

REVIEW

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A semi-systematic literature review, identifying research opportunities for more sustainable, receiver-led inbound urban logistics flows to large higher education institutions

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Abstract

Summary: This paper reports a semi-systematic literature review, identifying research opportunities for more sustainable, receiver-led, inbound logistics flows to large Higher Education Institutions (HEIs).

Methods: The literature - a body of 229 works - was reviewed using online scholarly databases: the NOVELOG toolkit database; a CASP checklist; followed by re-reading of the refined set of works. A two-stage approach was deployed: first scoping, using a semi-systematic approach, then a narrative review, guided by the systematic review in terms of literature survey and selection.

Findings: The field was found to be emergent, with 77% of all articles published after 2011. Key concepts were identified and grouped as recurring, or with noticeable gaps - and therefore suitable for further research. The key gaps identified as worthy of note at this stage were: urban freight and procurement activity; private purchasing behaviour; HEIs and freight; barriers to sustainable procurement; engaging with Action Research in purchasing and supply chain management; little or no theory development; and the use of electric vehicles (EVs) in freight.

Keywords: Urban freight, Logistics, Literature review, Sustainability, Procurement, Higher education institutions

1 Introduction and context

This review supported action research to explore sustainable solutions on the campus of Newcastle University, in the North East of England with a geospatially and economic significance in the centre of this medium city. The presence of freight delivery vehicles had generated a steady flow of complaints from senior management, pressuring the Estates and Purchasing functions. It was suggested there was a high proportion of freight on campus, with frequent complaints from senior management to Purchasing and Estates staff with regard to vehicle intrusion [137, 138].

The increased demand for distribution of goods and services in cities ('urban freight logistics') and solutions to the dis-benefits generated ('city logistics') are forecast to continue to grow through the twenty-first century, due to increasing urbanisation, income growth, and fragmentation of supply chains. Urbanisation was rising globally, with Europe the most urbanised continent, and the greatest rates of growth predicted to 2050 in Asia and Africa [124].

A fragmentation of logistics at the last mile delivery has been evident, both globally and locally, as smaller vehicles delivered smaller consignments of lower value, higher density goods [28]. The causes of this fragmentation were yet to be fully understood, including: rising home deliveries; on-line shopping; continued

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independent retailers in urban cores; regulations on time, vehicle size or type; reduction of storage; just-in-time principles; and replacement of working capital with transport response [85].

The inefficient use of resources has impacted on economic viability, since the cost of last mile deliveries could contribute anywhere between 13% and 75% of the total logistics costs, with research suggesting a norm of 40–50% for parcel deliveries [55, 98]. Costs could be generated by the low load utilisation of urban freight vehicles, partially due to market demand, restrictive regulation, and lack of co-operation in a free market [91, 126].

The social effects of urban distribution have been potentially lower than expected: delivery vehicles made up between 10% and 18% [51, 131] of urban road traffic and in general tended to avoid peak times. There were few noticeable social equity issues, although some recent research into US metropolitan areas had suggested traffic congestion growth negatively affected growth in income and employment [71]. Freight traffic was, however, highly unpopular with the public in the UK, who considered it of the lowest priority in terms of road use [118] and saw a growing issue of safety conflict between cyclists and trucks (Steer Davies [116]).

The environmental impact of freight distribution in cities has been observed as disproportionate to the number of vehicles: 20–30% of road-based emissions were related to freight and, with regard to air quality, freight could account for up to 50% of pollutants. Diesel was the predominant freight fuel and therefore the major contributor to nitrogen oxide pollutants (NO_x) and particulate matter (PM) - the main causes of poor air quality.

The Urban Freight Research Roadmap 2014, developed by two European Technology Platforms (ETP),¹ noted: “Therefore, a holistic approach should be followed to understand what can be done upstream to the supply chain to optimise urban logistics. But the peculiarities of cities and the differences [...] also call for a focus on the urban logistics itself. Different business models, new processes and technologies should be researched and implemented.” [7].

Urban freight transport has been seen as notoriously ‘difficult to organize, difficult to modernize’ [45], and was a classic ‘mess’ in systems approaches terminology [1]. Work had tended to focus on the transport chain, on regulation and on the technology of the operations. As a result of abductive insight, and the ground-breaking work of the TRAILBLAZER [127] project, I started exploring the role of receiver-led inbound logistics in 2011 [133], the activity as a supply chain that was

demand-led the inversion from ‘value chain’ to ‘supply chain’ championed by Martin Christopher [38].

I have detailed the local problem, the problems of urbanisation, logistics fragmentation, the challenges to sustainability and the abductive insight to address receiver-led inbound logistics. As a member of staff at a Higher Education Establishment I have completed cycles of logistics action research as an insider [41] and have adopted the lens of such establishments. I have, since 2011, actioned iterative cycles of literature review into this niche. For this iteration I wanted to adopt methodologies aiding a critical review of the opportunities and gaps in the literature.

As detailed in this paper there is a knowledge gap in receiver demand led research in the field of urban logistics and the purpose of my work and this paper is to scope that gap over time and explore areas for future research. The novelty of this work is exploratory in an area of knowledge previously unexplored and poorly scoped, deploying tailored literature review methods to a new area of enquiry.

2 Literature review methodologies

Literature reviews are utilised to help build knowledge, identify gaps, and to draw out concepts to frame a field so as to inform research questions and judge research outcomes. Most literature reviews in social sciences are ‘narrative’ reviews, developing an overview of a field through a reasonably comprehensive assessment and critical reading of the literature. An alternative approach, originating in medicine and traditional sciences is the ‘systematic’ review. This applies a transparent, replicable and often quantitative methodology to literature identification and review. In some highly quantitative fields, a researcher may adopt a meta-analysis, extrapolating and synthesizing results from multiple papers.

2.1 Review protocol

The use of fully or partial systematic literature reviews in operations management, transport and logistics research has increased in recent years [8, 56, 97, 105, 121].

The Critical Appraisal Skills Program (CASP) has developed methodologies for systematic and critical reviews of literature since 1993 [35]. With roots in UK healthcare it is not tied to any discipline and has been deployed for qualitative as well as quantitative sources [34]. The approach, which acts as an inclusion/exclusion protocol is viewed as rigorous but flexible and has in recent years been adopted by operations and transport researchers in both systematic and semi-systematic reviews [33].

It has been noted that a weakness of literature reviews in the field of transport, was the lack of explicit methodology [130]. To mitigate this, I adopted a “semi-

¹ERTRAC, the European Road Transport Research Advisory Council, and ALICE, Alliance for Logistics

systematic review". This is a review guided by a systematic review in terms of literature survey and selection ([31], pp. 98–112), combined with “framing a written discourse about the literature which may be established as a component part of a thesis or other research” [30].

This allowed an emphasis on such features as transparency about searching, and the potential for comprehensiveness. These “systematic” protocols, CASP for this review have been evidenced in the use explicit questions replicable research search procedures.

The narrative phase of the review allowed for a “plurality of knowing [40]” and insight from reading and understanding This addresses the suggestions that a metric driven meta-analysis is not appropriate for transport-based literature reviews, due to the “fact that many variables influence an independent variable (e.g. travel behaviour) in a complex way, resulting in complex causal relationships, and a multitude of data analysis methods and interpretations” [130].

I finalised the review with a framing using a socio-technical approach of ‘why, who, with what, where and when and how’ (5 W + h) which localised problems and solutions [135, 140] into an ensemble of actors, territory and techniques, chosen as specifically developed for this field.

The protocol adopted are shown graphically, as a flow-chart, in Fig. 1 below.

Having developed this protocol, I proceeded to delimit the first searches, scoping the review.

3 Scoping of the review

Based upon the local problems and the broader challenges, the review was tightly scoped to addressing sustainable, receiver-led inbound logistics flows to large Higher Education Institutions (HEI). Herr and Anderson note that “there is a conceptual framework that guides the data gathering and analysis as well as conceptual framework embedded in one’s particular approach to ... research. The former is guided by the literature that has been reviewed and the latter by the knowledge interests of the research itself” [64]. The scope was therefore delimited as follows²:

- Impacts that large municipal organisations have on cities, in terms of wealth creation, jobs, person and freight related trip making.
- Ways the operational models associated with goods and service supply to large municipal organisations are centralised and decentralised services

- The ways in which procurement systems operate across municipal organisations with large numbers of department.
- The ways in which supply chains serving large municipals have been made more sustainable, including collaborative logistics techniques (to include consolidation) as well as smart procurement.
- The utilisation of delivery service planning for receivers.
- The potential for typologies, taxonomies or conceptualisation in the field that would inform the development of the framing of work in the field.

It was intended that these ‘first pass’ topics would eventually be superseded by the iterative development of concepts of note as the narrative elements of the review became dominant and the systematic elements receded.

4 Process and results of systematic review

The first steps of the review resulted in various results, detailed in execution and interim findings as follows.

4.1 Top level scoping

Explicit searches were run to report the overall range and depth of literature in this top-level field. This was completed using WEB OF SCIENCE [WOS]³ Google Scholar [GS] and the EU Transport Research and Innovation Monitoring and Information System [TRIM IS⁴] databases.

A large proportion of non-peer reviewed literature existed in this field, often from research projects in the form of reports and other deliverables. Bryman called this ‘grey’ literature - of great value in many fields of research into people and systems. To enable a semi-systematic review of such materials, I utilised research outputs catalogued within the NOVELOG toolkit⁵ [135]. Since research and innovation projects and interventions had preceded academic publication in this field, this database provided a comprehensive *but* parallel inventory for the grey literature review process.

4.2 Top level results

The field in which the review was carried out, and renewed many times, lay in the enquiry into and about the movement of freight goods and derived vehicle demand in cities. Initial reading and personal insight had revealed this to be variously defined as ‘urban logistics’, ‘city logistics’, and also ‘urban freight’. Searching for (“urban freight” or “urban logistics” or “city logistics”) in

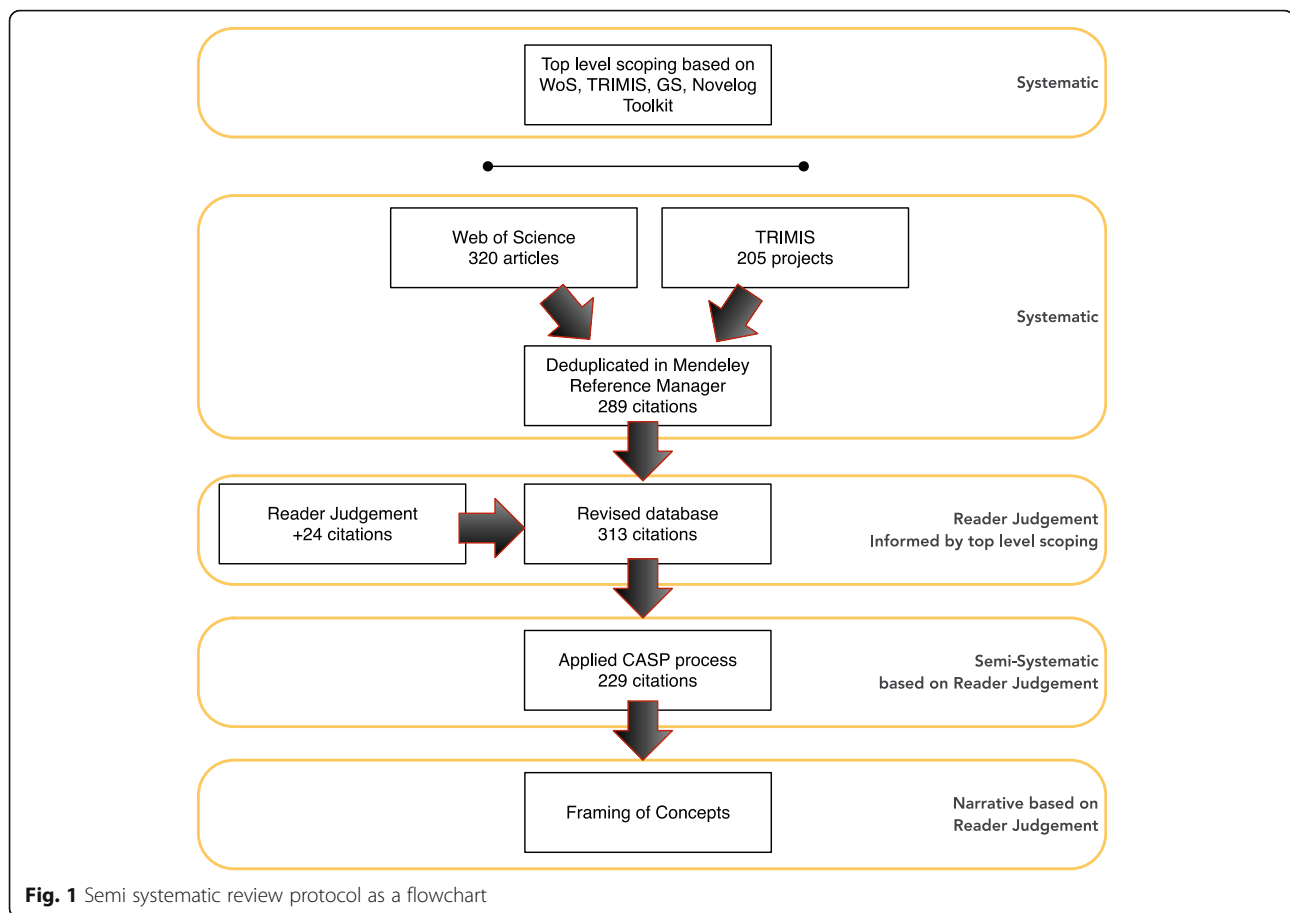
²Of note is that all literature reviews, especially those guided by systematic selection have to be quite tightly focused. The search criteria excluded exploration of alternative propulsion technologies for transport but included the use of electric vehicles in freight.

³apps.webofknowledge.com

⁴<https://trimis.ec.europa.eu>

⁵<http://www.uct.imet.gr/Novelog-Tools/Toolkit>

⁶Search from 1970 to 2018, search terms applied to all fields.



the WOS reported 1248 records as at 30/11/2018.⁶ The papers were published in fields largely related to transport, management, urban studies and environmental studies. It was apparent that this field was novel, and, over recent years, the number of publication and citations had risen sharply: suggestive of a field of research emergent in academic research.

Publication dates offered further evidence that this was a newly emergent area of publication, with 77% of all articles published after 2011, 59% of the publications were conference proceedings and 41% were peer-reviewed articles. These were followed up by a focused series of searches.

4.3 Focused searches

Focused searching followed using keywords and search terms *developed further* from the core research questions and the top-level scoping. This subset of the literature was then examined against an inclusion/exclusion list. These focused searches formed the body of work for the next step, which was a narrative review of the key literature. These focused searches covering the timespan

1970–2018. This approach was applied to each of the topics identified above, as shown in Table 1 below:

5 Grey literature

The grey literature focused review was firstly based on the projects recorded in the NOVELOG database, then investigated further, primarily on GS as more suited to finding non peer-reviewed reports, handbooks, and other grey literature. Reading and judgement of the key deliverables drew attention to certain key *bibliographic* projects, listed in Table 2 below, focused on good practice collection, taxonomy and conceptualisation of the field.

Of the original 289 items found, and after consideration of the wider field and certain key items of grey literature from UK and EU projects, additional works were added - primarily reflecting the top authorship in the field and personal expert knowledge, leaving a final review bibliography [136] of 313 articles, reports and documents as recorded above in Fig. 1. Once completed, the CASP systematic review protocol was applied.

6 CASP inclusion/exclusion process

The articles and grey literature were imported as documents and citations⁷ into the Mendeley reference

⁶Search from 1970 to 2018, search terms applied to all fields.

Table 1 Topic search terms

Review topic	Explicit search terms	WOS Results ^a	TRIMIS ^b Results	GS
Impacts that large municipal organisations have on cities, in terms of wealth creation, jobs, person and freight related trip making.	("urban freight" or "urban logistics" or "city logistics") AND ("municipal")	22	31	466
Ways the operational models associated with goods and service supply to large municipal organisations are centralised and decentralised services	("urban freight" or "urban logistics" or "city logistics") AND ("operational model")	63	79	37
The ways in which procurement systems operate across municipal organisations with large numbers of department.	("procurement" or "purchasing") AND ("systems") AND ("municipal")	74	44	>35k ^c
The ways in which supply chains serving large municipals have been made more sustainable, including collaborative logistics techniques (to include consolidation) as well as smart procurement.	("collaborative logistics") AND ("procurement")	28	0	533
The utilisation of delivery service planning for receivers ^d	"urban freight" or "urban logistics" or "city logistics" and "delivery service"	16	0	8
The potential for typologies, taxonomies or conceptualisation in the field that would inform the development of the framing of work in the field.	("urban freight" or "urban logistics" or "city logistics") AND ("taxonomy" or "typology" or "concept")	117	51	23

^aWOS searches were always TOPIC searches

^bEU funded research projects

^cToo high a response and excluded

^dAdded later as a conscious cross check after earlier iterations of the review cycle

manager. The resulting database was deduplicated and then filtered through the inclusion/exclusion protocol. A source had to receive a 'YES' in all boxes of the CASP checklist, following reading and reader judgement, as detailed in Table 3 below.

Works that explored theoretical and conceptual matters were given greater qualitative weighting in assessment for question A2 (above in Table 3). Works which were largely empirical were likely to be excluded at A2, or at question C8 (ibid) with minimal contribution to knowledge and theory. Following application of the CASP, the number of works was reduced from 313 to 229 from which I drew out the concepts to construct and narrate a framing.

7 Concepts

The concepts identified were organised into a conceptual framing, to support action research to address the local problems. A secondary purpose was to support further research by the academy in this emergent field. Table 4 below shows the year in which these concepts first emerge in the peer reviewed literature.

Framing in action research [112] iterative and dynamic developed from but replacing original delimitations. This section is a narrative report, concepts grouped by commonality, identifying key opportunities and gaps.

7.1 Co-operative intelligent transport systems (C-ITS)

C-ITS is the utilisation of Intelligent Transport Systems (ITS) and new Information and Communication Technology (ICT) apps and infrastructures to leverage vehicle

to vehicle, vehicle to infrastructure, and vehicle to human communications [110]. The theme of urban freight and C-ITS was emergent in the literature, but immature compared to the literature on C-ITS for private and public transport.

7.2 Timed delivery-window modelling

The literature had a lot of Japanese research outputs on timed delivery-window modelling, associated primarily with the research team around Taniguchi [119, 120]. That work was associated with the repurposing of traffic and network modelling at a very computational level. Taniguchi was one of the pioneers of city logistics research and was the highest output author in the top-level scoping.

7.3 Logistics sprawl and Modelling of distribution hub locations

Logistics sprawl was seen by researchers as the relocation of logistics facilities away from inner urban areas to suburban areas and had received an increasing level of attention from both academics and policy makers. The potential disbenefits of extending the last mile operation of an urban delivery route was exacerbated by sprawl and was inter-related to how land use planning and zoning of use varied between urban areas. Dablanc was the key foundational researcher in this field, working in both North America and Europe [47, 48]. Her work had then led to a growing body of quantitative and geo-spatial analysis from others [8, 63].

The modelling of distribution hub locations, and the balance between too close and too far away, was key to much grey and peer-reviewed literature; this had resulted in work - often led by Leonardi et al. - on the

⁷All databases had electronic file export facilities, Mendeley had a search function to locate the electronic sources.

Table 2 Key Bibliographic Projects on Grey Literature

Project Name(s)	Source
Co-gistics 2014–2017	[52,110]
CIVITAS urban freight initiatives 2002-present	[108].
The Smartfusion 2012–205 and STRAIGHTSOL 2011–2014 projects	[20,70,86]
SUGAR 2009–2011, BESTUFS 2003–2008, BESTFACT 2012–2016 etc.	[13,46,69]
NOVELOG 2015–2018	[4].
TURBLOG 2013–2014	[123].
Trailblazer 2010–2013	[127]

analysis, evaluation and optimisation of the break-point between the initial ‘stem’ delivery leg to a city and the ‘leaf’ delivery leg of routing [11, 68, 77, 82].

7.4 Freight landscape was peculiar to each location and time

A recurring concept was that a freight landscape was peculiar to each location and time [9, 79, 80]. Rodrigue et al. had noted that “Results from New York, Los Angeles, Paris and Seoul reveal substantial variations between metropolitan areas, which are observed across the respective levels of zonal specialization as well as density changes over distance from central areas” [107]. Giuliano et al. found that, when trialled in Los Angeles, using proxies to describe the metropolitan freight landscape was of utility [57].

Land use and zoning establishment surveys were key for North American research reported in the literature. Considered to be highly dependent on the data collected in a nation or city, these tended to yield useful analysis in the USA, but were problematic in the UK and elsewhere in Europe [66, 68] due to far less stringent zoning and less rich data collection or homogeneity. This was related to freight trip generation and/or attraction, in that the attraction of freight by receivers may have been more relevant to urban logistics than traditional trip generation models [3, 66, 127].

7.5 Multi-stakeholder nature of urban freight

The multi-stakeholder nature of urban freight, and the concomitant need for co-operation and collaboration, was recurrent: “A key characteristic of it is the heterogeneity of the stakeholders involved. Besides the traditional logistics actors such as shippers, carriers and receivers that share consistent interests (i.e. price and quality), city logistics highly respect the interests of public administrators and citizens that care more about the social welfare. To reach an optimal balance between private and public benefit, it is necessary to understand and in turn forecast the behaviour pattern of different groups” [15].

This need for co-operation led to the development and deployment of Freight Quality Partnerships in the UK [9, 42], and in Sweden [80], and was related to similar co-operation platforms such as “Marchandises en Ville” in France [44] and the Dutch “Platform Stedelijke Distributie” [61]. This concept of Freight Quality Partnerships - in which all key stakeholders in freight transport in a city or transport corridor met collectively to mutually solve problems, although not widely deployed outside of these examples - was emergent across the literature over time [72, 73].

A clear theme of the literature was that city logistics and urban freight was “difficult to organize, difficult to modernize” [45, 95]. This was due to local peculiarity in both place and time; the disconnect between disbenefits

Table 3 CASP list for inclusion/exclusion adapted from [35]

CASP inclusion/exclusion protocol for literature review	Yes	No	Can't tell
A: Screening question: Does this work address a clear question?			
1 Does this work address a clearly focused issue?			
a A clear statement of the aims of the research?			
b Have an appropriate study design?			
2 Is the work relevant to the research questions and the purposes of the literature review?			
B: Are the results of the study valid?			
3 Does the work clearly explain it's research methods?			
4 Does the work clearly explain it's data collection?			
5 Does the work elaborate concepts or theory in a meaningful fashion?			
C: How are the results?			
6 Are the results of the work explicit and easy to understand?			
7 Is the work and the conclusions sufficiently presented to support descriptive findings?			
8 Does the work add to the knowledge or theory in the field?			
9 Are the results important in practice?			

Table 4 Synopsis of concepts and the key years of emergence

Concept	Year of emergence
Urban consolidation centres (UCC)	1978
Time delivery window modelling	2000
Distribution hub locations	2002
Little or no theory development	2003
Use of rail, light rail or trams for freight delivery	2004
Evaluation frameworks	2004
Data standards	2004
Poor selection of location	2005
Multi-stakeholder	2005
'Why, who, with what, where and when'	2005
'Out of hours' or as 'night delivery'	2005
"Difficult to organize, difficult to modernize"	2007
Barriers to sustainable procurement	2009
Poor ex ante and ex post data collection	2010
Long term financial viability	2010
Logistics sprawl	2010
Freight trip generation and/or attraction	2010
Delivery and servicing plans (DSP)	2010
Recognition of need for viable business models	2011
Land use, zoning	2011
Controlled environments	2011
Urban freight and procurement activity	2012
EVs in freight	2012
Non-traditional approaches to consolidation	2012
Bicycles or e-bikes for cargo	2012
'Stem' and 'leaf' delivery legs	2012
Need for co-operation and collaboration	2013
Freight quality partnerships (FQPs)	2013
Typologies, taxonomies, frameworks	2014
Private purchasing behaviour	2014
HEIs	2015
Freight & C-ITS	2016
Engagement with Action Research in purchasing and supply chain management	2016
Walking as a delivery mode	2017

and the paying client; and the disruption of efficient supply chains, with the loss of time and increase in costs.

7.6 Urban consolidation Centres (UCC) and non-traditional approaches to consolidation

Urban Consolidation Centres (UCC) were a key theme of research and intervention. An Urban Consolidation Centre were defined as a logistics facility that was situated in relatively close proximity to the area that it served. Goods destined for this area were dropped off at the UCC and sorted and consolidated onto goods

vehicles (sometimes low emission vehicles) for delivery to final destination. This was clearly differentiated from an Urban Distribution Centre (UDC), which had a wider definition and included all typical commercial logistics hubs in urban locations [10, 114].

One of the first explorations of this concept in the literature was Schuster, from *Traffic Quarterly* [111]. The concept had become highly popular in the 1990s, in Germany, as part of a drive for an integrated 'city logistics' top-down approach to freight traffic management, by local government; over 80 such schemes were noted

in the trade magazine ‘Logistik Heute’, in mid-decade. All were eventually cancelled, usually due to financial non-viability [53, 54].

The widescale failure of UCCs in Germany had not prevented the concept being promoted at EU level, with multiple schemes (e.g. La Rochelle; Bristol-Broadmead) funded by EU research and development programmes, inter-regional funding etc. [74, 132]. Almost all of these had proved unsuccessful due to three key issues summarised by Martinez et al.: [lack of] Long-term financial viability; Poor selection of location; and Controlled environments [89].

Zunder [132] went further and contended that “most UCC initiatives fail in a liberal economy where free choice and market economics apply”. Despite a list of failed schemes, a few pilots - subsidized by EU or local funding – were held up as beacons to the viability of the UCC [132].

These could be divided into three key types:

- Retail-led UCCs serving whole urban areas;
- UCCs serving a controlled geography; and
- Construction project UCCs.

There had also been trials and discussions of non-traditional approaches to consolidation, such as mobile consolidation centres [125], or virtual consolidation centres (where the consolidation was achieved through pre-planned procurement rather than any physical location [126]), or the use of crowd logistics [32].

At many points in the review there were many comments about poor ‘ex ante and ex post’ data collection [60, 75] and the poor quality and homogeneity of data standards across nations and cities [11, 14]. Worthy of note was that circa one third of all UCCs originally identified in 2005 had left no discernible data for analysis [27].

7.7 Alternative delivery methods

There was a significant body of work researching, analysing and modelling the use of rail, light rail, or trams, for freight delivery in urban areas. This work explored technical, operational and timetabling issues. The potential for such modal shift of freight to urban rail systems had divided opinion, require existing rail infrastructure and, would need significant infrastructure investment. Examples included the Dresden cargo tram, the Zurich recycling tram, and the short-lived Amsterdam cargo tram. The Dresden example was probably an extended ‘conveyor belt’ between separated assembly lines at Volkswagen; the Zurich recycling tram was a novel use of infrastructure for regular but non time-critical large item recycling; and the Amsterdam example failed due to the lack of a viable business model [19, 22, 29, 81, 94, 99, 106, 113].

Little of the peer-reviewed literature was on the use of EVs in freight, although a tranche of EU funded projects launched from 2012 provided grey literature on this theme, such as the FREILOT and Smartfusion projects [58, 76, 83]. Lebeau et al. developed a ‘total cost of ownership’ model to assess the competitiveness of quadricycles and light commercial vehicles for freight transport companies [75]. Herron and Coleman evaluated the volumes of EV chargers required for a certain volume of vehicles [65]. Leonardi et al. delivered many cost-benefit analyses of urban logistics schemes, using diesel, electric and cycle vehicle solutions, as did the STRAIGHTSOL project [18, 77]. For those looking for a recent review of the literature on novel alternative propulsion I suggest Oliveira et al. [97] which fell outside the scoping of this piece of research.

The use of bicycles or e-bikes for cargo delivery was well represented in the literature [62, 93]. Of note were issues of safely sharing the roads with freight vehicles [17, 100]; health and social insurance issues [87]; scheduling into existing logistics networks [17]; and the opportunity for services such as Gnewt cycles to replace the last mile in London [12]. This also related to the use of walking as a delivery mode, which was researched quantitatively in London and shown to constitute circa 62% of inner London delivery rounds for parcel carriers [12].

7.8 Typologies, taxonomies, and frameworks

There was an emergent concept of the proposal and development of typologies, taxonomies, and frameworks [16, 23, 49]. This was evidenced early with the socio-technical approach of ‘why, who, with what, where and when’ which localised problems and solutions [140] into an ensemble of actors, territory and techniques. This was due to local peculiarity in both place and time, the disconnect between disbenefits and the paying client, and the disruption of efficient supply chains with the loss of time and increase in costs.

A significant development was the ‘4 As’ concept of ‘Awareness, Avoidance, Act and shift, and Anticipation’ of new technologies, by Macharis and Kin [85]. An alternative approach was taken in pragmatically repurposing taxonomies and typologies from research and EU initiatives into a novel, multi-dimensional, poly-parametric typology for city logistics, which had multiple uses in analysing and selecting interventions [135].

7.9 Business models

Recognition of the need for viable business models was evidenced, to allow transition between subsidised pilot trials to standalone viable solutions, as was a growing interest in the use of different business model frameworks and the financing of urban logistics from public-private initiatives [PPI] [24, 59, 74, 78, 84, 101, 102, 109].

7.10 Out of hours deliveries

The potential to deliver goods ‘out of hours’ or as ‘night delivery’ was explored differently in the literature. In Manhattan, NY there were extensive trials of receiver-led early morning deliveries, offsetting higher labour costs in office staff against reductions in congestion costs [67]. In the Netherlands, the PIEK programme had taken a strongly mechanical engineering-led approach, re-engineering vehicles and handling equipment to prevent ‘peak noise’. To comply with the standard, each product was acoustically measured and had to function emitting under 60 dB at 7.5 m from the sound source; it was then deemed suitable for out-of-hours delivery that would not cause noise disturbance to nearby residents.

7.11 Receiver led inbound logistics

A key theme of import in the review was the use of delivery and servicing plans (DSP), an establishment-led approach to analysis of receiver-led demand, developed in the Trailblazer project [127], deployed by TfL in their Palestra offices [122], and then developed further in the Smartfusion and STRAIGHTSOL projects [6,101, 117, 138]. The DSP methodology formed part of the analyses that underlay the Southampton UHS consolidation centre initiatives [78, 89].

Further to DSPs the literature held very little on urban freight and procurement activity. There was a theme of emergent ideas and proposals for mandatory municipal freight consolidation in Swedish cities and the potential power of procurement to change inbound urban freight [5, 21, 25, 37, 103, 134]. Finally, in 2018, the Transport Catapult had recommended to the UK government that “Government and Local Authorities should ...[adopt]... measures such as retiming deliveries and collaborative procurement” [89].

There was little about exploring private purchasing behaviour, save for Cherrett et al. looking at student purchases and Aditjandra et al. looking at private purchasing by University staff [36, 134].

There was a small and emergent literature on HEIs and procurement behaviour, with or without reference to freight. The work in the literature was largely written by myself and colleagues in parallel with our wider interventions, and in collaboration with colleagues from the Amsterdam Academy of Sciences, as well as a top-level overview with the Universities of Southampton and others [3, 4, 21, 90, 104, 134, 139].

There was little discussion of logistics and sustainable procurement in the mainstream procurement journals [129], sustainable procurement and supply chain logistics, from Murphy and Poist [96]. This stated that procurement could “influence the behaviour of private sector organisations” to achieve “social, environmental (and other) benefits”. However, with regard to

organisational barriers, they noted unwillingness to accept higher invoiced costs as the key barrier to adoption [128]. Also of relevance was the action research work of Meehan, Ludbrook and Mason, on institutional explanations of legitimised resistance, and how “strategic avoidance responses” such as “symbolic tick-boxing” could “entrench operational barriers” [92].

7.12 Theory development

Little or no theory development was evident in the literature. With the possible exception of ‘logistics sprawl’, the field was largely empirical observation with a potential tendency to ‘naïve empiricism’ [92]. The field of logistics research as a whole was weak in the late 20th and early 21st centuries in two areas: theory and explicit discussion, and statement of research philosophies [2, 26, 115]. The inability to address ‘meta’ issues may explain the difficulty in both developing theory and also “that much of the debate and criticism over methodology involves researchers who are failing to communicate with one another because they hold varying basic assumptions about their subject” [88]. The gap was a need to develop theory and, given the import of locality noted in urban freight, probably theory from case study research [50].

From these groupings of concepts I made a provisional framing using the 5 W + H approach of Zunder & Delinger [140].

8 Framing

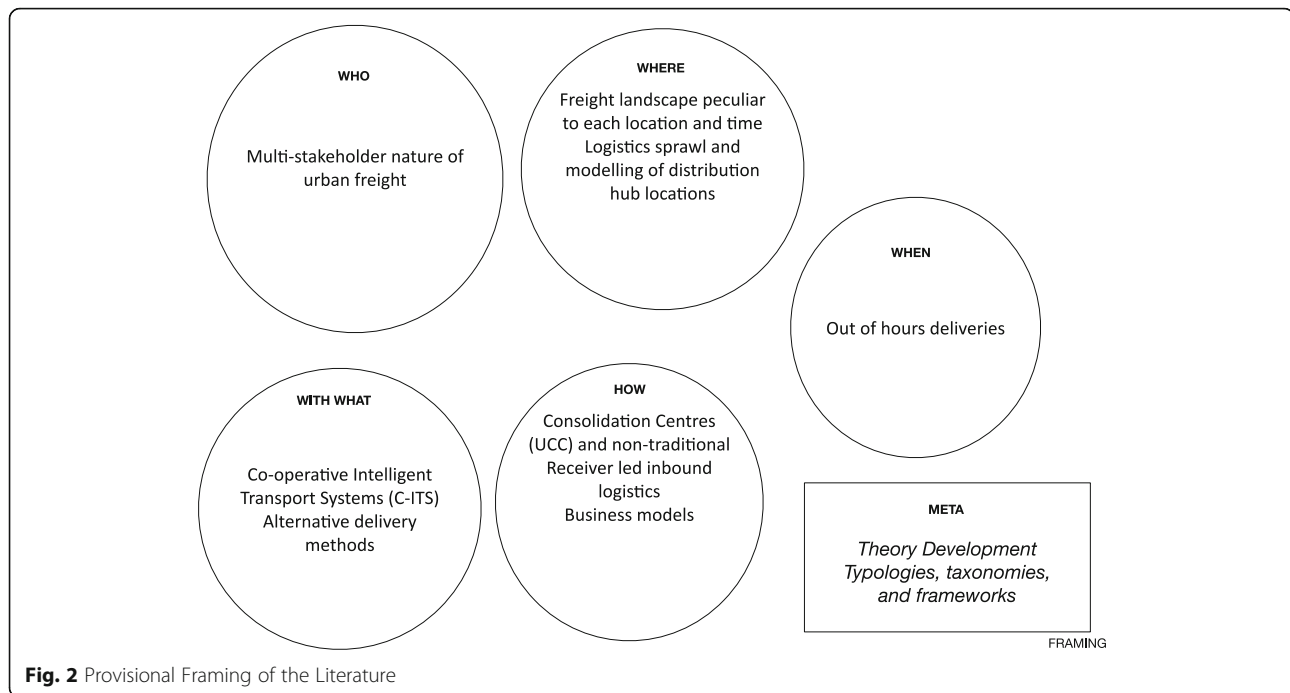
The framing is presented as a non-hierarchical representation of 5 W + H groups as portrayed in Fig. 2 below, no inference should be drawn from the relationships of the circles. A ‘meta’ group was required to frame such concepts, although one might use ‘with what’ for these.

9 Discussion

The key research gaps identified as worthy of note at this stage were: urban freight and procurement activity; private purchasing behaviour; HEIs and freight; barriers to sustainable procurement; engaging with Action Research in purchasing and supply chain management; little or no theory development in urban logistics; and the use of EVs in freight.

There may be additional potential wider gaps and opportunities that deserve further qualitative, quantitative or mixed methods research by others. Not least would be to explore the route that led to this sparsity of knowledge in a key sub set of logistics, and the interplay of different disciplines, commerce, industry, and innovation funding, for good or ill.

Of note is the breadth of grey literature in this field, and the delay between that material and the publication of peer reviewed literature. Given that much of the grey



reports are co-authored by academics, it suggests that the academy needs to plan this earlier work in a rigorous fashion, but also using methodological choices that align the applied work with academic publication, there are multiple versions of action research [39, 43] that would be appropriate and the literature review evidences this paucity.

10 Conclusion

In this paper I have detailed how a literature review added value by a conceptual framing of a niche urban freight logistics area within the wider research area into which it fitted. It has covered a semi-systematic literature review, identifying research opportunities for more sustainable, receiver-led inbound logistics flows to large Higher Education Institutions, along with existing and emergent evidence suggesting how the negative impacts of such activity could be mitigated. A two-stage approach was deployed, first scoping using a semi-systematic approach, then a narrative review, guided by the systematic review in terms of literature survey and selection.

The objective of this review was to identify research opportunities for more sustainable, receiver-led inbound logistics flows to large HEIs. I have evidenced that that was achieved and as a secondary added value have highlighted a range of potential options for further exploration and research. The field was found to be new, emergent, with 77% of all articles published after 2011. Using a mix of peer-reviewed and grey literature and a combination of online scholarly databases, the

NOVELOG toolkit database, the use of a CASP review, and framing using a suitable socio-technical framing, the literature - a body of 229 works - was reviewed and key concepts identified, grouped and those with noticeable gaps identified.

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Declarations

Competing interests

None.

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