



Cyclelogistics

Opportunities for moving goods by bicycle in Toronto

Photo: Cargo bike-Bakfiets in Toronto by CanPac Swire, CC BY-NC

The transportation sector is the largest source of emissions in Ontario, and the freight sector alone makes up 10% of the province’s emissions.¹ Due to growing population, urban sprawl, and increasing online shopping, emissions from freight are projected to continue to grow, and even surpass passenger emissions by 2030.

With this in mind, we see an immense opportunity to partially address freight emissions by shifting the movement of some of these goods from trucks to bicycles or cargo bikes.

Cyclelogistics is the integration of bicycles into the goods movement network to improve the efficiency of deliveries in congested urban areas. Cyclelogistics includes use of any bicycles to move goods, including a rider wearing a backpack, a bicycle with panniers, or cargo bikes and cargo tricycles.

Cyclelogistics is well established in Europe, with major carriers like DHL and UPS operating their own cargo bike fleets, or partnering with cyclelogistics companies to complete “last mile” segments of deliveries. In many cases, bicycles are being used in European cities to replace local delivery trucks in city centres because they can increase delivery reliability on heavily congested streets, reduce the operating costs for delivery companies (e.g. in terms of reduced fuel usage and avoided congestion charges and parking fines for illegal parking) and reduce emissions

(e.g. nitrogen oxides, particulate matter and greenhouse gases).

In Toronto, however, moving goods by bicycle is just beginning to catch on, and has huge potential. While there are many companies that use regular bicycles for on-demand courier services, Toronto has yet to take full advantage of larger capacity bicycles to replace delivery vehicles. This report showcases the current landscape of cyclelogistics in Toronto by identifying existing cyclelogistics companies and barriers to growth. We also explore opportunities to expand the cyclelogistics sector.

¹ Cyclelogistics: Opportunities for moving goods by bicycle in Toronto

Introduction

In the City of Toronto, cycling is becoming an increasingly popular commuting option, and cycling infrastructure across the GTA will be expanding with the approval of Toronto's Cycling Network Plan and infrastructure commitments in the provincial Climate Change Action Plan. To fully capture the benefits of this progress, a shift in mindset is needed to acknowledge that cycling infrastructure can be used to move goods as well as people. While there are some examples of using cycling to move goods, particularly courier services, there is a lot of room for growth and expansion.

Companies exist now that specialize in on-demand deliveries and business-to-business distribution, but there are no major carriers that make use of bicycles for last mile deliveries. Many of the service catchments for these existing cyclelogistics companies overlap in the downtown core. The downtown core, bounded by Spadina Avenue, Bloor Street, Sherbourne Street, and King Street, is well suited for deliveries by bicycles as it is a densely populated area.

As we work to get the most people moving in the most congested parts of Toronto, we need complementary ways to move goods along the last mile to their destination. Urban deliveries frequently face challenges including congestion, circling in traffic looking for legal parking leading to late deliveries, or getting parking tickets. Due to these issues, urban freight delivery is a big contributor to local air emissions impacts, as well as GHG emissions more broadly. By switching more goods movement onto bicycles we would be working towards three big wins:

- It would expand the demand, increase visibility of cycling, and thus continue to support advocacy for better cycling infrastructure across the city.
- It would directly help reduce emissions and local air impacts by taking deliveries off of fossil fuel consuming trucks and vans and moving them onto bicycles.
- It would help indirectly reduce emissions through reducing congestion on our streets.



Parcel delivery in Strasbourg, France

Benefits

Finding alternatives to vans or trucks for deliveries in congested areas can improve efficiencies, and therefore business costs, for delivery companies; it can also reduce emissions from urban freight and help reduce congestion on streets to help people and goods move faster through our cities. Improving goods movement in Toronto through cyclelogistics will bring the following benefits:

Reducing greenhouse gas emissions

Vans, light-duty trucks and SUVs represent 16.4% of greenhouse gas emissions in Toronto.² In congested areas where delivery vehicles are stopping, starting and idling, their emissions are much greater than in free flowing traffic. Expanding the use of traditional pedal bicycles and electric bikes to complete cargo and delivery trips can help the City of Toronto reach its goal of reducing GHG emissions by 80% by 2050.

Increase efficiency of last mile deliveries

Cyclelogistics can help improve goods movement in denser parts of Toronto. Delivery vehicles can be slowed down by traffic congestion, and face a lack of parking and/or significant parking fines. In some areas, cargo bikes can travel through traffic quicker and they're easier to park, making deliveries more efficient.

Distributors should consider cost savings and improved efficiency as the main reason for using bicycles in denser areas. In England, Last Mile Manchester, a cyclelogistics delivery service company, is able to do more deliveries per hour than a traditional delivery service vehicle, as it is able to move faster through traffic and park more easily.³ For example, DHL vans in Manchester are able to do 6-8 drops per hour, while Last Mile's emissions-free electric cargo bikes make 10-12 drops per hour⁴. While the environmental benefits are clear, with bicycles contributing zero emissions, the economic benefits also point to bicycles in certain urban contexts.

Improving traffic flow in dense, urban areas

Cargo bikes require less space than delivery vehicles. Delivery vehicles frequently obstruct traffic or bicycle lanes when they do not have the appropriate parking or loading space on a side street. Cargo bikes are more nimble and will interfere less with vehicular traffic in congested areas.

Increase popularity of cycling as transport option

Introducing cargo bikes as part of a multimodal strategy to move goods will increase the visibility of cycling in Toronto and demonstrate that cycling is a viable mode for moving both people and goods. This can increase the support and expansion of bicycle infrastructure in general.

Increase health and happiness of delivery employees

Delivery workers can spend a majority of their time sitting in a vehicle or stuck in traffic. On the other hand, riders of cargo bikes are able to have a rigorous workout while on the job. Walking or cycling to work is associated

with an overall 11% reduction in cardiovascular risk,⁵ therefore cycling during the work day, not just during the commute, could significantly reduce the risk of chronic diseases.

Stimulating the local manufacturing industry

The production of both traditional pedal and electric cargo bikes can help stimulate the growth of the local manufacturing industry. For example, Wike cargo bikes are manufactured in Guelph, Ontario. Table 1 shows a list of cargo bike manufacturers in Canada that could benefit from increased sales with the expansion of cyclelogistics in major Canadian cities.

Table 1. Canadian cargo bike manufacturers

Manufacturer	Location
Bikewrights	Halifax
Curious Cargo bikes	Vancouver
Cycles Melim	Montreal
Intercycle	Montreal
Manuel Cappel	Toronto
Paul Laursen of Invodane	Toronto
Vélo Ya	Quebec City
Wike	Guelph

Data source: Cargobike.ca

History of cyclelogistics

Cyclelogistics has been gaining traction in Europe for years, with major carriers like UPS, DHL and TNT using cargo bikes for last mile deliveries. Cyclelogistics is still growing, but it has established itself as a viable alternative to motorized vans when traversing urban cores where traffic congestion and limited parking make driving delivery vans difficult. The European Union has funded a six-year cyclelogistics project to identify ways to replace unnecessary motorized vehicles with cargo bikes for urban delivery and goods transport in order to reduce energy use.⁶

Many municipalities in Europe are leading by example, and have started to incorporate cargo bikes into their vehicle fleets. Using bicycles for some city operations can be lower cost and more efficient. For example, the City of Seville invested in 200 cargo bikes to do street cleaning and parks maintenance. The City of Vienna also invested in a cargo bike fleet for city services. This example has inspired local businesses and the Vienna Chamber of Commerce to use cargo bikes instead of vehicles for some operations.⁷

Larger carriers also frequently partner with smaller cyclelogistics companies to complete the last mile of trips. Last Mile Manchester in the U.K. partners with DHL, while WEGO, a collective of bicycle companies in Leicestershire, U.K., works with TNT to deliver shipments.

The New Cooperative Business Models and Guidance for Sustainable City Logistics (novelog) is a project that brings together stakeholders and local authorities to identify potential logistics strategies and measures. They are supporting cyclelogistics pilot projects in cities in Spain and Belgium to introduce micro consolidation

centres where multiple delivery companies can drop off packages for either shoppers to pick up, or for cargo cyclists to pick up and deliver the last mile.⁸ The pilots are still being evaluated but they demonstrate how cyclelogistics can be integrated into larger logistics solutions that benefit both logistics companies and city building.



Enviciclo in Seville, Spain

Types of bicycles that move goods

There are many different types of bicycles that move goods. In urban centres we regularly see bicycle couriers on regular bicycles who deliver everything from small packages from businesses or meals to customers. These couriers traditionally use backpacks, a saddle bag or panniers. For greater delivery flexibility, however, a cargo bike is very useful, as it has capacity to hold more goods or heavier items than a regular bicycle.

There are different configurations of cargo bike with cargo either in the front or back, but broadly, three types of bicycles are built or used specifically for moving goods:

Pedal-only

These cargo bikes are completely manual and rely on pedaling for movement. These bikes are cheap to maintain and lighter weight; however, they can be difficult to ride up hills and require more energy to get back to normal speeds from a standing stop. Currently, pedal-only cargo bikes are allowed on all public roads and bicycle facilities in Ontario.



Pedal-only cargo bike



Electric assist cargo bike

Electric assist cargo bikes

Also known as electric bicycles or e-bikes, electric assist bikes have an electric motor to assist cyclists to get from a standing stop to normal speeds. This means that cyclists can clear an intersection faster and ascend hills easier than with a pedal-only bicycle. Since they have an electric motor, these bicycles are heavier than pedal-only bicycles and are more expensive to buy and maintain.

While there is no clear definition of an electric cargo bicycle in Toronto, under the Toronto municipal code, e-bikes that weigh less than 40 kg and requires pedaling for propulsion are allowed on all types of cycling infrastructure. This includes painted bicycle lanes, multi-use paths where bicycles are allowed or cycle tracks (i.e. separated bicycle lanes).⁹



Pedal-only cargo bike

Cargo tricycles

Cargo tricycles can be pedal-only or electric, but have three wheels and a bike box. Cargo tricycles could have a higher weight capacity than two-wheeled cargo bikes. While pedal-only tricycles are allowed on all types of cycling infrastructure, because they have three wheels they may be too wide for some bicycle facilities in Toronto. There is no clear definition for electric cargo tricycles in the city, although under the Highway Traffic Act, they can be on city roads as long as they weigh under 120 kg.¹⁰

Service models

This section provides a detailed description of the main service models that incorporate cargo bikes. Some of these service models are already in place in Toronto, but all have the potential to expand. More information on how these models are used in Toronto can be found in the following section.

On-demand courier service

These services complete pick-up and delivery requests within a certain timeframe. They may wait for a few delivery requests in order to group deliveries and optimize a route, but from the customer's point of view this courier service is fulfilling orders at a moment's notice. The origins and destinations will always be different, which means that routing would need to be determined for every trip. This model is the one most widely used and visible in Toronto.

Business-to-business delivery

Delivery companies usually have established clients with scheduled pick-ups and deliveries. This makes it easier to consolidate deliveries and optimize routes. Businesses usually receive deliveries from the same locations, which means that the delivery routes will be somewhat consistent from week to week. Often deliveries can be scheduled for a certain day of the week based on pick-ups or when the delivery company will be serving a specific area of the city. This model is starting to become more popular in Toronto, as more businesses incorporate cargo bikes into their fleet.

Last mile

This service model can be used by larger carriers that receive packages outside of the urban area. It works on a hub-and-spoke model; cargo bikes pick up packages from a storage facility outside of the urban core and deliver within the denser urban area. This could lead to a more efficient system where bicycles can easily travel through congested areas and complete more deliveries than a delivery van. As this model has the most potential to reduce congestion and greenhouse gases in the downtown core most of our recommendations focus on expanding this model in the city.

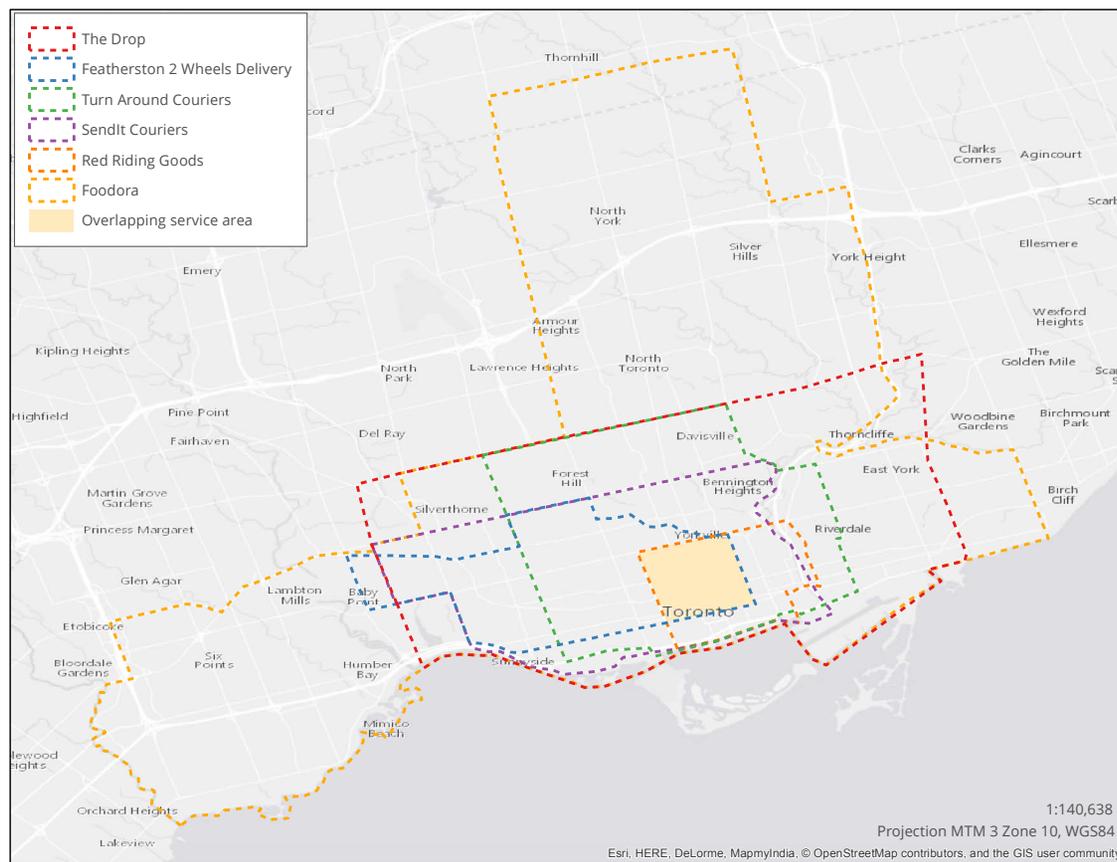
Current context

At least five different delivery companies in Toronto have cyclelogistics business models. Most of these companies offer on-demand services (see Service Models above for a detailed description).

There are also a number of other companies that have their own bicycle fleet to move goods between their businesses or deliver goods to customers. These include North of Brooklyn Pizzeria, Owl and Goose, Sweet Lulu's, Merchants of Green Coffee and Caplansky's.

Table 2 provides examples of cyclelogistics services in Toronto. This list is not exhaustive and there may be other smaller services that make use of bicycles to complete deliveries.

The map shows the service catchment areas for The Drop, Red Riding Goods, TurnAround, Sendit, and Featherstone 2 Wheels Delivery. We selected these companies to show their service catchments as they all do business-to-business deliveries. The map shows that all the courier services overlap in the downtown core from Bloor Street to King Street on the north and south, and Spadina Avenue and Sherbourne Avenue on the west and east.



Cycle delivery service catchments

Table 2. Selected Toronto courier companies using cyclelogistics

Organization	Description	Type	Bikes
The Drop	Distributes goods from producers and wholesale retailers to stores	Business-to-business	Cargo bike and electric car
Red Riding Goods	Routine deliveries for businesses and some on-demand deliveries	On-demand, business-to-business	Cargo bike
SendIt Courier	Delivery for restaurants and retail stores to customers	On-demand, business-to-business	Regular bicycle and cargo bike
TurnAround Couriers	Deliver packages, food and provide "last mile" service for other delivery firms	On-demand and last mile	Regular bicycle, car and van
Featherstone 2 Wheels Green Delivery	Routine deliveries for businesses and some on-demand deliveries	Business-to-business	Cargo bike
Foodora	Food delivery from restaurants to customers	On-demand	Regular bicycle
UberEats	Food delivery from restaurants to customers	On-demand	Regular bicycle

Case studies

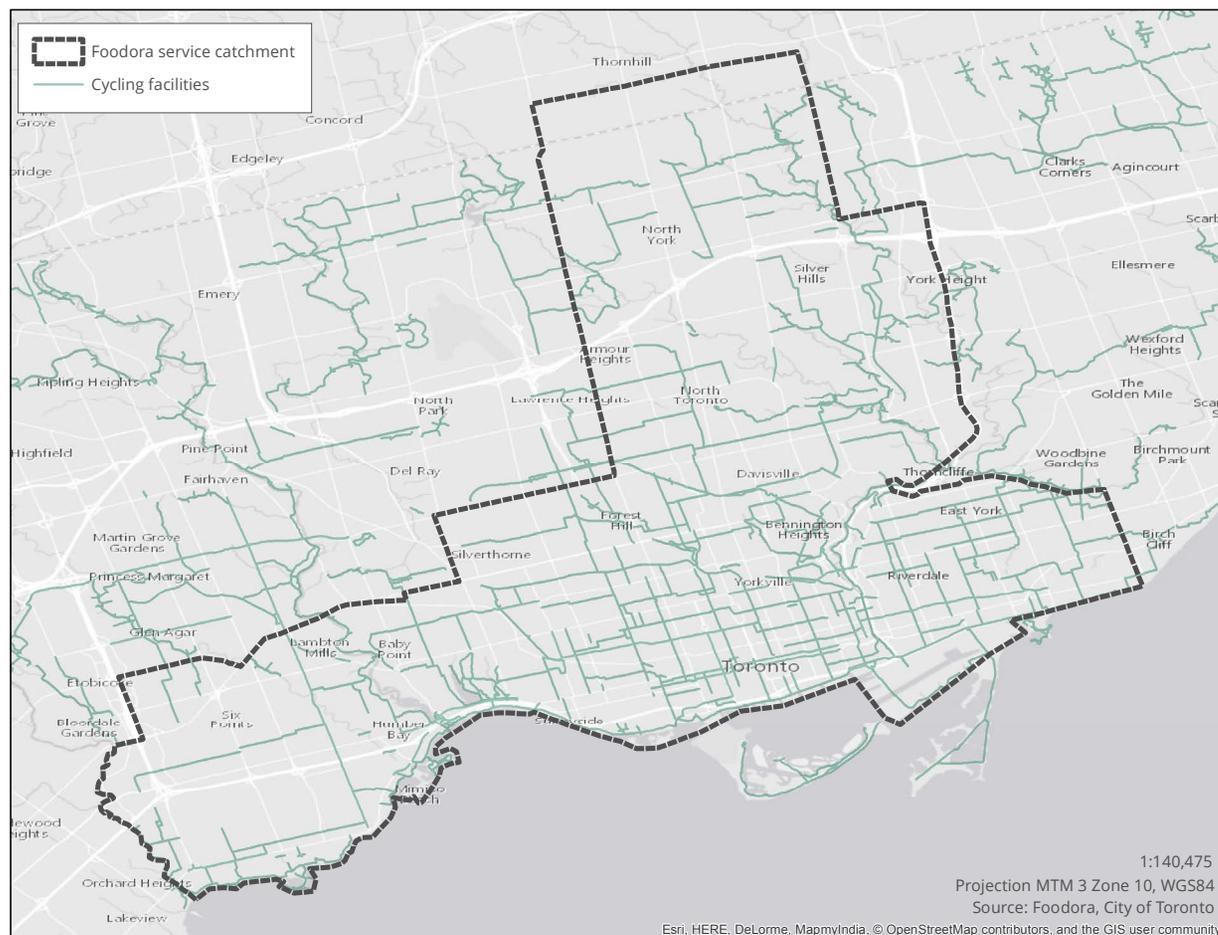
We selected companies operating in Toronto that represent on-demand courier and business-to-business delivery. There are currently no large carriers in the city that make use of cyclelogistics for last mile delivery, but we identify opportunities for large shipping carriers to incorporate bicycles into their operations.

Foodora

(On-demand courier)

Foodora is an online food delivery company. Customers use a smartphone app or the Foodora website to order food from nearby vendors, and Foodora couriers deliver these orders using traditional pedal bicycles. Most of their deliveries are to residential customers, but Foodora also has a corporate section to deliver larger catering orders. Their backend dispatching software allows them to combine multiple orders and deliveries to a single trip, which improves efficiencies and limits the distance a single cyclist has to travel for deliveries. For larger deliveries, Foodora is able to send multiple riders to split the load. Foodora is considering using cargo bikes for larger deliveries in the future and delving into business-to-business operations.

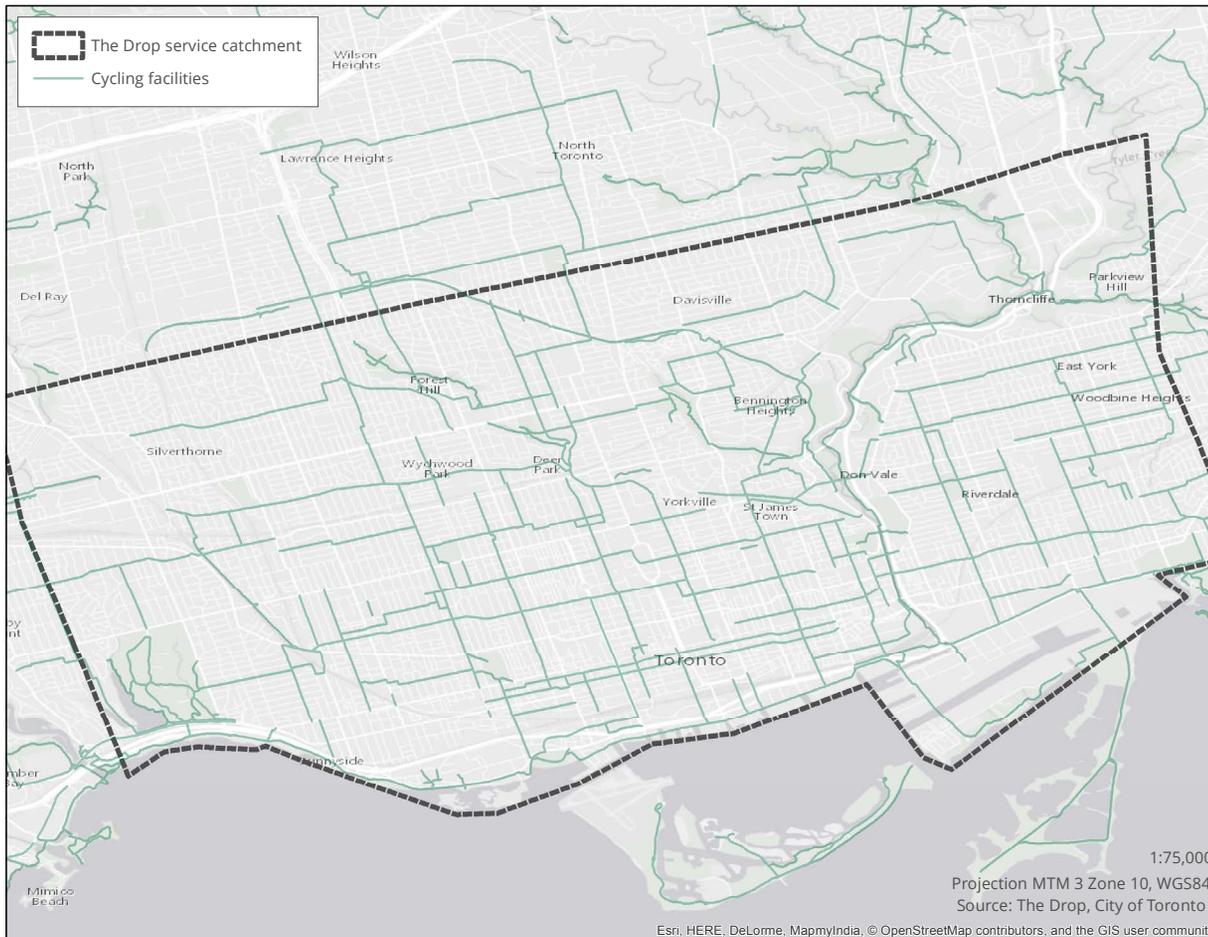
Foodora encourages their riders to become Cycle Toronto members, to use the existing Toronto cycling network and to travel on residential



Foodora service catchment

streets preferentially over arterial roads. The Queens Quay and Richmond/Adelaide cycle tracks are popular facilities for Foodora couriers. The Bloor cycle track is often hazardous; because

of the parking next to the track, pedestrians frequently fail to notice the facility and walk into the track, which makes it a risky route for Foodora riders.¹¹



goods on the day that The Drop is delivering in their area. This requires a changed mindset for customers who are used to overnight, same day or express shipping. However, trip chaining (i.e., increasing the number of deliveries along a single route) brings considerable benefits, including less distance traveled and fewer trips. This means that each bicycle can make more deliveries per hour by optimizing the delivery route, rather than providing on-demand deliveries. Customers could also potentially benefit from a more predictable delivery schedule, meaning they spend less time during the week waiting for and receiving deliveries.¹²

The Drop service catchment

The Drop (Business-to-business)

The Drop is a business-to-business delivery service that has a fleet of two cargo bikes and one electric vehicle. The Drop mostly works with small-batch food producers to deliver these

goods to Toronto grocery stores. Without The Drop, these producers may have each handled their own deliveries; by using The Drop the producers consolidate their deliveries and reduce the number of trips. The Drop organizes delivery schedules by geographic area. Producers can drop their goods off at one of two storage facilities, and receiving stores can expect to receive these

UPS

(Last mile)

UPS serves as a good example of how a global shipping company is testing and applying cyclelogistics, specifically for last mile solutions in urban centers. UPS has made use of electric and pedal-powered cargo bikes in cities including Hamburg, Germany; Basel, Switzerland; Beijing, China and Portland, U.S. with plans for a pilot in Toronto.

The bicycle design varies by jurisdiction, in accordance with local regulations, but they are narrow enough to travel on urban streets and in some cases to park on sidewalks. In Hamburg, UPS uses a shipping container stationed downtown as a storage facility for packages, from which cargo bikes and “walkers” (walking couriers) are able to pick up and drop off volume throughout the day. Following a successful pilot, they were able to replace nine of their traditional delivery vans with bicycles in the city center.

Close collaboration with city and other local authorities has been a crucial component of pilots and longer-term initiatives for example, to secure permanent parking space for a storage facility and identification of applicable regulations.

In Toronto, UPS currently uses “walkers” to deliver packages within the downtown core and on the path system. They recognize that bicycles and walking couriers are sometimes more efficient than vehicles in congested city centers. UPS’ success using cargo bikes in other jurisdictions demonstrates there is potential for larger carriers to complete last mile deliveries in downtown Toronto by cargo bike. Delivery vans can drop off packages at consolidation centers right outside of downtown Toronto, or trade packages with cargo bikes and successfully reduce the number of delivery vans in the downtown core.¹³



The UPS cargo bike on the University of Toronto campus. UPS has plans for a cargo bike pilot in Toronto.

Barriers

Currently, there are few infrastructure or legal barriers preventing companies from introducing a pedal-only cargo bike fleet. Companies can continue to easily use bike couriers to move restaurant takeout and small packages across the city. The main barriers lie in moving cyclelogistics from a niche goods movement mode to a widely adopted mode for last mile deliveries.



Photo: Ewa Franchuk, Pembina Institute
On-site mail delivery at a hospital in Germany

In order to make goods movement by bicycle viable for large shipments, we need to have regulations in place for the electric-assist cargo bikes that make it easier for riders to get up to speed at traffic stops and manage hills in the city. Besides infrastructure, the major barrier is a cultural shift to acknowledge that bicycles are a viable option to move not only people, but also goods across Toronto.

Below are a few of the barriers identified for widespread adoption of cyclelogistics in Toronto:

Regulations for e-bikes

There is no provincial vehicle classification for electric cargo bikes heavier than 120 kg, as these fall somewhere between an electric-assist bicycle and an electric van. Changes to the Ontario Highway Traffic Act would be necessary to allow heavier electric cargo bikes on public roads. This means that larger cargo bikes designed for delivery purposes, like the ones used by carriers in other countries, cannot currently be legally used in Toronto.

Logistics data

Each carrier company uses different bar code formats that contain information about packages, meaning deliveries cannot be consolidated or packages transferred from one company to another. A cyclelogistics company executing last mile deliveries for several larger carriers would need a specific device for each carrier's packages to read bar code delivery information. This can be a costly or complicated impediment to sharing packages between larger carriers and third-party cyclelogistics companies.

Infrastructure

Road infrastructure is not considered a major barrier for cyclelogistics but expansion of the cycling network should still consider how it can accommodate cargo bikes. The cyclelogistics companies we spoke to for this research often used the cycling facilities in the City of Toronto as part of their route planning. The Drop reported that their cargo bikes are able to fit on the cycle tracks and the width is only an issue if another cyclist wants to pass the cargo bike. Minimum width for all designated cycle facilities recommended in the Ontario Traffic Manual is at least 1.5 m. Desired width can be up to 2.0 m.¹⁴ Since many cargo tricycles are 1.2 m wide, they should be accommodated in most cycling infrastructure.¹⁵ There should also be space on the sidewalks to park a cargo bike, or short-term safe storage like racks designed for locking cargo bikes. Otherwise, cycling facility guidelines for both regular cyclists and cargo cyclists are similar.

Low profile

There is a general lack of awareness of the possibilities for using bicycles to deliver goods. Businesses receiving shipments may not know that goods can be refrigerated or kept cool on a bicycle, or that a bicycle can have a large weight capacity. Shippers may not be aware of potential cost savings and competitive delivery times cargo bikes can offer in congested areas of cities.

Recommendations

As we have examined the current cyclelogistics landscape in Toronto we have identified opportunities to expand the use of bicycles to move goods. Toronto has the benefit of learning from experiences and initiatives in European cities, and using those lessons to expand bicycle goods movement here. In order to shift cyclelogistics from its current scale, where there are only a handful of delivery companies with small cargo bike fleets, to a logistics operation that is widespread and prominent in the downtown core, there are a few barriers to address.

Below are the top recommendations for addressing these barriers, expanding cyclelogistics and making the use of bicycles for last mile deliveries a viable alternative to using motorized vehicles downtown.

- The Province of Ontario should work towards classifying electric cargo bikes of various weights and identifying how they can be used on public roads. Currently electric bikes that weigh more than 120 kg are prohibited from operating on Ontario roads. This law should be revisited in order to allow the production and use of larger electric cargo bikes that have a weight capacity suitable for replacing delivery vans.
 - The City of Toronto should consider or investigate replacing some of their vehicle fleet with cargo bikes where appropriate. In other jurisdictions cargo bikes are used for park maintenance or street cleaning activities. Edmonton used cargo bikes in summer 2017 to water 200 planters downtown.¹⁶ This is a good strategy for increasing the visibility of cyclelogistics and demonstrating the capacity of bikes, as well as a way to lower city operational costs.¹⁷
 - The City of Toronto should consider developing a framework and policies that will stimulate the expansion of cyclelogistics. Some examples include allocating city-owned space for storage facilities for cargo bikes and temporary storage of packages. Further, bicycle facilities and infrastructure should be planned to accommodate the width and length of cargo trikes.
 - Increase awareness of the environmental benefits and cost savings of consolidating deliveries among businesses and chain retail stores.
- Whether a bicycle or motorized van is used for deliveries, support of a delivery system that consolidates deliveries based on geography means fewer delivery vehicles on the road and fewer vehicle-kilometres traveled.
- Increase awareness among larger carriers of the economic benefits of either investing in a cargo bike fleet or partnering with a third-party cyclelogistics company to complete last mile segment of shipments in congested urban areas.
 - Municipal and provincial agencies should fund a cyclelogistics project, similar to the European Cyclelogistics Federation, to continue to identify ways to replace motorized vehicles with cargo bikes for urban delivery and goods transport in order to reduce energy use.
 - Develop a standardized information system for packages so that all barcodes contain the same information and can be read by any company. This way packages can be passed from larger carriers to independent cyclelogistics companies to complete last mile deliveries in the downtown core. Even in Europe where cyclelogistics is prominent, the difficulty in sharing packages among companies is slowing the expansion of last mile deliveries by bicycle.
 - Create forums to connect cyclelogistics companies with larger companies to identify solutions to improve the efficiency of deliveries along busier corridors through the use of cargo bikes.
 - Connect with depot managers or senior operations personnel for larger carriers to determine the cost benefit of introducing a cargo bike fleet for urban deliveries.
 - Focus cyclelogistics initiatives in small, dense areas where distance between deliveries would likely be short. We recommend first focusing on expanding cyclelogistics in the downtown core (Spadina Avenue to Sherbourne Street and Bloor Street to King Street). Another option is focusing on larger institutions like hospitals and universities, which may already have an internal mail system that could be replaced or supplemented by bicycles.

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