

Freight logistics and the city

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Abstract

In this paper we argue that urban studies should consider freight logistics as an integral part of ongoing urban transformations. The movement of goods is increasingly shaping cities, and the implications for sustainability, liveability and justice are uncertain. Still, freight logistics has been largely overlooked in urban studies. This paper seeks to remedy this. First, we review current literature on freight logistics in cities, and find that it is broadly characterised by what has been called a ‘technical-rational model’. Second, we situate urban logistics in social and political processes of urban change. Finally, we point to key areas for urban scholars to explore at the intersections between urban logistics and urban change to better understand the role of freight logistics in urban sustainability transformations.

Keywords

cities, planning, transport, urban logistics, urban studies

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摘要

在本文中，我们认为城市研究应该将货运物流作为持续城市转型的一个组成部分。货物的流动正在日益塑造城市，而其对可持续性、宜居性和公正的影响是不确定的。然而，在城市研究中，货运物流基本上被忽略了。本文试图对此进行补救。首先，我们查阅了目前关于城市货运物流的文献，发现其整体具有所谓的“技术理性模式”的特点。其次，我们将城市物流置于城市变革的社会和政治进程中。最后，我们指出了城市学者应该探索的，城市物流和城市变革的交集中的关键领域，以更好地理解货运物流在城市可持续性转型中的作用。

关键词

城市、规划、运输、城市物流、城市研究

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Introduction

The movement of goods is an essential basis for urban life. Without the flows of food, consumer goods and materials into and within cities, metropolises would not be viable. Despite this, urban logistics is often hidden in both social science analysis and policy agendas. Urban logistics thrives by being unnoticed, in the sense that an effective logistics operation is one that delivers goods to the recipient effectively and smoothly, without unnecessary costs, effort or disruption. As is often said about infrastructure, we only notice it when it breaks down. We assume it is unimportant, while it in fact is the opposite.

The proposition of this paper is that urban logistics should feature more prominently in urban studies, and in particular, in analyses of urban sustainability transformations. Although it may often be hidden, the movement of goods and the activities, material flows, financial flows, waste and human labour involved in it, play a significant role in shaping cities. Logistics operations are also shaped by the urban context – in fact, urban logistics can be seen as fundamentally about the effort of manoeuvring the spatial

constraints of a city. This interaction between logistics on the one hand, and the urban on the other, is not only intellectually appealing, arguably it is also increasingly relevant for future sustainability, liveability and transport effectiveness. The COVID-19 pandemic transformed consumer behaviour, which combined with the exponential rise of e-commerce and online shopping, just-in-time delivery and new business models in logistics, as well as digitalisation and robotics in warehouses (for the industry narrative on these trends, see DHL, 2022). For urban scholars, these trends should be interesting for what they indicate about changing urban conditions – how are lives, livelihoods, the environment, mobility, consumption and spaces in the city altered as a result of such trends?

Surprisingly little research has been done in urban studies on the movement of goods (freight logistics) compared to the movement of people (mobility). This is in itself not a new proposition – there is a host of previous papers with variations of the claim that logistics receives unreasonably little attention compared to the movement of people (Behrends et al., 2008; Cui et al., 2015; Hesse and Rodrigue, 2004; Lindholm, 2013; van Duin and Quak, 2007; Woudsma, 2001), but

even in the work that does exist, there is little critical reflection on the relationship to the sphere of the urban or on how logistics shape urban sustainability transformations. In this sense, we are linking two interrelated claims about the relationship between freight logistics and the urban. Firstly, that the movement of freight in cities has received vastly less attention than the movement of people, and secondly, that most of the research that does exist on urban freight logistics is based on a 'technical-rational model' (Marsden and Reardon, 2017) that ignores the politics and the social of the urban domain.

In this paper, we outline key areas for exploration in the relationship between freight logistics and the city. The task is to move beyond the dominant technical-rational model in studies of logistics and open it up to analyses of politics, justice, sustainability, as well as urban problems related to governance, planning, spatial conflicts and more. Our contribution to this is to outline several critical avenues for research where these issues can be addressed by urban scholars. Specifically, we discuss three concrete areas: (1) freight logistics and the future city, (2) justice of urban logistics and (3) new pathways for urban logistics sustainability transitions. In conclusion, we discuss the implications of integrating concerns for freight logistics in urban studies, emphasising possibilities for drawing freight logistics into wider processes of sustainable urban transformation.

Beyond the 'technical-rational model' of logistics research

The relationship between the movement of goods on the one hand, and the cities and urban life on the other, is relatively clear as a matter of historical experience. Cities have to a large extent developed through the exchange and manufacturing of goods (Hesse, 2016). Nevertheless, the academic

field of urban studies does not currently reflect the significance and relevance of freight logistics. In this section we will develop our two interrelated claims about the literature relevant to the freight-city relationship.

The first claim is that the movement of freight in cities has received vastly less attention than the movement of people. While urban mobility is a vast and growing field, urban studies scholars seem far less interested in the movement of goods. It has been stated repeatedly by other accounts, over a long period of time, that the movement of freight has received less attention than the movement of people (Behrends et al., 2008; Cui et al., 2015; Hesse and Rodrigue, 2004; Lindholm, 2013; Patier and Routhier, 2020; van Duin and Quak, 2007; Woudsma, 2001). Already in 2001, Woudsma, writing for *Urban Studies*, found that papers in the journal in the years prior had 'scant reference to the movement of goods' (Woudsma, 2001).

This is not just the case in the urban studies field but also in the broader planning and transport fields. Woudsma found that in the proceedings of major academic conferences on transport, such as the Transport Research Board Proceedings, only 3% of 1000 articles fell under the heading of freight transport. Hesse and Rodrigue (2004), examining textbooks and journals in regional science and geographical research, find that there is a slight increase in focus on logistics but conclude that 'logistics, as a geography, remains relatively unexplored' (Hesse and Rodrigue, 2004: 172). Lindholm and Behrends (2012) argue that there is a lack of systematic methodology for linking transport planning with land-use planning, in part because of the lack of attention paid to urban freight. Lack of attention is not just in academic research. It has been reflected in city authorities themselves – surveys have found that that more than half of European cities have no freight policy or

planning (Lindholm, 2013; Lindholm and Behrends, 2012).

Any suggestion as to why there is less focus on freight logistics is bound to be speculative. It has been suggested that logistics is widely considered to be a matter for the private sector rather than the public sector (Rosales and Haarstad, 2022), and therefore it may fall out of the scope of scholars of planning, policy, politics and governance. Another possible explanation may be that logistics operations thrive by being unnoticed, delivering goods smoothly and efficiently without unnecessary costs or disruption. Like infrastructure, it functions best in the background, as a context rather than visible object, and we only tend to be aware of its presence when it fails. Ballantyne (2013) found that freight transport is most often recognised in cities when stakeholders raise a complaint, for example regarding noise, safety and access restrictions.

Or perhaps freight logistics is simply less sexy than mobility? Mobility solutions can be spectacular and visually commanding in the urban landscape, can involve advanced architecture or green spaces, or be highly technological. In contrast, logistics solutions are typically conceived as a more efficiently organised value chain. This is perhaps less appealing to urban scholars, who may be more interested in interventions and solutions that more visibly reshape urban landscapes.

Our second claim about the literature relevant to the freight–city relationship is that while there is ample research on urban freight logistics, it is based on a ‘technical-rational model’ (Marsden and Reardon, 2017) that ignores fundamental issues at the heart of urban studies. The point here is that there is still a lot of research on freight logistics, in cities and beyond. Freight logistics is a significant and vibrant subfield of transport studies and management studies, as well

as subject to significant industry-based research. Emphasis has been on multi-actor preferences using modelling tools such as Multi-Actor Multi-Criteria Analysis (Fredriksson et al., 2021; Lebeau et al., 2018), Agent-Based Modelling (Gatta et al., 2017; Le Pira et al., 2017) or Q-methodology (Van Duin et al., 2018). A quantitatively oriented review found a growing number of articles published in urban logistics, which touch on themes such as policy, innovation, sustainability and stakeholders (Neghabadi et al., 2019).

The aim of the broader research field, however, seems to be to solve problems for urban logistics, rather than to examine the links between logistics systems and the city. Cui et al. (2015) describe the main concern of research in the field as ‘private-sector-led optimisation of performance’. The dominant narrative is one where cities are growing and there are new consumer and sustainability demands, which must then be resolved by improved understanding and optimisation of logistics operations of private operators. Here, logistics in cities is typically understood as a relationship between freight operators and their customers (Ambrosino et al., 2015; Cui et al., 2015; Fossheim and Andersen, 2017; Lindholm and Blinge, 2014). In Hesse’s (2016) account, *The City as a Terminal*, logistics is performed by major corporations operating large-scale networks, achieving a ‘dissociation from the city’, in which cities primarily serve as receptacles for objects and delivery systems beyond the deliberate control of other urban actors. The aim of the operators is a sort of ‘neutralisation’ of the urban territory, to avoid having to make specific operational designs for specific urban contexts (Dablanç, 2007).

In this narrative, urban logistics is a challenge that can be resolved through technical and rational means. In the systematic review by Neghabadi et al. (2019), sustainability, policy and stakeholders are ‘issues’ that can

be subdivided into component parts and resolved by generating more 'precise' knowledge of each part. Several recent papers are ambitious when it comes to new technological innovations, and sketch models of 'logistics 4.0' (Winkelhaus and Grosse, 2020), 'smart logistics' (Ding et al., 2021) and blockchain applications in supply chains (Pournader et al., 2020).

The narrative aligns well with Marsden and Reardon's (2017) perspective of the wider governance of transport field, which they critique for its limited technical-rational perspective, restricting its scope to models, quantitative approaches and hypothetical conceptual developments. The technical-rational perspective aims to provide 'tools' for policy makers, but has less to say about the processes and systems of the urban in which those tools must find relevance. This means that it lacks a more substantive engagement with context, power relations and legitimacy – issues that are at the core of urban systems in the perspective of urban studies (Savy, 2016).

Some of these issues are addressed in studies that look at logistics from a public sector governance perspective (Rosales and Haarstad, 2022). This work has highlighted coordination problems between different types of authorities (Nordtømme et al., 2015) and between stakeholders and public actors (Bjørngen and Ryghaug, 2022). This work suggests that freight logistics tends to fall between silos in urban governance systems. In other words, urban governance systems are already set up to deal with public transport and land use planning, but not necessarily the specific challenges that emerge when urban logistics becomes a matter of public concern.

In most available perspectives on urban logistics, then, the urban is a receptacle for objects delivered through extensive value chains that cities themselves can do little to control, and otherwise is a silent and inert

backdrop to complex logistics operations. It is simply the surface upon which logistics operations play out, and does not in itself actively shape those operations. We are not the first to point this out. Yet there is a need to develop a perspective on how the relationship between freight logistics and the urban can be understood, in a way that recognises the liveliness and vibrancy of the urban. As we make clear in the following section, freight logistics is in fact deeply embedded in shaping the contemporary city.

Situating freight logistics in the processes of urban change

The flows of goods in the city are deeply ingrained in the urban fabric. Making these flows efficient – the key objective of logistics practitioners and much of the academic work on the topic – is inherently a struggle with urban structures, actors and competing flows, mediated by material, social and political infrastructures. The purpose of this section is to illustrate how freight logistics is in fact deeply situated in social and political processes of urban change at multiple points. In doing so, we will highlight the relevance of existing literatures in and around urban studies, which have highlighted the social and political elements of related issues such as urban infrastructures (Guy, 1997; McFarlane and Rutherford, 2008), environmental and spatial justice in cities (Anguelovski et al., 2019), mobility justice (Nikolaeva et al., 2019; Verlinghieri and Schwanen, 2020), smart urbanism (Kitchin, 2014), cities as nodes in global networks of commodity chains, finance and social relations (Angelo and Wachsmuth, 2015; Broto et al., 2012) and more.

Although urban logistics systems may often be hidden, the movement of goods and the activities, material flows, financial flows, waste and human labour involved in it, play a significant role in shaping cities in ways

that resonate with analyses of the politics of water, electricity or road networks in cities (Guy, 1997; McFarlane and Rutherford, 2008). Each of these infrastructure types has its own history that can be examined, as Moss (2016) does illustratively in the case of Berlin's water system and underlines the social and political character of their constitution. We find work on the politics of urban infrastructure to be particularly instructive for opening a conceptual space around urban logistics. Both logistics and infrastructure are generated as derived demand, meaning that we do not build and maintain them for their own sake but because they help produce other things we need. They thrive in the background, physically and discursively, and a successful operation means that we are typically not aware of their presence, costs or politics.

What the work on infrastructures in urban studies does well is to disrupt the assumption that invisibility means that it is not important for the shape of urban forms. It recognises the 'mutual constitution or co-evolution' between infrastructure and the city, as well as 'the importance of specific configurations of agency in shaping their relations, and the inherently political nature' (McFarlane and Rutherford, 2008: 364). It can help us open the black box of urban freight systems for exploration, not just through the 'technical-rational model' (Marsden and Reardon, 2017), but for urbanists interested in the way the movement of goods shape cities and vice versa.

Freight logistics is deeply embedded in shaping the contemporary city, along multiple dimensions. For one thing, it shapes the spatial structure – a key driver of travel behaviour and car dependence in cities (Næss et al., 2011). Terminals are typically located outside of urban centres. Here one can often see large terminal buildings and associated road infrastructures where freight arrives by rail or by container trucks, before

it is loaded onto delivery trucks that make their way into urban cores or suburban malls. Some cities have large harbour areas dedicated to the arrival, storage and reloading of containers arriving from across the sea – but increasingly, these areas are considered a waste of prime urban real estate and they become suburbanised or move even further away into the urban perimeters (Hesse, 2016) – in what has been called a 'logistics sprawl' (Tennøy et al., 2020; Yuan, 2021).

In suburban areas there is typically less conflict over space, and often the zoning ordinances are less strict. There is also less conflict with powerful economic forces and socio-economic groups. Research has found that warehouses are disproportionately situated in low-income and medium-income minority neighbourhoods (Yuan, 2021), meaning that these socio-economic groups suffer from externalities such as noise, increased traffic, air pollution and around-the-clock activities. This illustrates how the organisation of urban logistics is not simply an economic and management issue of optimisation, but also a deeply social and political question involving class and environmental justice. These are issues about which urban studies has a lot to say.

Allowing logistics operations to sprawl also places undesirable elements of the urban systems out of sight, while opening prime urban areas in urban cores for more profitable forms of development. Removing logistics terminals from urban cores is a key element of the shifting base of cities towards service economies, and is entangled in processes of urban renewal, gentrification, socio-cultural displacement. Urban studies scholars have suggested that the urban renewal processes may result in elite enclaves of environmental privilege (Anguelovski et al., 2019). We might see the pushing out of undesirable freight activities and infrastructures, traffic, pollution and aesthetically

unpleasing terminals, as part of this process. This underlines what urban scholars have pointed to regarding the political underpinning of aesthetics in hegemonic place-making strategies (Jones, 2009). The shift towards more complex supply chains also changes the relationship between the city and logistics – Lyster (2016) holds that cities are now less shaped by static objects and more through the networked flows of logistical systems.

Removing industrial-type activities out of cities has also enabled many cities to make claims of becoming ‘green’, since they now can develop low-mobility, compact forms of urbanisation inside their formal boundaries. But as Holgersen and Malm (2015) point out in the case of Malmø, the claim of being the ‘world’s greenest city’ is actually a process of displacing industrial activities with high-consumption activities whose externalities are unaccounted for. We might question forms of environmental accounting that reward cities for moving polluting and emissions generating activities outside their boundaries. It may be that logistics sprawl is simply exporting and hiding environmental problems, while the underlying driver of the problems – consumption of goods produced elsewhere – persists. Making this process visible points to politically challenging questions of political accountability and geographies of responsibility for environmental issues that are inherently urban – yet are made to appear less so by the complexities of logistics systems.

Relocating logistics terminals and many logistics operations to urban perimeters intensifies the need for processes and infrastructures for transporting goods (back) into urban cores. There are complex and multi-layered distribution systems from terminals and distribution venues, using large trucks, perhaps rail, to suburban warehouses and costumers in and around urban cores. As these systems are typically privately

organised, they are shaped to maximise the efficiency of individual companies and their costumer networks, rather than, say, overarching concerns of regional planning, liveability and sustainability. There is an ongoing struggle between private and public interests over this issue, concerning the establishment of ‘consolidation centres’ for freight, where competing operators would be forced or enticed by subsidies to have joint terminals that facilitate collaboration around shared infrastructure, land use and even shared last mile delivery services (Giampoldaki et al., 2021). Cities have experimented with or established such consolidation centres in order to minimise consequences of logistics operations, but it also opens challenging political, bureaucratic and legal questions that urban authorities struggle to cope with (Cui et al., 2015).

The geographical organisation of freight systems not only has implications for urban peripheries and suburban areas, but also for the urban cores that they are intended to serve. The multiple networks of delivery services generate significant amounts of traffic, straining urban infrastructures and environments. Reliable data on freight traffic in cities is typically not available, but a while ago Dabanc (2007) found that goods movements represent between 20% and 30% of vehicle kilometres travelled in a city. It is safe to say that logistics represents a significant portion of traffic in cities, with a corresponding share of liability for congestion, pollution, emissions, and endangerment of others. Sprawling logistics, moving terminals to urban perimeters, has likely, in combination with increased demand, exacerbated these issues (although the picture is complicated, see Trent and Joubert, 2022). Logistics sprawl can deepen automobility dependence by locking in urban activities around road infrastructures and reliance on ‘hard’ transport infrastructures, making the shift to softer and more diverse forms of mobility

more difficult (Macharis and Kin, 2017; Næss et al., 2011).

If we shift our analytical gaze to the street level and look for traces of these complex logistics networks there, we typically see the last-mile or second-to-last-mile services. This has been particularly visible in the recent years owing to internet-induced changes in consumer behaviour and the convenience and traceability of e-commerce (Buldeo Rai and Dabanc, 2023). Possibly the most visible feature of the logistics systems in urban cores is the large trucks of major operators such as DHL, FedEx or Amazon, that idle on curbs while packages are delivered to a nearby store or resident. Here they enter into the daily contestation over use of street space with other users of urban space – pedestrians, other cars and especially cyclists. These sorts of conflicts, and perhaps bicycle activism in particular, have revealed the everyday forms of conflict, contestation and uses of power in urban space (Verlinghieri and Schwanen, 2020).

The presence of the delivery truck in urban space makes visible the human element of urban logistics. The hurried delivery worker reveals – finally – that there is embodied labour engaged in these complicated logistics networks. The last mile represents a significant cost relative to the total journey of a particular delivery, partly because it is labour intensive (Macharis and Kin, 2017). Ongoing transformations of the logistics sector have altered conditions for workers drastically. Jobs in freight activities such as warehouses and on docks have been relatively stable and unionised, which changed dramatically with liberalisation and the introduction of ‘lean’ management from the 1980s and onwards (Moody, 1997). In the past decade, logistics – through suburbanisation of warehouses, new technologies and new precarious forms of labour – has been ‘transformed in ways that have disoriented both workers and trade union leaders’

(Moody, 2019: 80). The rise of the ‘gig economy’ has exacerbated worker precariousness further, and is possibly creating a new urban precariat. Last-mile delivery operations like Deliveroo, Foodora, Uber Eats, Just Eat and the like have struggled to legally define delivery workers as self-employed and therefore not entitled to minimum wages or benefits (Woodcock and Graham, 2019). Last-mile delivery is, in turn, an arena for struggles over road space as well as worker rights in cities (Altenried, 2019).

Finally, urban logistics also plays into the material constitution of urban space. If we look for traces of logistics operations in the physical urban landscape, they may be well hidden – but the traces are everywhere. Access for deliveries is a central preoccupation for logistics actors, and urban logistics can be seen as fundamentally about the effort of manoeuvring the spatial constraints of a city. Terminals need proper road networks connected to them. In smaller cities or in historical cores, narrow streets and protected buildings can create challenges for deliveries. Malls and box stores have separate entrances, typically in the back, for delivery trucks, and these entrances demand sufficient road space, which can infringe on street space available for parks or public spaces. In certain areas of the city deliveries are only possible or legal at particular times of the day, which can infringe on both business operations and employment conditions. Warehouses and terminals not only occupy land in cities or suburban areas, but also occupy significant parts of the city’s wider transport infrastructure.

In this way, logistics operations are built into the material fabric of the city and take part in structuring its flows and relationships. As the work on politics of urban infrastructure highlights (McFarlane and Rutherford, 2008), this is always a particular type of structuring which has specific effects. Once built, urban space facilitates certain

types of logistics rather than others, enables a particular type of consumption, and helps create a particular type of city. It creates certain barriers and opportunities for making freight logistics more sustainable and just, while constraining other opportunities – illustrating the conflicting goals and interests in planning for sustainability (Gil Solá et al., 2018). Precisely how this occurs in different urban contexts would need further analysis, but as existing literature on urban transport systems illustrates, transport systems can serve to ‘lock in’ existing – typically high-carbon – modes of transport (Haarstad et al., 2022). Freight systems, with their terminals and road connections, trucks, delivery boxes and other material artefacts, can serve as strong drivers of lock-in.

By downplaying the movement of things in the city, urban scholars are missing an opportunity to account for a key factor of ongoing urban transformations. We have argued that there are conceptual affinities between urban logistics and the work on urban infrastructures, in the sense that they are often relegated to background issues, while they play a significant role in shaping urban dynamics. As urban systems, they also have fundamental political effects, which are hidden by the technical-rational model applied in the economic and engineering domains of knowledge generation. We pointed to some of the interlinkages between urban logistics and other critical work as well – work on urban renewal, gentrification and mobility justice – which create various bridges to urban studies. While this is obviously not an exhaustive overview of themes in urban studies that can inform a critical analysis of urban logistics, it intends to open urban logistics as a field of inquiry in urban studies. Following on from this, we will now outline key research pathways at the intersection of urban logistics and urban studies.

Key issues for research at the urban logistics/urban studies intersection

Freight logistics appear to be integrated in two fundamental processes of change that we are seeing the contours of at present: climate urbanism and digitalisation. First, cities are addressing the climate challenge by expanding the terrain for climate-related action, and this action increasingly includes multiple infrastructure systems underpinning urban development (Bulkeley, 2021). Urban consumption, infrastructure provision and transport are increasingly framed in terms of resilience, decarbonisation and adaptation (Derickson, 2018). As a mode of governance, this ‘climate urbanism’ gravitates around carbon accounting and climate hazards, which, in a neoliberal context and an urgency framing, has uncertain and underexplored justice implications (Long and Rice, 2019).

The other fundamental process of urban change is digitalisation. The shift to digital infrastructures, or the ‘pervasive and ubiquitous computing and digitally instrumented devices built into the very fabric of urban environments’ (Kitchin, 2014: 2) has profound implications for work life and urban life (Sareen and Haarstad, 2021). It is also reshaping the context for urban freight logistics. We see the contours of this reflected in, for example, the literature on platform urbanism, which assesses the implications of the platform organisation of urban activities such as mobility, hospitality and food delivery. Platform urbanism illustrates how digitalisation disrupts established power relations and creates new ones, particularly through the control of data (Söderström and Mermert, 2020; Stehlin et al., 2020). Here again, the implications for justice are uncertain and underexplored.

These fundamental processes of urban change – climate transition and digitalisation – are widely recognised, not least by the logistics industry itself (DHL, 2022). All actors involved are engaging in a form of ‘anticipatory governance’ (Guston, 2014), attempting the seemingly impossible task of forecasting and managing unpredictable developments and technological innovations under conditions of unclear responsibilities and mandates. Urban scholars have a critical role to play in clarifying the stakes. We will suggest that we can do so along these three lines of enquiry: (1) freight logistics and the future city, (2) justice of urban logistics and (3) new pathways for urban logistics sustainability transitions.

Freight logistics and the future city

It has been written about future mobility that ‘code is the new concrete’ (see Stehlin et al., 2020). In the discourses surrounding the future of urban freight logistics there is certainly a strong assumption that the ongoing processes of digitalisation and automation, coupled with greater consumer demand for faster, cheaper and more sustainable deliveries, will shape the future of the sector. New and old actors are experimenting with digital and more material solutions, as well as new business models connecting them. ‘Proximity logistics’ is rethinking and localising supply chains, placing terminals closer to city centres and to the goods’ destination (Buldeo Rai et al., 2022). Home deliveries on e-scooters, community drop-off boxes, in-car deliveries, self-driving vehicles and delivery drones, in combination with rising e-commerce, q-commerce and home office flexibility, is likely to reshape the relationship between freight logistics and the city. It is not the primary role of urban studies to make predictions about these trends, but rather to offer analysis and critique of ongoing, emergent

and uncertain processes of change. In turn, urban scholarship should explore how these emergent trajectories will influence the city and urban flows and what the socio-political implications will be.

One thing is the matter of material flows. If there is a shift from car-based commuting and physical shopping to digital work, e-commerce and home deliveries, how does this restructure the flows of materials throughout the city, the development of urban infrastructures and the experience of urban life? What new types of urban infrastructures will the disruption of existing flows engender, and what sorts of ‘splintering’ effects and socio-technical dynamics will these infrastructures in turn generate? Covid illustrated that radically new tech-mediated practices are available, but also that the opportunity to make use of them is very unevenly distributed and that physical-material forms of interaction are persistent (Florida et al., 2021).

Commentators on digital, smart and platformed cities concur that as these technologies develop in urban spaces under neoliberal forms of governance, there is a shift from public to private control and management of infrastructure and urban space in general. A central question is who controls the data, and who writes the code that shapes urban flows and extracts value from urban economies (Kitchin, 2014; Söderström and Mermet, 2020)? How do these flows play into existing inequalities and differences in cities, that is, what are the new splintering effects? Guma (2019) argues, in the context of Nairobi, that platform urbanism strengthens the role of private enterprises, ignores local needs and networks and potentially fragments access to services. Alternatively, Odendaal (2022: 22) argues that platforms are vulnerable to ‘insurgent practices’ and ‘allow for context-specific problem solving and mobilization’. In any case, little of this work is on freight logistics specifically, so there are additional

uncertainties in how these dynamics translate into the movement of goods.

In terms of physical land use and built form, we may be witnessing a reversal of the suburbanisation of logistics operations taking place some years ago (Hesse, 2016), and instead see a greater degree of localisation of logistics operations driven by consumer demand for immediacy, facilitated by flexible networks of start-ups and agile companies (Buldeo Rai et al., 2022). Urban planners may struggle to adapt, as the delivery routes and terminal locations alter, and retail in physical stores changes (Dablanc, 2007). The relationship between producer and consumer might be less mediated by the physical retail stores, which in turn disrupts the production of urban space.

The turn to logistics 4.0 (Winkelhaus and Grosse, 2020) points to how logistics operations are increasingly being intertwined with digital technologies and use of data across the entire value chain. As such, the lines between virtual space and the physical urban space get blurred, thus contributing to the rise of algorithmic governance in cities (Rodrigues, 2016). Digitalisation and algorithmic governance have already emerged as a matter of concern for cities, as these require renegotiation of the relationship between state and various private interests and politicises the access to, and interpretation of, related data for deciding on public space allocation (Docherty et al., 2018). How will local planners and decision-makers continue to work strategically to attract particular types of retail business to particular locations in order to shape urban space in public interest, when this retail business is replaced by algorithm-driven commerce controlled by distant and de-contextualised platform-based enterprises?

If code is indeed the new concrete, then who writes and controls this code matters a great deal for cities. However, in cities real concrete still exists. Algorithmic power is

necessarily mutually constituted with the more physically tangible materialities of urban space. So while we take seriously these new disruptive forces in freight logistics in the city, the key question is how they co-evolve with other types of urban infrastructures to shape urban futures.

Justice in the networks of urban freight logistics

Stephen Goldsmith, former deputy mayor of New York City, has suggested, with Neil Kleiman, that ‘cities should act more like Amazon to serve their citizens’ (Goldsmith and Kleiman, 2018: np). They suggest that the seamless and friction-free experience of the ideal Amazon delivery should be the model for how cities deliver services to their citizens. The image of Amazon-like governance of cities, and this reframing of citizens as consumers of public services, may bring quite different connotations to critical urban scholars (see Graham et al., 2019), and actually illustrate the profound justice implications of how logistics networks are managed. This phenomenon may also illustrate how the concentration of transactions through singular platforms enable an enormous extraction of control and wealth. The seamlessness is arguably a result of an effort to conceal the actual frictions, in terms of extraction, resources, labour and emissions, that go into producing the moment when an Amazon package is delivered at the doorstep of an urban resident.

There is need for urban critical scholarship in revealing the injustices and struggles along the commodity chains of urban freight logistics. There are multiple dimensions to this. Digitalisation and platformism appear closely linked to the ‘gig’ organisation of the economy and control of labour by means of digital technology with potentially detrimental effects for workers and organised labour. Moody (1997) has long documented the

effects of lean management on labour. Digitalisation and platformisation have further added to the workplace demands, fragmentation and individualisation of conditions for workers. Gig labour is 'typically short, temporary, precarious and unpredictable' (Woodcock and Graham, 2019: 9). Many of the delivery platforms are based on such gig labour, since their 'employees' are actually independent contractors without the worker protection, benefits or ability to organise enjoyed by most hired workers. This means that additional costs and risks associated with deliveries are offset to the worker (Lord et al., 2023). This has resulted in court battles in many countries, as well as efforts by unions to get contractors organised and granted status as employees. For critical studies of urban logistics, it is relevant to assess the extent to which logistics operations are underpinned by forms of organisation that exploit workers and undermine the powerbases of organised labour.

Urban scholarship can also unravel this idea of logistics as a friction-free experience by examining the broader commodity chains and metabolic processes through which goods delivered on the doorstep of an urban resident are produced. To fully comprehend the justice implications of urban logistics it is necessary to move beyond 'methodological cityism' (Angelo and Wachsmuth, 2015), and recognise that urban points of consumption are nodes in complex chains of commodities spanning the globe. This framing implicates, for example, resource extraction, child labour and environmental degradation in the Global South, as well as embedded carbon, into the products consumed in the metropolises of the world. Urban scholars can contest this narrative of friction-free delivery and foreground the flows and chains enabling urban logistics.

There are myriad other justice implications in emerging urban logistics systems –

new forms of urban spatial inequalities and gentrification, access and control over data and lack of democratic control are some. Our point is that urban logistics needs urban scholarship, and vice versa. Within this sector are, we would argue, fundamental urban justice questions for the future.

New pathways for urban logistics sustainability transitions

Sustainability appears to be a key driver of change in urban logistics, at least at a strategic or rhetorical level. The question is whether the industrial strategies to respond to the sustainability imperative actually produce transformative change towards sustainability in urban systems. Much of the existing research literature, and known industry strategies, focus on sustainability as making the delivery systems more efficient, shifting to electric vehicles, consolidating deliveries in fewer vehicles and using micro-depots (Strale, 2019) while planning and governance perspectives add emphasis on land-use and pollution (Cui et al., 2015; Lindholm and Blinge, 2014). In the literature there is a widespread assumption that these technologically driven innovations will create greener urban logistics systems. For urban studies, however, it is important to adopt a broader and more systemic perspective on the pathways to sustainability of urban freight logistics.

In such a broad perspective, some of the sustainability assumptions of the logistics sector might be questioned. Making logistics operations more efficient and electric may be profitable and relatively simple interventions from the perspective of the industry, but may actually increase the flow of goods and the number of deliveries and in turn generate more traffic and put additional strain on urban infrastructures. For example, delivery workers have, partly in order to meet higher demands of effectiveness, started using

electric scooters, which use more energy and appliance waste (Lord et al., 2023), and generate significant conflict with people using softer (and more sustainable) forms of mobility (Sareen et al., 2021).

New logistics services are also predicated on ever-growing demand and on stimulating that demand further, without questioning the underlying scarcities of resources and urban space. The rise of individual deliveries and gig economy of logistics is actually driving increased consumption, energy use and waste generation. As McLeod and Curtis (2020) suggest, we need to ask questions of how and why freight trips are generated, and what proactive planning and policy approaches can change the way we consume and move goods in the city. Since demand for delivery is derived demand, reduced need for the movement of goods in cities means that we must also question more fundamentally the patterns of consumption in cities and the broader systemic transformations that are necessary (Aurigi and Odendaal, 2021).

Work on sustainable urban mobility seems to have progressed significantly further than the more limited sustainability perspectives in urban logistics. Organisation of logistics is still thought of in individualised terms (with consolidation centres possibly as a lone exception), while mobility thinking abounds with real and imagined models of public forms of organisation, sharing and commoning (Nikolaeva et al., 2019). But cities and municipalities are increasingly extending the scope of their planning mechanisms to freight logistics (Shrestha and Haarstad, 2023). This may enable public and democratic forces, to a greater extent, to align developments in the sector with public interest. What alternative models for public and shared urban logistics organisations are possible? How do we 'common' urban logistics? This could involve forced consolidation of deliveries, zero-emission zones in cities, a minimum number of

deliveries per trip or other measures we have yet to imagine. The platform organisation of logistics services may perhaps also open up for various forms of 'crowd logistics' (Lord et al., 2023), where deliveries can be integrated with the daily movements of people – can we imagine ride sharing for packages? There is ample conceptual work here in sharing, debating and critiquing emergent models for enrolling urban logistics in urban sustainability transitions.

Conclusions

With this paper we hope to convince scholars of urban studies of the importance of drawing urban freight logistics into analyses of cities and urban change. It is sorely needed, because most of the existing work on this sector is limited by a technical-rational model, which considerably constrains the analytical imagination. After discussing this literature, we situated urban logistics in social and political processes of urban change. Our aim here was to illustrate that freight logistics is deeply implicated in areas that urban scholars are already interested in and relevant to approaches they use to understand those areas – such as the politics of urban infrastructure, environmental and spatial justice, gentrification, urban metabolism, smart urbanism, anticipatory governance, among others (Angelo and Wachsmuth, 2015; Anguelovski et al., 2019; Broto et al., 2012; Kitchin, 2014; McFarlane and Rutherford, 2008).

Most important, of course, is how urban logistics is enrolled in thinking, research and analysis on urban transformations in the future. We argue that with ongoing processes of transformation affecting cities, urban logistics will play an even larger role in processes of urban change. Urban scholars have a critical role to play here, and we have suggested three lines of inquiry in which urban scholarship can contribute

important analyses. Obviously, these are not exhaustive.

Beyond these specific areas, our general assertion is that the system of urban logistics, with its various technologies, practices, discourses, resource flows and infrastructures, constitutes an overlooked element of urban systems. It does not operate in abstract space but is mutually constituted with wider urban systems (Cui et al., 2015). Any attempt at urban sustainability transformations needs to account for the organised movement of things. Material flows are constitutive of urban space, and vice versa. It is up to urban scholars to make evident the links to the issues that we have competence and interest to say something about, namely issues of power, justice and politics in urban transformations. While others labour to make freight logistics as smooth and hidden as possible in urban space, it is arguably the task of critical urban studies to do the opposite. We should unmask the tensions and frictions that the movement of things generate. Our contribution to the anticipatory governance of this sector can be to make clear that these frictions cannot simply be avoided – increasing consumption and higher expectations of timely and convenient deliveries to growing number of urban residents have significant political and social implications.

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