

Evaluation of governments' role in coping with city logistics problems

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Abstract

City logistics is a multidisciplinary topic involving diverse stakeholders. Its environment is consistently affected by emerging trends that might lead to unsustainable and inefficient freight distribution network. Dealing with new challenges requires implementation of new alternatives. This paper proposes a methodology comprising of four steps (pre-workshop, workshop, literature review, and survey) through which stakeholders' objectives and roles in tackling the newly emerged trends can be identified. This methodology determines alternatives that not only cope with the identified trends but also satisfy stakeholders' objectives. To test the methodology, the Sydney Greater Area was selected as the case study. Among all the stakeholders, the government which has a major role in city logistics is considered as a sample. Through the pre-workshop phase, the emerging trends were identified. Next, workshops were conducted to identify government's objectives. Later, a literature review was done to find city logistics alternatives. Finally, surveys were conducted with local and state governments in Sydney to evaluate the acceptability of the alternatives. The methodology can be applied by all city logistics stakeholders to cope with newly emerging challenges.

Keywords: City logistics alternatives, emerging logistics challenges, evaluation methodology, survey, stakeholders' objective.

1. Introduction

The environment of city logistics changes continually. New trends, that mainly include population growth, urbanisation, demand changes (quality, quantity, and location), and disruptive events, can have a negative impact on the performance of logistics networks. For instance, as a disruptive event, the COVID-19 pandemic has hit city logistics and challenged the current logistics network design and management. Here, informing city logistics stakeholders of alternative solutions is critical to support them in designing and managing the logistics system to keep its functionality during diverse crises.

City logistics involves various stakeholders, but among them, governments have a critical role. This is due to the nature of their role that is connected to all other stakeholders. Governments need to satisfy residents' and customers' environmental and social concerns. For this purpose, they usually introduce some regulations that can affect freight carriers and shippers from an economic perspective. Governments' performance can also impact emissions (and consequently climate change), community costs in urban freight, energy use, the noise levels in urban areas, road safety, and traffic congestion (Browne, Piotrowska, Woodburn, & Allen 2007).

The role and objectives of governments in city logistics have gained much importance in recent years. By defining the main aims of city logistics such as mobility, sustainability, and liveability, Taniguchi et al. (2004) emphasized the role of government in achieving them. Later, Bempong (2019) mentioned that governments and administrators were the core of city logistics, and their decisions impacted other stakeholders. The other objectives of governments that are widely cited in the literature include environmental sustainability (Akyelken 2011), CO₂ emissions (Ramanathan, Bentley, & Pang 2014), and green city logistics (Russo & Comi 2016).

While governments aim to enhance the performance of the logistics network, new initiatives can accelerate the process of coping with unsustainability and inefficiency, launching new initiatives can be challenging. That is because alternatives need to be accepted by the majority of decision-makers and aligned with governments' roles. To tackle this issue, continuous collaboration and communication with government help apply their points of view in alternative selection. By focusing on new challenges and trends in the Sydney Greater Area (SGA), in this study, we first conducted workshops with Transport for New South Wales (TfNSW) experts and then undertook a survey in which the preferred objectives and alternatives of Governments were identified.

This paper provides insights into government's roles and objectives in city logistics, especially last mile logistics (LML). The study also aims to identify best initiatives for each objective to improve sustainability and efficiency from the social, environmental, and economic perspectives. For this purpose, in Section 2 the role of governments in city logistics, especially in NSW is reviewed. In Section 3 we present the research methodology, including pre-workshop assessment, workshop, literature review, and survey that enabled us to achieve our aims. Section 4 discusses and quantifies the findings from the survey with local and state governments in the SGA. Section 5 presents conclusions and highlights the study's findings, and possible future work.

2. Literature review

2.1. Role of Governments in City Logistics

City logistics is the optimisation process of logistics and transportation activities in urban areas and includes various stakeholders. Government is a key stakeholder that becomes involved in problem solving planning and strategies. An examination of government involvement in city logistics will be useful for identifying potential alternatives for mitigating the effects of new trends that negatively impact this area, particularly LML.

It is widely cited that Governments can play an important role in coordinating and harmonising initiatives, standards and policies in urban freight (Michael Browne, Johan Visser, Toshinori Nemoto, José Holguín-Veras 2015). Their roles can be classified as regulator, communicator, facilitator and implementer depending on the urgency of the problem and whether the market is capable of providing a solution (Visser 2015). In the following sections, each role of Government role is discussed.

2.1.1. Regulation

Governments typically develop regulations for urban freight to improve road safety and enhance public health. In urban freight systems, this involves load limits, maximum permitted driving hours, speed limits, and permissible noise and emissions levels. Governments also implement initiatives to improve the performance of urban infrastructure to promote more

efficient and sustainable distribution. This involves providing on-street loading zones where size, permissible times, location, price and duration limits all need to be determined.

Truck bans and curfews (time of day restrictions) on roads are also common in residential areas. Restricting access to city centres has become popular in numerous European cities. Low emission zones are common in several cities in Europe where engine-related access restrictions are implemented. Vehicle size and weight restrictions are used to protect assets and improve safety. This can involve designated routes for urban freight vehicles, restricted areas and designated lanes (PIARC 2017). Governments also determine road user charges, including tolls on urban freeways (Perera, Thompson, & Yang 2016).

Employment policies relating to the rights and recognition of on-demand (gig economy) urban delivery workers is an important area of regulation for governments. Recent high profile cases locally and overseas indicate that conditions in relation to drivers' wages and working hours can lead to health and safety problems.

2.1.2. Facilitation

Government can also sponsor and promote good practice. This can involve recognition and certification programs to encourage the adoption of sustainable practices and technologies. Successful schemes in the UK include the Freight Operator Recognition Scheme (FORS) and Delivery and Servicing Plans (DSPs). The FORS "is a voluntary accreditation scheme for fleet operators which aims to raise the level of quality within fleet operations and to demonstrate which operators are achieving exemplary levels of best practice in safety, efficiency, and environmental protection" (FORS 2022). DSPs consist of a range of tools, actions, and interventions aimed at reducing and re-timing deliveries, redefining building operations, and ensuring procurement activities account for vehicle movement and emissions (Transport for London 2022). Other schemes such as eco-driving and anti-idling education programs that aim to reduce vehicle emissions can be sponsored by governments.

Government can subsidise more fuel-efficient modes of transport to improve sustainability. Recent international schemes announced include subsidy for packages delivered by cargo bikes in French cities (CYCLING INDUSTRY 2022) and grants to assist delivery business to buy or lease electric vehicles in the Netherlands (Europeansting 2021). Governments can become active in supporting and sponsoring trials/pilot programs. In Europe, a large number of Urban Consolidation Centres (UCCs) have been subsidized. A local example is the Courier Hub in Sydney (Stokoe 2017). Providing support for innovations is another way governments can facilitate new technologies. This can involve innovation grants for quiet vehicles and loading/unloading equipment as well as specialised electric urban delivery vehicles that can operate in pedestrianised areas.

2.1.3. Coordination

Government determines land use zoning patterns in urban areas which impacts urban freight generation and attraction patterns. This is because freight operations require a high proportion of trips to and from warehouses, distribution centres, terminals (ports and intermodal terminals) and large retail and commercial facilities. Government also plays a key role in influencing the capacity of off-street loading docks for major developments. The provision of loading docks in large buildings can have a large influence on the efficiency of deliveries and the general amenity of the surrounding area.

2.1.4. Stimulation

Government can be actively involved in establishing partnerships with industry. For example, the public sector can play a role to facilitate cargo bike operations. In Oslo, the government was actively involved in providing space for a micro depot, closing streets for motorised vehicles and establishing a stakeholder forum (Tale Ørving, Fossheim, & Andersen 2019). Another role government can play in actively participating in urban freight is to establish a living laboratory.

2.2. Role of government in Australia

2.2.1 Federal government

In the Australian Government, the National Transport Commission is responsible for increasing transport productivity, efficiency, safety, and environmental performance through operational reform, regulatory approaches, and facilitating transport adaptation and innovation (Australian Government 2003). The Australian Integrated Multi-modal EcoSystem (AIMES) is a tangible example of Governmental programs in Australia. AIMES is a testbed for developing and testing new information-based technologies (Australian Integrated Multimodal EcoSystem 2022). AIMES has several freight partners, including Woolworths, MobileDock, ARAMEX, and Australia Post. Several trials relating to urban distribution are being planned and implemented, including signal priority for trucks in cities, ETA prediction at loading docks based on short-term forecasting, and driver warning systems for cyclists around trucks.

2.2.2 State government

Transport for New South Wales (TfNSW) is a state government organisation in NSW responsible for the development and integration of a safe, sustainable, and efficient transport system. Its focus is on regulation, strategy planning and funding allocation in NSW to improve customer experience in different modes of transportation. TfNSW's roles can be divided into four groups, industry engagement, legislation, transport reforms, and transport planning resource.

2.2.3 Local government

The roles of local governments, such as city councils, are listed as follows:

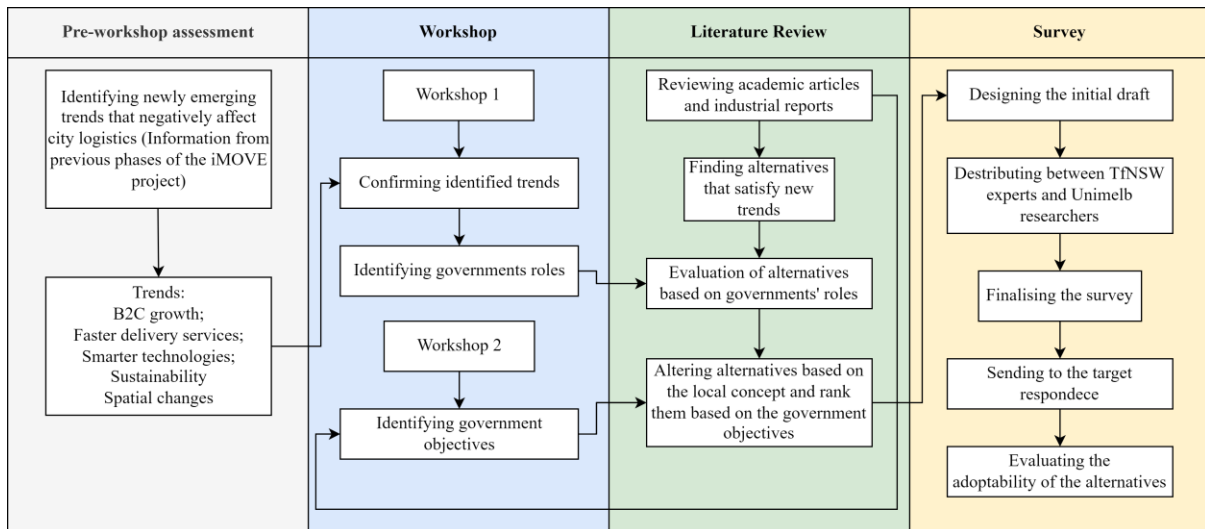
- land use decisions and facility development guides;
- management of local and regional roads;
- traffic management on roads, including traffic planning and investigations, regulation of works, and processing of road freight applications;
- management of footpaths and cycle paths;
- management of parking, such as operating pay parking schemes, parking areas' restrictions, the establishment of permit parking schemes, and providing off-street and on-street parking; and
- determining the location of transport stops.

Based on the critical role of government, there is a need for government to be active in urban distribution to ensure that the key principles of the NSW Transport Strategy (NSW Government 2020), such as enhancing sustainability, economic strength, safety, and performance are achieved. In addition, there will be a requirement for government to become involved in urban distribution to achieve the objectives of the NSW Freight and Ports Plan (NSW Government 2018). The plan covers economic growth, sustainability, capacity, safety as well as efficiency, access and connectivity.

3. Methodology

This study aims to determine city logistics alternatives to improve the level of logistics’ efficiency and sustainability. To achieve this aim, this paper presents a four-step methodology illustrated in Figure 1.

Figure 1. Research methodology’s steps



3.1. Pre-workshop assessment

This survey was a part of a larger research project in which the impacts of the COVID-19 pandemic on Sydney’s logistics system have been evaluated. The pandemic caused changes in personal activity, work methods, and travel patterns and consequently shifted goods distribution patterns across Sydney’s metropolitan area. Some new trends have been identified by conducting spatial analysis of parcel demand changes for two major carriers in Sydney, as well as contingency and correlation analysis (Kahalimoghadam, Stokoe, Thompson, & Rajabifard 2021). These trends include business to customer (B2C) growth, faster delivery services, smarter technologies, sustainability, and spatial demand changes.

3.2. Workshop

Two workshops were conducted between the University of Melbourne researchers and staff from Transport for New South Wales (TfNSW). In the first one, identified trends from the previous phases of the project. The other output of the workshop was how governments, as the main organisation that can facilitate new initiatives and regulations, can actively improve the efficiency and reliability of freight transportation, particularly in the last mile. The governments’ roles can be summarised as a) regulation, b) coordination, c) facilitation, and d) stimulation.

Additionally, it is required to know what governments intend to achieve. Therefore, in the second workshop, governments’ objectives were characterized, including:

- Strengthening the economy (SE)
- Improving sustainability (IS)
- Improving road safety (IRS)
- Enhancing the performance of distribution networks (EPDN)

3.3. Literature review

To be able to tackle the current unsustainable and inefficient situation, academic articles and industrial reports were reviewed to identify possible alternatives. These initiatives are categorised into six groups and briefly introduced in this section.

3.3.1. *Advanced planning and modelling (APM)*

This alternative aims to increase the understanding of ideal metropolitan areas in which advanced application of technology in LML is implemented. Also, optimised vehicle scheduling is used by all freight carriers. APM also includes different data channels for the provision of ongoing freight activity data to inform modelling activities.

3.3.2. *Prioritising access for low emission vehicles (PALEVs)*

Traditional vehicles, particularly the old ones, produce negative externalities, such as GHG emissions and noise pollution. These externalities adversely impact residents' life and well-being. Low emission zones provide a way for cities' stakeholders to reduce air pollution and facilitate the use of more electric vehicles for last-mile delivery purposes. By establishing low emission zones, the use of light electric vehicles such as e-cargo bikes to perform last-mile deliveries in urban areas, as well as priority access for light electric vehicles to loading zones are promoted. Another aspect of this alternative is prioritising access for electric freight vehicles, e.g., priority lanes on highways. Although low emission zones successfully reduce negative externalities, their establishment is challenging due to their impacts on businesses. Finally, low emission zones require a clear definition of their boundaries, policy approach, and enforcement model.

3.3.3 *Industry and partner engagement (IPE)*

Understanding the opinions of different stakeholders is a key to successfully implementing an initiative in urban freight logistics. One way to actively incorporate all stakeholders in decision-making processes is by establishing an ongoing industry forum and partnerships with the industry for investment that enable the engagement of industry partners, shippers, carriers, and, more importantly, local and state governments. Not only do forums improve the sustainability of last mile's distribution, but also they increase distribution network efficiency by evaluating customers' behaviour.

3.3.4. *Support development of facilities (SDFs)*

Logistics facilities such as UCCs and micro consolidation centres (MCCs) are the most cited solutions to cope with inefficiency in the last mile. Supporting the development of UCCs and MCCs can potentially reduce the movement of heavy vehicles in urban areas and increase sustainability. Also, the provision of charging and swapping stations in urban areas for light electric vehicles performing last-mile deliveries can reduce noise and air pollution in local areas.

3.3.5. *Pilot ecosystems (PEs)*

Not only does this initiative include incorporating various abovementioned approaches, but it also involves the implementation of low emission zones and defining restriction times for freight vehicles entering certain zones.

3.3.6. *Training programs (TPs)*

By focusing on smaller freight operators, this scheme aims to improve optimal efficiency by providing information on technology and practices that may lead to improvements in operational efficiency, e.g., consolidation approaches. TPs for carriers and freight operators

can reduce the negative externalities of last-mile activities and improve the fuel economy of commercial vehicles. That is because trucks and vans, the most common vehicles for last-mile deliveries, produce greenhouse gas emissions and noise pollution. The program should provide carriers personnel with essential information to understand their environmental responsibilities, identify potential transportation problems that can negatively impact citizens, and be able to describe common solutions to prevent these problems.

Table 1 classifies the literature review and includes objectives, advantages/disadvantages and role(s) of government for each alternative.

Table 1. Main characteristics of identified alternatives

Alternative	Objective	Advantage/disadvantage	Government role	Reference(s)
APM	To provide a simulation-optimisation framework that enables assessment of the alternative implementation	<p><i>Advantages:</i></p> <ul style="list-style-type: none"> -Encouraging the usage of autonomous delivery vehicles, e.g. robots and drones, in the last mile -Increasing customers' satisfaction -Increasing LMD effectiveness, efficiency, and sustainability <p><i>Disadvantages:</i></p> <ul style="list-style-type: none"> -Hard to establish due to the policy and law requirements -Needs the approval of different stakeholders, particularly shippers, carriers, and governments 	Regulation Coordination	(de Mello Bandeira et al. 2019) (Perboli, Rosano, Saint-Guillain, & Rizzo 2018)
PALEVs	To minimise the GHG emissions of last-mile freight activities by defining low emission zone and facilitating the use of electric and autonomous delivery vehicles.	<p><i>Advantages:</i></p> <ul style="list-style-type: none"> -Reduction of air pollution, noise pollution, and GHG emissions. -Reduction of traffic congestion. <p><i>Disadvantages:</i></p> <ul style="list-style-type: none"> -Increase the operational costs of carriers -Hard to establish due to the policy and law requirements. 	Regulation Coordination	(Bjørgen, Bjerkan, & Hjelkrem 2021) (Figliozzi 2020)
IPE	to engage industry for shaping future freight landscape Description" can be divided into two objectives: 1)To improve the sustainability of last-mile distribution by incorporating different stakeholders and evaluating different distribution strategies and delivery methods. 2)To increase the efficiency of the last-mile delivery by evaluating customers' behaviours, such as the most favourable mode of delivery.	<p><i>Advantages:</i></p> <ul style="list-style-type: none"> -Up-to-date information can be extracted from forums to evaluate distribution systems and freight efficiency. -Incorporating different stakeholders in decision-making processes, such as investment in logistics facilities. -Identifying emerging problems. -Understanding the characteristics of the current last-mile distribution. -Improving communications and interactions between different stakeholders <p><i>Disadvantages:</i></p> <ul style="list-style-type: none"> -The difficult process of amending rules to implement the suggested regulations. -Lack of awareness among stakeholders about the forum -Misunderstanding the aims and importance of the forum -Target stakeholders do not identify properly 	Facilitation Coordination Stimulation	(Nguyen, de Leeuw, Dullaert, & Foubert 2019) (Manerba, Mansini, & Zanotti 2018)
SDFs (UCCs and MCCs)	UCCs: To minimise the movement of heavy vehicles in urban	<p><i>Advantages:</i></p> <ul style="list-style-type: none"> -The analysis shows that the implementation of consolidation centres can increase the annual profit by 8%. 	Stimulation Facilitation	(van Heeswijk, Larsen, & Larsen 2019)

Alternative	Objective	Advantage/disadvantage	Government role	Reference(s)
	areas and optimise the profits	<ul style="list-style-type: none"> -Consolidated delivery fees contribute 73% of total revenue. -Decrease the movement of heavy vehicles in urban areas -Decrease noise and air pollution, so the sustainability in terms of social and environmental perspectives increases. <p><i>Disadvantages:</i></p> <ul style="list-style-type: none"> -Implementation of UCCs involves additional costs such as the cost of launching them and service fees for their customers. 		(Deng, Fang, & Lim 2020) (Dablanc et al. 2014)
	MCCs: To evaluate the characteristics of distribution networks in order to implement a network of micro consolidation centres through which to increase customer satisfaction and reduce delivery costs.	<p><i>Advantages:</i></p> <ul style="list-style-type: none"> -The following shows impactive parameters on the gross margin of micro consolidation centres and the percentage of their impacts: a) Delivery area: increase gross margin up to 25% b) The number of tours per day: can increase gross margin up to 40% c) Infrastructure efficiency: can increase gross margin up to 30% d) Staff productivity: can increase gross margin up to 30% e) Equipment utilisation: can increase gross margin up to 23% <ul style="list-style-type: none"> -Increasing efficiency of distribution network -Increasing vehicle loading factor -Reducing the movement of heavy vehicles in urban areas -Increasing the speed of delivery <p><i>Disadvantages:</i></p> <ul style="list-style-type: none"> -Needs initial investment for launching -Needs the approval of different stakeholders, particularly shippers, carriers, and governments 	Stimulation Facilitation	(J. Allen et al. 2018) (Janjevic & Winkenbach 2020)
PEs	To reach zero emissions in the last mile delivery	<p><i>Advantages:</i></p> <ul style="list-style-type: none"> -Increasing the usage of green vehicles in urban areas -Improving air quality in local areas -Reducing congestion and energy consumption <p><i>Disadvantages:</i></p> <ul style="list-style-type: none"> -Needs the approval of different stakeholders, particularly shippers, carriers, and governments 	Facilitation Stimulation	(Dablanc, Giuliano, Holliday, & O'Brien 2013)
TPs	To increase the knowledge of carriers' personnel about their impacts on urban traffic and improve last-mile delivery efficiency.	<p><i>Advantages:</i></p> <p>For drivers:</p> <ul style="list-style-type: none"> Professionalization of carriers' personnel -Improving economic and efficient driving skills -Improving safety in driving, loading, and unloading processes -Ability to use technology to improve driving behaviour -Reducing vehicle incidents by 50% -Reducing customers' complaints by 5% <p>For companies:</p> <ul style="list-style-type: none"> -Reducing fuel consumption 	Facilitation Coordination Stimulation	(Boysen, Schwerdfeger, & Weidinger 2018) (Brown & Guiffrida 2014) (Agatz, Bouman, & Schmidt 2018)

Alternative	Objective	Advantage/disadvantage	Government role	Reference(s)
		-Reducing operational costs, e.g. maintenance -Reducing GHG emissions -Reducing accidents rates <i>Disadvantages:</i> -Lack of training program realisation: to attract carriers' owners and drivers, the benefits of TPs need to be understood by them. -Costs: Although the advantages of TPs overweight their costs, the expenses usually concern many carriers and owner-operators. -Sustaining TPs' benefits over time: the evaluation of TPs needs to be assessed both in the short-term and long-term. However, most of the TPs evaluate immediately after the training.		

Reviewing various academic and industrial documents improved our knowledge of the government's roles and objectives. Therefore, the identified objectives of the government in the workshop were slightly modified in this step.

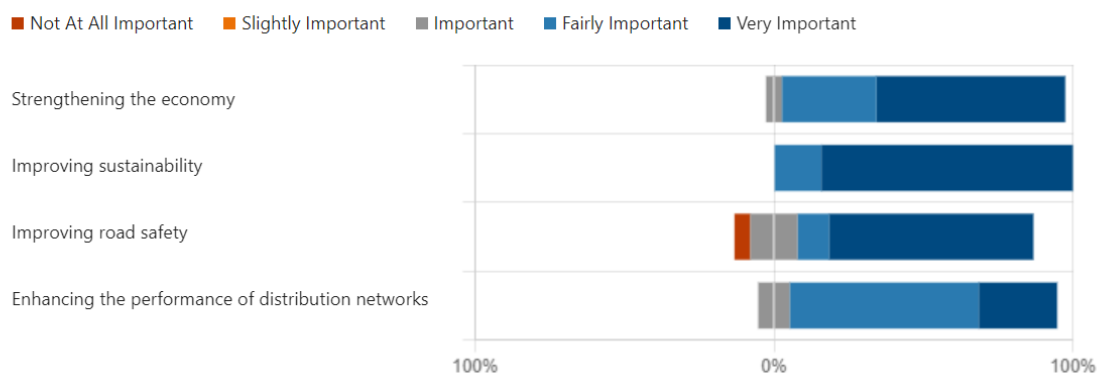
3.4. Survey

This step aims to reflect the stakeholders' point of view in the process of alternatives selection. It is because the success rate of an alternative implementation is highly related to involving relevant stakeholders in the process. One of the key stakeholders in city logistics is the government, who is responsible for regulation and coordination. Due to their critical role, surveys were conducted to evaluate our findings in the previous steps. After designing the first initial draft, the survey was sent to TfNSW staff and The University of Melbourne researchers to improve it. By addressing experts' feedback, the survey was finalised and distributed among the targeted responders. We tried to keep the number of questions as low as possible to increase the response rate. It consisted of 8 questions and was conducted online using Microsoft Forms.

4. Results and Discussion

In this section, the survey that was conducted in the SGA to evaluate the local, state, and federal governments' points of view will be discussed. The total number of contact persons in the survey were 65, and we received 19 responses which means the response rate was 29% which was higher than the average response rate (25%) obtained in past urban freight surveys (Julian Allen, Browne, & Cherrett 2012).

Figure 2. Results of the survey about the importance of government objectives



The first question asked about the type of organisation, including federal, state, or local government. 11 responses were received from state government, 8 responses from local government, and no responses were received from federal government. In the second question, the main objectives of the government are introduced, and responders are asked to select the importance of each objective from the provided options (Not At All Important, Slightly Important, Important, Fairly Important, and Very Important). This question is critical for future planning in city logistics because it shows how different governmental employees, who have been working in logistics for years, prioritise objectives. Figure 2 shows the importance of objectives from the responders' point of view. Table 2 also represents more details about the objectives. For example, among all responders, 16 of them mentioned that is very important, 3 of them said it is fairly important, and none of the responders selected other options indicated the importance of sustainability in future urban freight planning.

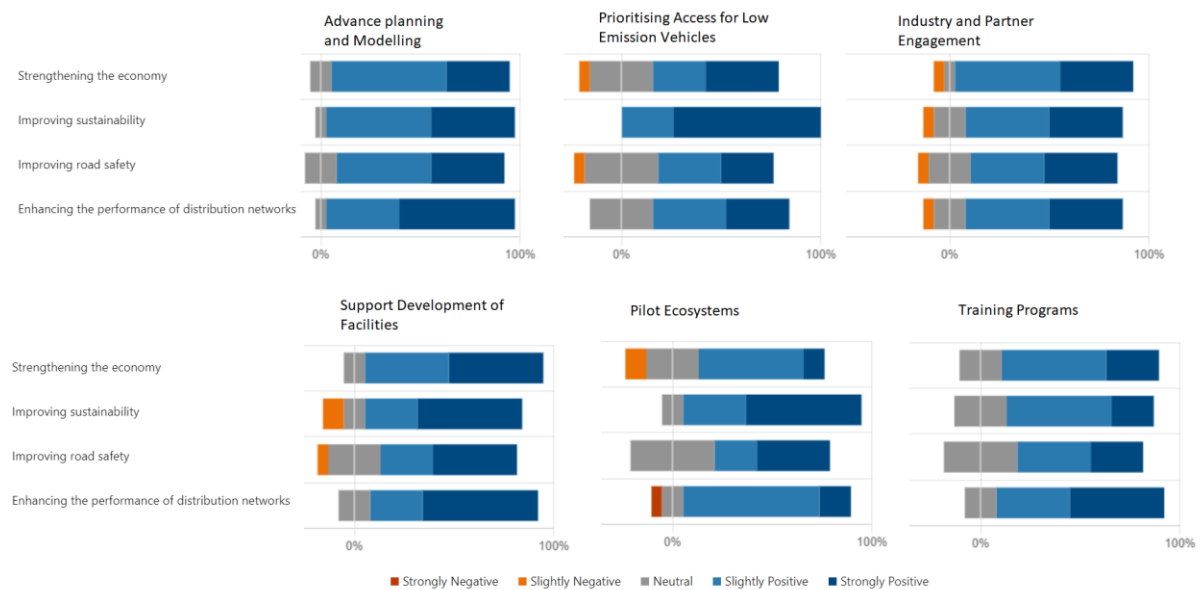
Table 2. Distribution of responses to each objective.

	SE	IS	IRS	EPDN
Not At All Important	0	0	1	0
Slightly Important	0	0	0	0
Important	1	0	3	2
Fairly Important	6	3	2	12
Very Important	12	16	13	5

The rest of the survey aimed to evaluate the performance of alternatives identified in workshops against the objectives. For example, one of the alternatives is APM, and responders were asked to evaluate the impact of this alternative on governments' objectives.

In Figure 3, the distribution of responses for evaluation of objectives against alternatives can be seen. The initial analysis of responses shows that that governmental personnel stressed the importance of APM and SDFs. In the following section the survey results will be quantified to provide an accurate comparison between alternatives.

Figure 3. Evaluation of government's objectives against alternatives



4.1. Quantification of the survey

4.1.1. Objectives

A group decision support (GDS) method is applied here to evaluate the preference objective(s), as well as the rating of alternatives. GDS consists of different methods such as PROMETHEE, ELECTRE which are preference based, or Analytical Hierarchy Process (AHP) which is initial qualitative assessment (Majdi 2013).

We, first, define a weight for each option of objectives which is shown in table 2. Then the score of each objective is calculated by using formula (1).

$$S_i = \sum_i w_i * n_i \quad (1)$$

Where, S is score, w is weight of each option based on Table 3, and n is the number of times that each option is selected for each objective.

Table 3. Weights that are used to quantify objectives' responses

Options	Weights
Not At All Important	1
Slightly Important	3
Important	5
Fairly Important	7
Very Important	9

Finally, by applying formula (2) which is a mathematical description of additive normalisation, the scores are mapped in the range between zero to one.

$$S'_i = \frac{S_i}{\sum S_i} \quad (2)$$

Where, S' is the normalised form of each objective score.

The overall and normalised scores of each objective are represented in table 4.

Table 4. Quantified evaluation of governments objectives

	SE	IS	IRS	EPDN
Overall score	155	165	147	139
Normalised score	0.25	0.27	0.24	0.23

The results emphasise that improving sustainability is the most significant objective for the governments in city logistics. One reason for that can be the enormous impact of sustainability in different dimensions of our life, including economic, social and environmental.

4.1.2. Alternatives

The same method was applied to rank alternatives. However, for standardisation, the extreme value normalisation method is used. This method results in better differentiation between the alternatives' scores. Alternatives' rating is shown in Table 4. The results show that APM is the most impactful alternative since it has a 100% effect on two objectives, IRS and EPDN. SDFs and PALEVs are the other influential alternatives that need to be considered by decision-

makers in city logistics. It also can be concluded that PEs has the lowest impact on the achievement of objectives.

The same method was applied to rank alternatives. However, for standardisation, the extreme value normalisation method was used. This method results in better differentiation between the alternatives' scores. Alternatives' rating is shown in table 5. The results show that APM is the most impactful alternative since it has a 100% effect on two objectives, IRS and EPDN. SDFs and PALEVs are the other influential alternatives that need to be considered by decision-makers in city logistics. It is also observed that PEs generally have a low impact on objectives, but there are some exceptions. For instance, PEs have a relatively high impact on IS and IRS.

Table 5. Quantified rating of alternatives

	SE	IS	IRS	EPDN
APM	0.82	0.53	1.00	1.00
PALEVs	0.44	1.00	0.00	0.17
IPE	0.74	0.10	0.53	0.21
SDFs	1.00	0.13	0.53	0.83
PEs	0.00	0.67	0.47	0.00
TPs	0.65	0.00	0.37	0.67

5. Conclusion

Change is constant in the city logistics environment since it involves a wide range of activities, from last-mile logistics to last-mile delivery. Such an environment brings emerging trends that can negatively affect the performance of the freight distribution network. This study proposed a new methodology by which alternatives that can deal with the adverse impacts of newly emerged trends, particularly in times of disasters and extreme events, and satisfy different stakeholders' objectives are determined. The proposed methodology included a pre-workshop assessment, workshop(s), literature review, and conducting surveys, as shown in Figure 1. The Sydney Greater Area (SGA) and governments in Sydney were considered as a case study and stakeholder, respectively, to test the methodology.

In the first step, some new trends in SGA, caused by the Covid-19 pandemic and negatively impacted logistics distribution networks, were presented. Later, two workshops were run between The University of Melbourne researchers and staff from Transport for New South Wales (TfNSW). As a result of the workshops, governments' objectives were identified, including a) strengthening the economy (SE), b) improving sustainability (IS), c) improving road safety (IRS), and d) enhancing the performance of distribution networks (EPDN). In the third step, academic articles and industrial reports were reviewed, and six main initiatives that can potentially tackle the current issues in Sydney's logistics system were identified. These initiatives are summarised in Table 1. In the final step of the methodology, surveys were conducted among local, state and federal governments to address their perspectives on the alternatives' selection process and increase the success rate of their launching.

After applying a quantification method to the survey results, it was observed that the concern of the majority of government persons was improving sustainability in the last mile activities. The results also demonstrated that the most effective alternatives to achieve the governments' objectives were advanced planning and modelling (APM) and Support development of

facilities (SDFs). The results of the surveys with government officials confirmed the effectiveness of the methodology.

While in this study, the roles and objectives of governments were thoroughly examined, there is a need to evaluate the contribution of other active stakeholders in city logistics. That is because the decisions of stakeholders impact the performance of each other. To address this issue, a study should be conducted to survey and integrate the perspectives other city logistics stakeholders, including shippers, carriers, residents, and receivers.

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