**Reverse Logistics and Urban Logistics: Commonalities and opportunities for collaboration**

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**Abstract**: The aim of this paper is to provide a description of the processes related to urban logistics and reverse logistics and the relationships between them. Based on a review of the literature, some insights are provided regarding the challenges and opportunities for collaboration between reverse logistics and urban logistics, such as waste management and commercial returns. Additionally, some suggestions are made to improve the performance of these areas for academics and logistics professionals.

**Keywords**: reverse logistics; urban logistics; waste management; commercial returns.

**1. Introduction**

Reverse logistics has received a lot of attention in recent years, in both the academic field and the business world. This concept has evolved from a very basic approach related to the recycling of raw materials [1] to being considered such an important part of logistics activity, and the management of the supply chain in general, that this cannot be analysed without taking into account the return flows described in the field of reverse logistics [2]. The academic interest in reverse logistics can be seen from the upward trend in the number of papers, monographs and books published on this subject [3,4]. Moreover, from a business perspective it should be noted that increasing numbers of companies are incorporating reverse logistics practices into their regular activity [5]. In short, it can be argued that reverse logistics is one of the aspects that has contributed most to developing the study of logistics and the management of the supply chain in recent years [6].

Although a wide range of logistical problems and challenges have been addressed through the field of reverse logistics, to date urban logistics, as such, has not been one of them [7]. However, factors such as the growing population concentration in urban areas, traffic congestion, noise and atmospheric pollution and the growth of electronic commerce make it necessary to more efficiently and sustainably manage all the movements associated with the distribution of goods in our cities [8].

Despite the links between these two areas, as far as we know there is no detailed analysis in this regard. The main objective of this work is to describe the existing relationship between reverse logistics and urban logistics in order to identify opportunities for collaboration between them and take advantage of the knowledge generated in each discipline. The structure of this work is as follows: in the next section, the reverse logistics and urban logistics concepts are presented; next, the commonalities between these logistics areas are described; finally, the main conclusions are drawn, setting out a series of ideas on the main opportunities for collaboration between reverse logistics and urban logistics.

**2. Reverse Logistics and Urban Logistics**

**2.1. Reverse Logistics**

Making the most of the materials used and the presence of return flows in the production-distribution process, such as commercial returns, is nothing new. In this regard, various authors, [9–12], have highlighted the evolutionary process being experienced by this discipline: from the first contributions where an eminently technical approach dominated, to the most recent when a more strategic and holistic approach prevails [13]. Reverse logistics can be defined as “*the process of planning, implementing and controlling backward flows of raw materials, in process inventory, packaging and finished goods, from a manufacturing, distribution or use point, to a point of recovery or point of proper disposal*” [12].

However, this holistic and unifying approach finally won out in the 21st century and involves the explicit recognition of the joint existence of forward flows (producer-consumer) and reverse flows (consumer-producer). This is the source of the Closed-Loop Supply Chain concept that is defined as a supply chain where, in addition to the typical flows of materials from suppliers to customers, there are return flows of products (post-consumption or use) to the manufacturers [14].

In parallel to this growing academic interest in reverse logistics, business experiences have also been developed [3,4,15,16]. This interest in implementing reverse logistics systems can mainly be attributed to three factors: 1) obtaining competitive advantages, 2) environmental legislation and 3) stakeholders pressure [14,17,18].

Although Reverse logistics is a key factor in the development of the supply chain [6], there are significant challenges that still require special attention and further work [3,21]:

* Analysis of new opportunities relating to the return of products and the different options for their recovery: uncertainty associated with the recovery processes, consumer incentives to recover EOU products, cost structure of reverse flows, design of products to facilitate their recovery and the corresponding recovery networks [21–23].
* Development of marketing strategies for recovered products. Just as important as the issues regarding the recovery of EOU products are those relating to their proper marketing once they have been recovered [2,3,14,24].
* Development of specific legislation on the return of products in certain contexts: Extended Producer Responsibility principle, design for the environment, efficient mechanisms for recovery products, etc. [3,25,26,27].

**2.2. Urban Logistics**

According to [28], 54% of the world’s population lives in urban areas and it is estimated that this figure will reach 66% by 2050. In particular, on the European continent, where countries such as Belgium (98%), Iceland (94%) and the Netherlands (90%) already have a high population concentration in urban areas, it is estimated that the level of global urbanisation will increase to 82% by the year 2050.

Although urbanisation processes seem to be positively correlated with economic growth [29], the effects of these processes are not always symmetrical and there are externalities that will hinder them: overcrowding, traffic congestion, atmospheric, noise and light pollution, etc. All of this impacts on both the quality of life and health of the population and the efficiency of the logistic activities of companies [30]. Given this situation, it seems necessary to find a balance between urbanisation and sustainable development, placing special emphasis on suitable planning that promotes the economic and social development of cities whilst reducing the negative impact on the environment [31]. In this regard, both the public authorities and companies must be able to work together in order to improve the quality of life of the citizens through good mobility management and the suitable and efficient management of commercial activity [32]. Urban logistics can play a very important role in the search for that balance [33].

According to [33], urban logistics is “*the process for totally optimising the logistics and transport activities by private companies with support of advanced information systems in urban areas considering the traffic environment, the traffic congestion, the traffic safety and energy savings within the framework of a market economy*”.

Whilst it is true that urban logistics involves both the transportation of passengers (in public and private vehicles) and the transportation of goods [34], the latter, along with the logistics activities that sustain it, has acquired special relevance due to the fact that it forms an essential part of a country's economic activity and has very important effects on all types of company. According to [8], urban freight transport is a very important component of traffic in cities (10%-15%) and significantly contributes to both noise and atmospheric pollution. For years, urban freight transport has been an issue of special interest both to researchers and to public authorities and companies [35–37]. This interest has also increased due to the development of new forms of consumption (e-commerce); to changes in consumer attitudes, tastes and preference, such as environmental awareness; and to the growing evolution of technology such as, for example, the use of drones or electronic vehicles [34].

Whilst it is true that most of the measures and pilot programmes and projects implemented have helped to improve the management of urban logistics with a view to obtaining sustainable development [33], it is also true that there is still a long way to go in this regard [31], and different challenges can be highlighted [8,31,34, 38], such as: greater prominence for urban logistics in the long-term planning of cities; increased cooperation and collaboration between the different stakeholders. improved management of data and information; development in certain areas of research: energy efficiency, pollution, noise, customer satisfaction, or safety.

**3. Areas of collaboration between Reverse Logistics and Urban Logistics**

Despite the range of problems and challenges covered by the field of reverse logistics, until relatively recently urban logistics has not been one of them [7]. However, some very interesting connections can be observed between them. Specifically, it is worth highlighting the importance of reverse logistics in urban areas in terms of both urban waste management and the management of commercial returns [8,31].

**3.1. Urban waste management**

This is an aspect of particular complexity given that it includes not only domestic waste but also industrial and commercial waste, which require various forms of collection and treatment which differ from those usually applied to domestic waste [39]: special containers, modes of transport, safety measures, etc. Moreover, the collection and management of products and materials through their recycling, re-manufacturing or reuse is a complex task that requires careful planning in relation to their collection so that it is possible to recover most of the value that they still possess. For example, when recovering domestic use products for recycling, the choice of collection channel and the technology used depend, among other factors, on where that separation stage takes place; that is, in the consumer's own home or alternatively in specialised separation centres [40].

It should be noted that although aspects relating to the acquisition and collection of products entering the reverse logistics system have traditionally been analysed, this continues to be a completely unresolved issue [41], and the stage at which this return process (product collection) begins is considered an essential element to be carefully considered when designing these logistical networks [42,43]. This problem is intensified in the case of cities, since this is where much of the population is concentrated and they become critical areas for the collection of waste, materials and products.

In this context, the effectiveness of urban logistics and, therefore, the corresponding reverse logistics operations are conditioned by aspects relating to the type of city, its radial structure, the high concentration of commercial, leisure and restaurant areas, as well as by the different objectives and interests of the main stakeholders - companies, residents, consumers, local authorities, etc. [44]. The local authorities tend to be legally responsible for managing municipal waste and, consequently, planning its sustainable collection and transportation. However, there is a growing trend for these institutions to outsource waste management to private companies [45].

**3.2. Management of commercial returns**

Commercial returns normally occur because the product purchased by the consumer does not meet their needs, has not been delivered in the right conditions, or does not meet their expectations. Because of this, a product return process, from the consumer to the manufacturer, must be created. This type of process has become very important especially due to the appearance and development of 1) new business models (e-commerce), 2) new sales conditions (extension of product trial periods, elimination/reduction of shipping costs, free product returns, etc.) and 3) new payment methods (via mobile, PayPal, virtual wallet, etc.).

It is suggested in several studies that the trend for this type of return is increasing [46]. This logistics of returns, considered to be unwanted logistics [22] becomes a real problem for many companies [47], especially for those companies where the volume of returns is considerable, as is the case for the U.S. where approximately 8% to 10% of all products are returned, this figure increasing to 30% in the case of products purchased online [48].

However, it is necessary for companies to consider this type of process given that, in many cases, and especially for online purchases, it may determine the individual's purchasing decision [49]. This increase in commercial returns evidently involves a greater flow of products from the consumer to the manufacturer that need to be managed which represents an increase in the complexity of the system and a greater negative impact on traffic, urban mobility and the environment. Hence the importance of achieving the greater integration of these direct and reverse flows to increase the overall efficiency of logistics activity [8]. Many companies are already working on improving their product return service in order to be more efficient, making use of the new technologies [50], although there is still a long way to go in this regard [48].

**4. Conclusions**

In this work we have tried to identify and describe the main commonalities between reverse logistics and urban logistics. The main conclusions obtained from this work are as follows.

Firstly, regarding reverse logistics, despite the growing interest that this subject has aroused, there are still significant challenges requiring further work, such as: new opportunities related to product returns and recovery options; commercialization of remanufactured products; development of legislation on product returns.

Secondly, we have highlighted the importance of proper logistics management in urban areas and the existence of key aspects that must be addressed such as: logistics planning in cities; collaboration between the different stakeholders; the development of new collaborative ways of exchanging data and information; and the development of research areas related to this topic.

Thirdly, we have identified the aspects where the two disciplines converge and that may represent opportunities for collaboration, such as: the proper treatment and management of urban waste; the proper recovery and management of recoverable materials and products (EOU and EOL); and the proper management of commercial returns.

Urban areas are a challenge for logistics. It is often difficult to provide effective solutions to logistics problems in cities, and not just for purely logistical reasons. Also having an influence are obsolete municipal regulations, the absence of effective mechanisms in the event of non-compliance, improperly planned policies, and user behaviour [51].

In any case, we believe that these two areas of logistics must be brought together as there are clear commonalities, not only for research but also for the business management of logistics.

**Acknowledgments**

Rubio, García-Gallego, and González-Valero acknowledge the financial support provided by the project "Promoting Sustainable Freight Transport in Urban Contexts: Policy and Decision-Making Approaches (ProSFeT)", funded by the H2020-MSCA-RISE-2016 programme (Grant Number: 734909). Rubio acknowledges the financial support from Ministerio de Economía y Competitividad and FEDER under the CIMADISC project DPI2015-67740-P (MINECO/FEDER). Jiménez-Parra acknowledges the financial support from Ministerio de Economía y Competitividad under the project ECO2015-63880-R.

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