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Interactions among stakeholders in the processes of city logistics: a systematic review of the literature

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Abstract
The aim of this article is to present a systematic review of the literature on urban logistics and its stakeholders and identify future research directions. In order to discuss the main contributions and trends of this theme, a combination of bibliometric analysis techniques, semantic and content and a technological prospection were performed. Through the evaluation of a sample group of seventy one articles, it was possible to trace paths and understand content approaches, identifying advantages, limitations and conditions for the good development of city logistics and its agents. Based on these findings, the low evidence of how effectively each of the stakeholders influencing the activities of city logistics stands out, since your heterogeneity and conflict of interest are singled out as the cause of the difficulty of this deployment. It is important to note that from the technological prospection was possible to identify the state of innovation on the world stage in the area studied.

Keywords City logistics · Stakeholders · Systematic review of the literature · Technological prospection

Introduction

Currently, more than half of the world's population lives in urban areas. For 2050, it is estimated that the population of the planet will double and that 6.5 billion people, accounting for two-thirds, will have urban residence (ONU 2017; PNUD 2018). In Brazil, about 84.4% of the population live in urban areas (IBGE 2011). This trend makes the urbanization one of the challenges more transformers of the twentyfirst century, emerging the contradiction in the economic and environmental relations: cities are responsible for 80% of global gross domestic product, generates more than 70% of emissions of greenhouse gases and consume 80% of the energy in the world (PNUD 2016).

Facing this scenario, goods movement activities that seek to operate in urban areas face necessities of significant transformations in the form to build and manage their processes

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and relationships with stakeholders and make themselves more sustainable. Travel delays, misuse of vehicles, low reliability and high cost of delivery correspond to some of the restrictions of accessibility and logistics problems generated by the traffic infrastructure of cities that is not designed for use intensive cargo. This problem causes congestion, deterioration and environmental problems such as air and noise pollution, resulting in a negative influence on the quality and safety of urban life (Cagliano et al. 2017) called negative externalities.

The negative externalities shown are some of the most worrying effects of flow of goods in the urban area. So, in response to these problems, the city logistics emerge in order both to enhance the logistic systems within an urban area by looking at the costs and benefits, and how to plan, organize, coordinate and control the physical flows and information, aimed at preserving the environment (Crainic et al. 2009; Fancello et al. 2017; Paddeu et al. 2017; Taniguchi et al. 2003).

Despite the efforts made, to reduce congestion related to transporting people or materials and the emission of gaseous less harmful to the environment and to social and economic activities within cities is still a challenging issue (Machado Filho 2018). City logistics is a complex field characterized by many actors and stakeholders and, therefore, many interests are at stake.

In response to the challenges of urbanization, the number of academic publications relating to city logistics is increasing in recent years. However, a detailed analysis of the published documents related to interactions between stakeholders in city logistics reveals some gaps of knowledge. It is important to highlight that documents related to transportation were not considered in this analysis, but they are important in the discussion on stakeholder issues in city logistics.

This article presents the results of a systematic literature review linked to city logistics and its stakeholders. To this end, summarizes and consolidates the body of knowledge related to this theme with the purpose to identify future research initiatives from the combination of the bibliometric analysis techniques, semantic and content and performing of technological prospection.

The article is organized in four sections. Section 1 presents the research, its context and its goals. Section 2 describes the methodological approach. Section 3 shows the results obtained and its discussion. Finally, Sect. 4 points the most important conclusions and research contributions.

Search method

A strutucture of a systematic review was used according to Geissdoerfer et al. (2017), Hajduk (2017), Jiao and Boons (2014), Lieder and Rashid (2016), Mirabella et al. (2014), Saavedra et al. (2018), Tukker (2015), with a bibliometric approach.

To that end, this project uses an interaction of bibliometric analysis with semantic and content (Carvalho et al. 2013; Homrich et al. 2018), for complementary purposes. Bibliometric studies, due to their approach and the large number of research and academic publications, have been increasingly accepted. They are concentrated in two strands of analysis: identification of standards publications and of citations for verification of works and authors considered important (Neely 2005; Prasad and Tata 2005). Semantic analysis may have a manual or automatic approach. It, by means of the information captured, quantifies sequences of words, modeling a related language (Bellegarda 2000; Wang and Tsai 2009).

The analysis of content, in its turn, allows the recognition of subjects and their definitions, approaches and methods (Ramos-Rodrígue and Ruíz-Navarro 2004; White and McCain 1998). The combination of these strategies aims to trace lines of research the subject, as well as identify gaps be filled by new research.

Thus, the present work can be classified as exploratory-descriptive: exploratory, due to have the goal of knowledge through selection and analysis of scientific papers published in academic journals obeying the criteria stipulated by the authors; descriptive, presenting as a result discussion of articles that make up the bibliographic portfolio through bibliometric analysis, semantic and content (Loos et al. 2016; Silva and Menezes 2005). In order to complement the studies relating to the theme, was also held a technological prospection.

Starting from the hypothesis that one of the relevant variables of city logistics corresponds to the stakeholder relationship, a systematic review of the literature was selected to answer the following research question: how are the agents involved in city logistics related?

Thus, the flow of research is presented in Fig. 1.

To answer the research question, it was employed the technical procedure bibliographical research method of inexhaustible source of information. This consists the examination of primary and secondary sources in order to get up, select, organize and analyze what has already been produced on particular subject which was taken over as a topic of scientific research, for the purpose of define and solve problems already known and explore new areas in which problems have not been consolidated, reaching innovative conclusions (Fachin 2006; Marconi and Lakatos 2010; Ruiz 2006). The data collected were both primary and secondary in nature, and were characterized by the primary framework established by the authors during the selection of the studies and secondary were chosen from the bibliographies comprised the bibliographic portfolio (Loos et al. 2016).

For the selection of the studies analyzed was applied the integrated criteria presented below:

(a) Chronological order: from 1988 to 2018;
(b) Document type: article and review;
(c) Source type: paper;
(d) Language: english.

Choice of research bases

The survey was conducted between April and July of 2018 in the scientific databases SCOPUS and Web of Science. In view of the various database options available, the criteria used for the selection of these bases were quality, quantity of publications and author's judgment. The two bases considered references with abstracts. The SCOPUS was selected to be considered as one of the largest bases of citations and abstracts of peer-reviewed literature, offering tools able to track, analyze and visualize research, enabling a larger view of the production of world research. It indexes more than 22,800 journals of 5000 international publishers (SCOPUS 2017). Already the database Web of Science was chosen by indexing more 9000 journals being categorized as a multidisciplinary basis. In addition, both bases are compatible with software of bibliometric analysis making transfer of abstracts, references, quotes, authors, institutions, countries, among others (Carvalho et al. 2013).

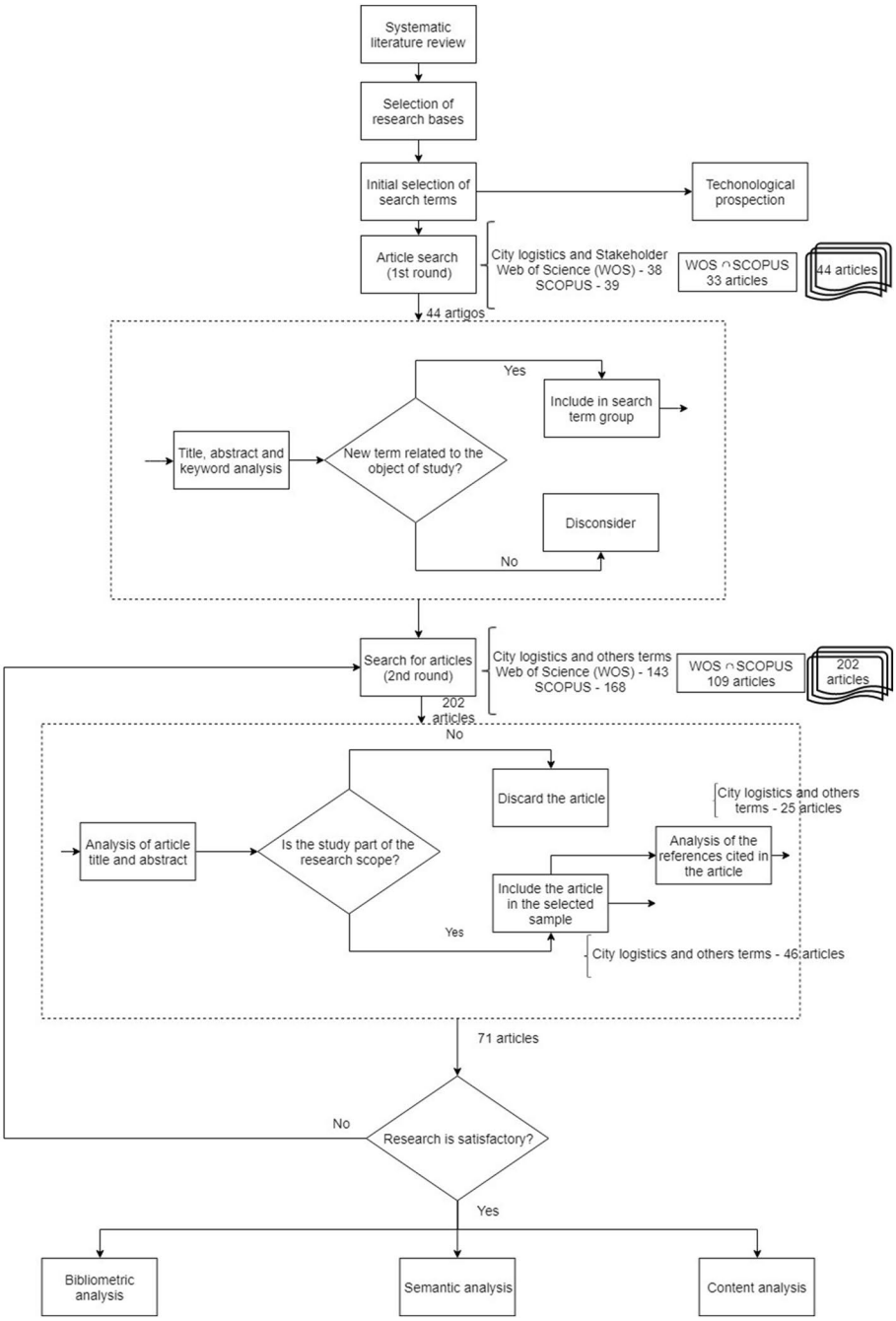

Fig. 1 Flowchart of systematic review of the literature

Results and discussion

Choice of search terms

Some search terms were chosen in order to obtain a variety of papers to be reviewed. The keywords were selected in two rounds of research in order to enhance the inclusion of relevant articles. The first round was carried out using the following search terms: city logistics and stakeholder. The second round had as its purpose the extension of research body. It was used an adaptation of the technique "snowballing" (Greenhalgh and Peacock 2005), in which from the tracking of papers obtained in the first round, it used the experience to decide the inclusion of new search terms. There were identified the following new research terms: stakeholder, multi-stakeholder, users, actors, public stakeholder, private stakeholder, public and private actors, multi-agent, city logistics participants, planners, residents, city logistics actors, public, customer, end consumers, receiver, stakeholder from industry, companies, logistics service providers, shippers, carries, logistics providers, transport operator, public authority, policy-makers, governmental stakeholder, municipal administrator, city administration, city government, public administrator, local authority, city authority, public managers. Defined the terms, search sequences were created with Boolean connectors as shown in next section.

Data collection, screening, search results and delimitation

As quoted above, with a standard approach to find publications containing terms in the titles of articles, summaries and/or keywords, the keywords were used in two rounds and obtained a corresponding total as presented in Table 1.

In both rounds, were deleted articles duplicated in more than one category and examined the titles and abstracts. The relevant documents were selected on the basis of the criteria already submitted plus the existence of relation with the objective of the present review, to ensure the accuracy and objectivity. Contributions with new ideas and differences or types of relationships between the stakeholders were elements taken into consideration.

Table 1 Number of articles and reviews resulting from the search string

Round	Research terms	Quantity	
		Web of science	SCOPUS
1	City logistics AND Stakeholder	38	39
2	City logistics AND (Stakeholder OR Multi-stakeholder OR Users OR Actors OR Public stakeholder OR private Stakeholder OR Public and private actors OR Multi-agent OR City logistics participants OR Planners OR Residents OR City logistics actors OR Public OR Customer OR End consumers OR Receiver OR Stakeholder from industry OR Companies OR Logistics service providers OR Shippers OR Carries OR Logistics providers OR Transport operator OR Public authority OR Policy-makers OR Governmental stakeholder OR Municipal administrator OR City administration OR City government OR Public administrator OR Local authority OR City authority OR Public managers)	143	168

In the first round, were analyzed 44 papers. Applied to these the technical adaptation "snowballing" (Greenhalgh and Peacock 2005), the search terms were defined. In the second round, were weighed 202 articles obtained from the search string. Of these ones, 46 were selected to compose the sample group.

Then, the trace of references was performed, i.e. the search for references of references (snowballing) proposed by Greenhalgh and Peacock (2005), in order to identify new sources with quality. It was analyzed the list of references of the selected documents and by judgment, it was decided to include work by looking at the relationship with the objective of this work. There were analyzed 2399 references. Of these, 25 were added to the sample.

Therefore, 71 articles were considered as representative of the city logistics theme and its stakeholders (Aditjandra and Zunder 2018; Anand et al. 2012, 2014; Anderson et al. 2005; Ballantyne et al. 2013; Behrends et al. 2008; Bjerkan et al. 2014; Björklund 2011; Björklund et al. 2017; Cagliano et al. 2017; Çalişkan et al. 2017; Chanut and Paché 2012; Chhetri et al. 2017; Crainic et al. 2009; Dablanc 2007; De Brucker et al. 2013; Ehmke and Campbell 2014; Estrada and Roca-Riu 2017; Fancello et al. 2017; Gammelgaard 2015; Gammelgaard et al. 2017; Gatta and Marcucci 2016; Harrington et al. 2016; Holguín-Veras and Sánchez-Díaz 2016; Holguín-Veras et al. 2006, 2007, 2008, 2011; Janjevic and Ndiaye 2017; Jayne 2012; Johansson and Björklund 2017; Kedia et al. 2017; Lagorio et al. 2017; Le Pira et al. 2016, 2017a, b; Lindholm 2013; Lindholm and Behrends 2012; Lindholm and Blinge 2014; Lindholma and Browneb 2013; Macharis and Bernardini 2015; Macharis and Milan 2015; Macharis et al. 2014; Maggi and Vallino 2016; Manier et al. 2016; Manzano Dos Santos and Sánchez-Díaz 2016; Marcucci and Gatta 2012, 2017; Marcucci et al. 2015, 2017a, b; Muñuzuri et al. 2005; Nordtømme et al. 2015; Nuzzolo et al. 2016; Oliveira et al. 2018; Österle et al. 2015; Paddeu 2017; Paddeu et al. 2017; Pan et al. 2017; Prell et al. 2009; Puckett et al. 2007; Quak and De Koster 2009; Rose et al. 2016, 2017; Stathopoulos et al. 2012; Sung et al. 2016; Taniguchi et al. 2003; Valeri et al. 2016; Voinov and Bousquet 2010; Weber 2003; Zwald et al. 2016).

Extraction, synthesis and reporting

After definition of the sample, the articles were examined and compared, with the purpose of providing a description of patterns. This was an exploratory process, in which relationship types and categories of similarity emerged. In this sense, bibliometric analyses, semantic and content and technological prospection were made.

Bibliometric analysis

According to Tague-Sutcliffe (1992) and Vanti (2002), the word 'bibliometry' was popularized by Pritchard (1969) replacing the term 'statistical bibliography'. Tague-Sutcliffe (1992) defines bibliometry as the study of the quantitative aspects from models and mathematical measures for prediction and decision-making of the literature. According to De Bellis (2009), bibliometric research aims to analyze, quantify and measure the for the purpose of constructing representations of its behavior. In this same vein, Braga (1974, p. 162) points out that "to generalize empirical statistics […], bibliometrics examines, first, the relationships between different variables: human resources-documents, periodical-articles, production-consumption etc., which feature various regularities of distribution".

Vanti (2002) still shows some of the possibilities of application of bibliometrics to a certain area: identify trends, growth of knowledge, main journals, users and dispersion

and obsolescence of the scientific literature; measuring coverage of secondary degree and standard magazines of collaboration between authors and emergence of new themes; parse citation and co-citation processes, statistical aspects of language, of words and phrases, circulation and use of documents and the productivity of individual authors, organizations and countries.

The bibliometric analysis method used in this research follows the methodology proposed by Carvalho et al. (2013), that includes the determination of three key indicators: number of publications by period and year, changes in the number of publications per year and citations analysis.

The first indicator has allowed the identification of journals that addressed the theme more often (Loos et al. 2016), as well as the examination of the evolution of the forms of publication over time.

The second indicator was broken down into two segments of classification of documents from: keywords grouped by affinity diagram, resulting in two levels of analysis and methodological approach used by means of a coding scheme adapted from Carnevalli and Miguel (2008). Table 2 shows the encoding scheme used for the classification of documents.

The third indicator was constructed from the co-citation network of quotations applied to the 10 most cited articles (Anderson et al. 2005; Björklund 2011; Crainic et al. 2009; Dablanc 2007; Holguín-Veras et al. 2006; Muñuzuri et al. 2005; Prell et al. 2009; Quak and De Koster 2009; Stathopoulos et al. 2012; Voinov and Bousquet 2010). To this end, the software NETDRAW® (Borgatti 2002), Sitkis 2.0® (Schildt 2002) and Ucinet 6® to Windows® (Borgatti et al. 2002) were used. The co-citation network pointed out the degree of similarity between the references, showing the documents that were cited together.

In Table 3, the evolution of the number of publications and year was presented. The first document was published in 2003, however, only after 2012 it is possible to see a significant increase in the number of publications. Approximately 50% of the articles considered in this paper and related to the area were published in 11 journals, which generally have a greater impact factor compared to other: Transportation Research Part A: Policy and Practice, Transportation Research Part E: Logistics and Transportation Review, Research in Transportation Economics, Journal of Transport Geography, Case Studies on Transport Policy, Research in Transportation Business and Management, International Journal of Physical Distribution and Logistics Management, Networks and Spatial Economics, Transportation Science, Transport Reviews e Transport Policy.

Table 2 Encoding of the research method and level of analysis
Source: adapted from Carnevalli and Miguel (2008)

Research method	Level of analysis
Conceptual research	LA1: principles and limits
CR1: conceptual-theoretical	LA2: models
CR2: literature review	
CR3: theoretical modeling or simulations	
Empirical research	
ER1: survey	
ER2: case study	
ER3: action research	
ER4: experimental research	

Table 3 Number of publications by journal and year

Journal	Year															
	2003	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Transportation Research Part A: Policy and Practice			1	1								1	1	2		6
Research in Transportation Economics													1	3		4
Journal of Transport Geography		1							2	1						4
Transportation Research Part E: Log. and Transp. Review									1					2		3
Case Studies on Transport Policy													1	2		3
Research in Transportation Business and Management											2			1		3
International Jour. of Phys. Dist. and Log. Management												1	1	1		3
Networks and Spatial Economics				1	1			1								3
Transportation Science						2										2
Transport Reviews	1												1			2
Transport Policy											1	1				2
IFAC-PapersOnLine													1	1		2
European Journal of Operational Research										1	1					2
European Transport Research Review														1	1	2
European Transport - Trasporti Europei										1						1
Transportation				1												1
Sustainability (Switzerland)															1	1
Habitat International												1				1
International Journal of Logistics Systems and Management														1		1
International Journal of Retail and Distribution Management														1		1
Society and Natural Resources						1										1
International Journal of Sustainable Transportation													1			1
Industrial Management and Data Systems														1		1
International Journal of Transport Economics												1				1
Transportation Planning and Technology					1											1

Table 3 (continued)

Journal	Year															
	2003	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
International Journal of Urban Sciences											1					1
European Journal of Transport and Infrastructure Research										1						1
Journal of Purchasing and Supply Management								1								1
Social and Cultural Geography									1							1
American Journal of Health Promotion													1			1
Supply Chain Management												1				1
Transportation Research Record													1			1
Transport														1		1
Expert Systems with Applications									1							1
Innovation	1															1
Environmental Modelling and Software							1									1
Transportation Journal														1		1
PLoS ONE													1			1
Cities		1														1
Problems and Perspectives in Management									1							1
Production Planning and Control													1			1
Physica A: Statistical Mechanics and its Applications														1		1
Environmental Science and Policy													1			1
Operations Management Research														1		1
Total	2	2	1	3	2	3	1	2	6	4	5	6	12	21	2	71

Number of publications listed in descending order

Table 4 displays publications trends sorted by level of analysis and methodological approach. They are divided in 5 times of 3 years: Q1:2003–2005; Q2:2006–2008; Q3:2009–2011; Q4:2012–2014; Q5:2015–2018.

Considering the level of analysis, it is observed that the papers are still centered on the principles and the themes, corresponding to a concentration of 80%. In the case of the research methods applied, it is observed that most studies have qualitative approach, supporting questions related to city logistics that are still being explored and consolidated. Theoretical and conceptual research, literature review, survey and case study reflect approximately 62% of the approaches used. There is still a tendency to the development of studies on quantitative approach combining the concepts of city logistics in order to determine best practice collections, in view of the growth in the number of publications involving simulations and modeling.

In Table 5, the article impact index (A_{II}) proposed by Carvalho et al. (2013) referring to the 10 most cited articles is shown. A_{II} presented by Eq. 1, was calculated based on the number of times the article has been cited (A_{TC}) and the journal impact factor obtained from the Journal Citation Report (JCR_{IF}). It is important to note that the impact factor identifies the average frequency with which an article from a journal is quoted in a given year. The year of 2017 was selected (PERIÓDICOS CAPES 2018).

$$A_{II} = A_{TC} \times \left(JCR_{IF} + 1\right) \tag{1}$$

It is worth highlighting the possibility of changing a document in the citation ranking from the impact index of the article due to the consideration of the impact factor of the journal. However, for the group of documents presented, it was not verified the change of the ranking due to the JCR.

Figure 2 graphically shows the evolution of the citation of the 10 most mentioned documents over time in addition to the impact index of the article presented above. Considering the 2015 citations found in 71 articles, 1414 of the citations were related to the 10 most cited articles.

By the end of 2010, only some works related to city logistics were cited. The documents that were mentioned most frequently were Holguín-Veras et al. (2006) and Dablanc (2007). Holguín-Veras et al. (2006) evidence the main implications for the pricing policy of highways pointing to productivity increases, cost transfers and changes in the use of the facilities to the alternative timetables. Dablanc (2007) features of urban goods movements in some European cities, highlighting the slow change of the logistic processes due to the indifference of stakeholders. Another document that appears often in this period is Muñuzuri et al. (2005) that launch initiatives that can be applied by local administrations in order to improve the supply of goods in the urban environment.

After 2010, other papers were also cited with more frequency: Voinov and Bousquet (2010); Prell et al. (2009); Crainic et al. (2009). Voinov and Bousquet (2010) bring the different types of modeling of stakeholders and make the comparison between participatory modeling and other structures that involve the participation of stakeholders. Prell et al. (2009) discuss through a case study, the role of stakeholders and the consequences of marginalization of some group in decision making with environmental elements such as the city logistics. Finally, Crainic et al. (2009) propose a model for integrated planning of short-term cities involving a two-tier distribution structure.

Figure 3 shows the co-citation network. This points out the similarity level between references, identifying the documents that cite texts together. The co-citation network allows both to clarify the intellectual structure of an area and how to map the relationship

Table 4 Publications by period by level of analysis and by methodological approach

Level of analysis	Period									
	2003–2005	2006–2008	Trend	2009–2011	Trend	2012–2014	Trend	2015–2018	Trend	Total
LA1—Principles and limits	3	6	↗	5	↘	11	↗	33	↗	58
LA2—Models	1	0	↘	2	↗	3	↗	7	↗	13
Total	4	6		7		14		40		71
Research method										
CR1—Conceptual-theoretical	1	2	↗	1	↘	2	↗	5	↗	11
CR2—Review of the literature	0	0		0		2	↗	3	↗	5
CR3—Theoretical modeling or simulations	1	0	↘	3	↗	4	↗	13	↗	21
ER1—Survey	1	2	↗	0	↘	4	↗	11	↗	18
ER2—Case study	1	1		2	↗	1	↘	6	↗	11
ER3—Action research	0	0		0		1	↗	0	↘	1
ER4—Experimental research	0	1	↗	1		0	↘	2	↗	4
Total	4	6		7		14		40		71

Caption: up arrow: growth; down arrow: degrowth

Table 5 Impact of article index for the 10 most cited articles

Article	Journal	Citations (A_{TC})	% citations	JCR_{IF}	A_{II}
Voinov and Bousquet (2010)	Environmental Modelling and Software	434	30.69	4.177	439,177
Prell et al. (2009)	Society and Natural Resources	227	16.05	1.823	229,823
Dablanc (2007)	Transportation Research Part A: Policy and Practice	164	11.60	3.260	168,260
Crainic et al. (2009)	Transportation Science	149	10.54	3.338	153,338
Muñuzuri et al. (2005)	Cities	126	8.91	2.704	129,704
Holguín-Veras et al. (2006)	Transportation Research Part A: Policy and Practice	77	5.45	3.026	81,026
Stathopoulos et al. (2012)	Journal of Transport Geography	63	4.46	3.338	67,338
Quak and De Koster (2009)	Transportation Science	63	4.46	2.699	66,699
Björklund (2011)	Journal of Purchasing and Supply Management	60	4.24	3.667	64,667
De Brucker et al. (2013)	European Journal of Operational Research	51	3.61	3.428	55,428

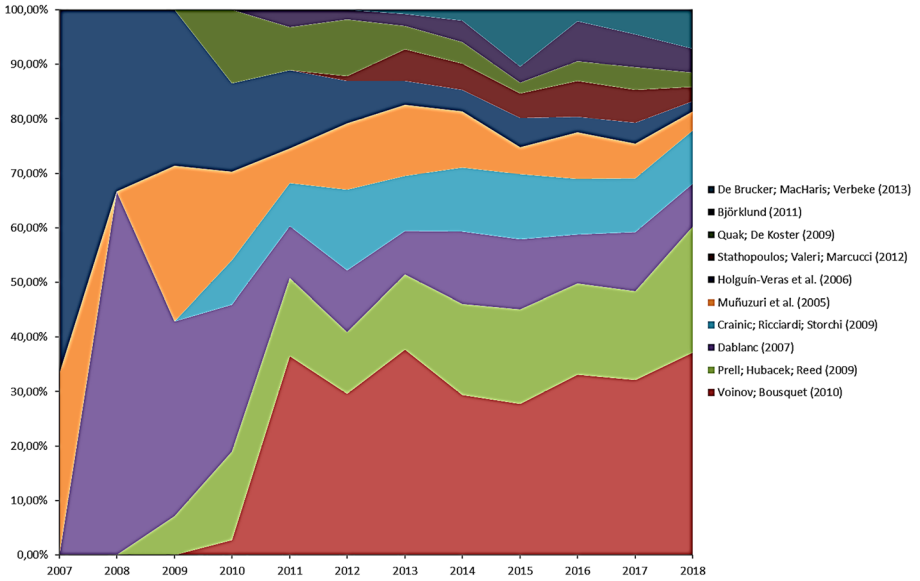

Fig. 2 Evolution of the citation of the 10 most mentioned articles

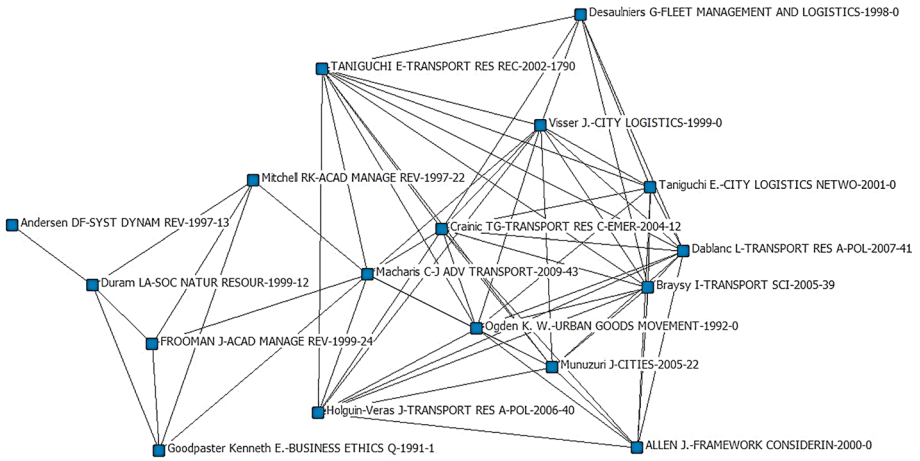

Fig. 3 Co-citation network

of groups of researchers and related themes (Culnan et al. 1990). There is a quote more expressive of the authors Eiichi Taniguchi, Teodor Gabriel Crainic and Laetitia Dablanc.

Eiichi Taniguchi published 50 papers in the period of 1998 to 2016, and 19 of these are related to the theme city logistics, presenting works with other 42 authors, including Tadashi Yamada, Ali Gul Qureshi and Joel Teo from Kyoto University and also Russell Thompson from the University of Melbourne. His publications have been cited by 758 other documents. His research is focused on city logistics and freight urban transport

modeling and multi-agent simulation considering the behavior of stakeholders involved in the urban transport of goods.

Teodor Gabriel Crainic published 173 papers, of which 16 are associated with city logistics. He reproduced works with other 150 authors, including Michel Gendreu, Walter King, Michel Toulouse and Guido Perboli, all members of the Centre Interuniversitaire de Recherche sur les Réseaux d'Entreprise, la Logistique et le Transport (CIRRELT). Teodor Gabriel Crainic is professor in the Department of Management and Technology at the University of Quebec in Montreal, in the Department of Computer Science and Operations Research of Unviersity of Montrel and director of CIRRELT's Intelligent Transport Systems Laboratory.

Laetitia Dablanc published 34 papers in authoring and co-authoring with 44 other authors, and Eleonora Morganti of the University of Leeds and Adeline Heitz, University of Paris-East were the main with. Her works have been cited by other 393 documents. Laetitia Dablanc is research director of the French Institute of Science and Technology for Development, Transport and Networks at the University of Paris-Est and team leader of the MetroFreight, the Volvo Foundation's Centre of Excellence for Research and Education in urban freight research led by the University of Southern California.

Semantic analysis

In this stage of the research, it was performed a semantic analysis of the sample group, aiming to identify the definition of the theme. It consisted of analyzing the syntax of the structures and content of the text that contained definitions of the terms studied. The definitions were evaluated by means of an automatic approach with the help of the Tropes® software (Molette and Landré 2007).

The Tropes® will detect the words that represent the content of a phrase, grouping them into equivalent classes according to a standardized scenario previously determined. Although the Tropes® give the option of building their own scenario, this paper opted to use the software scenario. Thus, during the analysis process performed on a statistical basis, the software will: define the meaningful words, analyze their distribution in subcategories and examine their order of occurrence. The analysis of the definitions is aimed at verifying the differences between the terms, characterizing them.

The selected documents were classified as argumentative, since the authors argue, explain or analyze about the content dealt with the purpose to convince the interlocutor. This refers to the verbal configurations that are presented as supporting in statements about a specific state or action.

Semantic graphs were generated, being plotted on star, in which classes to the left or right of the central are said predecessors and successors respectively, i.e. acting as subject and object of action and indicate the frequency of incidence which concepts are most explored. In addition, it was two analyses suggested by the software Tropes®: references (lower ranking level, in which it gathers all the classes selected by the program to semantically sort the text) and relationships. The references reflect the context and group the main nouns of the documents analyzed in similar classes in descending order of importance. The relationships reveal the classes that are often connected.

Figure 4a–c represents the analysis of references and relationship with the plotting of the classes "logistics" and "city" and the subjects and related objects considered important for this study.

From Fig. 4, it was possible to perform the following inferences: the analyzed documents have concentrated its speech in the terms studied "city" and "logistics", that is, the terms presented as object of analysis are the most used in the texts presenting an occurrence of 1257 and a strong relationship with the classes "transport", "freight",

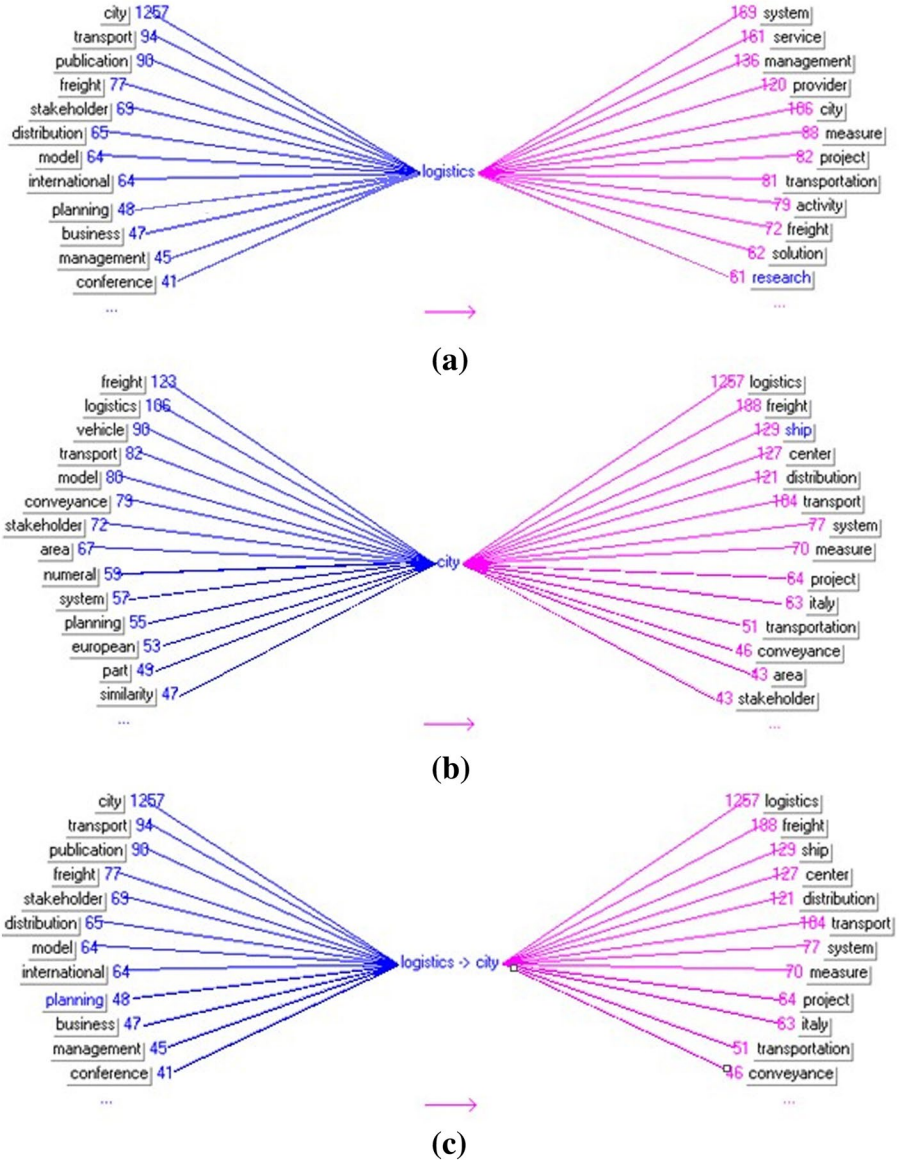

Fig. 4 Graphs related to the definition of city logistics

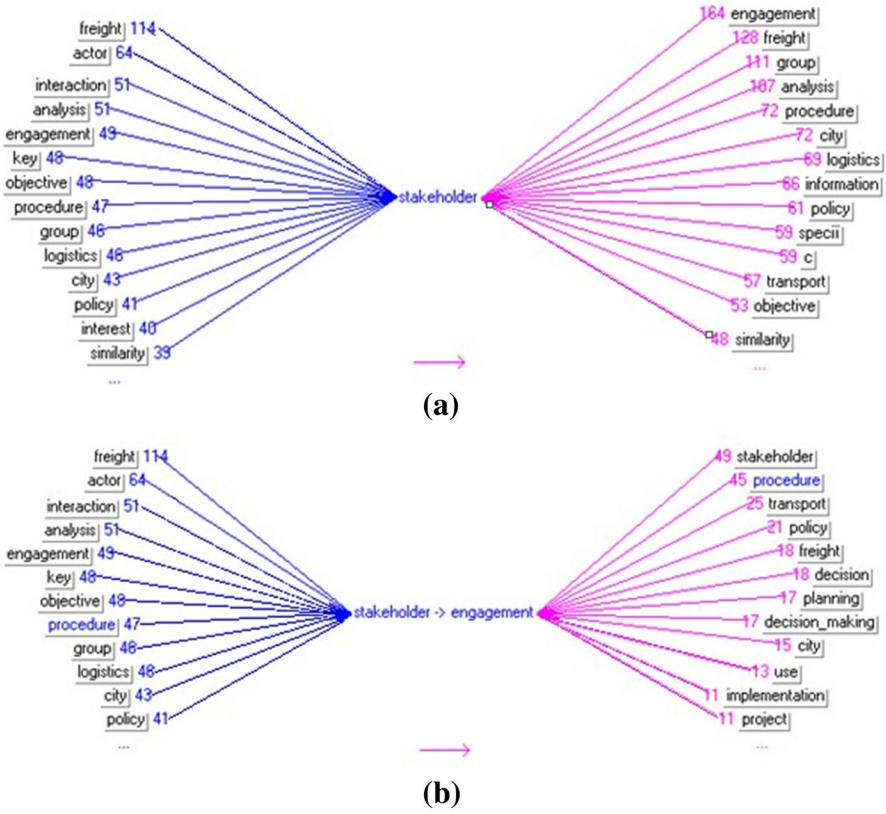

Fig. 5 Graphs related to stakeholder definitions

"distribution", "management", "planning", "stakeholder", "service", allowing the identification of elements necessary to the development of city logistics.

Figure 5a and b presents the analysis of references and relationship of the stakeholder's class. Figure 5a shows the presence of a strong association with the class "engagement", which referred the presentation to the relationship between the two classes in Fig. 5b.

It can be inferred that in the decision-making process related to the planning and implementation of city logistics policies, there must be stakeholder's interaction and engagement.

Technological prospection

The technological prospection was carried out on the basis of patent applications deposited in various regions of the world: *Instituto Nacional de Propriedade Industrial* (INPI), Derwent Innovations Index (DII), European Patent Office (EPO) and United States Patent and Trademark Office (USPTO). The survey was conducted in August 2018. To this end, it was used the search term "city logistics", "logística urbana", "urban freight transport", "transporte urbano de mercadorias", "urban freight" e "frete urbano". An exploratory reading of

Table 6 Research on basis of patents

Terms	INPI	DII	EPO	USPTO
City logistics	0	27	20	8
Logística urbana	2	0	0	0
Urban freight transport	0	0	0	0
Transporte urbano de mercadorias	0	0	0	0
Urban freight	0	2	1	3
Frete urbano	0	0	0	0

INPI Instituto Nacional da Propriedade Industrial (INPI), *DII* Derwent Innovations Index, *EPO* European Patent Office; *USPTO* United States Patent and Trademark Office

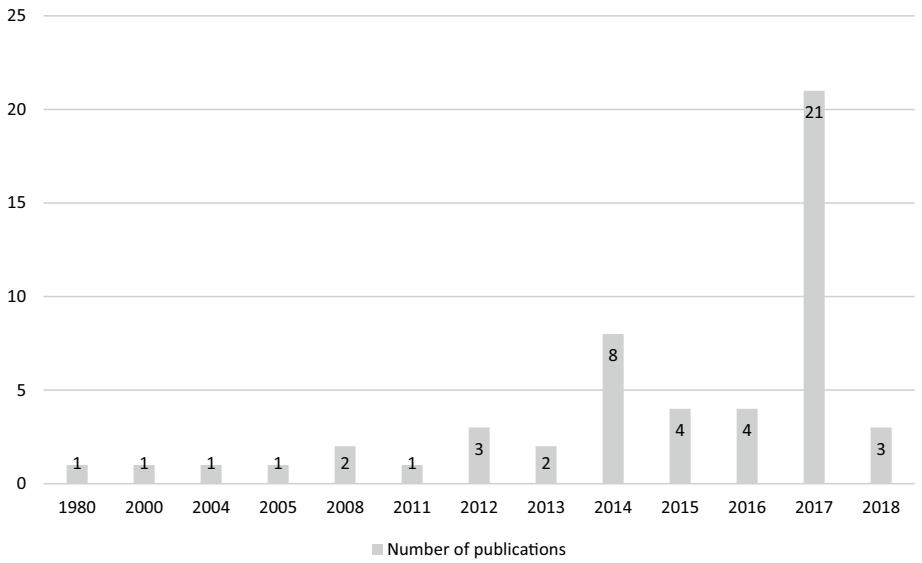

Fig. 6 Publication of patents according to the year

titles and abstracts was performed and also patents that contemplated results related to the theme were selected.

According to da Silva et al. (2016), the technological prospection is essential for the creation of the ability to compose innovation systems that meet the interests of the company. Through it is possible to identify both opportunities as requirements for research and development (P&D).

The search in patent databases found 52 patents ("Appendix 1") when using the terms "city logistics", "logística urbana", "urban freight transport", "transporte urbano de mercadorias", "urban freight" e "frete urbano" (Table 6). The repeated patents were deleted. The selected patents were divided into two groups of classifying according to International Classification of Patents: (a) processing and transportation operations (36.5%); (b) Physics (63.5%).

In relation to the world scene, China represented approximately 69.2% of the results. Other countries like United States, Brazil, France and Germany accounted for 21.2%, 3.8%, 3.8% and 1.9%, respectively.

Patents were also classified according to the year (Fig. 6). It was noted the concentration of publications in 2017, corresponding to approximately 40.4%.

When comparing the publications according to the year of both articles and patents, there is a concentration in the year 2017.

In relation to physical group sub classing, it was observed that approximately 57.6% of the patents are related to systems or data processing methods adapted for management purposes. When it comes to patents related to processing and transportation operations, it was noted that there are both special types of vehicles as of devices and moving or storage of loads.

Content analysis

With the purpose of advancing studies, it was conducted a content analysis of selected articles. According to Kazemi et al. (2018), content analysis is an important step for recognizing the different topics, as well as to indicate the areas that require the development of more studies from the evaluation of a high volume of data in a structured and systematic approach.

For content analysis, the documents were classified into a set of groups that reflect the characteristics and contributions of the studies (Carvalho et al. 2013; Kazemi et al. 2018). Two approaches can be used: deductive or inductive. In the deductive approach, keywords and categories are defined before the analysis of the sample, while in the inductive, they are verified assessing sampling group (Abedinnia et al. 2017; Shekarian et al. 2017).

In this paper, the deductive approach was applied. To this end, it was produced a series of 392 different keywords, representing the theme. Thus, from the keywords referring to the theme, 5 classification groups were proposed and the articles were classified as: urban freight distribution, sustainability, governance, strategies and modeling type (Fig. 7).

It was noted that the distribution of goods is focused on consumer goods. There were more often considered the sectors: Accessories, cosmetics, clothing and footwear, food and beverage, pharmacy, entertainment, electronics, appliances and furniture (Aditjandra and Zunder 2018; Fancello et al. 2017; Kedia et al. 2017; Oliveira et al. 2018; Paddeu 2017). It was noted that most of the studies did not focus on specific industry.

Key stakeholders in the work were declared: shippers (manufacturers, wholesalers, retailers), receivers (end consumer), public administration (national, state and municipal), logistics service providers, inhabitants of cities and others (planners, traffic engineers and transportation, university, non-governmental organizations) (Aditjandra and Zunder 2018; Björklund et al. 2017; Cagliano et al. 2017; Crainic et al. 2009; Estrada and Roca-Riu 2017; Fancello et al. 2017; Kedia et al. 2017; Le Pira et al. 2017a, b; Marcucci et al. 2017a, b; Muñuzuri et al. 2005; Oliveira et al. 2018; Paddeu 2017; Stathopoulos et al. 2012).

Related to the advantages that the studies of city logistics can provide, the main ones are: reduction in the emission of greenhouse gas; reducing the risk of theft of goods; increase the performance of urban distribution systems and its stakeholders; maximizing revenues and reducing the cost of travel of service performed; reducing the amount of vehicles adversely impacting both the economic aspect as the environmental one, through optimized routing, more suitable location of warehouses and improved charging strategy (Aditjandra and Zunder 2018; Cagliano et al. 2017; Crainic et al. 2009; Kedia et al. 2017; Marcucci et al. 2017a, b; Oliveira et al. 2018).

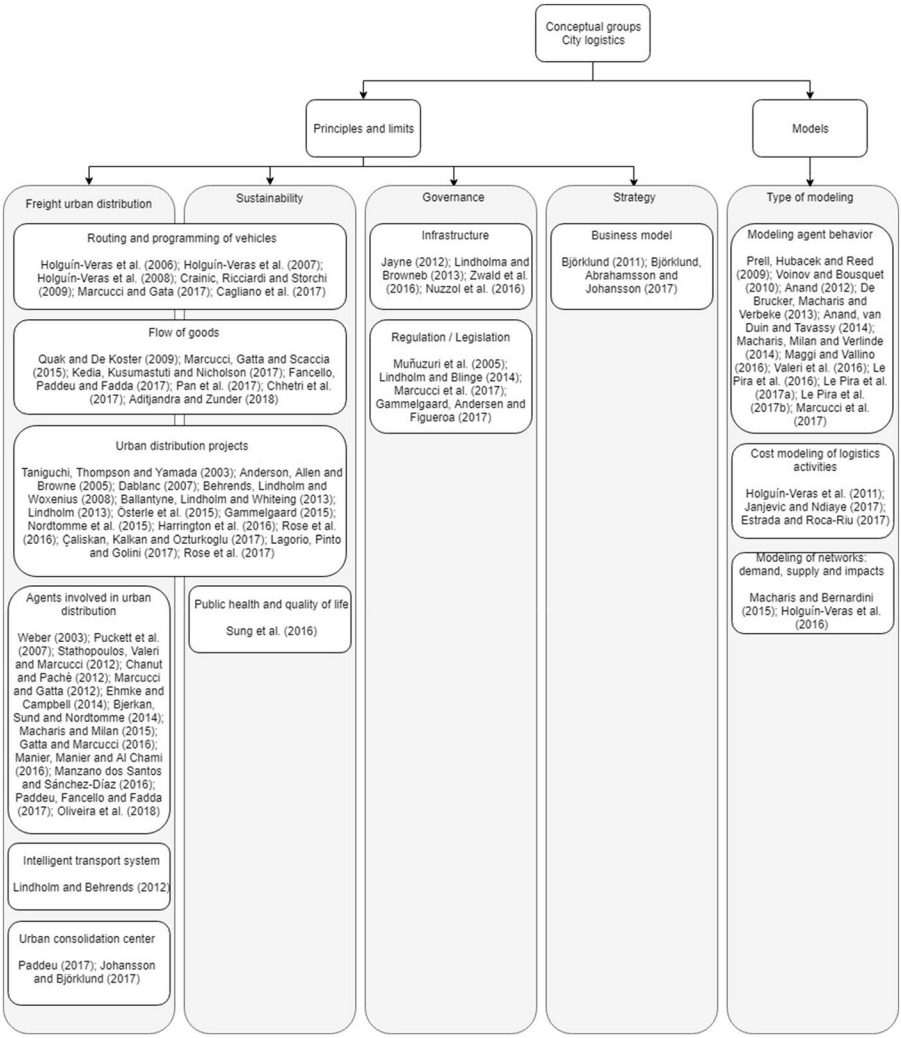

Fig. 7 Classification regarding the bibliographical portfolio approach

Related to the limitations for the development of city logistics, Table 7, content analysis identified that the most recurrent are: heterogeneity and conflict of interests of different groups involved; lack of information to support the distribution planning in urban area; high costs associated with shared consolidation terminals; lack of budget or persons for implementation of public policies of city logistics planning; and diversity of the goods delivered.

Several authors showed the heterogeneity and the conflict of interests of groups involved as a cause of the difficulty of implementation of city logistics (Björklund 2011; Dablanc 2007; Fancello et al. 2017; Gammelgaard et al. 2017; Le Pira et al. 2017a, b; Marcucci et al. 2017a, b; Muñuzuri et al. 2005; Oliveira et al. 2018; Prell et al. 2009; Stathopoulos et al. 2012; Voinov and Bousquet 2010). Marcucci et al. (2017a, b) claim that the underlying characteristics of the domain, such as heterogeneous agents, their conflicting goals and distributed decision-making, make the city logistics measures often fail, mostly due to lack of support and commitment of stakeholders, that is, the existence of conflict of interest.

Table 7 Limitations for the development of city logistics

Limitation	Muñuzuri et al. (2005)	Dablanc (2007)	Crainic, Ricciardi and Storchi (Crainic et al. 2009)	Prell et al. (2009)	Voinov and Bousquet (2010)	Björklund (2011)	Stathopoulos et al. (2012)	Le Pira et al. (2017a, b)	Cagliano et al. (2017)	Fancello et al. (2017)	Marcucci et al. (2017a, b)	Gammelgaard et al. (2017)	Björklund et al. (2017)	Paddeu (2017)	Janjevic and Ndiaye (2017)	Estrada and Roca-Riu (2017)	Oliveira et al. (2018)	Aditjandra and Zunder (2018)	Total
The provision of urban services is weak and inadequate to the demand		X																	1
Approach to governance of urban freight as a matter solely of public administration												X							1

Table 7 (continued)

Limitation	Muñuzuri et al. (2005)	Dablanc (2007)	Crainic, Ricciardi and Storchi (Crainic et al. 2009)	Prell et al. (2009)	Voinov and Bousquet (2010)	Björklund (2011)	Stathopoulos et al. (2012)	Le Pira et al. (2017a, b)	Cagliano et al. (2017)	Fancello et al. (2017)	Marcucci et al. (2017a, b)	Gammelgaard et al. (2017)	Björklund et al. (2017)	Paddeu (2017)	Janjevic and Ndiaye (2017)	Estrada and Roca-Riu (2017)	Oliveira et al. (2018)	Aditjandra and Zunder (2018)	Total
Public authorities do not feel responsible for the companies when it comes to urban planning														X					1
Receiver behavior influences the demand for urban distribution of goods																		X	1

Table 7 (continued)

Limitation	Muñuzuri et al. (2005)	Dablanc (2007)	Crainic, Ricciardi and Storchi (Crainic et al. 2009)	Prell et al. (2009)	Voinov and Bousquet (2010)	Björklund (2011)	Stathopoulos et al. (2012)	Le Pira et al. (2017a, b)	Cagliano et al. (2017)	Fancello et al. (2017)	Marcucci et al. (2017a, b)	Gammelgaard et al. (2017)	Björklund et al. (2017)	Paddeu (2017)	Janjevic and Ndiaye (2017)	Estrada and Roca-Riu (2017)	Oliveira et al. (2018)	Aditjandra and Zunder (2018)	Total
Consolidation and coordination are in the variables that influence the city logistics			X																1
Costs associated with shared consolidation terminals are high		X														X			2

Table 7 (continued)

Limitation	Muñuzuri et al. (2005)	Dablanc (2007)	Crainic, Ricciardi and Storchi (Crainic et al. 2009)	Prell et al. (2009)	Voinov and Bousquet (2010)	Björklund (2011)	Sathopoulos et al. (2012)	Le Pira et al. (2017a, b)	Cagliano et al. (2017)	Fancello et al. (2017)	Marcucci et al. (2017a, b)	Gammelgaard et al. (2017)	Björklund et al. (2017)	Paddeu (2017)	Janjevic and Ndiaye (2017)	Estrada and Roca-Riu (2017)	Oliveira et al. (2018)	Aditjandra and Zunder (2018)	Total
Discouragement of public administration the adoption of mobility policies for being unpopular																	X		1
Difficulty taking appropriate decision for all stakeholders																	X		1

Table 7 (continued)

Limitation	Muñuzuri et al. (2005)	Dablanc (2007)	Crainic, Ricciardi and Storchi (Crainic et al. 2009)	Prell et al. (2009)	Voinov and Bousquet (2010)	Björklund (2011)	Sthopoulos et al. (2012)	Le Pira et al. (2017a, b)	Cagliano et al. (2017)	Fancello et al. (2017)	Marcucci et al. (2017a, b)	Gammelgaard et al. (2017)	Björklund et al. (2017)	Paddeu (2017)	Janjevic and Ndiaye (2017)	Estrada and Roca-Riu (2017)	Oliveira et al. (2018)	Aditjandra and Zunder (2018)	Total
Difficulty in preserving the quality of the goods to be delivered										X									1
Availability of loading/unloading areas is low																	X		1
Shortage of information to support planning of urban distribution of goods								X	X	X					X		X		5

Table 7 (continued)

Limitation	Muñuzuri et al. (2005)	Dablanc (2007)	Crainic, Ricciardi and Storchi (Crainic et al. 2009)	Prell et al. (2009)	Voinov and Bousquet (2010)	Björklund (2011)	Stathopoulos et al. (2012)	Le Pira et al. (2017a, b)	Cagliano et al. (2017)	Fancello et al. (2017)	Marcucci et al. (2017a, b)	Gammelgaard et al. (2017)	Björklund et al. (2017)	Paddeu (2017)	Janjevic and Ndiaye (2017)	Estrada and Roca-Riu (2017)	Oliveira et al. (2018)	Aditjandra and Zunder (2018)	Total
Lack of methods designed to assess policy acceptance								X											1
Lack of business model for city logistics													X						1
Lack of budget or persons for implementation of public policies of city logistics planning	X	X																	2

Table 7 (continued)

Limitation	Muñuzuri et al. (2005)	Dablanc (2007)	Crainic, Ricciardi and Storchi (Crainic et al. 2009)	Prell et al. (2009)	Voinov and Bousquet (2010)	Björklund (2011)	Stathopoulos et al. (2012)	Le Pira et al. (2017a, b)	Cagliano et al. (2017)	Fancello et al. (2017)	Marcucci et al. (2017a, b)	Gammelgaard et al. (2017)	Björklund et al. (2017)	Paddeu (2017)	Janjevic and Ndiaye (2017)	Estrada and Roca-Riu (2017)	Oliveira et al. (2018)	Aditjandra and Zunder (2018)	Total
Heterogeneity of goods delivered		X								X									2
Heterogeneity and conflict of interests of different groups involved	X	X		X	X	X	X	X		X	X	X					X		11
Relatively new inclusion of freight transport in sustainable mobility planning agenda								X											1

Table 7 (continued)

Limitation	Muñuzuri et al. (2005)	Dablanc (2007)	Crainic, Ricciardi and Storchi (Crainic et al. 2009)	Prell et al. (2009)	Voinov and Bousquet (2010)	Björklund (2011)	Stathopoulos et al. (2012)	Le Pira et al. (2017a, b)	Cagliano et al. (2017)	Fancello et al. (2017)	Marcucci et al. (2017a, b)	Gammelgaard et al. (2017)	Björklund et al. (2017)	Paddeu (2017)	Janjevic and Ndiaye (2017)	Estrada and Roca-Riu (2017)	Oliveira et al. (2018)	Aditjandra and Zunder (2018)	Total
Existing shipping policies don't measure important changes that have occurred in the sectors of production, distribution and consumption		X																	1
Little flexibility to receive goods at other times																	X		1

Table 7 (continued)

Limitation	Muñuzuri et al. (2005)	Dablanc (2007)	Crainic, Ricciardi and Storchi (Crainic et al. 2009)	Prell et al. (2009)	Voinov and Bousquet (2010)	Björklund (2011)	Stathopoulos et al. (2012)	Le Pira et al. (2017a, b)	Cagliano et al. (2017)	Fancello et al. (2017)	Marcucci et al. (2017a, b)	Gammelgaard et al. (2017)	Björklund et al. (2017)	Paddeu (2017)	Janjevic and Ndiaye (2017)	Estrada and Roca-Riu (2017)	Oliveira et al. (2018)	Aditjandra and Zunder (2018)	Total
Urban Consolidation Centre projects are often based on intuition															X				1
Logistics providers consider deliveries at home a difficult market		X																	1
Size of the city															X				1
Vehicle traffic																	X		1
TOTAL																			40

Phases of planning for city logistics, proposed by Crainic et al. (2009), specify 3 (three) steps, as already consolidated in the literature: (1) strategic Level: System design and its assessment; (2) tactical level: transport plan to outline the operations and use of resources adequately satisfying the demand for transport within the quality criteria agreed with customers driving the real-time activities of the system, i.e., departure times, routes and vehicle loads, forwarding of demand; use of consolidation and distribution facilities; and (3) operational level: working time of drivers and employees of terminals; control and dynamic adjustment of the vehicle and the terminal operations.

To achieve a proper city logistics, some authors predict the need for development of policies requiring public–private interaction and behavioral changes in order to reach a more sustainable level (Aditjandra and Zunder 2018; Crainic et al. 2009; Le Pira et al. 2017a, b). To do so, it must write strategies and business models to adapt to urban aspects pondering the various components that must be designed, such as: amount of customers, distances, and population density (Björklund et al. 2017; Cagliano et al. 2017; Muñuzuri et al. 2005). It is worth noting that Dablanc (2007), in her work, points out that the urban goods movements are independent of local urban characteristics. In addition, policies should be developed at national level, together with measures taken at a local ball (Anderson et al. 2005; Oliveira et al. 2018), based on incentives (Marcucci et al. 2017a, b), through surveillance (Muñuzuri et al. 2005).

With regard to conditions for access, Dablanc (2007) proposes to abandoned entry criteria to urban areas based on the size and weight of trucks, adopting performance-based environmental parameters and in addition, Oliveira et al. (2018) indicates the proposition of monetary incentives for delivery of merchandise during off-peak hours.

With regard to infrastructure, Estrada and Roca-Riu (2017) and Janjevic and Ndiaye (2017) recommend the development of strategies of consolidation, in which it is possible to reduce delivery costs by gains in distance or time. Kedia et al. (2017) and Fancello et al. (2017) indicate the maintenance of subsidies for both urban consolidation centers for alternative systems of collection and delivery.

In reference to the use of land, Voinov and Bousquet (2010) and Oliveira et al. (2018) suggest as a condition of the planning and the regulation of the supply of spaces, not only loading/unloading areas on the streets, but also rail and river transport. Cagliano et al. (2017) still ponder the need to take into account demographic characteristics, purchase behavior, consumer travel and land use patterns, before effective implementations.

Other issues to be addressed are the need to develop intelligent transport systems based on collaboration and partnership between the segments (Crainic et al. 2009), as well as to harmonize local regulations regarding the movement of different species of vehicles (Voinov and Bousquet 2010).

Finally, the participation of all stakeholders in urban freight distribution planning is an important condition for the success of city logistics in order to avoid failures in the various initiatives (Dablanc 2007; Fancello et al. 2017; Le Pira et al. 2017a, b; Marcucci et al. 2017a, b; Oliveira et al. 2018; Prell et al. 2009). In order to do so, it must observe the plurality, rationality and relevant strategies of the agents involved (Gammelgaard et al. 2017; Marcucci et al. 2017a, b; Stathopoulos et al. 2012). It is important to point out that the creation of stakeholder relationship platforms takes time and should create co-value (Gammelgaard et al. 2017), seeking combined solutions rather than specific solutions (Dablanc 2007; Muñuzuri et al. 2005).

With regard to stakeholder coordination as well as freight distribution activities, Fancello et al. (2017) and Muñuzuri et al. (2005) point out the public authorities as possible mediators. Marcucci et al. (2017a, b) bring as an alternative the involvement of researchers acting in this role.

Conclusion

From this paper, it was possible to carry out a systematic investigation of documents related to the city logistics theme and its agents using a combined methodological approach: bibliometric analysis, semantic and content, as well as a technological prospection from 4 bases conceptualized to identify trends and gaps in the literature.

It was possible to establish the main journals and keywords, publication trends and citation of the most cited articles and co-citation network. To delve into the sample group of selected documents, it could understand the aspects of content approach, namely: urban distribution of goods, sustainability, governance, strategy and type of modeling. These aspects point to the advantages, limitations, conditions for the good development of city logistics and agents involved. It is suggested a broader definition of city logistics: a process of efficiently planning, organizing, coordinating, controlling and optimizing the transportation and consolidation of goods, as well as services, information and revenue in the urban area, observing the plurality of cities and involved, as well as the relevant rationality and strategies of the latter

It was noted that from this concept, an efficient city logistics depends on the effective coordination of variables, the engagement and interests of the stakeholders being one of them.

In addition, this study is a pioneer in the Brazilian scenario in carrying out technological prospecting in the thematic, in which it was possible to identify that most innovation systems are directed to data processing adapted for management purposes. It is important to note that China is the leading country depositor of patents.

Regarding the level of analysis, most of the documents studied are concentrated in conceptualization, namely: city logistics, urban sustainability and sustainable transport of goods; and delimitation of specific issues related to city logistics, namely: project/planning/management of transport and facilities in the urban area with effective participation of stakeholders to formulate sustainable policies, mainly observing freight pricing, service costs, fleets, schedules delivery; with concentration of methodological approaches used in qualitative research themes.

It is a fact that urban freight transport is one of the main contributors to the unsustainability of cities. Thus, in order to achieve a more sustainable urbanization, it is necessary to adopt patterns of consumption production of goods and services and urban expansion compatible with the limits of environmental, social and economic sustainability of cities.

Although the issue is being addressed by an increasing number of documents, it has not yet been extensively studied, and both the advantages and the limitations remain little explored. Knowledge about their relationship, correspondences and differences are relevant to conceptual clarity, as well as to point out the interests and purposes of the use of this area by the various agents involved. In this way, this research was able to aggregate through the integration of concepts a better understanding in the impulse of political interests, social inclusion, sustainability and economic prosperity.

Compliance with ethical standards

Conflict of Interest The authors declare that they have no conflict of interest.

Appendix 1

See Table 8.

Table 8 List of patents

Title	Author	Code, Year
Roadside reporter system	Owens; T.A., Ismaili; A., Gee; B., Lowry; F.	(14523429, 2014)
Software as a service (saas) platform based logistics distribution method involves receiving distribution task assigned by saas platform, and obtaining corresponding distribution route according to assigned distribution task	Pan X	(CN107085776–A, 2017)
Transport system for inner city logistics, has platform that is smaller than loading area of delivery vehicle, and distribution vehicle driven independently of delivery vehicle when distribution vehicle is in its use arrangement	Grodde G, Rahm's H	(WO2018046729-A1, 2017)
City logistics system has vehicle portion that is provided with controller, and communication system that is communicated with external electricity obtaining system for obtaining electric energy to drive walking system	Cheng W	(CN207216679–U, 2017)
Intelligent city logistics system, has logistic network transport line connected with node, distribution center city-type goods logistics network connected with city conveying line to transfer goods from tubular urban logistics network	Cheng W	(CN107480932–A, 2017)
City logistics transportation method, involves connecting city- stream network with transportation logistics distribution center, performing transit transportation process, and performing cargo transportation process between two cities	Cheng W	(CN107578209–A, 2017)
Network-based city logistics system, has monitoring and dispatch center which plans transport route and controls operation of multiple logistics vehicles on orbit through branch switching mechanism	Cheng W	(CN107491926–A, 2017)
Function-expandable intelligent urban service platform	Zhang Jiawen	(CN107146188 (A), 2017)
City comprehensive logistics transporting system, has city logistics hub station and multiple logistics transportation station regions provided with underground tunnel, and transport channel provided with transport robot	Liang Y, Sun B, Gong M, Liu T, Zhang B	(CN107527178–A, 2017)
Register for counting and tracking items in a bag	Rinehart; W.H., Mcgowan; A.J., Gordon; M.M.	(US 20160092833 A1, 2016)
Storage concierge	Rinehart; W.H., Mcgowan; A.J., Gordon; M.M.	(US 20170140183 A1, 2017)

Table 8 (continued)

Title	Author	Code, Year
Reboque para coleta de resíduos eletroeletrônicos	Prug; G., Imperatori; L.M., Trigo; F.C., Fleury; A.T.	(BR1020120218259 A2, 2012)
City logistics dispatching system, has data analyzing module connected with data caching module, analyzing module transmits processed information to distribution module, and distribution module pushes plan information to delivery personnel	Wang Z	(CN107886282–A, 2017)
Goods pouring device for city logistics vehicle, has guide column fixed with lifting plate, and rotating seat whose left end is connected with connecting rod, where lifting plate is hinged with end part of container	Zhang D	(CN204588166–U, 2015)
City intelligent logistics system for use during unmanned cargo transportation process, has distribution management system provided with emergency response system, taking human identity recognition and package dispensing system	Liang Y	(CN108022074–A, 2018)
City logistics distribution place address system for delivering package in electric business environment of logistics enterprise, has web server for storing city name, and data base server for storing city address with name and code data	Lin Q, Xie C, Zhang G	(CN104899647–A, 2015)
Logistics transportation mode and business marketing mode	Linbo Xu	(CN101241568 (A), 2008)
Superspeed pipeline bullet train with minimum unit and minimum pipe diameter	Lu Zhengxiang	(CN102910179 (A), 2013)
Sistema de recarga de unidade de placas para refrigeração em baús de veículos leves de carga	Medeiros, J.A.	(BR1020140114033 A2, 2014)
Express transceiving system, has cargo carrying device operated with transport channel system according to instruction sent by control mechanism, and selection system connected with cargo carrying device along control of running direction	Liu Y	(CN107368982–A, 2017)
Interactive transport channel stream system, has cargo carrying device for operating interactive transport channel unit in accordance with instructions, and line selection system for controlling running direction of goods carrying device	Yu X	(CN107194631–A, 2017)

Table 8 (continued)

Title	Author	Code, Year
Municipal logistic distribution truck, has shelf upright post arranged with foldable shelf, inner container fixed with goods guide rail strip and guide rail, and shelf shaft whose side is connected with steel wire rope	Huang J, Huang W, Lu X, Lu Y	(CN203780628–U, 2014)
Shock absorption transport case	Li Chaozhi	(CN203740344 (U), 2014)
Intelligent logistics platform system, has transaction value added service module connected with vehicle transaction platform and delivery guarantee function module by supply chain finance module	Bao Z, Tang Z, Zheng R	(CN107316172–A, 2017)
Insight and algorithmic clustering for automated synthesis	Swamy; Gitanjali	(13826338, 2016)
Dipper intra-city car-free carrier logistics platform has car-free carrier logistics platform main portion to which acquired goods real-time position is uploaded through communication transmission network	Yang J, Zhang M, Wu B	(CN206946547–U, 2016)
Beidou non-vehicle carrier logistics platform, has wireless carrier service platform terminal for determining real-time goods position and sending real-time goods position to non-vehicle carrier service platform through transmission network	Yang J, Zhang M, Wu B	(CN106548320–A, 2016)
Standardization inter-city city logistics system	Liu Rihui; Qi Chuandai; Wei Xianli; Hao Shijie; Ruan Jiuhong; Guo Xingyu; Zhang Peng; Yang Fuguang	(CN103559600 (A), 2014)
Standardization inter-city city logistics system field station	Qi Chuandai; Wei Xianli; Hao Shijie; Jiang Tao; Li Shaodong; Ruan Jiuhong; Guo Xingyu; Zhang Peng; Yang Fuguang	(CN103559599 (A), 2014)
Intelligent optimization scheduling method based on city delivery	Cao Gaoli; Cao Peng; Zhao Ruibin	(CN106447121 (A), 2017)
Intelligent city logistics distribution box, has identity authentication module and storage battery connected with controller, and electric lock matched with opening part of box body and connected with controller	Bai D, Xiao G, Zhang J	(CN107194653–A, 2017)
Real time map rendering with data clustering and expansion and overlay	Mason RJ, Koch JM	(US 20150112741 A1, 2015)
History timeline display for vehicle fleet management	Adams; N., Koch; J., Jelinek; H.	(61449044, 2011)
Railway logistic system	Tie Bing	(CN103971216 (A), 2014)

Table 8 (continued)

Title	Author	Code, Year
Urban logistics electric vehicle frame structure, has bottom frame whose front end is fixedly connected with front bumper mounting bracket, and bottom longitudinal beam whose end is fixedly connected with rear bumper fixing bracket	Wang T	(CN206797477–U, 2017)
System for utilizing track in city to carry out fast, automatic and modern urban rail logistics transportation, has freight service system which includes operation line, logistics node and distribution system	Yang Y, Zhu R	(CN205139982–U, 2015)
Methods suitable for optimizing linehaul operations	Satir; S., Christie; J.S.	(US 20080140597 A1, 2008)
Three-dimensional urban logistics transportation device, has power box back whose front end is mounted with first permanent magnet and second permanent magnet, and magnetic head connected with third magnet and fourth permanent magnets	Pan H, Lv Y, Zhou D, Wu W, Wang J, Zhang Z, Yan K, Jiang Z	(CN206767122–U, 2017)
Circulating operation-type city logistics system, has processing area equipped with sorting line, logistics center equipped in vehicle for transporting container to be emptied, and container transported to container parked position	Su C; Liu Y; Chen G; Shu S; Wang Y	(CN107285050–A, 2017)
Standardized city logistics information input assistance device, has main body provided with bottom bump that is inserted into bottom bump groove, and input keyboard provided with bearing bottom surface that is matched with pressing surface	Wang T	(CN206726176–U, 2017)
Internet-of-things based large data stream management system, has logistics terminal for receiving pick-up point confirmation instruction and buyer real-time position information, and city logistics system for comprising pick-up points	Yu S	(CN108197874–A, 2018)
Hybrid propulsion system comprising shiftable clutches provided for a motor vehicle	Glonner; H., Sich; B., Gumpoltsberger; G., Domian; H.J., Dreibholz; R., Kaindl; M., Michael; J.	(6705416, 2000)

Table 8 (continued)

Title	Author	Code, Year
Tobacco city logistics automation system, has scheduling system for managing city stream area through upright information system, and monitoring system connected with electronic display screen and conveyor	Gu H, Ran Z, Li C, Xu C, Pan S, Pan N, Chen J	(CN202864198–U, 2012)
Shared-space city logistics system, has scheduling platform for determining flow demand of goods by stream line, and logistics terminal for interacting logistics terminal distribution and freight logistics stations in planned driving route	Zheng K	(CN107609827–A, 2017)
Block type city logistics supply chain system	Meng Zhanyong	(CN107045757 (A), 2017)
Heat preservation type refrigeration container for seafood, has side plate connected with upper and lower sides of fixing tenon, and bottom plate provided with mortise unit that is arranged on top plate	Zhou X	(CN203283603–U, 2012)
Systems and methods for redundant vehicle detection at highway-rail grade crossings	Hilleary; Thomas N.	(US20120286103A1, 2013)
Communications and computing based urban transit system	Dickerson; Stephen L.	(6697730, 2004)
Lightweight trailer bed construction	DeWitt; Merl	(4232884, 1980)
Multifunctional vehicle with movable top cover	Liu Zujiang	(CN2712688(Y), 2005)
Method for assisting driving of e.g. train, involves modulating information message flow by driver assistance device based on calculated vigilance index, and displaying modulated message flow on control panel for driver	Miglianico D, Vanderhaegen F, Polet P, Mouchel M, Dahyot R, Berdjag D	(FR3063703-A1, 2018)
Assembling thin copper part and thin aluminum part of electrode tabs in battery cells used in electric accumulator of e.g. light vehicle, comprises placing ends of parts, pressing ends, and applying alloy to welding zone formed by pressing	Benoit A, Schleich D, Paillard P, Baudin T	(FR2998202-A1, 2014)

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