CiViTAS 2020
Cleaner and better transport in cities
PROSPERITY

Innovation brief
on city logistics solutions

Urban freight logistics is an essential function of a successful city. It is fundamental to the economic prosperity of many businesses and it facilitates the economic growth of the entire urban context.

Innovation plays an indispensable role that allows the needs of a globalised society to be served as customer demands evolve and where expectations must be met while also taking into account the overall sustainability of the city environment.

The goal of this document is to provide the reader with a brief background into the current state of urban logistics and the **innovative solutions** used to bring about change to the organisation of the transport system and to the relationships between businesses, governments, regulators, operators, users and customers. This innovation brief complements the topic guide that discusses "Developing a Sustainable Urban Logistics Plan (SULP) as part of the SUMP concept", developed within the updated set of SUMP Guidelines (2019), which focusses on the planning process.

Problem description

At present, more than **half of the world's population** lives in an urban area. The vitality of cities is critical to the success of national economies and therefore, in order to maintain vitality and quality of life, an **efficient urban logistics** is considered to be a fundamental. However, even if the continuous growth of a cities' population offers the opportunity for increased prosperity, it also poses a challenge for city logistics.

With the growing demand for the delivery of goods and services, urban logistics faces a **real challenge** due to intense competition for street space. It also has to satisfy **globalised trade** demand on the one hand and on the other it must meet **environmental requirements**. In this context, innovation is a crucial topic to enable current city logistics systems to transition into sustainable systems.

By 2025, cities are likely to be larger, information and communication technologies (ICTs) will be pervasive, and the **online retail sector** will comprise nearly 20% of total retail market. Certain emerging global trends will significantly **change the logistics sector paradigm** and its internal mechanisms. Therefore, freight distribution is becoming increasingly important to modern city life.

Who will benefit?

Efficient urban logistics are critical to sustaining both the **quality of life** and **vitality** of metropolitan areas. Increasing the efficiency and sustainability of freight distribution is crucial to both economic and environmental goals and may carry a series of benefits for multiple actors.

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Firstly, the **community and individuals** will benefit from less heavy transport vehicles, less emissions, increased accessibility to shopping areas and overall improved living conditions.

Secondly, **companies** will generate cost savings due to better transport trip efficiency, time savings due to less congestion, less need for personnel and increased productivity.

Finally, **consignees** will benefit from improved reliability and delivery optimisation, increased convenience for residents and improved access to shops.

Disadvantages and risks

At the moment, there are a lot of negative externalities associated with the transportation of goods in metropolitan areas, especially if **efficiency and sustainability** goals are not addressed by the different stakeholders involved.

In fact, among the different components of urban mobility, urban freight logistics is traditionally considered to be the least sustainable because of its **negative impacts**, these include **noise, pollutant emissions, congestion and the safety of road users.** Such problems are exacerbated by the fact that **trucks** still remain the **dominant transport mode**. Urban freight transport currently accounts for 30% to 40% of urban transport related CO_2 emissions and nearly 50% of particulate emissions.

In addition, the continued (and fast) **growth of online sales** will place additional pressure on the last mile providers to move increased volumes of goods through the network. Failing to address the importance of current and future freight flows will result in multiple economic, environmental and social issues that will pose serious problems to both the customers and the logistics service providers.

Stakeholder analysis - who are drivers, who are opponents

Success in implementing urban freight logistics measures requires the **involvement of multiple stakeholders**, from both the public and private sector. Their engagement is very important because, motivating change and contributions to better policymaking in the urban freight and logistics systems is difficult without their support.

The **supply chain actors** are responsible for sending, carrying and receiving goods and the relationship between them determines the logistics activities. **Shippers** send goods to other companies or persons and are often not located

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in the city. As a result, they usually do not feel responsible for urban freight transport issues. **Transport operators** usually aim to minimise their costs by maximising pick-up and delivery efficiencies and they are expected to provide a high level of service at low cost. **Receivers** located in the urban areas are typically the end-point of the logistics chain and have a great deal of power in influencing urban supply chains.

Public authorities (local government, national government and the European Commission) play a crucial role because they set the policy boundaries to determine the urban freight transport possibilities. They make changes to operations through the introduction of measures and regulations that force or encourage companies to alter their behaviour.

Finally, there are other groups that are **impacted**, but who do not directly influence the urban freight transport, but they are affected by it. They include traffic participants, city residents and users and visitors/tourists.

Policy options for cities

Every city can address the issue of freight transport through different initiatives and actions that aim to increase delivery efficiency, reduce traffic congestion and reduce negative environmental impacts. There are six groups of measures that have been identified.

The first group of measures refers to **stakeholder engagement**, which is becoming increasingly recognised as an important part of any decision making process.

Freight quality partnerships (FQPs)	Bring together the public and private-sector parties involved in freight transport and logistics to discuss problems, identify and implement solutions.
Freight advisory boards and forums	Establishing committees, boards, and forums to provide the most direct way to engage all the actors and find best solutions for everyone's needs.
City Logistics Manager (CLM)	A real intermediary between the various local stakeholders and the public authority with the task to reconcile the needs and demands of the different actors.

The second group includes **regulatory measures**, they include rules designed to control the activities of private freight operators to preserve the liveability of the urban environment and to guarantee an adequate level of mobility in the city.

Time access restrictions	Restrictions on the times when freight activity can take place to reduce freight traffic activity during peak hours and minimise noise constraints.
Parking regulations	Provision of loading/unloading spaces is a common local policy to organise last-mile delivery operations and facilitating the movement of all vehicles by increasing road capacity.
Environmental restrictions	Preserve the liveability of city centres by reducing the negative externalities produced by freight vehicles (emissions and noise).
Size/load access restrictions	Increase the liveability of urban areas and optimise the use of public space by preventing vehicles of a certain weight/size from using a particular road or area. Minimum load factor to increase efficiency can also be imposed.
Freight-traffic flow management	Impose special restrictions to freight traffic on certain routes or allocate different users according to time windows.

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The third group consists of **market-based measures**, which aim to intervene with delivery costs by the use of the price mechanisms to persuade operators and their customers to change their behaviour.

Pricing	Most common options adopted by local authorities, including road pricing, congestion charging, parking charge.
Taxation (and tax allowances)	Used to raise revenues and foster behavioural changes leading to public benefits. It can be imposed on vehicle emissions, fuel, vehicle ownership or use.
Tradable permits and mobility credits	Pricing scheme based on mobility credits that establish the total amount of acceptable emissions in a specific zone. Economic operators can use such credits to purchase freight transport services.
Incentives and subsidies	Incentives to encourage the development of sustainable urban distribution and more energy-efficient urban freight transport. Incentives may be economic or competitive.

Adapting on-street loading zones	Allocating adequate kerb space for parking and loading activities to accommodate current and future traffic and commercial vehicles volumes.
Using building code regulations for off-street delivery areas	Ensure that new business premises provide adequate space for goods handling and storage for suitable off-street delivery areas or storage zones.
Nearby delivery areas	Use staging areas to develop an implementation-site and off-street areas at businesses or facilities that regularly receive freight.
Upgrading central off-street loading areas	Redesigning docks to accommodate the geometric needs of current and future trucks.
Integrating logistics planning into land use planning	Identifying areas of conflict between freight activities and other land uses to delineate efficient strategies for a compatible development.
Collection points	Use of specific locations for pick-up/deliveries to reduce costs by concentrating deliveries and reducing their failure.
Urban consolidation centres (UCCs)	Promote the consolidation of cargo shipments at one or more urban terminals. Instead of making separate trips, carriers transfer their loads to a neutral carrier managing the last leg.

The fourth group incorporates **land use planning and infrastructure measures** which aim to change the private use of space in urban areas for the public good.

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Dynamic routing	Systems used by public authorities to enhance safety and prevent violations of access regulations. Truck routing and decision support system based on Intelligent Transportation Systems requiring real-time traffic data.
Real time information systems (RTIS)	Set of technologies and strategies that can help monitor and manage traffic based on real-time traffic information to generate immediate response with direct impact on real-time decision-making.
Traffic control	Strategies to monitor and control traffic with the aid of signs, equipment, and devices.

The fifth group refers to the adoption of a series of **new technologies** for the optimisation of urban logistics.

Anti-idling	Use of technologies such as fuel-operated coolant heaters, auxiliary power units, truck stop election
Eco-driving	Changing drivers' travel behaviour and enhancing his competencies through specific training.
Modal shift	Encourage the use of alternative modes to reduce the number of trucks and vans in the city centre.
Staggered work hours	Reduce truck demand during peak periods by distributing the receiving hours throughout the day. Similarly, staggering receivers' delivery hours can be an effective strategy.
Recognition and certification programmes	Voluntary schemes to provide recognition, guidance and advice to transport operators assessing the levels of legal compliances, as well as operational and environmental performance.

Finally, the sixth group includes **eco-logistics measures**, which aim to promote eco-friendly (but also economic) sustainability in urban distribution.

Who (in the city administration) has to deal with it?

Within urban transport, freight logistics poses a significant challenge for public authorities and policy makers in relation to decision-making and successful outcomes for a range of stakeholders. In fact, city logistics tends to respond effectively to economic requirements but it is also a major contributor to social and environmental impacts such as congestion, local air quality and noise. For these reasons, freight activities often result in conflicts between economic, social and environmental priorities.

Addressing these conflicts and trade-offs represent a major challenge for cities and administrations and it requires substantial change and innovation within the public and private sectors. In particular, local administrations, such as city councils and transport/environmental departments, are responsible for the initiation of the measures that deal with urban freight logistics.

Innovation is a key factor in the evolution of urban freight logistics and it should always be on

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the political agenda so that existing systems can transform into sustainable systems. In this sense, a central role of urban freight logistics within the urban mobility governance is clear: city logistics should be planned by city administrations that aim to support sustainable freight distribution processes in terms of economic, environmental, and social equity/cohesion aspects.

Innovative practices

Recently, the urban freight sector has witnessed the development of new and innovative fulfilment methods whose goal (and priority) is to provide flexibility and choice, while also shortening the distance and time between product and customer.

In order to balance the growing appetite for online shopping and customer expectations of low prices extra pressure is put onto retailers to effectively manage the financial costs of increasingly complex delivery services. The table below summarises the different innovative, and sometimes technologically sophisticated, fulfilment methods that are either consolidated or still in an experimental stage.

Fulfilment method	Pros and Cons (retailers)	Pros and Cons (shoppers)
Home delivery non-food and food	Outsourced to logistics specialists as own fleet can be too expensive (-) Traffic and parking can be an issue (-)	Very convenient if shoppers are at home (+)
Click & collect at retailers	Ease of implementation (+) Additional impulse to purchases (+) Economics are superior to home delivery (+) Extra space is necessary for pick up (-)	Good for returns (+) Speed of collection if item is in stock (+) No risk of missed deliveries (+) Cheaper option (+)
Click & collect at third parties	No investment needed (+) Superior economics compared to home delivery (+)	Good for returns (+) Limited hours of operations (-)
Lockers (everywhere)	Low maintenance (+) Good for high-traffic areas (+) Less expensive than home delivery (+) Physical and financial investment necessary (-) Difficult replenishment (-) Multi-temperature zone lockers still expensive (-)	Shoppers can collect on their own terms and 24/7 (+) No risk of missed deliveries (+) Restricted to small orders (-)
Lockers at residential homes	Could be very successful via a pan retail pan courier approach (+) Traffic and parking issues are the same as home delivery (-)	Shoppers do not have to be at home (+) Good for returns, even if customers have to bear the costs (+) Not useful if it is only for one logistics company (-) Pan-retail pan logistics is a must (-)
In-car delivery	Could be very successful via a pan-retail/pan-courier/pan-automotive manufacturer approach (+)	Very convenient (+) Safety concerns (-) Shoppers might make bogus complaints (-) Restricted to small and medium-sized orders (-)
Crowdsourced	No own investment (+) Lack of brand visibility (-) Trust in partner company is necessary (-)	Pretty expensive and mostly only suitable for specific consumer groups or urgently-needed items (-)
Drones/Robots	Still a very experimental ground. No drones or driving robot can be expected in the near future (-) Security is an issue (-)	Security and trust are issues (-) Only suitable to non-food goods due to lack of chilling capabilities (-) Possibly difficult handling of returns (-)

Source: Herrlein S., Vor dem Berge F., 2015

Example 1–Trunk deliveries

The concept of in-car delivery has gained popularity in recent years. This was supported by the assumption that a person's car doubles as storage locker on wheels. Pilot projects include experiments by Audi in Germany and by Volvo in Stockholm. The main example was carried out by Amazon, in partnership with General Motors (GM) and Volvo. After initially delivering packages inside its customers' homes, in 2018 Amazon launched the in-trunk delivery which allowed couriers to access a person's vehicle for the purpose of leaving packaged deliveries inside.

So far, the service has been tested in Washington and California in the United States where the service is available to premium member owners of 2015 or newer GM and Volvo cars. To access the new service, customers need to download a specific app and add a description of their vehicle and it also needs to be parked within a certain radius of an address used for Amazon's deliveries. To find the car, Amazon's couriers will have access to the car GPS location and license plate number. Amazon never accesses the customer's connected car login details and all communications between the company and the connected car systems are encrypted.

With this service, Amazon will face a significant challenge in totally reshaping its last-mile supply chain, especially considering that they now have to deliver to a location that can shift and change depending on where the car is parked. In fact, during the beta testing phase, Amazon did not know the location of the car until about six hours before the delivery was scheduled to take place.

Source: Retrieved from https://www.theverge.com/2018/4/24/17261744/amazon-package-delivery-car-trunk-gm-volvoin March 2019

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Example 2–Autonomous vehicles and deliveries

We might not be too far away from the point when autonomous technology will make it practical for trucks to move packages with minimal human involvement, reducing operating costs and increasing safety on roads. In particular, technologies and practices first developed for the taxi industry may help freight carriers negotiate complex in-town delivery.

One such example from Scottsdale (Arizona) was developed by Kroger, in partnership with Nuro (a Silicon Valley start-up), it used unmanned autonomous vehicles to deliver groceries. The vehicles did not have any passengers and only carried products that could be delivered same-day or next-day, 7 days a week. Kroger's goal was to us autonomous vehicles to redefine the grocery delivery experience by creating an ecosystem that offers customers anything, anytime and anywhere.

It is likely that Scottsdale will be the first of many cities to have deliveries fulfilled by self-driving vehicles as many more fully autonomous vehicles hit the road in the near future.

Source: Retrieved from https://www.forbes.com/sites/lanabandoim/2018/12/19/kroger-is-using-unmanned-autonomous-vehicles-to-deliver-groceries-in-arizona/ in March 2019

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Example 3: Electric Cargo Bikes

In order to limit air and noise pollution linked to the increasing volume of traditional freight vehicles, many urban areas in Europe and North America are witnessing an increase in the development of alternative vehicle types for delivery. In particular, electric-assisted (EA) cargo bikes have the potential to help meet the increasing demand for the transport of goods.

Current freight infrastructure is unable to meet the diverse and dynamic delivery needs of the last mile, which is considered the most expensive part of the delivery process. Therefore, many companies are introducing EA cargo bikes as an alternative mode to cover the last mile delivery.

EA cargo bikes can be more cost-effective when compared to delivery trucks for deliveries in close proximity to a distribution centre, where there is a high density of residential units and low delivery volumes per stop. Therefore, EA cargo bikes have great potential to tackle some of the detrimental effects associated with heavily-polluting vehicles in cities over the last mile. They have the power to be implemented within the last stretch of the supply chain, particularly in cities that already have a well-established cycling infrastructure.

Source: Retrieved from https://www.icebike.org/cargo-bike-delivery/in June 2019

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Example 4: Crowdshipping

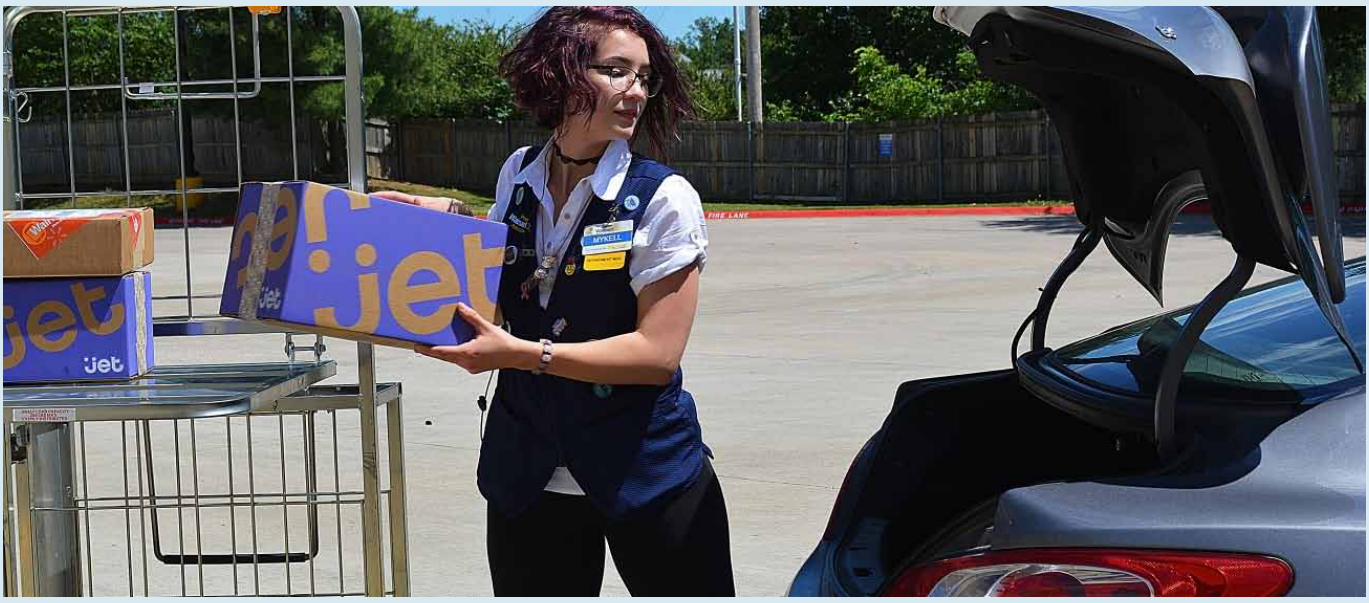
Crowdshipping represents a rising platform that could provide some help towards the challenges created by increasing urbanisation and the e-commerce boom. The concept involves using technology to marshal a large group of people to accomplish deliveries. In other words, the platform enlists people who are already travelling from points A to B to take a package along with them, making a stop along the way to drop it off.

Currently, most crowdshippers are start-ups, but some big companies are coming into the market.

For example, Walmart outsourced some of its deliveries to its own customers. In-store shoppers would deliver packages on their way home from the store to people who bought items on the Walmart website. In return, in-store customers received a discount for their delivery efforts.

DHL is another example, it launched a pilot crowdshipping platform in Stockholm called My-Ways. The platform uses a mobile app to connect individuals who ask for flexible deliveries with those offering to transport parcels along their daily routes with the chance to earn a little extra money.

The greatest challenge facing policymakers is the need to redistribute costs and benefits among stakeholders. In addition, concerns about damaged packages, delays or privacy issues have yet to be raised. Subsidies might be necessary to enable crowdshipping platforms to deliver the social benefits to society. In any case, similarly to EA cargo bikes, they have great potential to replace the use of heavily-polluting vehicles for last mile deliveries.



Source: Retrieved from https://blog.walmart.com/innovation/20170601/serving-customers-in-new-ways-walmart-begins-testing-associate-deliveryin June 2019

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Costs

There are two categories of costs associated with urban freight delivery. On the one hand, there are negative externalities associated with the transportation of goods within cities, especially if efficiency and sustainability goals are not addressed. The principal components of such externalities include noise, pollutant emissions, congestion and safety for road users.

On the other hand, there are costs that retailers and parcel carriers have to sustain in order to fulfil their operations. In order to increase the efficiency and reduce the costs associated with last-mile delivery, without impacting on customer service levels, operators seek the following:

IMPROVING	REDUCING
Vehicle load factors and drop densities	Extent of deliveries to residential addresses
Efficiency of unloading at the kerbside in busy urban areas	Delivery failure rate
Logistics facilities in urban locations from where last-mile deliveries can be operated	Vehicle stopping requirements
Businesses to work together in product procurement to share suppliers	Product return rates
Operational collaboration between parcel carriers	Personal deliveries to workplaces in congested locations

Open questions

In the near future, which innovative fulfilment methods will take flight and which ones will vanish?

What will be the role of cities in a future dominated by online commerce such that delivery requests could rise exponentially?

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Possible future developments

The emerging global trends will significantly change the urban logistics sector and its mechanisms, as freight distribution plays an increasingly important part of everyday modern city life. Customers' expectations for shipping continue to rise, but still inefficiencies within the ecosystem mean that meeting those expectations is challenging. Also, demand for the transportation network has shifted, making shipping more complex. To meet this new world of demand, eco-system players need to understand how different new technologies and practices are evolving.

Digitisation represents one of the main elements that should be considered to tackle such issues. IT and connectivity should always represent the core of freight companies, where sensors, computing power and the ability to connect combine with unprecedented power. As a result, the ability to extract value from data, especially in real time, is a large and potential opportunity that could become a source of competitive advantage for carriers.

Another key element is the general adaptation of new urban supply concepts. Every retailer and logistics company should push for models and technologies to shorten time and distance to delivery. One step may be to slow or even reverse the proliferation of delivery destinations. Also, as delivery volumes increase and units per delivery fall, especially in dense urban areas, simply locating distribution centres closer to cities can cut costs and delivery time. With such an approach, distributed inventory models can be effective when delivery volumes are limited and to-your-door speed is a priority. The apotheosis of this trend is a rolling inventory model, in which every unsold good, no matter its location, is a candidate for delivery.

Asset sharing might also play a fundamental role in the future of urban freight logistics. Just as carsharing and ridesharing have challenged traditional modes of personal movement this could also lead to greater sharing of commercial vehicles and prompt a rethinking of how carriers operate. Sharing assets could facilitate transportation companies to accomplish more, take better advantage of their own network's capacities, and increase vehicle utilisation reducing the cost per delivery.

Finally, it is necessary to mention the importance that alternative vehicles will have in the future. Electric vehicles (EV) purchase subsidies alongside exemptions from low emission zones and vehicle taxes are a fundamental contribution towards the uptake of EVs, which are progressively finding their way in the trucking industry. Also, autonomous vehicles and drones will also play an important role among new possibilities for the freight business.

How and where does it fit into a SUMP

The impacts of freight movement to and within cities suggest that city logistics should be a priority due to their evolving transportation networks and therefore need to be a key element of cities' Sustainable Urban Mobility Plans (SUMPs).

In addition to developing SUMPs, cities also need to focus on developing Sustainable Urban Logistics Plans (SULPs), with the objective of optimising urban freight logistics processes, in order to reduce the related energy consumption and environmental impacts to ensure economic sustainability.

The concept of SULP was developed as a useful tool to identify the main requirements and to plan and evaluate possible solutions that could be integrated into an overall SUMP. SULPs involve strategies, measures, and rules that can be adopted with a cooperative approach between the different actors to reach common objectives that are aimed at achieving an overall urban sustainability outcome.

To learn more about the wider planning process, a topic guide about "Developing a Sustainable Urban Logistics Plan (SULP) as part of the SUMP concept" has recently been added to the updated set of SUMP Guidelines (2019).

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Authors

Stefano Borgato
borgato@trt.it

Giuseppe Galli
galli@trt.it

Simone Bosetti
bosetti@trt.it

TRT Trasporti e Territorio - www.trt.it

www.sump-network.eu

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