidiary of Mediengruppe Magdeburg). The local actor established business model of receiver led consolidation by enabling the consignees to consolidate their deliveries by different CEP providers at the urban hub. Deliveries can be performed demand based at the desired day to either the address or a parcel locker, with parcels all at once. The introduction of this new system leads to significant reductions of CO<sub>2</sub> emissions and improves the service quality.



Figure 1: Example of system components (cargo bike, static parcel station, battery-swap station, micro depot)

Source: Otto-von-Guericke University Magdeburg



Figure 2: Mobile parcel station

Source: Otto-von-Guericke University Magdeburg

## Introduction

Currently, consignees are getting parcels by multiple CEP-providers during the day. Hence, it is a common situation that inner city streets are blocked by a yellow, blue, brown and other delivery cars in parallel. Through increasing trips of CEP-providers the traffic situation in cities and especially in narrow, neighbourhood roads get more and more problematic. Adding to that, more often than not, CEP- providers need multiple attempts to deliver the parcel. On the flipside the situation leads to less profitability and endangers the customer satisfaction.

Granted, there may be possibilities to route the parcel to a nearby parcel station but the customer has to enable that for every parcel and for every service provider which is a lot of work just for receiving a parcel.

Hence the objective of the EFRE supported project PAKET-MD-KV2 was twofold. The first step was to decrease the traffic problem and associated externalities shall by introducing cargo bikes with micro-hubs. The second step aimed to accelerate the traffic effect by introducing receiver led consolidation, aiming to reduce the total kilometres and improve customers service.

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## Methodology

The project followed a three stage approach. In the first stage we deployed the hub-and-spoke system and its components. The receiver led consolidation was deployed subsequently. The last stage formed the evaluation.

The hub-and-spoke deployment consisted of three phases, planning the system, developing the novel components and setting it up. In the first phase we did the location and capacity planning for micro-hubs, parcel lockers (stationary and mobile) and the urban hub based on real world data of Biberpost.

The main focus was on the development of the new components micro-hub and mobile parcel lockers. Our partner FiaPro, an expert in prototyping for vehicles and logistics, carried

out extensive workshops on the requirement analysis and built prototypes to test it in real world operation. The last phase was the setup by deploying the system and reorganizing the material and data flows.

The receiver led consolidation was designed in parallel through intense contact and requirement analysis with partners. The main task however was to integrate a warehouse management and customer platform to allow the consolidation of parcels of different CEP-providers.

Lastly, we evaluated the system. Based on real-world data of the deliveries (stop records and GPS-data) the micro-hub and cargo bike solution was evaluated.

## Results

The project firstly showed good results in reducing externalities and secondly introducing two innovative components for urban last mile deliveries.

Based on our data evaluation we can show that Biberpost could reduce its climate impact through a CO<sub>2</sub>-reduction of 94,77% thanks to the deployment of cargo bikes. NO<sub>x</sub> emissions can also be reduced by up to 100%. Supply problems of components due to COVID-19 delayed the complete system deployment.

The main contribution of the project turned out to be the micro hub concept and the mobile parcel locker. The patented mobile

parcel station can be used anywhere and dynamises the use of parcel stations. It also creates the benefit for the CEP-provider that it fits on a cargo bike and can be loaded upstream the logistics network.

The second novelty is the micro-hub which perfectly fits on a parking lot and still provides sufficient space for one cargo bike and two swappable containers. Additionally, it is flexible in the sense that it can be transported as a container and with a 3,5t vehicle making it very easy to implement and change locations depending on demand. Two or more micro-hubs can even be combined to one larger one through removable walls.

## Learnings

Our main learning is: It is worth drilling down on the last mile issue, because it leaves many options for innovation and improvement. But please be careful, it is not easy as we learned:

- Although the industry is talking about micro-hubs for a long time, technical feasible and cost effective solutions are scarce. We had to ride some extra kilometres in the project to get a satisfying solution. We hope it will also satisfy the user.
- Receiver led consolidation sounds fancy and is well known in academic papers. However, implementing it in a city and modifying operations and it-infrastructure is a challenging task for which you need to plan more capacities than you assume at the beginning.

- When we started the project, nobody used cargo bikes for parcel deliveries in Magdeburg. Nowadays three operators do it with a pretty large fleet. Being the first can make others follow you and accelerate the impact of the project.

*Note: The contents and results of this paper originate from the research project Paket-KV-MD2 (reference number: 307.4.10-32323/1915003002), which is funded by the European Regional Development Fund (ERDF) and the state Saxony Anhalt.*

# THE NETHERLANDS

MYPUP BV



## Summary

As e-commerce continues to grow, MyPup (My Pick-Up-Point) strives to redesign urban last-mile parcel logistics to help create healthier cities. The MyPup logistics model uses a combination of consolidation hubs at the edge of the city, electric and carbon-free vehicles and automated parcel lockers to reduce unnecessary and polluting delivery trips. This short report will consider to what extent MyPup has been able to achieve this and actually help make cities healthier.

The report concludes that since 2014, the implementation of the MyPup logistics model in Amsterdam, Amstelveen and Utrecht has reduced **267.359 km** of fossil fuel-powered trips, **67.781 kg** of CO<sub>2</sub> emissions and **318.906 grams** of NO<sub>x</sub> emissions. However, these

results do not give a complete representation of our environmental impact, as they don't consider all elements of our business due to a lack of available data. Nevertheless, they do show that the MyPup model when implemented in apartments, offices, housing complexes and universities is a significantly more sustainable urban last-mile logistics model than the one most actively used in Europe.

As a result of this, MyPup has recently started a pilot with the municipality of Utrecht to test our model in the public sector and determine whether it can be a viable solution to reducing home deliveries and their negative environmental impact.



Figure 1: MyPup parcel locker

Source: MyPup



## Introduction

MyPup (My Pick-Up-Point) strives to redesign urban last-mile parcel logistics to reduce unnecessary trips and thereby help create healthier cities. A big problem with urban last-mile deliveries is that a single apartment building or office will encounter multiple couriers every day all delivery a mere few parcels each. Moreover, if a parcel cannot be handed over, the courier must return back another day. Our logistics model uses a combination of consolidation and automated parcel lockers to reduce these unnecessary and polluting trips. MyPup users have their parcels delivered not to their homes or offices, but rather to the MyPup consolidation hubs on the outskirts of the city. This ensures that the MyPup service is entirely courier agnostic. We then subsequently accept the deliveries on behalf of our users, scan them and then

do a single trip to deliver them ourselves, using either cargo bikes or electric vehicles, to the relevant Pick-Up-Point. Furthermore, MyPup users can also use our Pick-Up-Points to return or send parcels, which we pick up at the same time we deliver. The use of automated parcel lockers ensures that all parcels can be safely delivered even if there is no one to accept them, and the use of consolidation allows for all parcels (regardless of courier) to be delivered to a location using a single trip. In 2014, the MyPup founders came up with this idea and decided to implement it in apartments, offices, housing complexes and universities. This short report will look into to what extent the implementation of this model has reduced unnecessary urban last-mile trips and thereby helped create healthier cities.



Figure 2: MyPup large parcel locker

Source: MyPup

## Methodology

To calculate the total urban last-mile trips reduced by MyPup since 2014\*, the following formula will be used:

$$\text{Trips reduced} = P_i * V - 2 * D_i * N_i$$

$i$  = LSP (Logistical Service Provider)

$P$  = Number of parcels delivered by MyPup

$V$  = Distance normally driven per parcel by LSP

$D$  = Distance LSP travels to deliver parcels to MyPup depot

$N$  = Number of times the LSP delivers to us per day

Furthermore, using this data we can also calculate the reduction in CO2 emissions caused by the reduction in trips driven.\* This will be done using the following formula:

$$\text{Reduction emission}_j = \text{Trips reduced} * F_j$$

$F$  = Emission factor\*\*

$j$  = Type of emission

\* Due to a lack of necessary data, we can only calculate this reduction in the cities Amsterdam, Amstelveen and Utrecht  
 \*\* EMEP/EEA air pollutant emission inventory guidebook 2019 – Update Oct. 2020

## Results

Fossil Tripdistance Saved (km)

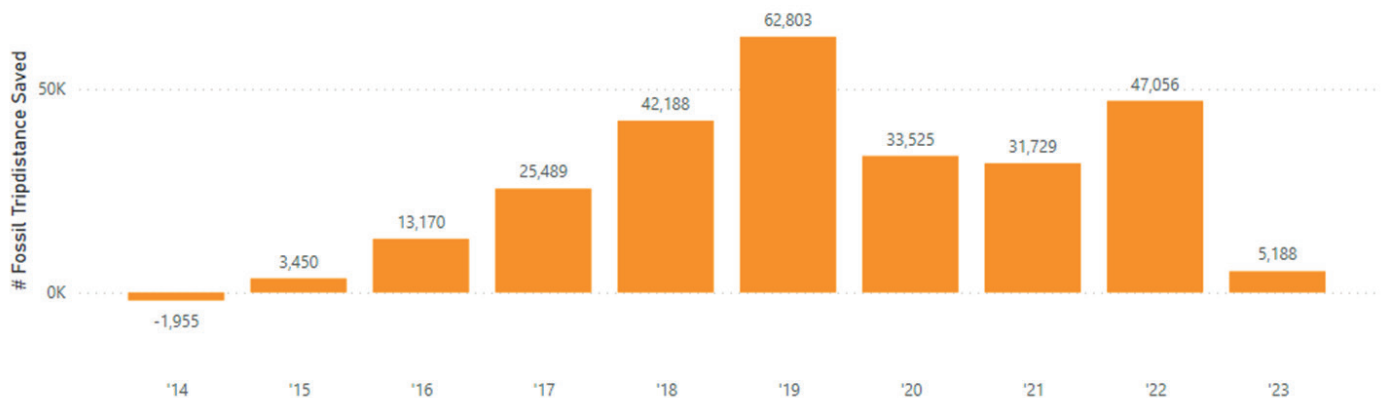


Figure 4: Total distance from trips driven with fossil fuels reduced (in km/year) Data as of 31-1-23  
 Source: MyPup

## Reduction CO2 (kg)

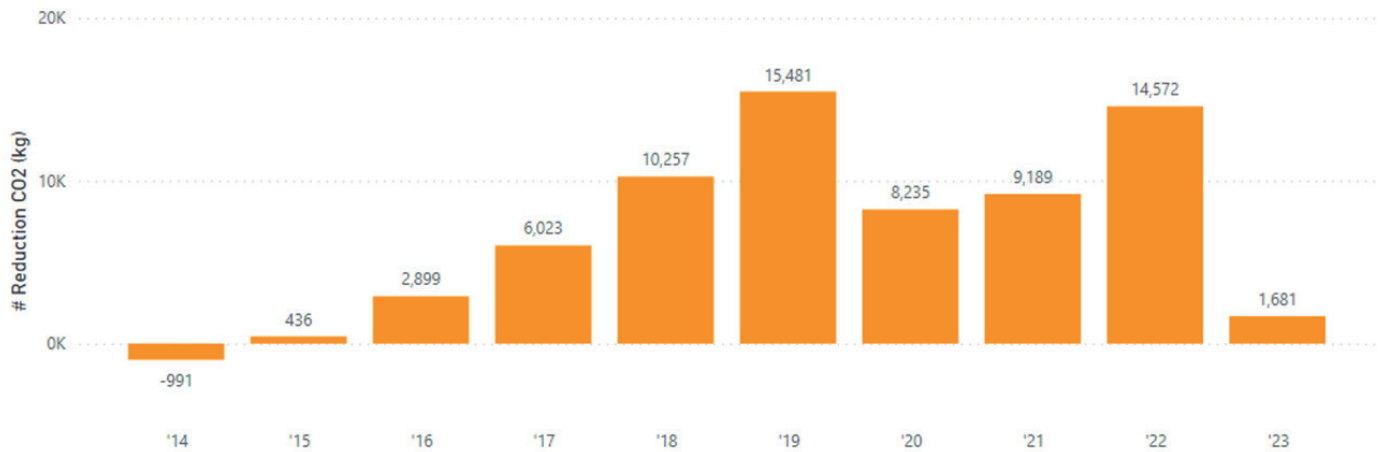


Figure 5: Reduction in CO2 emissions (kg/year) Data as of 31-1-23

Source: MyPup

Since 2014, the implementation of the MyPup logistics model in Amsterdam, Amstelveen and Utrecht has reduced **267,359 km** of fossil fuel-powered trips, **67,781 kg** of CO2 emissions and **318,906 grams** of NOx emissions.

## Learnings

Based on these results, over the past 9 years, MyPup has been able to reduce the equivalent of 498 flights from Amsterdam to London in CO2 emissions. There are, however, a number of factors that need to be taken into consideration regarding these results. Firstly, these results only consider deliveries and therefore do not include the reduction in emissions and trips caused by our return/send parcel service. Secondly, these results only focus on Amsterdam, Amstelveen and Utrecht.

MyPup is active throughout the Netherlands and has Pick-Up-Points in London, Dublin, Berlin and Munich. Therefore, these results only consider the environmental impact of 66% of all our Pick-Up-Points. Finally, these results do not consider whether Pick-Up-Points with low utilisation rates actually reduce the number of delivery vehicles or whether they simply add one more. However, overall, the results above evidence that MyPup can provide a more sustainable urban last-mile logistics model than the current

system and therefore has helped make our cities healthier.

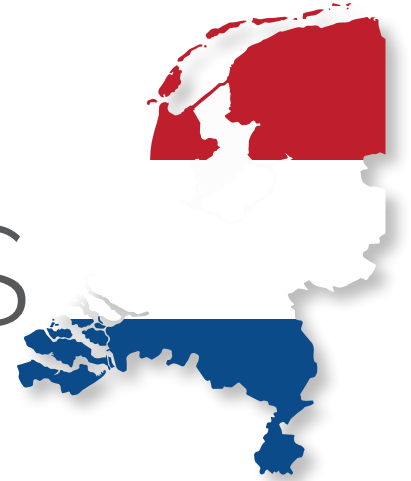
So, what's next for the future of MyPup and our logistics model?

Over the past nine years, it has become increasingly accepted that consolidation hubs, carbon-free vehicles and central delivery points are some of the most effective means of redesigning urban last-mile logistics to make them more sustainable. However, these solutions are unpopular with the larger market players, expensive and unpopular with the consumer respectively. Therefore the role of local and central governments has become increasingly important in creating an environment that facilitates and promotes green innovation such as ours.

We are therefore pleased that MyPup has recently started a pilot with the Municipality of Utrecht to test our model in the public sector in an attempt to reduce home deliveries and the negative environmental impact they cause.

# THE NETHERLANDS

SMART MILE SOLUTIONS B.V.



## Summary

In November 2020, we started tracking one compartment per Smartmile Hub across our Dutch parcel locker network to contribute to reforestation. For every parcel customers pick up, return, or send using these impact compartments, we donate to Eden Projects to plant trees across Madagascar, Mozambique and Kenya. The initiative started as #DuurzameDeurtje/#Open Doors in the Netherlands. We have planted 18,281 trees so far.

In 2022, we ran another proof of concept. We set up an “instantly reusable” pick-up code linked to one compartment. Dutch customers used this code to open the “We Stand For Peace” donation compartments dedicated to Ukraine. We set up notifications, tracking all donation compartments and notifying Bike Courier StoreShippers to pick up the donations and ship them to Emergency Appeal and The Polish Library.

In 2023, our impact compartments will move to Finland. We are changing the name of the campaign to #WeOpenToChange to show the industry that, with the right technology and partners, lockers can impact beyond parcel exchange.

We will use our technology to invite different impact partners (recycled fashion, re-purposed plastic waste, reusable packaging etc.). By collaborating with impact partners, we can build additional, innovative impact services and push the boundaries of lockers.



Figure 1: #WeOpenToChange statistics  
Source: Smartmile

## Introduction

Our #WeOpenToChange initiative is a campaign that contributes to a happier planet. It is also a direct proof-of-concept that our technology could be the last mile's central component for service designs using lockers.

We plan to invite two additional impact partners to our #WeOpenToChange initiative in Finland using the same principles as before: allocating single compartments to impact services.

We are reviewing different impact partners and exploring various use cases to set up. The conversations' status makes pinpointing the exact service nature difficult.

However, we are investigating the following use cases:

- Setting up one collection compartment (comparable to the Ukraine campaign) for collecting plastic waste or even old fashion items = Intention to contribute material to companies focussing on circular fashion or repurposing plastic waste for other materials.
- Connecting e-commerce players, our hubs, and reusable packaging companies to offer one compartment for direct at-hub collection of reusable packaging.
- Tracking of parcel transactions to donate to collecting ocean plastic (pick up, return, shipment).
- Inviting customers actively to support #WeOpenToChange.

Our collaboration with Eden Reforestation Projects will re-launch in Finland and expand from 113 current reforestation doors in the Netherlands to 150+ doors in Finland. Our goal is to grow our Smartmile forest by at least 30,000 trees in 2023.

Our trackable progress: <http://donors.edenprojects.org/user/smartmile/>  
We will set up additional project tracking for all implemented impact services.



**We believe our lockers are meant to impact beyond parcel exchange.**

**Dedicating doors to impact partners.**

#weOpenToChange

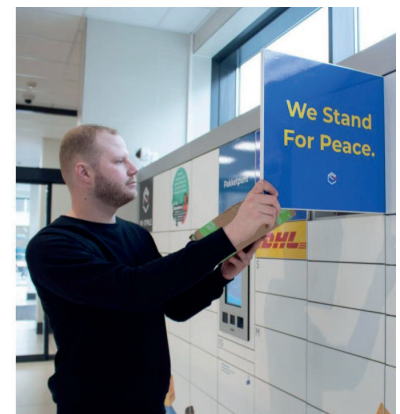


Figure 2: Dedicated parcel locker compartment.

Source: Smartmile

## Methodology

Being a sustainable player trying to change the last mile, we need to start with eliminating our footprint. #WeOpenToChange is part of our sustainability strategy. On one hand, we eliminate a part of our footprint by dedicating transactions to reforestation. Secondly, we simultaneously develop low-risk case-studies to prove new service models for the potential of lockers beyond parcel exchange which could be implemented industry wide.

To eliminate part of our own footprint we use the daily transactions of our customers at the machines. We dedicate concrete compartments, and thus part of our revenue to offset the footprint of our service while generating consumer engagement with our brand and mission.

We have transaction information available in real-time. Our reporting tool can pull transactions on a single-compartment level, filtering out and reporting the number of consumer transactions as a counter. We use this counter to inform the donation amount and map out our CO2 impact.

We see our Finnish network as a platform to prove that sustainable service building is possible with lockers at its centre. Setting up smaller collaborations developing services with impact partners is a low risk way of experimenting with new service models including KPI tracking. By tracking the impact potential of new services, we can show the industry a variety of services that could re-invent last mile processes.

## Results

In 2022, we supported Eden Reforestation Projects in planting 10,911 trees, reaching a forest of 18,281 trees so far.

Eden established a benchmark of 840 metric tons of Carbon per hectare of mature mangrove forests based on an average of 25 years of lifetime planting 10,000 trees per hectare.

### Calculations

Variables:

Carbon Sequestered (C)

Carbon dioxide (CO<sub>2</sub>)

### The ratio of CO<sub>2</sub> to Carbon based on the atomic weights of each molecule

$(12+16+16)$  (atomic weight of CO<sub>2</sub>) / 12 (atomic weight of C) = 3.67

### The amount of CO<sub>2</sub> sequestered per hectare of mangrove forest

$3.67 \times 840$  t of C = 3,082.8 t of CO<sub>2</sub>/hectare

### The annual CO<sub>2</sub> offset, dividing the total amount of CO<sub>2</sub> per hectare by the growth life of the trees, or 25 years.

$3,082.8$  tons/hectare / 25 years = 123,312 tons of CO<sub>2</sub>/year/hectare

### Average offset per tree per year (over a 25 year lifetime)

123,312 tons of CO<sub>2</sub> per hectare per year / 10,000 trees per hectare = 12.3 kg of CO<sub>2</sub>/tree/year

### Our CO<sub>2</sub> offset

12.3 kg of CO<sub>2</sub> per year x 18,281 = 224,856.3 kg of CO<sub>2</sub>/year

### Workdays created 2022

141.4 workdays

The Ukraine campaign resulted in 47 donations (food, clothes and medicine).

*Source: Smartmile*

## Learnings

The user flow including a reusable pick up code for donations, on the first testing occasions, resulted in confusion. Customers placed actual returns inside instead of donations. For future partner-bound impact services, we are developing a user flow connected to a partner's customer base. Gated access to this information flow will ensure that these compartments are used solely for the impact purpose.

The We Stand For Peace project was our first multi-partner collaboration, connecting a bike courier and a distribution partner in one service flow to our Hubs. The trial showed that collaboration in this sector leads to impactful results and new customer experiences.

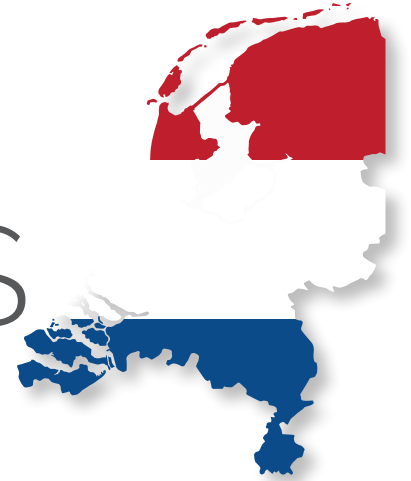
Proof that the delivery industry could function as one ecosystem around our Hubs with partners open to collaborate and build services together.

Through the collaboration with Eden Projects we set up the structure needed to track single compartments and automate donation numbers. We missed active consumer engagement, because we had no strategies in place to invite customers to play an active role. We will collaborate with a variety of impact partners to build more content and let customers support causes they care about, increasing engagement.

We will continue to work towards realising our ecosystem vision for the industry.

# THE NETHERLANDS

SMART MILE SOLUTIONS B.V.



## Summary

The industry has to offset its footprint by 2050. We believe that to realise the set goal, the last mile has to change drastically and be able to experiment.

Most parcel lockers focus on connecting any courier and customer to parcel lockers to reduce driving compared to home delivery, solving one segment of the last mile problems. We have observed additional solutions come to market addressing other parts of the last mile challenges: Electric cars, bike couriers, reusable packaging, and automated click-and-collect. Each solution has an impact potential, but its actual impact is directly dependent on the actions of other solutions in the supply chain.

## Introduction

We plan to turn the last mile into an ecosystem with regained control over its footprint and collaborative processes.

Multiple stakeholders own different parts of the service chain, from retailers' warehouses to consumers' doorsteps. Each part holds another responsibility in solving the last mile. Connected, these individual solutions can transform a disconnected, high-emission, We push our partners to focus less on

All these solutions combined and aligned could reduce CO<sub>2</sub> up to 91% (Last Mile Experts, 2022), but only if all solutions are designed to complement each other. For the past two years, we prepared our parcel locker with a software platform to make it a neutral basis to connect and align any last-mile solution.

Experimenting with the combined knowledge of the different players to, one day, complete the last 9%. Achieving 100%, we believe, is possible in a neutral ecosystem that connects and bundles the logistics knowledge — an ecosystem we have been preparing the foundation for.

re-designing single parts of the last mile and more on problem-solving as one (eco) system.

To connect any last-mile player, we extended our technology to integrate any system. Our platform can run on any parcel locker (regardless of hardware provider API) and turn it into a connector of retailers, couriers, e-commerce, impact initiatives, customers, etc.

By Q4 2023, we plan to offer tools for connected partners. Partners use these tools to combine the functionality of our lockers with complimentary service design. These tools keep locker-based service development low-cost, requiring no extensive technological knowledge.

To push the boundaries of lockers further, we need the insights of connected couriers

and customers to understand how to eliminate overflow and optimise capacity. Again, this optimisation works best with direct knowledge and data sharing. We are launching version one of our capacity feature Q2 2023. Much like how our environment functions optimal, if delivery looks at its challenges as an ecosystem, it could optimise the last mile and any solution within it.

**Without aligning, last mile solutions cannot reach their full potential.**

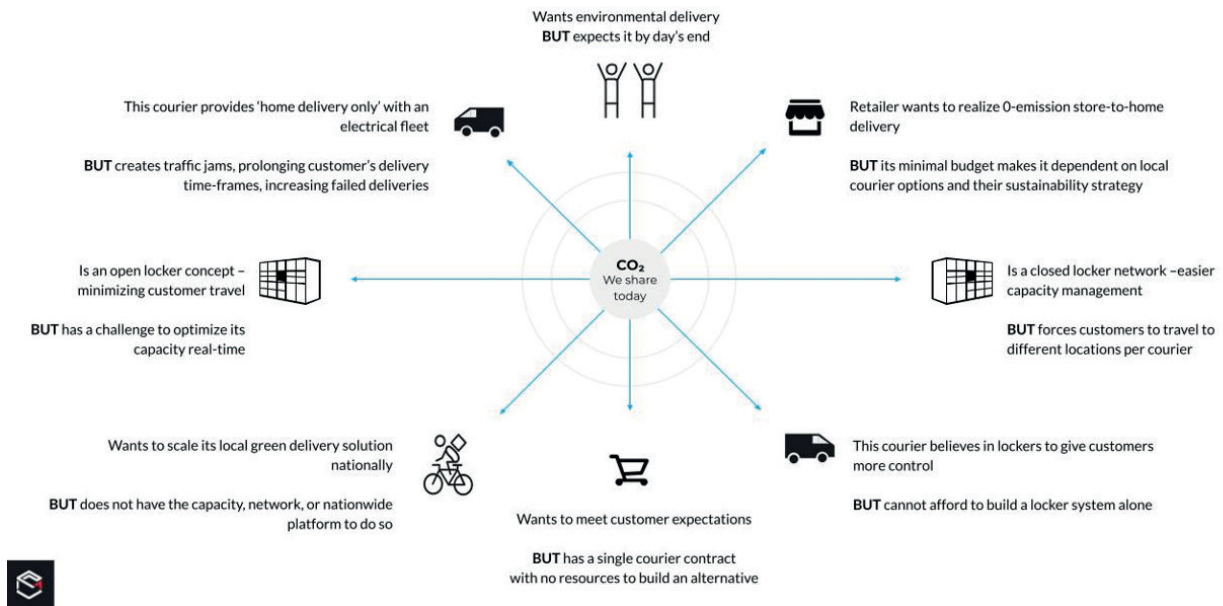


Figure 1: Not aligned last mile actions.

Source: Smartmile

**By aligning delivery solutions in one (eco)system, we can redesign the last mile as one- connecting anyone with a neutral player at the core.**

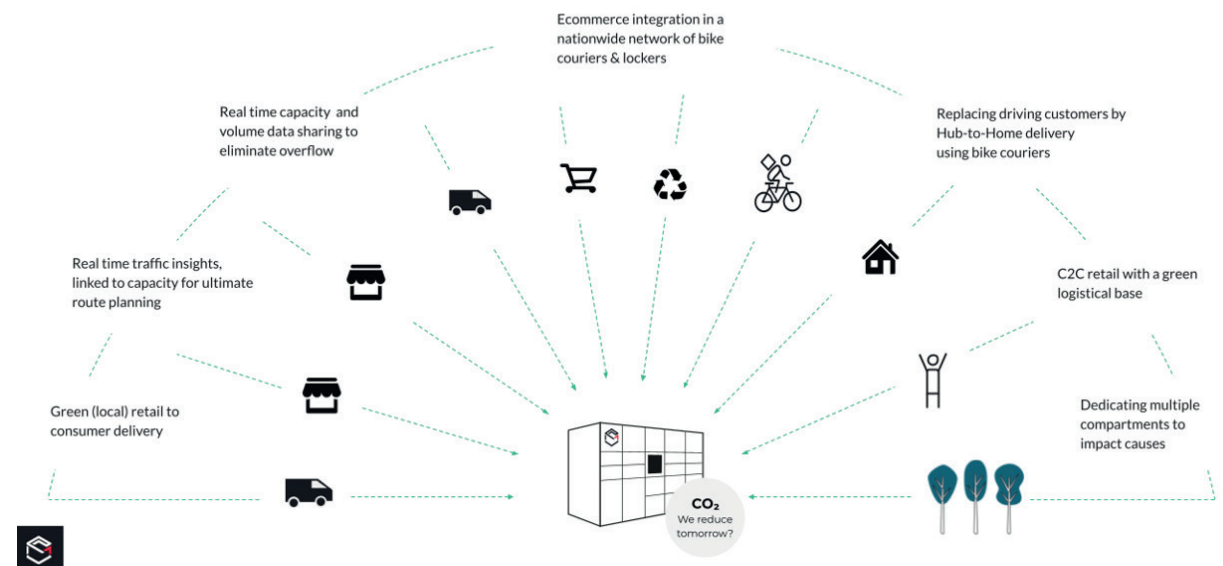


Figure 2: Aligned last mile actions.

Source: Smartmile



## Methodology

We invite industry players to join our locker system, from courier to retailer, to impact initiative, to e-commerce player, to revolutionary software startups. We brainstorm new service flows using innovation sessions focusing on reducing footprint and eliminating partner pain points. After evaluating the initial impact potential, our team determines the project shared budget, timeline, and KPIs, agrees on all-round footprint tracking, and defines the expected outcome.

Service examples:

- Connecting local bike couriers to run pick-ups and returns for customers between home and hub.

- Integrating traffic/route optimisation software directly into real-time locker capacity insights.
- Connecting e-commerce, couriers, reusable packaging, and our hub; allocating single compartments to return reusable packaging.
- Integrating e-commerce or C2C retail apps for either direct exchange through our hub or developing a sustainable local courier and hub network.

Most importantly, any of the above services only work if all systems are connected, and all partners are willing to collaborate.

## Results

An international ecosystem for delivery with a set of innovative locker-based services. The services are launched by an ecosystem of partners all with different expert knowledge about the last mile. Any project ultimately runs with continuous footprint tracking.

Current studies comparing home delivery and APMs show that even with one courier connected to an APM, the deliveries are 75% greener than home delivery\*. Drawing from that and using our own network as a base, from just one of our connected couriers, we reduce the footprint by around 2500 kgs CO<sub>2</sub> per week. We are running the open network with four connected major couriers and our findings are supporting the findings of the Polish Academy of Sciences referred by Inpost. Based on the study of University of Groningen (Assistant Professor Paul Buijs), 30% deliveries done to Out of Home Delivery will decrease the delivery route length by 15%. This will lead to less delivery cars required to deliver the same amount of parcels when

using Out of Home Deliveries or APMs (\*\* Assistant Professor Paul Buijs (University of Groningen) Consumer behavior has a major role when picking-up the parcels. University of Groningen study of 50,000 deliveries, found that even 54% of parcel pick-ups were done by car, people were combining these trips (59%) with other daily tasks, so these trips would have happened anyway and thus not causing additional emissions. To fully evaluate all impact on all CO<sub>2</sub> emissions in the delivery ecosystem requires model and close cooperation between the stakeholders. However these studies and our own experiences already show encouraging results and we are continuing our work towards next steps of implementation.

(\*Inpost: Estimated based on CO<sub>2</sub> calculator co-created with Polish Academy of Sciences and Foundation of Administration and Public Economy. Calculation was based on CHG Methodology and ECOINVENT database, using the ILCD MIDPOINT+EC-JCR Global) calculation method.  
(\*\*Postal Hub Podcast, Episode 299: Assistant Professor Paul Buijs (University of Groningen)

## Learnings

Connecting all couriers to the same hub does not give full guarantee of environmental impact. Without collaboration, many high-potential solutions including open and shared lockers will not affect the required change

but rather work against each other and dilute impact. This is why we dedicate our lockers to connecting and addressing the last mile as a whole. Sharing knowledge with all stakeholders.

# NORWAY

## POSTEN NORGE AS



### Summary

Through the articulation of a clear and well-defined climate strategy, Posten Norge (Norway Post) has been able to achieve solid sustainability results in the past few years. The group has reduced its emissions by 51% since 2012 and today 44% of Norway Post's vehicles, including selected subcontractors, are fossil-free.

The company has set clear targets for transportation in selected regions and cities

### Introduction

Norway Post has a strong commitment to contribute towards a more sustainable post and logistics sector. Our science based targets approved climate goal is to reduce our own total emissions by 42% and emission intensity in our supply chain by 32% in 2030 compared to 2020. At the same time, we have a growth expectancy of 41%. We are committed to deliver fossil-free distribution by vans in the centre of 40 Nordic cities and regions by the end of 2023, and complete electrification of our van fleet by 2028. By 2040 all transportation, including subcontracted transportation, will be fossil-free.

To reduce carbon emissions while meeting the increasing customer expectations in

to be carried out only by vehicles using fossil-free fuels. Two of these regions are Bærum and Asker, right outside of Oslo. To make this change possible, Norway Post opened Norway's large city distribution point in 2022, which enables fossil-free delivery in both municipalities.



Figure 1: Post Norge delivery e-vehicle

Source: Posten Norge

their last-mile delivery experiences, we are investing in order to incorporate fossil-free alternatives in our fleet, both for last mile and linehaul. Investments in new distribution points enable us to utilise the range of electric vehicles to a much greater extent than before as charging becomes less of a problem. Distribution points also give us more flexibility to use different vehicle alternatives as the journeys on average become shorter.

## Methodology

In October 2022 Norway Post opened Norway's largest all-electric distribution centre at Rud outside Oslo with 140 employees and 70 electric cars, the centre services an area of 200.000 inhabitants in two rural areas Bærum and Asker right outside of Oslo. 71 charging stations have been established to service the needs of the vehicles.



Figure 2: Post Norge electric delivery vehicle

Source: Posten Norge

## Results

The establishment of the hub has enabled total electrical distribution by Norway Post in one of Norway's largest counties, Bærum. Distribution in Asker is likewise fully electrical, with one route excluded where a four-wheel drive is required which are not yet commercially available as an electric option.

Before the establishment of the new centre, goods were transported to Bærum and Asker directly from our national logistics centre at Alnabru, located right outside of Oslo.

This meant that 75 to 80 trips by fossil-vans had to be made between Alnabru and Bærum every day. Today, one semi-trailer has replaced these trips. This change corresponds with a reduction in CO<sub>2</sub>-equivalent of 502 kg per day. The use of electric vans reduces the noise pollution from local roads and improve the air quality in the area. The hub additionally makes it easier to switch from cars to electric trolleys or eBikes in city centres, which again increased the productivity as less time is needed on each stop.

## Learnings

To be able to lead the entire organisation towards our ambitious environmental goals, we need a clear and understandable strategy communicated from the top and down. For instance, communicating the ambition to offer fossil-free transportation in selected areas by the end of 2023, instead of exclusively communicating wider climate goals, makes it easier for different part of the organisation to understand how the strategy applies to them and what they should focus on at local levels.

Further, we have learned the importance of giving local leaders freedom to invest in new solutions without heavy decision-making processes. The establishment of the distribution centre in Rud was initiated locally, which provides a strong ownership to the project. Local leaders who care deeply about the company's climate agenda, have the greatest impact, both since they can mobility directly within their regions but also since they become role models on how the rest of the organisation can bring about change.

# POLAND



EMAPA S. A.

## Summary

The steep increase in fuel and raw material prices, which impacts the production of vehicles and associated transportation costs (such as fuel, drivers, vehicle rental, and maintenance), is posing a significant challenge to industries that rely heavily on transportation. Companies must seek cost savings and improve work efficiency to remain competitive in the market.

Route optimisation algorithms can help improve the efficiency of delivery fleets by re-arranging existing routes, ultimately minimising the distance covered by vehicles each day. In many cases, advanced route optimisation can lead to the elimination of some vehicles while or fulfilling the same number of orders with a smaller fleet.

With not only skyrocketing fuel prices but also increasingly expensive leasing and credit fees, annual savings from eliminating each vehicle will reach at least tens of thousands of euros.

Optimisation solutions for transportation are no longer just an attempt to find more ways to save money or a popular trend towards eco-friendly logistics. They have become a necessity for transport companies to stay afloat during these challenging times and maintain a competitive level of work efficiency.

The case of an electrical goods warehouse is described below, illustrating the impact of route optimisation on real savings in the company.

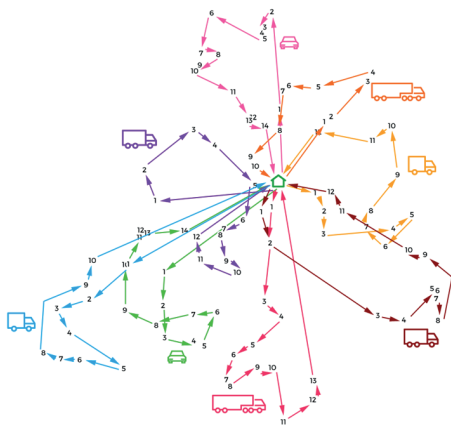


Figure 1: Warehouse, multi vehicle routes  
Source: Emapa

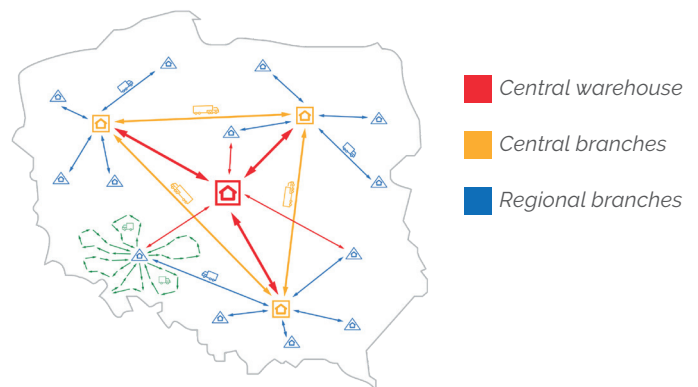


Figure 2: Central warehouse, central branches, regional branches  
Source: Emapa

## Introduction

An example of a wholesaler of electrical goods:

Client: A wholesaler of electrical goods  
Operational objective: To efficiently select the order of route points and appropriate vehicles to rent from subcontractors in order to complete orders within a given timeframe while minimising the total distance covered.

Financial goal: minimising transport costs  
Initial assumptions:

- 1000 pallets to be delivered daily.
- 150 vehicles with a load capacity of 4 to 32 pallets are available.

The central warehouse delivers goods to 36 wholesalers.

Next day orders are collected the day before. On their basis, routes for the next day (a dozen or so) are created.

## Outcome:

Monthly savings for one of the wholesalers:  
reduction of the number of routes by 27.4% (from 260 to 192)  
reduction of the monthly distance travelled by 21,248 km (from 75,188 km to 53,940 km), i.e. by 28.3%  
monthly financial savings\*: 21,248 EUR  
annual financial savings\*: circa 255,000 EUR  
CO2 reduction by ~28%

\* assuming the cost of 1 km = 1 EUR (the rate that may change at the time of reading the report).

## Methodology

The objective of the assignment was to efficiently choose a required set of vehicles to be leased from subcontractors for fulfilling orders within a specified time frame. Furthermore, the client aimed to reduce overall distribution expenses by minimizing total distance, taking into account that vehicles with lower payloads have less weight and are subject to fewer road restrictions, ultimately affecting the total distance travelled. The optimisation procedure also considered information on traffic congestions, as journey time is contingent on the traffic situation.

To optimise the process, the client provided a month's worth of data for a branch that covered central Poland. The data consisted of normalised and geocoded destination addresses, which were then grouped into completed routes. This allowed for a comparative analysis to be conducted between the state before and after the implementation of the optimisation system. To do so, the actual paths of the original routes were determined and compared with the routes obtained after optimisation.

## Results

The following average monthly savings were achieved for one branch:

- Reducing the number of routes by 27.4% (68 fewer routes).
- Distance reduction by 28.26% (21,248 km less).

Significant improvements were observed, particularly during peak days when the number of points to be visited exceeded 120. The optimisation system led to a reduction of 6-7 routes and a remarkable decrease in total distance, even surpassing 40%.

There was an increase in the utilisation of larger vehicles, leading to a reduction in both the number of routes and overall distance. Additionally, the focus shifted from medium vehicles to smaller ones, resulting in more efficient use of the available cargo space. This adjustment allowed for better optimisation of the transport process.

Assuming the average rate per kilometre at the level of 1 EUR, the monthly savings for one wholesaler oscillate around 21,248 EUR.

For 36 wholesalers, this is a monthly savings of 766,000 EUR.

## Learnings

Knowledge base about algorithms is located here:

<https://blog.emapa.pl/podstawowe-pojecia-z-dziedziny-ptymalizacji-vrp/>

Benchmark research:

<https://www.sintef.no/projectweb/top/vrptw/homberger-benchmark/>

<https://www.sintef.no/projectweb/top/pdptw/li-lim-benchmark>

Upon receiving similar results based on their data, clients are often taken aback by the efficiency of the advanced VRP algorithms provided by Emapa. Properly implemented, these algorithms can revolutionise their business activity, generating significant savings even on a daily basis. The cumulative effect of these daily savings, multiplied by the number of days in a month and then the months in a year, is often well above expectations. However, it is the result of pure math that leaves no room for doubt. Additionally, the Emapa tools save up to 90% of the time needed for route planning.

What used to take an entire day to plan using Excel and maps, can now be done in just a few minutes with the help of intelligent VRP algorithms. These algorithms take into account parameters such as time windows, driver working time, vehicle load capacity, and other vehicle features. The planner can indicate priority points, and the software will arrange the routes accordingly. The algorithms will also help to arrange the goods on the vehicle to ensure smooth unloading at each point on the route. The optimisation problem described here is relatively simple, but Emapa provides technology that can optimise much more complex issues.

# POLAND



EMPIK S.A.



## Summary

Taking care of the planet's future is in our hands. That is why recently there has been a lot of talk about the environmental issues and ecological crisis, caused by the rapid development of industry, civilisation or population growth. Consumers are more and more aware of the negative impact that humans have on the environment, which is why they are interested in pro-ecological solutions.

As part of the "Empik loves the Planet" program, Empik has implemented an ecological delivery project. Orders placed on Empik.com are collected by customers in stationary stores without any packaging and additional fillers. By introducing this eco-delivery, only in 2022 the company has reduced the consumption of cartons by 707 tons.

## Introduction

The outbreak of the Covid-19 pandemic has led to a lockdown, resulting in unprecedented e-commerce growth. In Poland, over 77% of Internet users shop online, of which 1/3 confirm that they order more products online than before 2020\*. At the same time, consumers are becoming more and more ecologically aware, and thus eco-friendly solutions such as sustainable delivery become an essential element in their decision and purchase-making process. Therefore e-commerce platforms need to place more and more emphasis on **green logistics**.

In late 2021, Empik, one of the leading omnichannel retailers and TOP3 e-commerce platforms in Poland, introduced a solution for green logistics on a large scale – resignation from the use of packaging for shipping online orders to Empik stores. In addition, the company has reduced the use of cardboards used for transporting goods from suppliers and from the warehouse by 50% annually, thanks to their multiple (re)use.

## Methodology

### No packing – the solution to minimise the e-commerce environmental impact.

Eco-delivery is one of the main projects of the "Empik Loves the Planet" initiative. The orders from our own product portfolio, delivered to

stationary stores, are collected by customers without any packaging and additional fillers. The huge popularity of this delivery option translates into thousands of trees saved annually.

\*The 2021 "E-commerce w Polsce" report, compiled on the basis of an electronic survey conducted by Gemius using the CAWI technique on a representative sample of 1,769 internet users over the age of 15 between 10 and 14 June 2021.

Currently, over 90% of products from Empik.com's own selection are covered by eco-delivery. The solution applies to online orders containing up to five products at the same time, where each of the products is included in the following categories: Press, Music, Books, Film, Toys, Own collections, as well as

parts of the Sport and Automotive categories and some of the household appliances. Currently, the company has a network of approximately 340 locations (Empik + Papiernik by Empik) throughout Poland and is constantly developing by opening new stores.

## Results

So far, we have completed over 5.55 million eco-deliveries and the number of clients choosing the package-free delivery is constantly increasing month by month.

Currently over 90% of shipments to stores are sent without any additional packages. By resigning from packaging and the fillers, we have reduced the negative impact on the environment as well as the consumption of

cartons by 707 tons over the course of the year. With the help of our clients, we manage to save thousands of trees. Our customers' reactions are very positive. We are constantly examining their satisfaction using the NPS (Net Promoter Score) indicator, which for store orders in 2022 amounted to over 70 points. This is a higher level than for non-store orders.

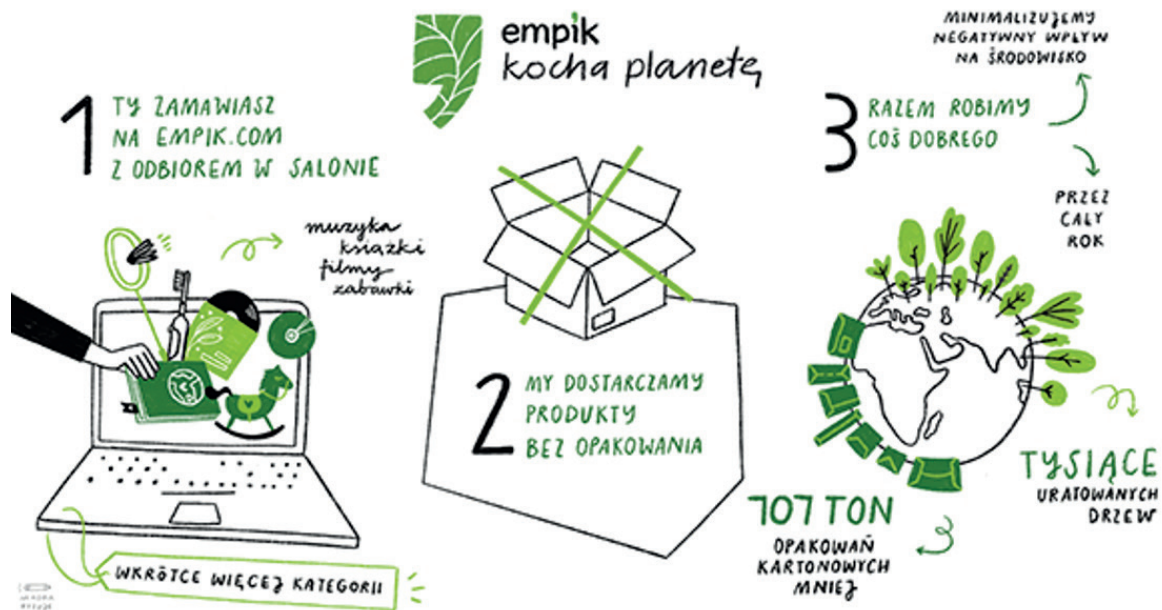


Figure 1: No packaging delivery process  
Source: Empik

## Learnings

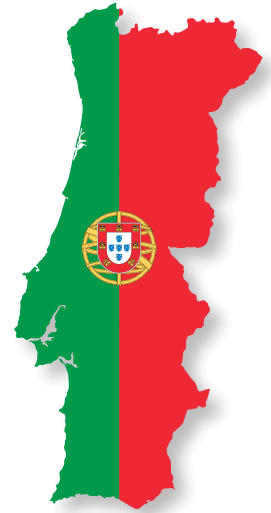
Based on the NPS, we learned that when customers pick up their orders in the store without packaging, their level of satisfaction is higher than when they pick them up packed in a cardboard box. Our consumers are characterised by ecological responsibility when making a purchase, which motivates us

to implement further pro-ecological changes. We still have a long way to go in making Empik.com fully green, but we have a lot of ideas that we would like to implement as part of developing the "Empik loves the Planet" program.



# PORTUGAL

BLOQ.IT



## Summary

Portuguese company Bloq.it teamed up with second-hand fashion marketplace, Vinted, to revolutionise logistics, with a strong focus on sustainability, both economically and environmentally.

By creating its own network of Smart Lockers in France, Vinted Go is shaping the future of one of the fastest growing segments in logistics, C2C (consumer-to-consumer).

## Introduction

Vinted's business model depends heavily on third-party courier companies and local store partnerships (PUDO). This current model works well in all Vinted markets, including France. However, in order to have more ownership over the customer journey and further optimise the C2C transactions, they concluded that Locker to Locker shipments were an important milestone.

Vinted wanted to address two main pain points: the lack of environmentally-friendly delivery options and the fragmented cross-border shipping infrastructure in Europe. Vinted Go was created to tackle these challenges, starting with their strongest market in France.

The network already has more than 300 active smart lockers in Paris, and is already live in Lille and Lyon. Vinted Go plans on launching this service in 3 more cities this year in the country, and reach a total of at least 2000 machines.

This partnership is a testament to the success of Bloq.it's innovative approach to the market, and further proof of Vinted's commitment to making second-hand easy, affordable and environmentally friendly.

As Vice President of Vinted Go, Vytautas Atkočaitis, stated: "There is a lack of accessibility, convenience, and connectivity – all of which are crucial to enabling international e-commerce businesses".

In early 2022 the two companies partnered up to create the V-Locker, a Smart Locker adapted to Vinted's marketplace needs. From that moment, a great partnership paved the way for the viability of this new concept.

This will not only improve the overall efficiency of the logistics network, but it will also provide a more convenient, sustainable and reliable experience for Vinted's customers.

Vinted's goal to create its logistics network through the introduction of a Smart Lockers with its new branch (Vinted Go) only took a few months from idea to reality.

Bloq.it has brought its extensive experience in developing smart locker solutions to the table, while Vinted has provided its extensive knowledge of the second-hand marketplace

and the needs of its customers.

The result of this collaboration is a solution that has set a new standard for the logistics industry as a whole. With Vinted Go, the company is demonstrating its ability to create solutions that are not only technologically advanced, but also practical, scalable, and effective.

## Methodology

Bloq.it has increasingly been positioning itself as an end-to-end solution in this segment, which proved to be the case in this project.

Starting in the ideation phase, where the product design itself is defined in cooperation, based on the specific project, ranging from door distribution, overall locker size, and hardware features.

After the product is defined, the production phase starts, already aimed at scale and industrialisation, allowing for large volume output, at a competitive price.

After that stage, there are multiple workshops between teams to define user and operational flows, and the requirements from a technical perspective. Typically there are small changes at the software level and the integration process starts. Bloq.it has invested in interfaceability, having created one of the most extensive and adaptable API's – which allows teams to quickly and easily integrate services.

## Results

The results of the partnership have been widely considered a success story so far. From the launch in record time 0 to 200 machines in little over 3 months, the network now already processes thousands of parcels daily, with high occupation rates across the network. As a result, the service is now expanding, and Vinted Go has already announced that the network size will increase by at least 2000



Figure 1: Vinted Go parcel locker

Source: Bloq.it

After this stage, the pilot typically starts, and there's a period of key learnings, improvements and adaptation from both sides to stabilise and prepare the solution for scale. Where the Bloq.it team will closely monitor the service not only from a technical perspective, but also from a user satisfaction point-of-view.

Once the pilot is finished, as the product is polished, scaling of the service starts, and the service quickly expands.

more machines during 2023 alone, launching three new cities across France. In what will likely become the largest and most used network in the country.

Bloq.it will keep supporting the quick growth of the network, and plans to add new features to the network, including the launch of new V-Locker units, including outdoor units.

The carbon emissions generated by delivery and last-mile transportation can vary based on transportation mode, distance, parcel size, and delivery network efficiency. In the European Union, e-commerce deliveries have an average carbon footprint of 0.9 kg CO<sub>2</sub> per parcel. The number of trips and vehicles required for parcel transport also contributes to urban traffic and CO<sub>2</sub> emissions.

OOH delivery to specific points and in bulk can significantly reduce CO<sub>2</sub> emissions and fleet size. Vinted Go's network of lockers (VLockers) in Paris and Lyon currently has over 300 units, with an estimated 2,700 by year-end. Delivering to V-Lockers powered by Bloq.it has an estimated reduction on CO<sub>2</sub> emissions up to 67% on the last mile. Based on their most recent report, in 2021, about 73% of Vinted's members chose to

Sources:

"The Environmental Implications of e-Commerce and High-Technology Retailing" by the MIT Center for Transportation and Logistics: <https://ecommerce.mit.edu/wp-content/uploads/2019/06/Environmental-Implications-of-E-commerce-and-High-Tech-Retailing.pdf>

"Decarbonising Urban Logistics" by the International Transport Forum:

<https://www.itf-oecd.org/sites/default/files/docs/decarbonising-urban-logistics.pdf>

"How high are the CO<sub>2</sub> emissions per parcel?"

<https://www.dpd.com/de/en/faq/wie-hoch-ist-die-co-c2-b2-emission-pro-paket/>

"Last Mile Delivery with Parcel Lockers: evaluating the environmental impact of eco-conscious consumer behavior"

<https://www.sciencedirect.com/science/article/pii/S2405896322010631>

"Last Mile Delivery with Parcel Lockers: evaluating the environmental impact of eco-conscious consumer behavior" [https://press-center-static.vinted.com/Vaayu\\_x\\_Vinted\\_Full\\_Climate\\_Impact\\_Report\\_2021\\_045f9e5c4b.pdf](https://press-center-static.vinted.com/Vaayu_x_Vinted_Full_Climate_Impact_Report_2021_045f9e5c4b.pdf)

have their shipments delivered to a pick-up point instead of their homes. This option proved to be more environmentally friendly since home delivery results in 1.6x times more emissions than a pick-up point delivery when factoring in how consumers pick up their items. Moreover, deliveries to pick-up points generated only 21% of the emissions compared to home deliveries for the last mile. These findings suggest that using pick-up points for deliveries can significantly reduce carbon emissions and contribute to a more sustainable future. While it's still difficult to estimate the precise impact of the Vinted Go network on CO<sub>2</sub> emissions, we can easily conclude it has a direct impact on CO<sub>2</sub> emissions on Last Mile delivery in their second life C2C marketplace.



Figure 2: Vinted Go parcel locker touchscreen

Source: Bloq.it



Figure 3: Vinted Go parcel locker

Source: Bloq.it

## Learnings

The execution of this project in such a short period of time was only possible due to the close cooperation and efforts of both companies.

This remains a record time between ideation, execution of launch for such a service, with roughly 2 months from agreement between both companies, and the deployment of the

first MVP unit.

For Bloq.it this has been a massive learning opportunity and the company believes that working in such a large project will prove to be a pivoting point for the company growth, and an important step in their goal of becoming the world's leading solution in the Smart Locker segment.

# ROMANIA



## SAMEDAY



### Summary

In 2019, Sameday reinvented the delivery experience in Romania and developed the largest network of lockers in the country, based on the most innovative technologies. The aim was to introduce a fast, convenient, low-pollution, and low congestion method of delivery.

Easybox is a solution that significantly reduces the number of km travelled by the courier, which has a huge impact on reducing emissions. A door-to-door courier delivers between 70 and 120 packages per day. A courier with only easyboxes on his route manages to reach 400-500 parcels daily. For a parcel delivered to easybox, the courier does not need to drive to several consumer



Figure 1: Sameday parcel locker

Source: Sameday

addresses. Consolidated delivery means fewer vehicle kilometres and fewer stops. Given the average size of an easybox, a driver can deliver over 50 parcels in one stop.

### Introduction

The initial project started with 30 lockers placed in the big cities of Romania. In 2018, the pilot project was launched, which planned to reduce the number of kilometres travelled by couriers. In 2019, the technology was perfected, and in the following year, which was marked by the pandemic, Sameday accelerated the contactless delivery method, growing the number of easyboxes installed with 250% within one year.

Demand from customers increased and so did the number of parcels delivered to easybox.

A standard courier delivery, service which delivers the parcel at any address indicated by the customer, generates an average carbon footprint of 300 grams of CO<sub>2</sub>. This footprint is dependent on the travelled distance between the warehouse and the customer, vehicle load, and the number of delivery attempts.

In a similar manner, showroom or post-office deliveries generate 3 to 6 times more carbon emissions than deliveries to easybox. The carbon emissions increase ratio is associated with the fact that customers are obliged to travel (generally by personal car) to collect their parcels. Meanwhile, easybox is an innovative, proximate and environmentally friendly solution considering that delivering a parcel to easybox only generates 14 grams of CO<sub>2</sub>. In four years since its launch, the

easybox network has exceeded the number of 4500 lockers and the borders of the country. Now, easybox is also available in Hungary and Bulgaria and continues to help reduce the carbon footprint of Sameday. In addition to the standard easyboxes, currently, there are 33 green lockers in Romania, which are powered by solar energy, and their number is growing. Sameday's objective is to help reduce to zero the carbon emissions generated by the courier industry.

## Methodology

Studies show that the highest CO<sub>2</sub> emissions in e-commerce are associated with last-mile delivery.<sup>1</sup> More specifically, the carbon footprint of an order purchased online is generated by three main components, namely last-mile delivery (42%), packaging (27%), and energy consumption in buildings (19%).

In answering the need of reducing its last-mile delivery carbon footprint, Sameday launched the easybox delivery service. The continuous expansion of the easybox network, both nationally and cross-border contributes to reducing urban traffic all while contributing to reducing emissions generated on the last mile.

In Bucharest-Ilfov urban area a customer can find a locker within a 4 minutes walking distance from their house or other location. Within the national easybox network, the average walking distance a customer has



Figure 2: Sameday electric delivery vehicles

Source: Sameday

travelled to collect their parcel from easybox is approximately 7 minutes.

Moreover, Sameday has a partnership with a software company that uses AI to decide where the easybox is most needed and help the company maximise the locker potential. When the courier has loaded the parcel into the locker, the system sends an automatic SMS to the consumer. They receive a box unlock code, so the need to use paper is reduced to zero.

## Results

The latest studies about the importance of carbon emissions when using the services of a company have increased in the past year for customers between 25 and 35 years old.<sup>2</sup>

When comparing easybox with other standard delivery services employed by two of our

biggest partners, eMAG and Fashion Days - courier, post-office, or showroom - we see a rapid increase in the easybox adoption rate among our customers. In 2022, we saw almost 25% YOY growth increase in easybox adoption for eMAG and Fashion Days, with other clients even surpassing these results.

The sports brand Decathlon, for instance, benefitted of a YOY growth of 95% for the easybox delivery method, while Avon saw an increase of 350% YOY in the number of orders delivered to easybox. These impressive growth rates also translate into a net decrease in carbon emissions generated by last-mile delivery.

By means of utilising the easybox service, Sameday group managed to reduce its direct carbon footprint generated through fuel consumption significantly. In 2022, more than 27 million parcels, representing approximately 47% of all Sameday's domestic shipments, were delivered at easybox.

## Learnings

In the four years, easybox has become the preferred out-of-home delivery method for most online shoppers. In Romania, 67% of online shoppers give preference to online stores that include easybox as a delivery method<sup>3</sup>. One of the reasons why young people prefer easybox delivery is the green component of the solution.

To further reduce the carbon footprint associated with last-mile deliveries, in October 2021, Sameday launched its first locker powered by electricity from photovoltaic panels. The aim is of scaling the technology nationally and working towards significantly reducing carbon emissions. To date, there are 31 PV-powered lockers in the easybox network. Sameday's objective is that of increasing the number of autonomous lockers and concentrates its efforts so that at least 10% of the newly installed lockers are PV powered.

Reducing the electricity consumption of easybox lockers has a significant impact on the environment by derivation on the carbon footprint associated with last-mile deliveries.

The investments in technology and state-of-the-art solutions led Sameday Group to a 38% increase in delivered parcels versus the previous year.

For eMAG, the largest online shopping platform in Romania, in 2021, the increase in the number of easybox orders aided Sameday in avoiding the generation of 2,522 tonnes of CO<sub>2</sub>e translating into a Scope 1 reduction of 19%. However, by virtue of comparing the present situation to that of a scenario in which the easybox service would not be available or in use, we find out that the real Scope 1 carbon saving raises to 39% meaning the avoidance of 5,121 tonnes of CO<sub>2</sub>e.



Figure 3: Sameday courier delivering parcels to parcel locker  
Source: Sameday

A single PV-powered locker saves 50 kWh a month, amounting thus, to 600 kWh in a year. Consequently, the network of PV-powered easybox lockers currently contributes to saving 18.600 kWh a year. This translates into avoiding the generation of 4.9 tonnes of CO<sub>2</sub>e.

The development of the easybox network, the introduction of easybox green, the expansion of the fleet of electric cars and the abandonment of the use of papers made Sameday an example of sustainability for business customers. Green delivery has become an important selling proposition for online commerce.

<sup>1</sup> *Is E-Commerce good for Europe? Oliver Wyman, 2021. is-ecommerce-good-for-europe.pdf (oliverwyman.com)*

<sup>2</sup> *ANCOM - Quantitative Study on the methods of providing postal services among individual end users, October 2022*

<sup>3</sup> *According to a report commissioned by Sameday in April-May 2022.*

# SWEDEN

## POSTNORD GROUP AB



### Summary

The global climate crisis is the single biggest challenge facing humanity and since it is caused by us humans, we are also in the position to solve it. PostNord recognises the scale of the challenge, and we are committed to take the lead in paving the way for a climate transition of the transport and logistics sector.

PostNord's commitment is to show that it is possible to achieve completely fossil-free transport and operations already by 2030. Our transition roadmap that we have named 'Green by PostNord' has started since 2021

### Introduction

Green by PostNord (GbPN) is the Nordics largest parcel and logistics provider's plan to reduce its climate impact. The program's goal is to go fossil-free in all sectors by 2030. There are also intermediate goals introduced, i.e., 40% emission reduction by 2025 as well as providing emission free last mile throughout the Nordics by 2027 (see Figure 1).

and is in line with the Paris Agreement and approved by Science Based Targets Initiatives.

Green by PostNord is our opportunity to take green responsibility and by that make a real and sustainable transformation of our company. Green by PostNord means to go green for real and make a true difference for the countries where we operate, for our customers, partners, subcontractors and for all our employees. It is a structured way of working for reaching our climate targets – by working smarter, standardise, and coordinate<sup>1</sup>.



Figure 1: Climate goals of Green by PostNord  
Source: PostNord

<sup>1</sup> <https://www.postnord.com/>

The goals and ambitions set by GbPN are verified by Science Based Targets initiative (SBTi), which means that the goals are in line with what the relevant science deems necessary for reaching the Paris Agreement goals, i.e., keeping the global temperature increase below 1.5 degrees Celsius.

GbPN will cover the whole chain of PostNord's letter, parcel, and third-party logistics business across the Nordics, including the last-mile operation, facilities, and network.

The program includes not only the PostNord's own fleet operation, but also promises to ensure a fossil-free operation of subcontractors and third-party providers by 2030.

GbPN is about PostNord coming together. It's about all countries implementing a unified transformation creating new ways of working that works for all of us, and it is directly sponsored by the group CEO which emphasises the high priority of climate actions at PostNord.

## Methodology

GbPN provides a cross-Nordics framework for collaboration and co-creation to optimise the use of resources and expertise across the PostNord organisation. The framework consists of different centres of excellence

(CoE) comprising of subject matter experts from across the Nordics. Each Centre of excellence addresses a major topic towards the goals of the project (see Figure 2).

CoE Responsibilities		Current focus areas	
<b>Technical CoE</b>	<b>Electromobility</b> (BEV, FCEV)	Staying up to date on new technology, maturity and suppliers, to ensure scalability and timing, and creating standards for sourcing and deployment of new technology.  Giving recommendations on decisions and investments, and sign-off on projects and pilots related to the technology or expertise area	Defining charging standards for BEV (hardware & software).
	<b>Bio-drive</b> (HVO, Gas)		Secure network of biogas
	<b>Rail and air</b> (Standards & SAF)		Establish intermodal transport pilot partnership
	<b>Net-zero buildings</b>		Ensure buildings can power the charging infrastructure
	<b>Packaging</b>		Support customers with their sustainable packaging requirements
<b>Subcontractor transitioning</b>	Support subcontractors' transition (e.g. bonus/malus) with help of standards and knowledge-sharing	Drive pilot transition of a subcontractor before scaling	
<b>KPI &amp; Reporting</b>	Follow-up on KPIs in green projects, pilots and investments	continuous improvement of KPI and data quality	
<b>Policies &amp; Subsidies</b>	Monitor upcoming regulations, influencing possibilities in EU and local setting, and possibilities for seeking subsidies and grants	Secure funding for the green transition	
<b>Commercialization</b>	To ensure that the other operational CoEs' work has a customer-centric / business case approach	Assisting in rolling out of green corridors Commercialize sustainability	
<b>City Logistics</b>	To ensure that the other tasks are aligned with future city logistics policies and trends.	Monitor the pressing issues and regulations within city logistics in the Nordics	

Figure 2: Current CoE within GbPN  
Source: PostNord



The benefit of the concept of CoE is twofold:

- It brings the decision making to the level of people being mostly involved and affected with the decisions.
- The solutions provided by the CoE are standardised solutions applicable to different countries.

This is achievable due to the involvement of experts from different countries in each CoE and it will also optimise the use of resources in the organisation.

The program is supported by a PMO that alongside the common PMO tasks, is also responsible for defining a detailed roadmap

of reaching the project goals. The roadmap highlights the progress, the current trends in the technologies, recommendations on the future decisions, and risks and uncertainties. The roadmap is developed by the PMO, approved by the group leadership team, and in general serves as a basis for future investments and business plans within the program. Moreover, it is also used to secure external fundings in the form of Green Bonds from different public and private investors.

The roadmap is updated frequently to capture the progress and risks in different areas, as well as the latest trends in relevant technologies.

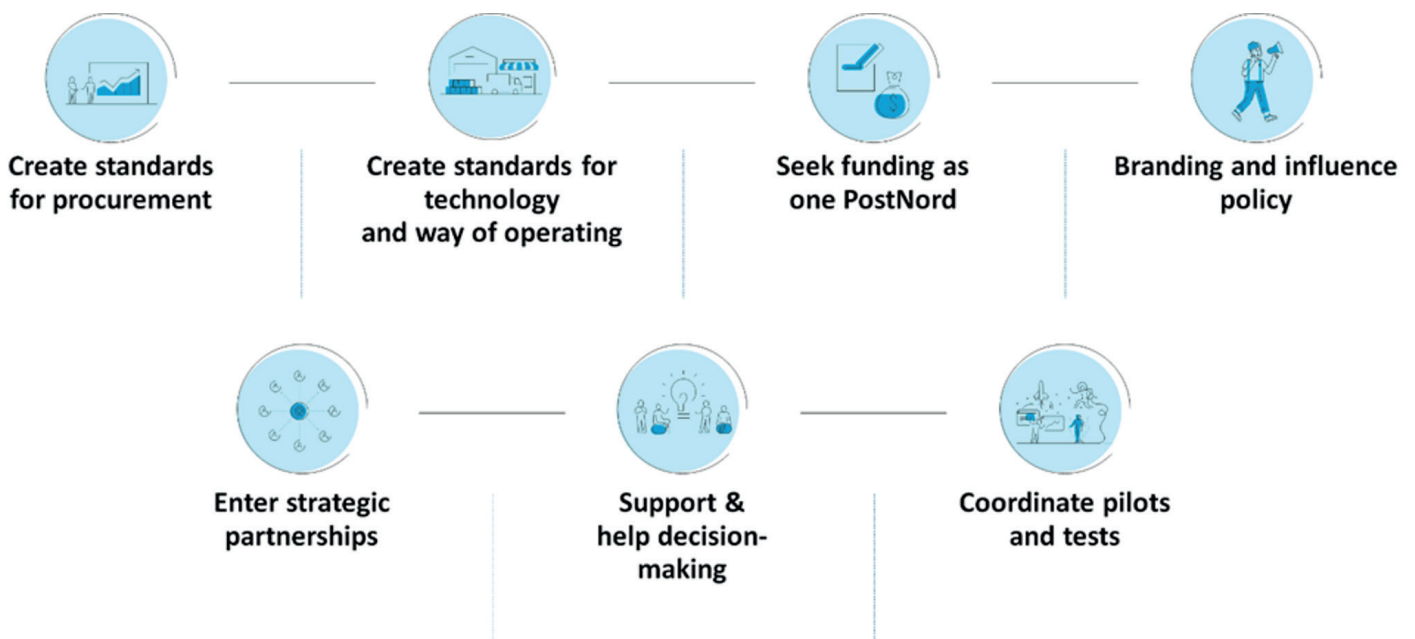


Figure 3: GbPN structured way of working

Source: PostNord

## Results

Since the start of the program, PostNord has been moving fast toward its goals, and in fact it is ahead of the initially projected CO<sub>2</sub> emission reduction (see Figure 4).

Progress towards the climate goals has been also appreciated by PostNord's customers and stakeholders. Within the framework of GbPN and through the Green Corridors initiative, we have managed to win back customers with strict emissions requirements.

As a result of planning toward our goals, we have been investing heavily in electrified transportation (both within last mile and linehails), as well as fossil-free fuels. To minimise the impact from the flight operations, we have also managed to successfully run pilots of flights in Sweden with the highest allowed blend rate of SAF possible in the country, leading to 5.2 k tons of CO<sub>2</sub> reduction in the total of 2300km<sup>2</sup>.

Our endeavors within sustainability have been acknowledged by both investors as well as our customers. We have recently managed to secure a funding of total 1.2 BSEK from Nordic Investment Bank<sup>3</sup>. But more importantly, according to the Sustainable Brand Index report and for the third time, PostNord was awarded the most sustainable logistics company by Swedish customers in 2022<sup>4</sup>.

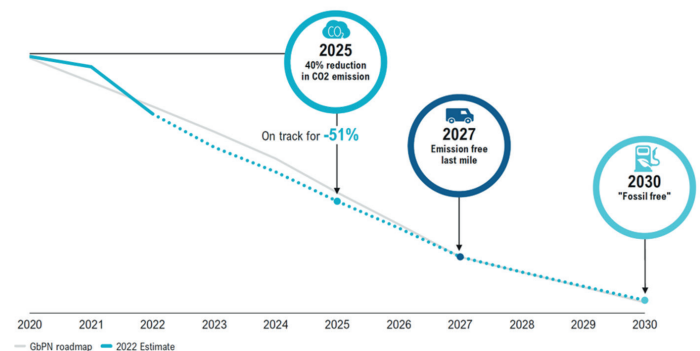


Figure 4: Progress of PostNord with respect to its climate goals (Source: PostNord, Roland Berger analysis)

Source: PostNord

## Learnings

Green transformation has been a major point in PostNord's agenda. We have learned that this is not a just an option, but rather a key requirement from our external stakeholders (consumers and shippers). We have also learned that decarbonisation is a necessity of success in the market considering the regulatory risks and competition. This, however, is not a straightforward journey.

Clarifying our priorities and strategy and translating them into well-defined and concrete initiatives and action-plans are proven to be key factors when dealing with such complex journey.

Ambitious transformation of an organisation in

the scale of PostNord is a time-consuming procedure. We see this transformation as a marathon, in which we need to keep the pace throughout the race. Regular follow-ups and pulse checks, as well as clarifications of rolls and responsibilities are needed to ensure a smooth ride to the final line.

The green transformation of PostNord is no journey exclusive to the upper managements nor the transformation PMO. We have learned to utilise key competences from across the organisation in taking strategical decisions. More importantly, the whole organisation on all levels needs to be engaged and energised to ensure a sustainable transformation of this scale.

<sup>2</sup> <https://www.postnord.se/om-oss/pressmeddelanden/2022/unik-postflygning-testar-koldioxidsnalt-bransle>

<sup>3</sup> [nord-pressmeddelanden/2022/postnord-haller-hog-takt-i-klimatomstallningen--investerar-i-fornyelse-av-fordonsflottan](https://www.postnord.se/om-oss/pressmeddelanden/2022/postnord-haller-hog-takt-i-klimatomstallningen--investerar-i-fornyelse-av-fordonsflottan)

<sup>4</sup> <https://www.postnord.se/om-oss/pressmeddelanden/2022/postnord-utsedd-till-mest-hallbara-logistikbolaget-av-konsumenterna>

# UNITED KINGDOM

EVRI



## Summary

Evri recently launched a comprehensive and ambitious strategy to reach net zero direct and indirect carbon emissions by 2035. As part of that roadmap, the company is exploring active delivery models to create zero-emission final-mile delivery solutions, particularly in urban and congested areas.

In early 2022 Evri trialled an e-cargo bike delivery model in Driffield, East Yorkshire

## Introduction

We're the UK's leading dedicated parcel delivery company and we're on a mission to become the most sustainable. As a responsible carrier, we recognise our impact on the environment and ESG (environmental, social and governance) principles are embedded in all that we do.

We recently launched a comprehensive and ambitious strategy to reach net zero direct and indirect carbon emissions by 2035. As part of that roadmap, we're exploring active delivery models to create zero-emission final-mile delivery solutions, particularly in urban and congested areas.

In 2021, we successfully delivered 75,000 parcels via a street-portering trial, in collaboration with Ford, from one of our

E-cargo bikes have long presented a sustainable delivery solution compared to traditional vans, and results showed an increase in productivity of around 13% and an 89% reduction in CO<sub>2</sub> emissions. Then, in May 2022, we partnered with zero-emission delivery start-up Zedify for a final-mile project. This was based in Bristol but is scalable across the UK, and resulted in similarly positive reductions in CO<sub>2</sub>.

London delivery units. The benefits are clear: two electric vans and eight porters means six diesel vans are taken off the road.

In early 2022, we trialled an e-cargo bike delivery model in Driffield, East Yorkshire. E-cargo bikes have long presented a sustainable delivery solution compared to traditional vans. Most designs were severely limited by capacity, but the EAV bike we trialled is different. It has a 2m<sup>3</sup> capacity, similar to a small van, and is able to carry upwards of 130 parcels. Results showed an increase in productivity of around 13% and an 89% reduction in CO<sub>2</sub> emissions – a very real proof of concept that could aid in the decarbonisation of the final mile.

## Methodology

In May 2022, we partnered with zero-emission delivery start-up Zedify, a company with the shared goal of making deliveries more sustainable. Evri x Zedify kicked off in Bristol, an ideal city to trial such a project with its commitment to launch a clean air zone and government investment in sustainable urban planning.



Figure 1: Evri ecargo bike by Zedify

Source: Evri

How it works:

Zedify pick up our parcels from our nearby Brislington delivery unit. Then, their riders deliver them, on time, to homes and businesses across the city.

Zedify's operation model utilises hyper-local micro-hubs which act as a gateway at the edge of the city centre. Meanwhile, our decades-long expertise in logistics means we have established volumes of parcels ready to be delivered daily (we're currently delivering c700million parcels a year). Consumers increasingly want more from home delivery: flexible and fast delivery options, same day and next day solutions, and clear action on sustainability. Therefore, efficient low-carbon deliveries are an absolute must. Zedify's 100% electric cargo bikes are ideal for delivering our customers' and clients' parcels speedily through our congested cities.

## Results

The project provided local people and businesses with reliable and efficient deliveries. The initial trial showed a 98% reduction in carbon emissions in the final mile compared to a traditional van delivery. The estimated carbon saving figure from the trial is 62kg CO<sub>2</sub>e per week.

As with any trial, the barometer for long-term success is scalability and commercial feasibility, and the ability to complement or

augment existing operational processes in a seamless manner. It's worth noting that Zedify is in 10 cities and aims to launch in a further eight cities during 2023.

At Evri, we're committed to exploring the viability of implementing alternative delivery options that help reduce the carbon footprint of parcels, as well the introduction of innovative circular business models that will support our clients and customers.

## Learnings

Cycle logistics is shaking things up in the final-mile delivery space. In terms of operational innovation, Zedify's model is built entirely on 100% electric zero-emission delivery vehicles, including cargo bikes and trikes. Deliveries are consolidated, so parcels headed to similar neighbourhoods are combined into one cargo bike, enabling deliveries to be as time-efficient and cost-effective as possible. Although

Zedify don't currently consolidate our volume with other volume they might be carrying, we are working towards this as a next step.

This innovative approach means the project is easily scalable and can be implemented in other cities where Zedify has hubs, including London and Edinburgh.

# UNITED KINGDOM

## UNIVERSITY OF HULL



### Summary

Research shows that consumers are becoming increasingly aware (and worried) about the environmental impact of online shopping.

Although couriers can reduce their own emissions by delivering parcels in bulk to centralised "out-of-home" locations, their calculations usually ignore any emissions associated with the customer collection. Online shoppers are often encouraged to collect e-commerce parcels from a collection point or locker as a more 'environmentally friendly' option. Is this greenwashing?

Is it better for the environment to get our parcels delivered to our door, or to a pick-up point? Sometimes it's hard to know which is the most sustainable option.

The University of Hull's Aura Innovation Centre has joined forces with smart parcel locker company iParcelBox to develop an online carbon footprint tool to help people make green choices when shopping online.

Leading academics at the University of Hull worked with iParcelBox to undertake carbon mapping of e-commerce deliveries, creating the MyParcel carbon calculator. The simple online tool gives customers a fair and unbiased comparison of the carbon footprint of different last-mile delivery options, enabling them to make informed decisions as to which delivery method is the greenest for their personal circumstances.

The carbon calculator is available at: <https://co2.myparcel.org.uk>

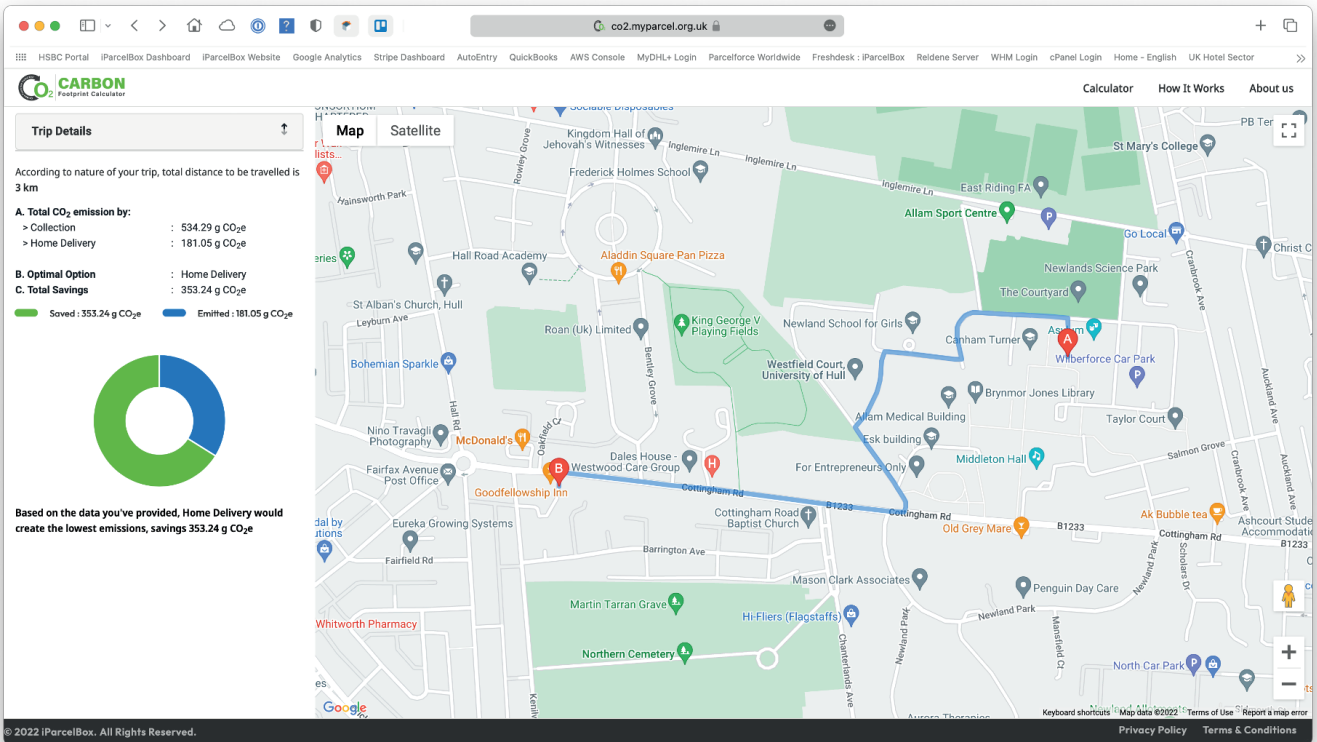


Figure 1: Screenshot of carbon calculator  
Source: University of Hull

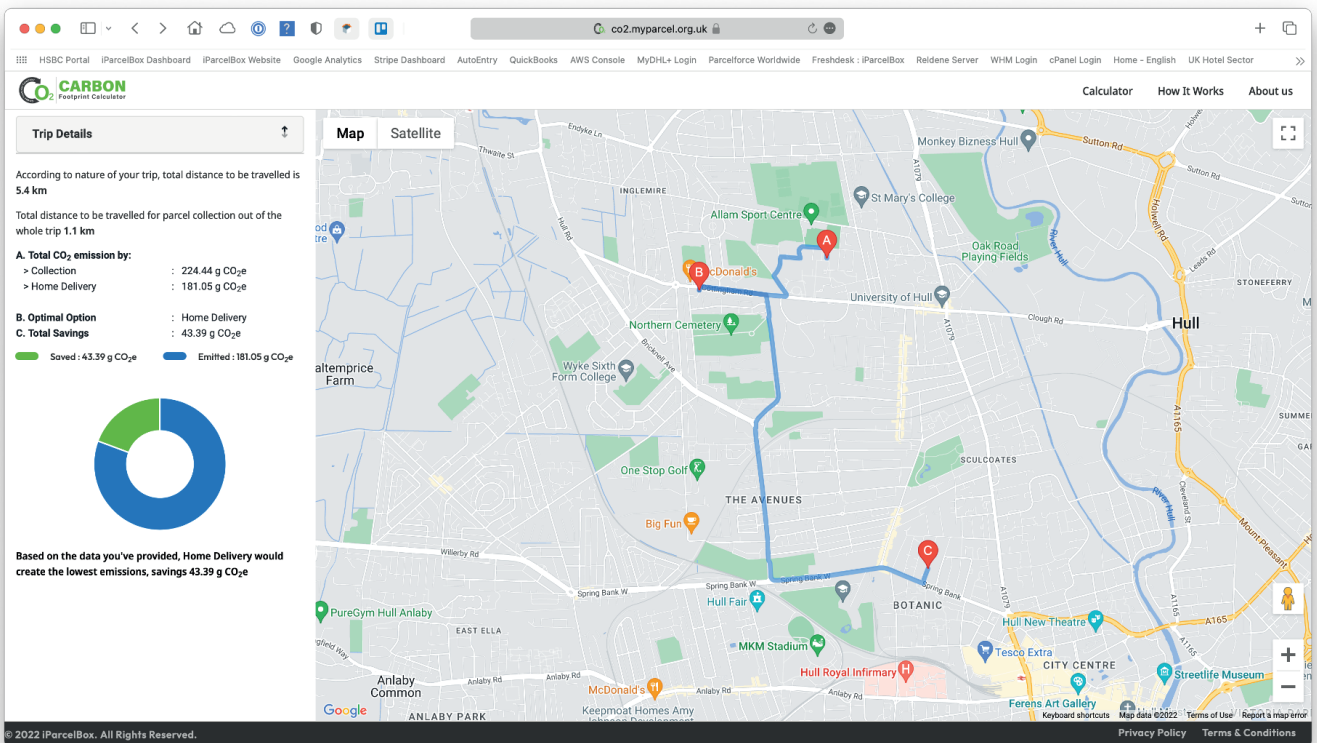


Figure 2: Screenshot of carbon calculator  
Source: University of Hull

## Introduction

The MyParcel CO<sub>2</sub> calculator is a collaborative project between University of Hull Business School and iParcelBox, funded by Aura Innovation Centre (AIC).

AIC is a community that supports businesses of all sizes, helping them to accelerate low-carbon projects, drive green innovation and deliver clean business growth. By connecting businesses with university research power, Aura is helping to shape the way in low-carbon innovation.

AIC matched iParcelBox up with University of Hull Business School's logistics and supply chain expert Dr Sushma Kumari, who leads a masters course in the subject, also securing European Regional Development Fund funding for the project.

### The aims of the project were as follows:

- To calculate the average expected carbon emissions associated with an at-home parcel delivery by a logistics provider.

- To calculate the carbon emissions associated with logistics provider delivering parcels to a central locker or pick-up point.
- To calculate the carbon emissions associated with customers collecting parcels from a central locker or pick-up point.
- To suggest the most appropriate parcel delivery option for customers to minimise carbon emissions.

Depending on their personal circumstances and the distance to the pick-up point, customers may choose to walk, take public transport, or drive a vehicle to collect their parcel, all of which create different levels of emissions.

It is expected that this project will help customers to reduce the overall emissions associated with parcel deliveries by enabling them to select the most appropriate delivery option which helps them to minimise emissions.

## Methodology

For home deliveries, the researchers use a method based on academic research to estimate the average distance travelled and number of parcels delivered by a typical parcel delivery van each day. From that, they used DEFRA data to calculate the total emissions of the vehicle, and therefore the average emissions per parcel.

For deliveries to pick-up points, there are two elements to take into consideration: the courier delivery to the pick-up point; and the customer collection.

For courier deliveries to pick-up points, data published by a leading locker manufacturer was used to calculate the distance travelled and number of parcels delivered, and that was then used in a similar methodology to the home deliveries above to calculate the emissions for that part of the journey.

For the customer collection, the University use the information provided by the customer on the website to calculate the total distance travelled from their home to the pick-up point (and back again). The tool then calculates the emissions associated with that journey for the vehicle/travel type selected, combining it with the courier delivery emissions above to get a total emission associated with the pick-up point.

If the customer combines their trip with another essential journey, they can provide details of their destination, and the calculator will only use the additional distance associated with the parcel collection.

The emissions values for both collection and home delivery are then compared to identify which option results in the lowest emissions.

## Results

The e-commerce industry has previously suffered from a lack of reliable information for eco-conscious customers to use when considering how they get parcels delivered.

Using the carbon calculator tool, consumers can see the likely total emissions associated with both scenarios, allowing them to make their own, informed decision about the best option for their personal circumstances.

This new tool will deliver accurate, unbiased data to give consumers information on which of the available delivery options will be best for the planet. This should help customers make an informed decision when it comes to

home delivery, and could even start to cause behavioural change – something which can only be good for sustainability.

Dave Dawson, Innovation Manager at the AIC, said: "The University of Hull has world-class expertise in logistics, so I knew there'd be academics who'd love to work on such an innovative project. Given the continued growth of online shopping, this tool can help to support a reduction in last-mile emissions and contribute to meeting net zero targets."

The carbon calculator tool is now available at <https://co2.myparcel.org.uk>

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## Learnings

In dense urban locations where a pick-up-point is within convenient walking distance, it is likely that the online carbon calculator tool will reinforce that out-of-home delivery is the most sustainable option (assuming a sufficiently dense network of lockers & pick-up-points can be deployed to meet demand).

However, in suburban and rural locations, customers will have to travel further and are less likely to walk or cycle to collect their parcel. Unless the pick-up point is located directly along the route of an existing essential trip, it is probable that a secure at-home delivery will result in the lowest emissions.

To avoid greenwashing, retailers and Logistics providers must therefore carefully consider

making any blanket claims that out-of-home delivery is the greener or more sustainable option.

Unless there is a suitably dense network of pick-up options within the immediate vicinity of a customer's home location, retailers should ensure that they provide an objective, evidence-based way to choose the most sustainable delivery option, either at checkout or during the courier's pre-delivery communications with the customer.

This will help to drive behavioural change by consumers to select the delivery option which is truly the most sustainable, not just the one that helps the courier reduce their own emissions.



Prepared with the support of:



# ASSESSMENT OF THE VALUE OF PROJECTS

# HIGH LEVEL ASSESSMENT OF PROJECTS

Our report featured projects from different areas of the CEP industry and all of the solutions presented have a positive impact on the environment. In our opinion, the most effective ways to reduce emissions and negative environmental impact in the short term relate to the education of all stakeholders about the benefits and relative ease of an eco-friendly last mile as well as strong promotion of consolidated out-of-home delivery (PUDOs and parcel lockers).

While many experts suggest that operating fleets of EV's or cargo bikes has the greatest single impact on our environment, it will take several years, if not decades, before the infrastructure is ready for this and all legacy vehicles can be economically mothballed.

Moreover, in some countries, particularly in CEE, electricity is obtained via fossil fuels and is therefore less "clean" than one might expect.

Of course, manual cargo bikes or small EVs such as scooters can be an interim solution for the infrastructure problem as they require less infrastructure and can even be supported by battery change stations with pre-charged battery packs.

Understanding the whole problem leads us to the basic conclusion that the fastest way to achieve a significant reduction in emissions is to EDUCATE all stakeholders.



To be frank, the activities of individual companies or institutions in the field of environmental protection are extremely important and necessary, but only united actions promoted by legislators and local/central government will accelerate the process of making the last mile truly "green". This joint effort should include:

- **Consumers**, who should consciously and responsibly order online, choosing delivery methods that generate low emissions,
- **Retailers**, to adapt their packaging so as not to "carry air" and to promote OOH or EV delivery as the most environmentally friendly solution,
- **Carriers** (courier companies, post offices) who should train their couriers and drivers in economic driving, run low emission fleets or facilities and promote OOH,
- **Legislators** and city authorities who, through legislation or fiscal benefits, can stimulate (accelerate) change to improve the quality of the surrounding environment.

Prepared with the support of:



# THE ENVIRONMENTAL IMPACT OF THE LAST MILE

# THE ENVIRONMENTAL IMPACT OF THE LAST MILE

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## Methodology and key assumptions

Last year UPIDO performed a long term assessment of the potential green last mile effects of various development scenarios. Given the importance of the findings and the fact that they are long term and still valid; we include this data in the 2023 report without change. Despite the ongoing geopolitical and macroeconomic uncertainties, our mid-2022 analysis remains a valid projection for the next decade, as we maintain our belief that technological advancements can support these assumptions. We have conducted a long-run assessment of the impact generated by last mile deliveries in terms of the carbon footprint in Europe. The purpose was to compare different scenarios and forms of mitigating CO<sub>2</sub> emissions in the last mile, by stressing what could happen in ten years time. The analysis focuses on possible last mile delivery solutions and technologies that could be deployed in 2032. We expect alternatives to today's main delivery systems, such as parcel lockers or the use of electric vehicles to be implemented at a larger scale by 2032. It must be noted that the transition path between 2022 and 2032 is not detailed since the speed of implementation of decarbonised solutions for the last mile may vary from one country to another in the European Union, the United Kingdom, Switzerland and Norway. We simply assume a convergence between countries in the application of new last mile solutions by 2032. On the first stage, total European

B2C parcel delivery volumes were forecasted for the year 2032. Then, in a second stage, this forecast was used to estimate CO<sub>2</sub> emissions in the last mile for the group of countries made of the European Union members, the United Kingdom, Switzerland and Norway. We extrapolated the carbon footprint estimations produced in several detailed studies (especially from Poland, due the quantity and quality of available data) regarding the impacts of parcel locker networks and adoption of electric vehicles for last mile delivery.

Given the different geographic features of Poland compared with other European countries, such as population density, we adjusted key parameter values for European CO<sub>2</sub> emission estimates according to the most relevant geographic differences between Poland and other European countries. As a rule, we took the most conservative estimates out of the different calculations that were run for this exercise in order to minimise any possible over-estimation of some effects. We assumed that the density of OOH delivery networks will have become high enough in 2032 to allow for decarbonised collection of parcels by consumers (such as walking to the collection point and by so-doing avoiding any additional trip by car). We also assumed that pick up and drop off points (PUDO) could achieve the same level of last mile energy efficiency as parcel lockers.

# THE ENVIRONMENTAL IMPACT OF THE LAST MILE

## Last mile delivery: carbon footprint scenarios

The environmental impact of last mile delivery will depend on the next generation of delivery and automotive technology, which are the key dimensions to be considered in any carbon footprint assessment scenario in the long run (Table 1). On the one hand, transitioning from traditional home deliveries, in the coming ten years, to a “new last mile” made of dense out of home (OOH) parcel lockers networks, pick up and drop off (PUDO) points or unattended home delivery solutions, such as residential parcel boxes or smart home lockers, will determine part of the reduction in CO2 emissions.

On the other hand, electric vehicles (EV) will contribute to mitigate or even eliminate most of CO2 emissions once deployed for most European B2C parcel deliveries by 2032. We focus here on the possible impacts of the adoption of out-of-home delivery and electric vehicles in the last mile, while acknowledging the potential of other solutions for fulfilling emission reduction pledges in the CEP industry. Eventually a mix of environmentally friendly technologies will be applied by different postal and parcel companies over the next decade.

EV adoption \ OOH adoption	No adoption <i>parcels delivered by EVs in 2032: 0%</i>	Intermediate adoption <i>parcels delivered by EVs in 2032: 50%</i>	High adoption <i>parcels delivered by EVs in 2032: 100%</i>
No adoption <i>parcels delivered in lockers or PUDOs in 2032: 0%</i>			
Intermediate adoption <i>parcels delivered in lockers or PUDOs in 2032: 50%</i>		<b>Carbon footprint scenarios</b>	
High adoption <i>parcels delivered in lockers or PUDOs in 2032: 100%</i>			

Table 1  
Carbon footprint of last mile delivery in the EU+UK+CH+NO in 2032: scenarios and impacts according to different levels of OOH & EV delivery adoption

Source: UPIDO

# THE ENVIRONMENTAL IMPACT OF THE LAST MILE

## Running away from the worst last mile scenario

Decarbonisation of last mile deliveries requires a very fast shift from traditional delivery methods to cleaner ways of bringing convenience to online shoppers. We evaluated the impacts of various scenarios combining different degrees of adoption of out of home (OOH) delivery and electric vehicles (EV) (Table 2). The goal is to quantify the benefits from avoiding the worst-case scenario, that is the one without adoption of OOH delivery and EVs. Our base-case scenario assesses the impacts of an intermediate level of adoption of OOH and EVs. This scenario is closer to what could be expected

for 2032 today. However, these efforts might turn out to be insufficient should global warming be limited to an increase of 1.5oC. Thanks to OOH and EVs, greater climate ambitions could be pursued.

The base case is compared with three other scenarios: the case of full adoption of OOH but no adoption of EVs, namely the OOH-only scenario; the case of full adoption of EVs but no adoption of OOH, namely the EV-only scenario; and finally, the best-case scenario combining both a full use of OOH and EVs.

EV adoption \ OOH adoption	No adoption parcels delivered by EVs in 2032: 0%	Intermediate adoption parcels delivered by EVs in 2032: 50%	High adoption parcels delivered by EVs in 2032: 100%
No adoption parcels delivered in lockers or PUDOs in 2032: 0%	<b>Worst-case scenario</b>		<b>EV-only scenario</b>
Intermediate adoption parcels delivered in lockers or PUDOs in 2032: 50%		<b>Base-case scenario</b>	
High adoption parcels delivered in lockers or PUDOs in 2032: 100%	<b>OOH-only scenario</b>		<b>Best-case scenario</b>

Table 2  
Carbon footprint of last mile delivery in the EU+UK+CH+NO in 2032: estimating the impacts according to different levels of OOH & EV delivery adoption

Source: UPIDO

# THE ENVIRONMENTAL IMPACT OF THE LAST MILE

## Coping with 40 billion deliveries in the last mile

We forecast 40 billion B2C parcel deliveries in the European Union, the United Kingdom, Switzerland and Norway in 2032 (with an error margin of two years). As shown in Table 3, this would result, on average, in CO<sub>2</sub> emissions ranging from 13 to 139 g of CO<sub>2</sub> per parcel across the different scenarios and European countries under analysis. Following the base-case scenario route would only lead to 55 g of CO<sub>2</sub> per parcel in 2032. This means that there is still a very large room for improvement in order to achieve a carbon footprint per parcel equivalent to 13 g of CO<sub>2</sub> in the best-case scenario

for 2032. Policies focusing on a single way to reduce emissions cannot bring the most desirable outcome alone (compare, in Table 3, the 32 g CO<sub>2</sub> per parcel through electric vehicles only or the 36 g CO<sub>2</sub> through out-of-home delivery only to the 13 g CO<sub>2</sub> with high adoption of OOH and EVs). Only a strong combination of last mile instruments fighting climate change, as illustrated here by the carbon outcomes for relatively high levels of adoption of OOH delivery and EVs, can lead to the lowest emissions per parcel in European countries (as highlighted in darker green colors in Table 3).

EV adoption \ OOH adoption	No adoption <i>parcels delivered by EVs in 2032: 0%</i>	Intermediate adoption <i>parcels delivered by EVs in 2032: 50%</i>	High adoption <i>parcels delivered by EVs in 2032: 100%</i>
No adoption <i>parcels delivered in lockers or PUDOs in 2032: 0%</i>	139 g CO <sub>2</sub>	86 g CO <sub>2</sub>	32 g CO <sub>2</sub>
Intermediate adoption <i>parcels delivered in lockers or PUDOs in 2032: 50%</i>	87 g CO <sub>2</sub>	55 g CO <sub>2</sub>	23 g CO <sub>2</sub>
High adoption <i>parcels delivered in lockers or PUDOs in 2032: 100%</i>	36 g CO <sub>2</sub>	24 g CO <sub>2</sub>	13 g CO <sub>2</sub>

Table 3  
Carbon footprint of last mile delivery in the EU+UK+CH+NO in 2032: CO<sub>2</sub> emissions per parcel for different levels of OOH and EV delivery adoption

Source: UPIDO estimates, and calculations based on previous studies commissioned by InPost.

# THE ENVIRONMENTAL IMPACT OF THE LAST MILE

## Dividing European last mile emissions by eleven

By 2032 the total amount of European CO<sub>2</sub> emissions generated by last mile deliveries could be reduced from 5,568,000 metric tons of CO<sub>2</sub>, if B2C parcels are delivered without any support from OOH and EVs, to 510,400 metric tons of CO<sub>2</sub> should all deliveries be made with electric vehicles to parcel lockers or pick-up and drop-off points (Table 4). The complete elimination of CO<sub>2</sub> is not possible as long as last mile deliveries impact the movements of individual non-electric vehicles on the road, such as personal cars with internal combustion engines. Achieving these new emission milestones would

require a much more intensive use of the OOH infrastructure than today, since the growth of parcel lockers and PUDOs could be physically limited in space for various reasons. It is critical that parcel lockers and PUDOs can be used several times a day to their full capacity, which also means that the average parcel collection time of one day or more must be dramatically reduced (through better IDM for instance). From an EV perspective, EU regulations have been adopted to ensure minimum procurement levels of EVs by parcel companies.

EV adoption \ OOH adoption	No adoption <i>parcels delivered by EVs in 2032: 0%</i>	Intermediate adoption <i>parcels delivered by EVs in 2032: 50%</i>	High adoption <i>parcels delivered by EVs in 2032: 100%</i>
No adoption <i>parcels delivered in lockers or PUDOs in 2032: 0%</i>	5,568,000 metric tons CO <sub>2</sub>	3,429,888 metric tons CO <sub>2</sub>	1,291,776 metric tons CO <sub>2</sub>
Intermediate adoption <i>parcels delivered in lockers or PUDOs in 2032: 50%</i>	3,497,400 metric tons CO <sub>2</sub>	2,199,244 metric tons CO <sub>2</sub>	901,088 metric tons CO <sub>2</sub>
High adoption <i>parcels delivered in lockers or PUDOs in 2032: 100%</i>	1,426,800 metric tons CO <sub>2</sub>	968,600 metric tons CO <sub>2</sub>	510,400 metric tons CO <sub>2</sub>

Table 4  
Carbon footprint of last mile delivery in the EU+UK+CH+NO in 2032: total European CO<sub>2</sub> emissions for different levels of OOH and EV delivery adoption

Source: UPIDO estimates, and calculations based on previous studies commissioned by InPost.



# THE ENVIRONMENTAL IMPACT OF THE LAST MILE

## Towards ambitious emissions reduction targets?

Our base-case scenario with an intermediate level of adoption of OOH delivery and EVs would correspond to a 61% reduction in European last mile delivery emissions. In Table 5, only three out of nine scenarios would be compatible with CO<sub>2</sub> emissions reduction targets higher than 80% by 2032 (see dark green colors). New generations of consumers are expected to become very demanding in terms of carbon footprint requirements related to their online purchases. Customer loyalty and sales growth,

which are key drivers of customer lifetime value creation, are more and more likely to depend on ambitious targets of CO<sub>2</sub> emission reductions. On top of contributing to the fight against climate change, there is a real business opportunity in targeting the greatest CO<sub>2</sub> emission reductions. Given that last mile delivery is at the heart of the customer experience, the acceleration of the transition towards an ever cleaner last mile should be prioritised by postal and parcel companies in the new post-pandemic normal.

EV adoption \ OOH adoption	No adoption <i>parcels delivered by EVs in 2032: 0%</i>	Intermediate adoption <i>parcels delivered by EVs in 2032: 50%</i>	High adoption <i>parcels delivered by EVs in 2032: 100%</i>
No adoption <i>parcels delivered in lockers or PUDOs in 2032: 0%</i>	5,568,000 metric tons CO <sub>2</sub>	3,429,888 metric tons CO <sub>2</sub>	1,291,776 metric tons CO <sub>2</sub>
Intermediate adoption <i>parcels delivered in lockers or PUDOs in 2032: 50%</i>	3,497,400 metric tons CO <sub>2</sub>	2,199,244 metric tons CO <sub>2</sub>	901,088 metric tons CO <sub>2</sub>
High adoption <i>parcels delivered in lockers or PUDOs in 2032: 100%</i>	1,426,800 metric tons CO <sub>2</sub>	968,600 metric tons CO <sub>2</sub>	510,400 metric tons CO <sub>2</sub>

Table 5  
Carbon footprint of last mile delivery in the EU+UK+CH+NO in 2032: percentage reduction in total CO<sub>2</sub> emissions for different levels OOH & EV scenarios

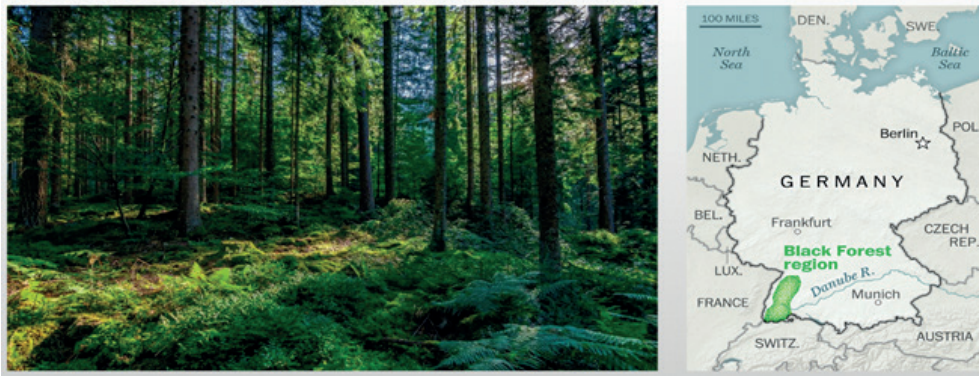
Source: UPIDO estimates, and calculations based on previous studies commissioned by InPost.

# THE ENVIRONMENTAL IMPACT OF THE LAST MILE

## The benefits of a greener European last mile

The impact of OOH and EV delivery on CO2 emissions in 2032 can also be measured in terms of preserved forested land. Table 6 shows the number of trees that could be planted, for the different scenarios under consideration, thanks to carbon

footprint reduction instruments in the last mile. The most ambitious scenarios allow for planting the equivalent of all trees, or more, of the Black Forest every year. Indeed, a greener last mile does matter for a greener Europe.



EV adoption \ OOH adoption	No adoption parcels delivered by EVs in 2032: 0%	Intermediate adoption parcels delivered by EVs in 2032: 50%	High adoption parcels delivered by EVs in 2032: 100%
No adoption parcels delivered in lockers or PUDOs in 2032: 0%	0.00 x Black Forest	0.47 x Black Forest	0.94 x Black Forest
Intermediate adoption parcels delivered in lockers or PUDOs in 2032: 50%	0.45 x Black Forest	0.74 x Black Forest	1.02 x Black Forest
High adoption parcels delivered in lockers or PUDOs in 2032: 100%	0.91 x Black Forest	1.01 x Black Forest	1.11 x Black Forest

Table 6  
Impact of OOH and EV delivery on forested land in the EU+UK+CH+NO in 2032: how many "Black Forests" could be planted with OOH and EV delivery every year?

Source: UPIDO estimates, and calculations based on previous studies commissioned by InPost.

Prepared with the support of:



# FUTURE LAST MILE DEVELOPMENT CONCEPTS

# SWEDEN

## OMNILOOP AB



Omniloop

### Summary

For last mile transport, vehicles on streets are dominating. With the expected growth in e-commerce and circular economy congestion and operating cost will increase. Lockers and sidewalk robots reduce labour cost, but congestion prevails. Air drones reduce congestion but cannot take the required volumes and still have restrictions on use and high operating cost. Water and rail are not available everywhere.

This project explores the installation of a capsule pipeline for transport of small items. It suggests adapting the pneumatic technology used in hospitals. A 5 kg capsule does, in many cases, the same job automatically as a motor vehicle with 500 times larger mass

### Introduction

Current technologies are considered not sufficient to achieve the Paris Agreement or EU's Fit for 55. Citizens are realizing that street space should be used for other things than motor vehicles, and many cities are implementing car-free zones. The 15-minute city concept requires arranging access to services and products within short walking or biking distance.

and a driver. In one investigated scenario, 30% less traffic and CO<sub>2</sub>, the freed space paid for installation of the whole system, and the reduction in user cost resulted in a payback period of 11 months. The pipes can also be used for storing which allows the customer to retrieve his items when and where he wants. This reduces the need for space in buildings and enables automatic retailing. It can accommodate very large volumes to a low operating cost but requires large investment in underground infrastructure.

Finally, suggestions for further research and commercialisation are presented for taking the concept to full deployment.

The desired increase in life and re-use of packaging, products, components, and materiel in circular flows requires more transport than today's linear flows.

Underground pipes are used for transport of water, sewage, gas, and district heating, and was used for transport of mail in capsules in 44 large cities 1853-2002.

Several underground freight transport systems have been proposed with pipe diameters of 90 – 250 cm. However, none is commercially operating, mainly because of difficulties in attracting enough freight volumes to pay for the high cost of infrastructure investment. This project suggests using pipes with a diameter of only 30 cm for handling both waste and goods all the way to and from the user. This is expected to keep the investment cost low, large volumes from start, and a willingness to pay that is higher than the cost.

Research questions:

1. Is it technically feasible?
2. For what will it be used? At home? At work?
3. Pain-points, risks, and challenges?
4. How can these be mitigated?
5. What are the benefits for each service?
6. How much are users willing to pay?
7. Is it economically feasible for the society?
8. Impact on CO2 emissions, environment, and street space?
9. Need for further research and development?

## Methodology

An assessment of the state of art was made based the analyses of about 3000 articles and patent applications together with participation in some 50 workshops and conferences over a period of five years.

A first basic design was made based on the pneumatic technology used in hospitals and industry as depicted in the central part of Figure 1. About 40 people were interviewed about using the system in their daily life at home and at work. Based on the requirements from these use cases a second design was made and used in more interviews. After two years of iterations about 30 generic use cases with new technical solutions were developed, as illustrated in Figure 2. Some of them have been described in patent applications. The latest application has 35 pages and 38 claims. Hence, we could answer yes on research question 1.

A LEGO-model illustrating some of these use cases was built and displayed at exhibitions, conferences, and workshops. At one exhibition 81 visitors answered a survey covering the research questions 2, 3, 5, and 6.

To get quantitative answers to the research questions 5, 7, and 8 a simple cost-benefit

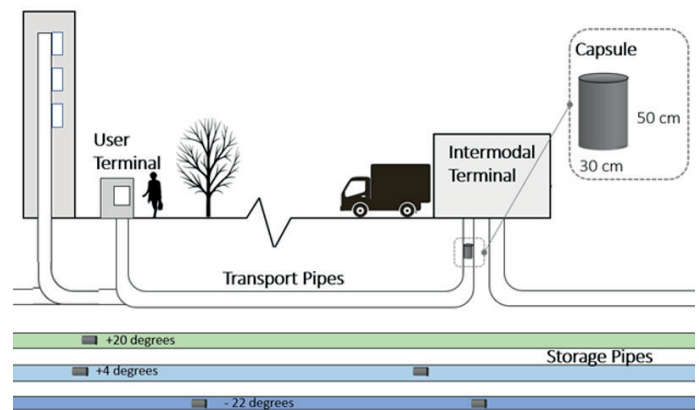


Figure 1: Basic Urban Capsule-pipe Logistic System  
Source: Omniloop

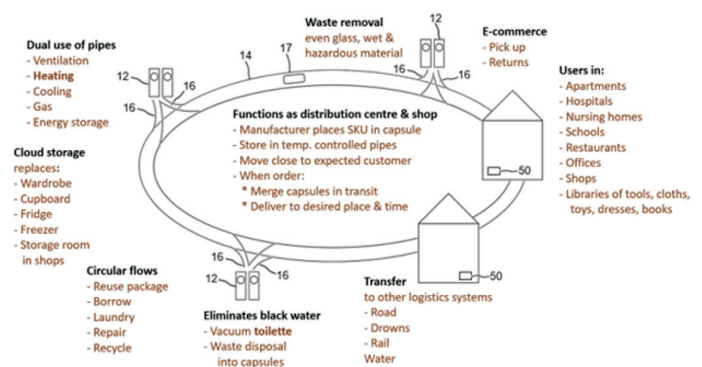


Figure 2: Services based on Capsule-pipe System  
Source: Omniloop

model was developed. We assumed an installation costs of 2 400 EUR per user if 50 persons share one user station. This is twice the cost of a pneumatic waste collection system. To calculate the benefits, we estimated cost savings per type of service from an average person living in the Swedish town Varberg with 36 000 inhabitants.

## Results

Service\Benefit per user	Vehicle km/year	Transport cost/year	Space saved sqm	Rent for space/year	Cost reduct./year	Pay back year
Waste removal	7	9	0.21	16	25	96.0
Distribution of mail & newspapers	251	359	0.76	60	419	5.7
Bought delivery of merchandiser	528	756	1.60	126	882	2.7
Own picking up merchandises	786	658	1.23	87	745	3.2
Total to/from home	1 581	1 782	3.80	289	2 071	1.2
To/from work places (30% above)	474	535	1.20	87	622	3.9
All above services	2 055	2 317	5.0	376	2 693	0.9

Figure 3: User's savings in EURO per year and payback time per type of service

Source: Wandel et al 2022

- The value of the saved space was 1.6 times larger than the investment cost
- 2 055 less vehicle\*km/year per user means 30% less traffic and parking
- Less need for private cars. About 45% of trips by cars are today only for transport av items.
- Emissions of CO2 were reduced by 760 kg/year per user, which is 30% of per capita CO2 in Sweden.
- 30% less emissions of harmful particles and noise.
- Better service since the user can decide when and where to pick up a shipment.
- Storing services replace some wardrobes, freezers, parcel lockers, micro-fulfillment centers, and even complete retail stores.
- Enabling circular economy concepts for example borrow, share, repair, reuse and recycle.
- One direct channel between users and providers both up and down stream.

## Learnings

Although urban capsule pipeline systems are technically and economically feasible, the concept is still unknown for most. We have identified the following research questions:

- Suitable planning, legal, and institutional framework?
- Actors in the future ecosystem and their business models?
- Integration with other logistics systems?
- Best mix of last mile transport means for different types of cities as density; mixture of workplaces, residences, commercial areas; green field or brown field; and future year?
- Start with transport inside buildings, e.g., shopping centre as now in hospitals? Between courtyards? Between cities and major air- and seaports?
- Where to place terminals? Courtyards, entrance, shop, or kitchen?
- How far upstream the supply chains? City outskirts, place of production or the farm?
- Is it cost-effective to invest in infra-culverts underground and multi-shafts in buildings to prepare for possible future capsule-pipe systems?
- How to design ventilation, heating and cooling systems using the same pipes as the capsules?

To achieve this, it will be necessary to establish a cluster of researchers and all the relevant stakeholders to participate in the development and testing of prototypes and demonstrators. Both research funding and financing of the commercialisation is needed.

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# UNITED KINGDOM



## U SPACE



### Summary

The market for drone operation services in Europe was previously limited by the lack of proper tools, systems and environments for carrying out unmanned aerial vehicle (UAV) missions in a coordinated, informed, and safe manner for other airspace users and for the people on the ground. Approvals for UAV missions also took a significant amount of time, ranging from a few hours to three days. SESE addressed these market limitations

by introducing a comprehensive solution to facilitate the large-scale use of UAVs in urban and rural, sometimes very distant locations. The solution includes a bespoke routing system with an EU-compliant flight safety plan, a mobile application for iOS, Android, and web browsers for planning, routing, and declaring UAV missions, and a system for analysing flight safety and executing the flight plan.

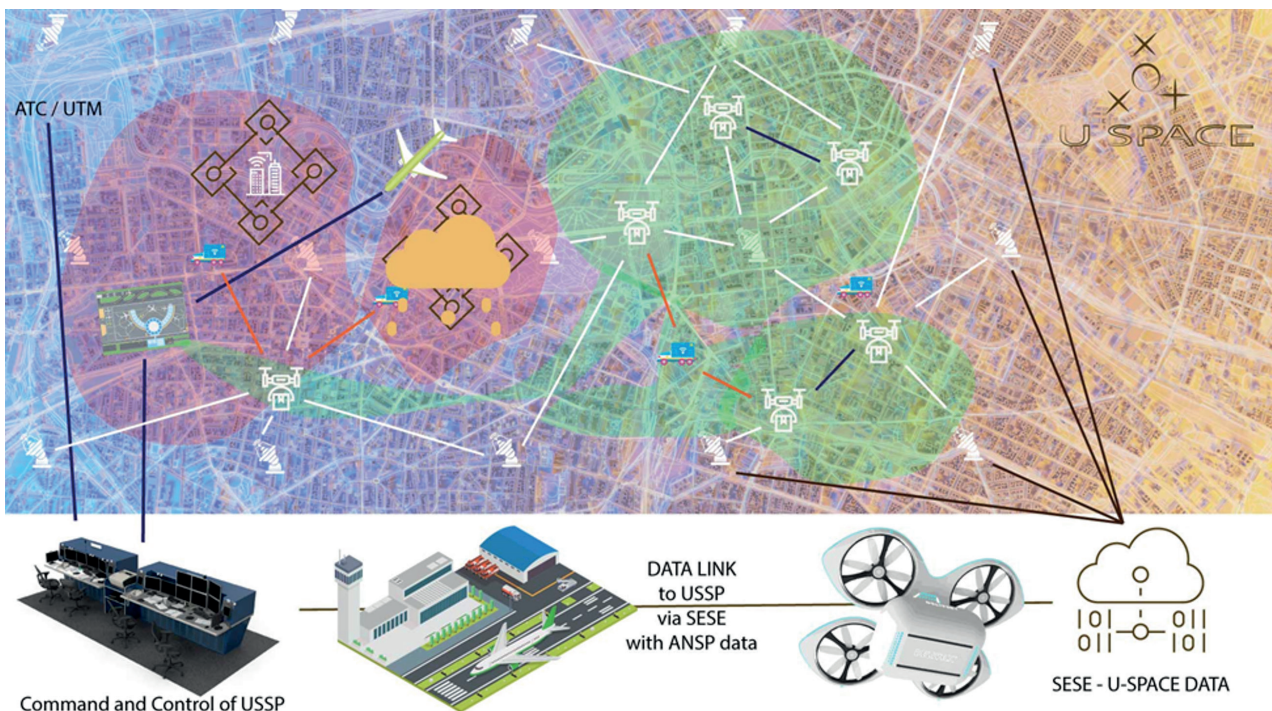


Figure 1: Drone delivery operational setup  
Source: Uspace



This system acts as a U-SPACE (USSP) management centre, offering a complete situational picture to both the **Single European Smart Environment** operator and the drone pilot, including aerial, meteorological, and aeronautical information. The platform and application are accessible through a monthly or annual subscription, and they allow two-way communication with air navigation services and other airspace users.

The testbed platform and system were created by New Science Technology Agency and Warsaw Collaboration Cluster Network, and they have already met the existing market need and regulations' (valid in the EU from 26.01.2023) for a streamlined and safe, autonomous UAV mission approval process. The system is a success in allowing for efficient and informed UAV operations in the EU.

## Introduction

The purpose of this project is to explore the potential of drone delivery as a cost-effective and sustainable delivery mode. As technology matures, regulation evolves, and business models emerge, drones could become a significant player in the delivery supply chain. With more than 2,000 commercial drone deliveries happening daily worldwide in early 2022, the industry is rapidly growing. Our study aims to examine the costs associated with drone delivery, considering factors such as labour, technology, and regulation. The goal is to determine the conditions under which drone delivery will become cost-competitive with traditional delivery methods, and provide recommendations for companies looking to develop a drone delivery strategy.

The CO<sub>2</sub> emissions for last mile delivery can vary greatly depending on the mode of transportation used and the distance travelled. According to a study by the University of Cambridge, the average CO<sub>2</sub> emissions for last mile delivery by small vans can range from 70 to 130 grams per kilometre travelled.

For electric vehicles, the emissions can be as low as 20 grams per kilometre and therefore we incorporated this into our initial assumptions:

- Labour costs associated with drone delivery currently make up to 95% of the total cost, as regulations require a visual observer to monitor each drone in operation.
- For drones to become cost-competitive, low-to-zero emission technology and regulation must advance to allow a single operator to manage multiple drones simultaneously.
- The number of drones per operator needs to increase significantly to reduce labour costs.
- Autonomous drone flight, unmanned traffic management systems, and sense-and-avoid solutions are crucial to the advancement of drone delivery and reduction of the CO<sub>2</sub> emissions.

**Expected Outcome:**

Based on our modelling and assumptions, we expect that drone delivery will become cost-competitive with traditional delivery methods in the near future. Our analysis suggests that with a single operator managing 20 drones simultaneously, the cost of a single package delivery will be around \$1.50 to \$2.

This is in line with the cost of an electric car delivering five packages or a van delivering 100 packages in a single trip. Companies will need to consider factors such as product feasibility, regional demand, infrastructure,

and sustainability goals when developing their drone delivery strategy.

With the potential cost and environmental benefits, drone delivery could become an important part of the delivery ecosystem, and forward-thinking companies should start planning for this future today.



Figure 2: Uspace delivery drone

Source: Uspace

## Methodology

The methodology for testing the assumptions for drone delivery could involve conducting a cost-benefit analysis by comparing the costs and benefits of drone delivery with traditional delivery methods. This analysis can be based on both primary and secondary data sources. Primary data can be collected through surveys of companies in the delivery industry, field studies of existing drone delivery operations, and interviews with industry experts. Secondary data can be obtained from published reports and studies on the drone delivery industry, data from drone manufacturers and operators, and regulatory reports on the drone delivery industry.

To determine the labour costs associated with drone delivery, a time-and-motion study can be conducted to measure the time required for a single operator to manage multiple drones simultaneously. This study can be carried out in real-life scenarios to determine the actual costs associated with drone delivery. The study should also take into account the costs of training and certifying drone operators, as well as the costs of maintenance and repair.

To determine the impact of technology and regulation on the cost of drone delivery, a

simulation study can be conducted. The simulation should model the potential advancements in technology and regulation and their impact on the number of drones a single operator can manage simultaneously. The simulation should also consider the costs associated with the development and implementation of these advancement

Finally, a financial analysis can be conducted to determine the break-even point for drone delivery, when the costs of drone delivery are equal to the costs of traditional delivery methods. This analysis should take into account the costs of drone delivery, the costs of traditional delivery methods, and the expected benefits of drone delivery, such as improved delivery times and reduced fuel consumption.

In conclusion, a combination of cost-benefit analysis, time-and-motion study, simulation, and financial analysis can be used to test the assumptions for drone delivery. This methodology will provide a comprehensive picture of the potential of drone delivery as a cost-effective and sustainable delivery mode and help companies develop a drone delivery strategy that considers the costs and benefits of this mode of delivery.

## Results

A recent study has shown that using small drones for last-mile package deliveries is more energy-efficient and produces fewer emissions than conventional delivery methods. The research was aimed at balancing the increasing demand for last-mile delivery with reducing the environmental impact of transportation. The study found that both payload mass and total flight duration were the primary contributors to the drone's overall energy consumption. The team found that quadcopter drones have a 94% lower energy consumption per package compared to other vehicles. Although there are still operational and regulatory challenges to be addressed, some drone delivery operations have already begun to safely deliver medical supplies and groceries. A recent survey found that over 60% of online customers would be willing to pay extra for autonomous delivery robots. However, larger packages cannot be delivered by small drones, and electric cargo bicycles and other ground autonomous delivery robots may be a more energy-efficient solution.

The results of this study show that using small drones for last-mile deliveries can result in substantial energy savings and reduce greenhouse gas emissions. Retail chains, restaurant groups, and supermarket chains can reap potential cost and sustainability benefits from incorporating drone deliveries into their strategy.

However, they need to weigh the challenges of drone operations against the benefits. To optimise their drone delivery strategy, companies should consider:

1. Feasibility of delivering certain products and customer receptiveness.
2. Regions with high demand for drone delivery.

3. Modification of current stores/warehouses or need for new infrastructure.
4. Integration of drone operations into overall delivery processes.
5. Potential partners for drone delivery operations.
6. Contribution of drones to the company's sustainability goals.

"Last-Mile Drone Delivery Challenges"

- One Drone and One Truck (i.e., Flying Sidekick Traveling Salesman Problem)
- Multiple Drones and One Truck (i.e., Multiple Flying Sidekick Traveling Salesman Problem)
- Multiple Drones and Multiple Trucks (i.e., Vehicle Routing Problem with Drones)
- Routing
- Combinatorial Optimization (i.e., Knapsack Problem)
- Cargo Distribution Scheduling
- Cargo Distribution Optimization
- Battery Usage Optimization
- Swapping/Charging Station Implementation
- Drone Battery Management
- Networking for Data Collection, Data Sharing, Navigation, and Control
- Cybersecurity
- Data Communication
- Reducing Green House Gas (GHG) and Pollution
- Increasing Energy Efficiency
- Implementing Renewable Green Energy Sources
- Environmental Protection

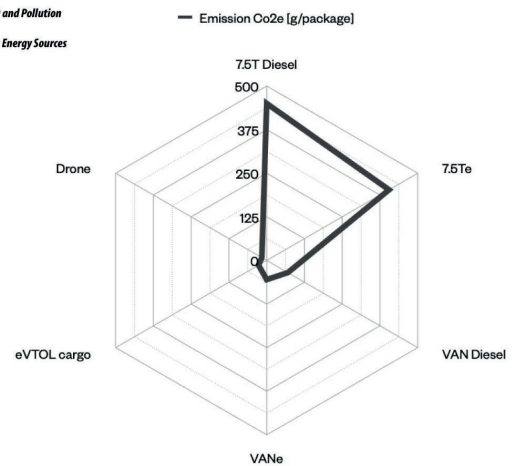


Figure 3: Emission of CO2 per parcel per delivery type  
Source: Uspace

"Last-Mile Drone Delivery Challenges"

Cost Reduction where as 100% on HGV Diesel

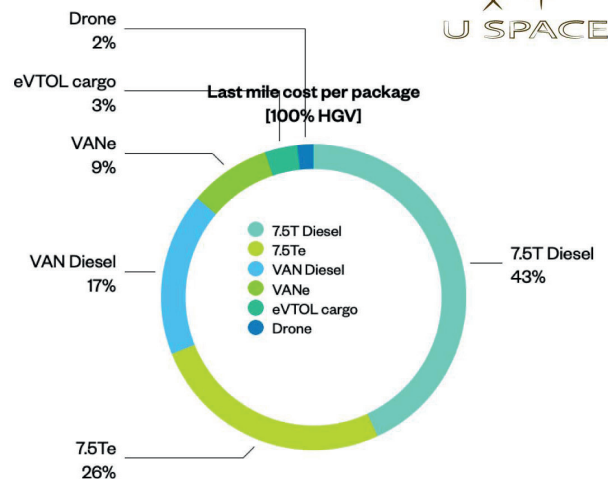


Figure 4: Delivery cost comparison  
Source: Uspace

## Learnings

Drone delivery has the potential to revolutionise the delivery industry, but it is currently facing several challenges that need to be addressed before it becomes cost-competitive with traditional delivery methods. Labour costs, which make up 95% of the total cost, are the biggest challenge. Up to 26.01.2023, regulations required a visual observer to monitor each drone in operation, but this is now changed with advancements in technology and regulation. For drones to become cost-competitive, autonomous drone flight, unmanned traffic management systems, and sense-and-avoid solutions are crucial. Based on our analysis, we expect that drone delivery will become cost-competitive when a single operator manages 20 drones simultaneously, which would bring the cost of a single package delivery to around \$1.50 to \$2. Companies should start considering drone delivery as a future strategy to stay ahead of the competition and benefit from the cost and environmental benefits. The economic and environmental advantages assures that drone delivery could become an important part of the delivery ecosystem. Forward-thinking companies will plan today for a drone-enabled future with a use of U-SPACE system. As they do so, they should prepare to evolve their drone strategy over time, in line with regulatory changes, technological advancements, shifts in customer preference, and their own capabilities.

An autonomous system provides improved drone delivery by increasing efficiency and reducing labour costs and service carbon footprint. With autonomous flight capabilities, a single operator can manage multiple drones simultaneously, reducing the need for a visual observer for each drone in operation. The use of drone flight & navigation management system U-SPACE and sense-and-avoid solutions can also help to increase

safety and minimise the risk of collisions, further reducing the costs associated with drone delivery. These advances in technology and regulation are crucial to making drone delivery cost-competitive with traditional delivery methods and the tested system shall meet that criteria.

Courier companies will benefit from switching to drones for last mile delivery in several ways:

1. **Increased Efficiency:** Drones make deliveries faster and more efficiently than ground vehicles, reducing the time and cost of delivery.
2. **Improved Customer Experience:** Drones provide customers with a more convenient delivery experience, with the ability to deliver directly to their doorsteps or a specific location.
3. **Reduced Carbon Footprint:** Drones potentially reduce emissions compared to traditional delivery methods, such as ground vehicles, helping the company to meet sustainability goals and improve its environmental impact.
4. **Increased Reach:** Drones reach remote or hard-to-reach locations, expanding the company's delivery capabilities and reach.
5. **Cost Savings:** The use of drones in long term lower delivery costs by reducing the need for ground vehicles, fuel, and human labour.



Figure 5: U-space drone command centre

Source: U-space

Prepared with the support of:



# CONCLUSIONS AND THE FUTURE

# CONCLUSIONS AND THE FUTURE

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## The environmental impact of the last mile

More and more studies confirm that the green last mile is not just a fad, but a real challenge, and also opportunity, faced by retailers and logistics operators.

Last mile operators who wish to be competitive and customer centric, need to pay attention not only to the economic aspects of transport and distribution, but also to the increasingly important requirement for sustainable transport, which should be low-emission, human and environmentally friendly.

Sellers and e-commerce market places, are increasingly aware that their customers and other important stakeholders no longer just look at

low-cost or fast delivery.

A growing group of e-commerce customers are willing to pay more, or to choose one supplier over another where the delivery of their package will be environmentally friendly.

Stakeholder awareness is fundamental to the development of the green last mile and while the challenge of making the last mile greener is mainly faced by CEP operators, it is choices made by buyers and merchants, as well as “nudges” from governments or local authorities that will make the difference.



# CONCLUSIONS AND THE FUTURE

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While, based upon UPIDO's calculations, EVs have the most significant carbon reduction effect. Their mass implementation is nonetheless not possible at scale for some time, due to, amongst others, restrictions in charging infrastructure and the numbers of legacy vehicles in use. This means that OOH implementation or "eco education" for merchants, drivers and consignees are arguably the most important short term weapon in the carbon beating armoury.

More than 40 billion B2C parcel deliveries in Europe will generate additional stress on the environment after 2032, during a period that will be critical for limiting global warming to a 1.5°C increase above pre-industrial levels. Our impact analysis of different last mile instruments fighting climate change show that the European CEP industry is already equipped with several powerful green last mile solutions that could significantly contribute to mitigating global warming.

The goal must now be to systematically and effectively switch to these green options and it will take changes in habits to make this possible:

## **Consumers:**

Consumers will need to really understand the environmental impacts of decisions that they take. This can range from single orders versus consolidated ones, acceptance of 24 or even 48 hour delivery versus

"on demand", pickup at a proximate consolidated collection point (i.e. Parcel Locker or PUDO point).

Also consumer returns habits such as checking an order more carefully before clicking the „buy“ button, or return via out of home and even to use the circular economy can also make a difference. Finally feedback to merchants who ship air or use eco unfriendly packaging can all help reduce carbon emissions. While data is not easily achievable, available research suggests that Nordic consumers are the most progressive in this respect, and it would be good to seek to understand what can be done to replicate this mindset elsewhere in Europe.

## **Merchants:**

Merchants have a huge opportunity and responsibility in helping consumers make the right choice. This can be done by highlighting and incentivising (with price or other tools) eco options at checkout and explaining why one option is more ecological than another.



# CONCLUSIONS AND THE FUTURE

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They also need to actually offer ecological options such as accessible out of home delivery, and teach their staff to pack goods and not air. Steps such as making customers pay for returns are not always popular but also represent a step in the right direction of achieving a greener last mile. Merchants such as H&M, Etsy or Zalando are already known to be promoting green last mile solutions in their tenders. From a different perspective, OLX and Vinted are promoting the second life economy via out of home, which represents a "double winning" combination of reused items being shipped in an ecological manner.

## **Carriers & Posts:**

Carriers & Posts need to offer better interactive delivery options so that consignees can share preferences and change their minds, where needed, so that first time delivery is almost always possible. This will involve more use of out of home and, in many cases, partnerships between carriers with a view to achieving a proximate and effective network.

Of course carrier staff education is also important as misrouted parcels, failed deliveries or driving style will also have an impact on the carbon footprint.

Carriers such as PostNord, InPost and GeoPost Group are investing millions in offering a greener last mile.

At Last Mile Experts we found two interesting takeaways from Kantar's work. Firstly, only 13% of logistics players benefit from a sustainability-enhanced consumer profile. Secondly, some of the players with the largest expected Sustainability Index, such as Collect+ or InPost, were not included in the list, while players such as UPS or FedEx, who have apparently done little in this space, were included. Moreover, the US integrators have an "express delivery model" with significant single D2D parcel delivery, which is expected to generate more carbon emissions.

Unfortunately, many important last mile players, especially those with North American roots, seem to be guilty of playing a „greenwashing" game. This is evidenced by the fact that we were unable to find any meaningful and "real" projects in the public domain nor by repeated requests for details of initiatives that were only shared in the most nebulous terms.





# CONCLUSIONS AND THE FUTURE

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## **Governments, Local Authorities and other stakeholders.**

Without a concerted effort from the above groups to educate and offer advantages for merchants, carriers or consumers choosing green last mile options and disadvantages or penalties for those who don't, no effective and tenable solution will be possible in the short term.

This can range from subsidies in education or promotion of green options to requiring carbon footprint "health warnings" on last mile services to coercing players to consolidate their last mile services.

The European Union and several national governments are setting goals on fossil fuel usage although few coherent and significant last mile projects appear to be in place at the moment. Local and city authorities seem to be faring better with players such as TFL (Transport for London) who are seeking to implement greener last mile options or Salzburg City who helped set up MYFLEXBOX which is now a leading, open parcel network in Austria.



# CONCLUSIONS AND THE FUTURE

Let's take an opportunity to look at some possible future models for a greener last mile.

Idea	Time to implement	Difficulty/Cost	Positive environmental impact
Education	short	limited	high
Legal and fiscal incentives/penalties	medium	medium	medium to high
OOH development	short	high (unless consolidation takes place)	high
EV (non fossil fuel) vehicle development	medium to long	high	high
IDM (better first time delivery)	short	low	medium
Route optimisation	short	low	medium
More partnership and consolidation	short	low	medium to high
AGV's & UAV's	medium to long	high	medium
Crowdshipping	medium	medium	medium
Tunnel based transportation	long	high	high

Figure 1: Future last mile delivery developments and concepts

Source: Last Mile Experts

Some interesting myths that need to be "busted":

Many experts state that one cannot unequivocally state that a parcel locker or PUDO network will reduce the carbon footprint as the individual surroundings and framework conditions have to be considered. For this reason, we are careful to state that real gains will only accrue from an efficient out of home infrastructure that is a mixture of:

- proximate or, to coin a bpost phrase "slipper distance" from the consignee
- easily accessible and, where possible, 24/7
- operating under the sharing economy rule (eg PUDO vs parcel shop)
- effective IDM and consumer control

Our view is that where an efficient out of home network exists, carbon reduction will be up to 2/3 in urban areas and even more in rural ones.

# CONCLUSIONS AND THE FUTURE

## Next generation Green Last Mile developments

Several options for enhancing the green last mile are currently being discussed. These ideas include using parcel reception boxes, smart door locks, and in-car delivery. Deliveries to parcel lockers and pick-up/drop-off locations (PUDO) are, however, expected to be the main drivers of alternative out-of-home handover options in the foreseeable future.

As we look towards the future of transportation, it's becoming increasingly clear that non-fossil fuel vehicles and e-cargo bikes will play a crucial role in the last mile delivery. Non-fossil fuel vehicles, such as electric cars and vans, are becoming more popular due to their low carbon emissions and reduced dependence on fossil fuels. E-cargo bikes, on the other hand, offer a cost-effective and environmentally friendly alternative for short-distance deliveries in urban areas.

As cities become more crowded and congested, these modes of transportation are likely to become more prevalent in the last mile delivery sector, helping to reduce air pollution, traffic congestion, and the overall carbon footprint.

In addition to their environmental benefits, the use of non-fossil fuel vehicles and e-cargo bikes is also being promoted by regulatory changes in many large cities around the world. Local governments are imposing stricter emissions standards and implementing policies to encourage the use of sustainable transportation modes, and this trend is gaining traction year after year.

Over time, last-mile delivery is expected to undergo significant and positive changes with the introduction of autonomous delivery systems, en-route manufacturing, and robotic stores on wheels.



Figure 2: DHL electric van

Source: DHL

# CONCLUSIONS AND THE FUTURE

Deliveries to parcel lockers and PUDO's are already playing a major role in changing last-mile delivery due to their convenience, cost and security. According to Fortune Business Insights, the global smart parcel locker market is projected to grow from USD 806.5 million in 2022 to USD 1,833.9 million by 2029. More importantly from our perspective, by utilising these alternative delivery options, companies can reduce the carbon footprint of last-mile delivery while also improving customer satisfaction.

The development of new AI and technology is likely to create even more next gen opportunities for sustainable and efficient last-mile delivery solutions in the future.

Looking at some of the more interesting ideas. AGV (robotic) and UAV (Drone) delivery, must be high on anyone's list. Indeed, there have been over 660,000 commercial drone deliveries to customers over the past three years, not including countless test flights to develop and prove the technology. As of early 2022, it is estimated that more than 2,000 drone deliveries are occurring each day worldwide\*.

The technology's benefits include significant cost reduction, particularly for remote areas with limited delivery options, and time-saving capabilities, with packages delivered in less than 10 minutes. Moreover, drone fleets are an environmentally friendly alternative to existing vehicle-based networks, particularly for last-mile delivery, which constitutes up to 60% of logistics costs. Despite this technology's advantages, there are still several issues to address before widespread adoption can be considered. Safety remains a key concern as command and control technology as well as the regulations surrounding drone delivery are still evolving, particularly in terms of airspace usage.



Figure 3: Amazon delivery drone  
Source: [www.amazon.com](http://www.amazon.com)

\* source: [www.mckinsey.com](http://www.mckinsey.com)

# CONCLUSIONS AND THE FUTURE

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**Autonomous robotic delivery** has been rapidly gaining traction as a new way to deliver goods in a more efficient and cost-effective manner. While we don't anticipate Boston Dynamics type "humanoid" robots able to operate at scale, nor the use of Starship or Cainiao type street accessible deliveries. We do see an opportunity for autonomous last mile vans which will potentially be non-fossil fuelled and use efficient routing to deliver a "non-driving" courier to a convenient place to make deliveries or collections and then waiting for him/her at a convenient and safe location, or driving back to an optimal pick up location when the courier is ready.

This form of delivery will not only be more efficient but will also potentially reduce congestion and parking issues.

The main challenges and obstacles with autonomous robotic delivery include safety concerns, the need for regulations, lack of public acceptance, high initial and ongoing costs, and limited range.

**Crowdsourced delivery** or "Crowdshipping" is something that few last mile parcel operators other than Amazon (Amazon Flex), have used. This approach has gained attention as a potential solution to improve delivery services, offering benefits such as cost-saving, environmental friendliness, and trust. Crowdshipping can reduce delivery costs by utilising existing trips and transport modes, promoting the use of clean transport modes to benefit the environment. Trust in the operator and its competence in implementing and managing the system is crucial to attract participants and ensure the safety and reliability of the delivery process. Also, this system will tend to work best for specific point to point deliveries or in supplementing a traditional professional driver type network at peak or holiday/non work times.



Figure 4: Nuro delivery robot  
Source: [www.nuro.ai](http://www.nuro.ai)

# CONCLUSIONS AND THE FUTURE

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**Tunnel-based cargo transport.** Cargo tunnels are an innovative solution to reduce the problems associated with conventional delivery vans, such as congestion and emissions. The idea is to use automated guided vehicles or rail-bound cargo vehicles to transport shipments from a central depot outside the city centre via cargo tunnels toward inner-city micro-hubs.

Cargo bikes can then be used to deliver shipments to customer homes. While we quite like the idea, operational requirements and investment costs for the tunnels would seem to be a significant downside. Omniloop in Sweden, Smart City Loop in Germany and Cargo Sous Terrain in Switzerland are seeking to promote this concept.

Coordination of delivery schedules and capacities in the micro-hubs are some of the challenges that need to be addressed.

Despite the lack of scientific operations research literature on tunnel-based last-mile concepts, this concept has the potential for future research albeit several hurdles still need to be addressed.

As climate change becomes more evident consumers will become increasingly aware of the environmental impact of their actions. Moreover, technology may be expected to offer new alternatives and sustainable delivery options are likely to become more popular and sought after.

Prepared with the support of:



**HOW DO  
WE PLAN TO  
DEVELOP THE  
REPORT FOR  
NEXT YEAR?**

# HOW DO WE PLAN TO DEVELOP THE REPORT FOR NEXT YEAR?

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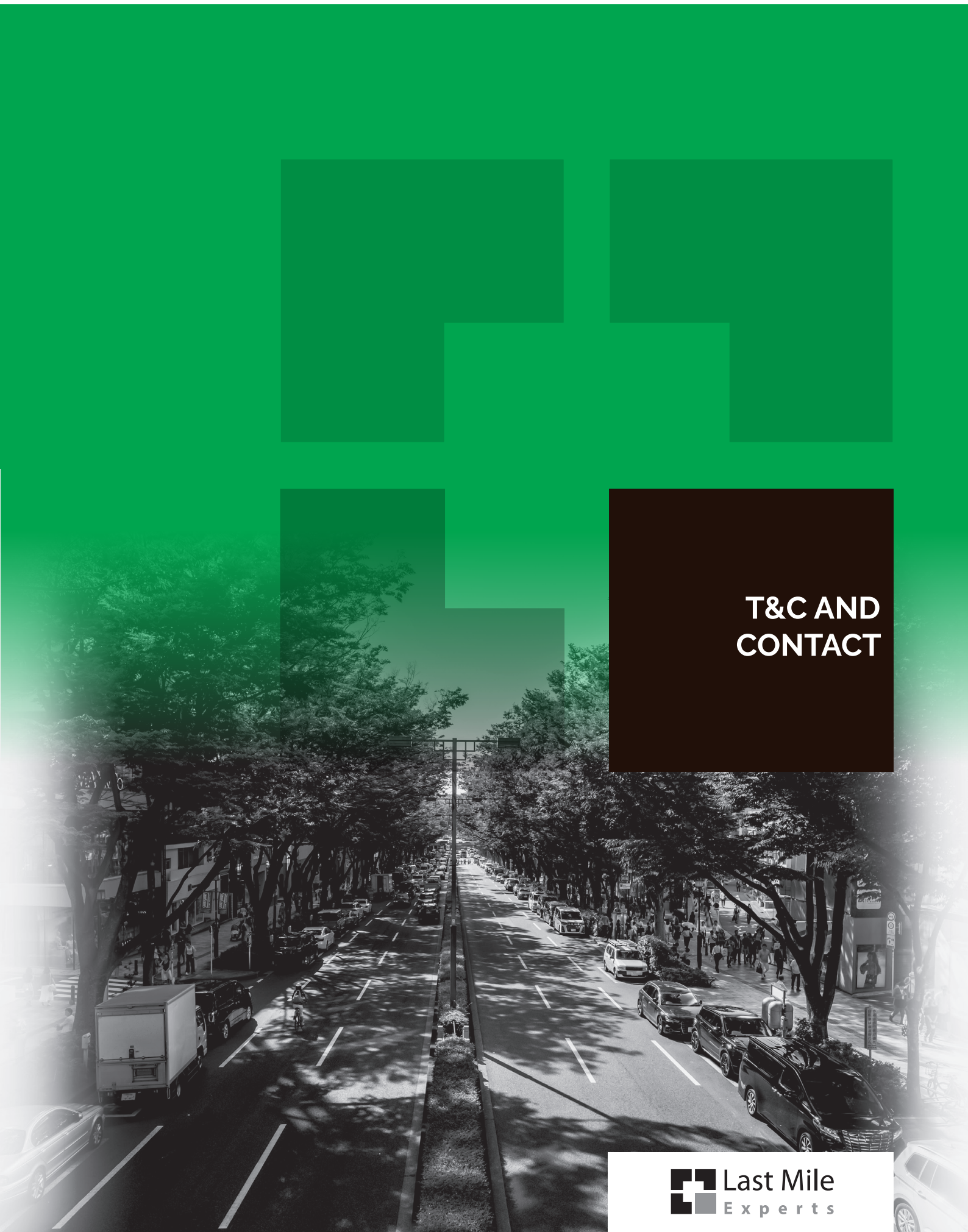
Although we consider our 2023 Green Last Mile report to be the most comprehensive collection of relevant last mile projects in addressable markets, we have encountered a surprising lack of concrete and meaningful data. Despite our team's efforts to promote the call for submissions with the support of Last Mile Prophets and our friends and partners, many of the carriers and posts that claim to be truly green have not shown any interest in our initiative. This suggests that the Green Last Mile may not be a priority for them, or that their projects are more of a "greenwashing" exercise than a reality. However, we are committed to our long-term goal of making our Green Last Mile report an industry benchmark.

As the report gains momentum, we hope to encourage these players with green credentials to walk the talk and participate in future editions.

We appreciate and congratulate the companies that have submitted their initiatives for analysis in this year's report. While we have provided some general comments on the effect of selected green initiatives this time around, we plan to evaluate individual projects next year and to start to recognise the best initiatives in their respective areas.

Finally, without our sponsors; Parcel Pending by Quadient, Sameday and Swipbox, and our contributors, UPIDO, Kantar, Dr Tom Assmann, Fiaz Gul and Johan Peeters this report would not have been possible. We would like to thank them for their time, effort and engagement.





**T&C AND  
CONTACT**

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