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Using Procurement Power to Accelerate Sustainable City Logistics: Lessons from Change Agents in The Netherlands

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Abstract: The role of large procurers (receivers) in improving city logistics is gaining increased attention among scientists and professionals. Knowledge, guidance, and agreements in this field have led to more willingness, ability, and opportunities among receivers to contribute to efficient and zero-emission city logistics when buying goods and services. Change agents play a vital role by initiating, managing, and implementing the change towards more sustainable processes within organisations. The experiences of change agents in The Netherlands show that the number of initiatives in which governments, universities, businesses, and health care institutions (jointly) use their procurement power to accelerate sustainable city logistics is growing. However, the development towards realisation and scaling in practice is going slowly. For this research, we asked change agents in The Netherlands to discuss together the circumstances and actions that support progress towards sustainable city logistics using the buying power of large (clusters of) organisations in cities. Qualitative data has been collected in three workshops, covering 10 initiatives in Amsterdam, Rotterdam, The Hague, Utrecht, and Nijmegen. A list of twelve lessons has been derived and compared with the existing literature. Their experiences confirmed that change is supported by knowledge networks, objectives that motivate stakeholders, a strategic vision, a baseline measurement, social pressure, monitoring and communicating progress, market dialogue, and a broad set of measures. The research also provides new recommendations for change agents. They are advised to form a 'seed-group', involve a high-ranking ambassador, and actively promote knowledge sharing among peers to increase involvement. Lastly, it has become clear that knowledge on financial feasibility is scarce. This is because every business case is made-to-measure and is barely quantified from the perspective of receivers.

Keywords: city logistics; sustainable procurement; change agents

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1. Introduction

Logistics is essential for cities to progress towards attractive environments for citizens, organisations, and visitors. It is needed for the supply of food, construction materials, technical services, health care, consumer products, and for the collection of waste and circular materials. At the same time, logistics is associated with negative effects of CO_2, air pollution, traffic safety, visual nuisance, and space occupancy; all of which are even more crucial in densely populated areas. As population density in cities increases, the demand for products and services per square metre increases while space becomes scarcer. The concept of 'compact cities' envisions high residential density, a mixed range of functions in close proximity that promote social interaction, low car dependency, and reduced emissions [1]. While moving towards compact cities and climate agreement ambitions, the need to organise logistics more efficiently becomes more crucial among different stakeholder groups, each of which brings their own criteria. Logistics improvements are not only driven by costs and service levels, but also by social, spatial, and ecological values like safety, liveability, and climate mitigation. As a result, policy makers have introduced low emission zones, car-free areas, and financial innovation in electric freight vehicles. Shippers can

reduce the emissions of their warehouses and transport operators can work on efficient planning and electrification of their fleets.

During the last 10 years, the attention on the role of receivers in the generation of freight and the implementation of sustainable logistics solutions has increased. Receivers include public organisations such as governments, municipalities, universities, and hospitals, as well as private businesses (e.g., retailers) or clusters of businesses [2–5]. More recently the role of 'influencers' was introduced by Brettmo and Williamsson [6]. Influencers are indirect stakeholders that can support sustainable urban freight by persuading receivers to change how freight flows are managed. The European Commission is also paying attention to the role of large (public) receivers in zero-emission city logistics. This is done by financing and promoting relevant projects. An example is the BuyZET project (www.buyzet.eu (accessed on 21 December 2021).) (2016–2019) that developed procurement plans to achieve zero-emission urban delivery of goods and services to the public sector [7]. In the year that BuyZET ended, the Dutch research project City Logistics Lab (CILOLAB) (2019–2022) continued the reasoning that large procurers in cities can accelerate city logistics innovations and reduce emissions. CILOLAB (www.cilolab.nl (accessed on 21 December 2021).) is financed by The Netherlands Organisation of Scientific Research (NWO). Within CILOLAB, governments, suppliers, logistics operators, interest groups, and researchers develop new approaches and actions to guide and facilitate the required transition in city logistics. CILOLAB focuses on four research themes: (1) inner city and last-mile transport concepts, (2) standardisation and data exchange, (3) policy and locations, and (4) procurement. This paper is a result of the research activities in the fourth research theme. Using procurement as an instrument for zero-emission city logistics is being explored, tested, and evaluated by early adopters in the CILOLAB network. Experiences in practice show that the development towards actual realisation and scaling goes slowly and that there is a need to assist (future) initiators. The current literature (see following section) does provide knowledge on the different solutions that can be adopted from a procurement perspective, but knowledge on how the solutions can be realised using procurement power has not yet been fully explored. This paper presents a first attempt by elaborating on the following research question: which actions and circumstances support the realisation of sustainable logistics when the procurement power of large organisations in cities is used as an accelerator? The paper starts with a literature review summarising current knowledge on city logistics stakeholders, specifically the role of receivers, and sustainable procurement. Next, the research method is described, followed by a description of four of the 10 cases that are part of this study. Then, the results are presented and discussed in relation to the theory and method, after which we end with a conclusion.

2. Literature

2.1. City Logistics Stakeholders and the Role of Receivers

The variety of different stakeholders in city logistics has attracted growing attention over the last 20 years. Quak [8] distinguished four different groups: shippers, carriers, receivers, and local authorities. Oliveira and Oliveira [9] added residents, as did Kiba-Janiak [10] who also added public transport operators. Zenezini [11] identified 10 different stakeholder groups, including urban consolidation centre (UCC) operator, green delivery operator, ICT platform operator, and real estate developer. Zenezini further addressed the idea that local authorities have multiple roles in city logistics: as a network coordinator, user of logistics services, and receiver of goods. The NOVELOG project [12] developed a guide for local authorities on Sustainable Urban Logistics Planning (SULP) with much attention for multistakeholder collaboration and participation. From 2014 onwards, multiple studies focused specifically on the role of (large) receivers in urban freight transport generation and efficiency. Receivers can be retailers, offices, restaurants, public buildings, schools, and cultural institutions. The preferences of retailers in urban freight distribution have been studied, for example, by Dell'Olio et al. [13], Holgain-Veras and Sanchez-Diaz [3], and Marcucci and Gatta [14,15]. Various researchers in city logistics have conducted research

using their own university as the receiver of freight [2,4,16,17]. Universities can, considering their size, spending, location, and social responsibility, act as a launching customer for sustainable city logistics. This also applies to municipalities and national governments (e.g., offices of ministries). Brettmo and Williamsson [6] distinguished between direct and indirect stakeholders. Influencers are indirect stakeholders that set norms to the actors that are directly part of the supply chain, the direct stakeholders. Influencers "tend to engage with issues linked to sustainability (e.g., local air pollution or congestion) and therefore are often strongly motivated to enforce standards of behaviour that by changing the attitudes of receivers may put financial pressure on the firms providing transport services (i.e., carriers)" [6]. Examples of influencers are Business Improvement Districts (BIDs), property owners, facility management companies (FMCs), and public procurement organisations (PPOs).

From existing studies, a list of measures that receivers and influencers can take to reduce the spatial and ecological footprint of city logistics can be derived. These measures are as follows:

- Quantify the vehicle movements and related CO_2 emissions that are generated by the procurement of products and services (e.g., counting on site, estimations using procurement data).
- Integrate low-emission criteria when selecting suppliers (e.g., in tender procedures).
- Coordinate delivery days and moments (e.g., stimulate off-peak deliveries) within an area and reduce delivery frequencies (e.g., no longer 'next-day-delivery' but two fixed delivery days per week).
- Introduce or stimulate the use of physical locations where deliveries are consolidated and zero-emission vehicles are used, such as an UCC, parcel lockers, microhub, or central mail room.
- Initiate or join collaborative procurement schemes and collective waste management to reduce the number of suppliers, and thus vehicle movements, in an area.

The measures that a receiver employs and the underlying objectives can be set out in a Delivery and Servicing Plan (DSP). Transport for London (TfL) provides guidance to building occupiers on how to set up a DSP. The DSP is a live document describing how delivery and service activities are optimised from the receiver end of the supply chain [18,19]. It can be used for new development sites as well as existing sites and covers business deliveries, services, and personal deliveries to employees or residents.

Researchers in the BuyZET project explored how the environmental impacts of freight flows and service trips can be estimated using procurement information, such as contracts, invoices, and delivery receipts [7,16]. Their experiences and findings showed that this is not simple. Some of the required data are more reliably gathered through onsite observation or supplier surveys than from a procurement system, though physical counting and surveys are time-consuming. Although many steps have to be made before procurement systems can monitor CO_2 emissions in a consistent way, the first rough and simple attempts already help to create more awareness, tailor policies, and stimulate actions among receivers. This outcome alone is valuable, as individual receivers do not always feel the responsibility to contribute to sustainable logistics. They believe that it is not within their scope of influence, or they do not see any potential for cost-savings [18]. Business improvement districts, on the other hand, are more engaged with city logistics. They are motivated to make a positive impact on the environment, especially when congestion is visible in the area and concerns about bad air quality exist [5]. However, for an external stakeholder like BIDs, it is even more difficult to gather freight data from individual procurement systems. Instead, they can request their members to estimate or monitor their deliveries and servicing for a period of 2–4 weeks [19].

2.2. Sustainable Procurement and the Role of Change Agents

More and more, organisations are taking sustainability into account when procuring goods and services. Sustainable public procurement has been a policy instrument for

decades. Government bodies use their role as a large buyer to force businesses to contribute to the achievement of public objectives [20]. By combining their procurement power and their social responsibility, they can make impactful choices that contribute to sustainable societies. As well as public organisations, businesses also use sustainability criteria when buying goods and services. The aim to contribute to societal goals is called corporate social responsibility (CSR) and can be driven by both ethical and strategic reasons. Hence, CSR can be linked to philanthropy or activism but also to the ambition of being a frontrunner, being attractive for customers and employees, becoming familiar with future standards, or contributing to an attractive local environment (sources). Sustainability criteria can, for example, be related to the production and consumption of energy (e.g., green energy), the composition of products (e.g., the circular economy), labour rights, and social return. When it comes to transport, BuyZET distinguished three categories for which sustainable criteria and objectives can be applied [21]. Category 1 includes the organisation's own fleet such as lease vehicles or garbage vehicles owned by municipalities. The second category includes the procurement of transport services. Examples in category 2 are public transport, postal routes, or business trips. Category 3 covers the procurement of goods and services that require transportation to deliver the order, but where transport is not the primary subject of the contract. Examples are office supplies that are delivered or construction work for which material and personnel has to be transported. Compared to category 1 and 2, international knowledge, the amount of available guidance, and best practices for sustainable transport criteria in category 3 is still limited [22–24]. Hence, there is potential to raise awareness among public and private procurers on how to include relevant selection criteria and measures for zero-emission city logistics when contracting suppliers for non-transport products/services and how it can benefit them.

To accelerate sustainable city logistics through procurement, it is relevant to explore the factors that can positively influence sustainable procurement behaviour. The degree to which an organisation implements sustainable procurement is influenced by several factors. Grandia [25,26] studied these factors for public organisations in The Netherlands. She concluded that alongside the behaviour of procurers, the behaviour of change agents is also crucial in the implementation of sustainable public procurement (SPP). Change agents are persons from inside or outside the organisation who promote change in the organisation without the formal authority to do so. Examples are sustainability advisors, CSR professionals, or action-driven researchers. Change agents are informal leaders that, by fostering dialogue and knowledge exchange and by providing tools and advice, contribute to a better understanding of interests, constraints, and opportunities with the aim of initiating, managing, and realising change [25,27,28]. According to Grandia [26], informal leaders like change agents play a more important role in the implementation of SPP than formal leadership from top management and hence should be honoured and rewarded. Another relevant finding is that actors need to be willing and able to implement SPP. Willingness and ability are influenced by the level of affective commitment and knowledge, the perceived procedural justice, and alignment of procurement policies with the organisation's strategic vision [26]. Willingness (motivation) and ability (capability) are also part of the behavioural change wheel methodology [29]. This methodology is used for the development and evaluation of behaviour change interventions. Alongside motivation and capability, the behavioural change wheel also describes 'opportunity' as an important determinant for behaviour. Whether there is an opportunity to change behaviour can relate to both physical (e.g., infrastructure) and social conditions (e.g., social norms) [30]. Knowledge on the role of change agents and determinants of behavioural change can be applied when developing or evaluating procurement measures for sustainable city logistics. It helps to assess what is needed (or missing) to realise change in practice.

3. Method

The research question was which actions and circumstances support the realisation of sustainable logistics in cities when the procurement power of large organisations is used as the accelerator? Figure 1 presents the steps of the research approach that was followed.

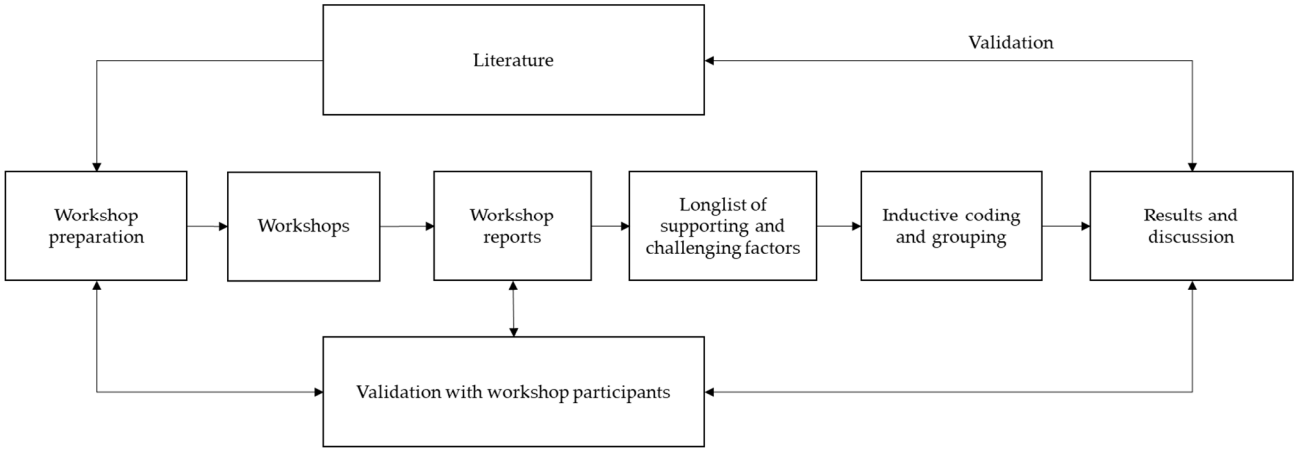

Figure 1. Research approach.

To answer the research question, qualitative data from three workshops in 2020 and 2021 was analysed. The workshops were held online due to the corona pandemic. Information about the workshops is shown in Table 1 and information about the cases and change agents is shown in Table 2. In total, 10 cases from five cities in The Netherlands were discussed by 37 participants. Each case represents a receiver or a cluster of receivers: governments, universities, business and medical centres (e.g., hospitals). The cases have in common that a change agent supports the receivers, suppliers, and logistics operators to accelerate efficient and zero-emission city logistics using the procurement power of the receiver. The change agents are internal or temporary staff members, researchers, or advisors of the respective case. They all had multiple years of experience with accelerating sustainable logistics in practice.

The workshop participants consisted of business professionals, public professionals, advisors, and researchers from the CILOLAB network. The last column of Table 1 shows which cases were discussed in each workshop. The setup of the workshops was as follows: the change agent of each case presented their ambition and the steps that were taken and elaborated on the factors that support or challenge progress towards the realisation of sustainable city logistics. The aim of all three workshops was to gather and exchange knowledge and experiences among change agents. This was facilitated by the workshop moderators by inviting the workshop participants to reflect on each presentation by asking questions and by sharing their own experiences on the topics that were raised by the change agent.

Table 1. Workshop information.

	Date	Number of Participants	Cases Presented (See Table 2)
Workshop 1	23 April 2020	15	c, d, g, h, i
Workshop 2	12 May 2020	16	b, e
Workshop 3	19 January 2021	22	a, b, e, f, h, j
Total unique participants/cases involved:		37	10

Table 2. Cases and their change agents.

Name of Case	Start Year	City	Receivers Involved				Position of the Change Agent Involved
			Government	Universities	Businesses	Medical centre	
a. City Logistics The Hague	2012	The Hague	x		x		Temporary staff
b. Municipality of Amsterdam	2014	Amsterdam	x				Internal staff
c. Municipality of Rotterdam	2014	Rotterdam	x				Internal staff
d. UvA-AUAS	2014	Amsterdam		x			Researcher
e. Green Business Club Zuidas	2018	Amsterdam		x	x		Internal staff
f. Green Business Club Utrecht	2018	Utrecht			x		Temporary staff
g. Campus Heijendaal	2018	Nijmegen		x		x	Researcher
h. BIZ Knowledge Mile	2018	Amsterdam	x	x	x		Internal staff
i. Cordaan	2019	Amsterdam				x	Advisory
j. Utrecht Science Park	2020	Utrecht		x	x	x	Temporary staff

x = type of receiver is involved.

The workshops were prepared by CILOLAB researchers and the presenters of the cases. Each workshop had a slightly different focus. Workshop 1 focused on success factors and costs and benefits for different actors. Workshop 2 focused on the steps and division of roles between the different actors to realise measures. Workshop 3 focused on successes, barriers, and improvements to bring the cases further towards realisation.

Each workshop was followed by a written report that summarised the gathered input. The reports were shared with the participants for review and approval. From the approved reports, a longlist of actions and circumstances was extracted that, according to the experiences of the workshop participants, supports the realisation of sustainable logistics using procurement power. The longlist was categorised by inductive coding and grouped in themes. This analysis led to a final set of lessons which was validated with the literature and with the workshop participants.

In the following section, four of the 10 cases are described in more detail. The results from the workshops are presented in Section 5.

4. Case Descriptions

In this section, four of the 10 cases are described to further illustrate what the organisations have achieved by using their role as a large procurer to realise efficient and zero-emission logistics solutions. These four cases have been selected to illustrate the diversity of the cases, the change agents, and the variety of measures that have been taken.

4.1. City Logistics The Hague

City Logistics The Hague is the result of a collaboration between the national government of The Netherlands and the Municipality of The Hague. The two organisations have many offices and premises in The Hague and share the ambition to contribute to zero-emission city logistics. They decided to work together to prepare a tender for a logistics hub, which was published in 2018. The tender was granted in 2019 to a partnership of logistics service providers. The hub is not only used as a consolidation centre for deliveries to the governmental and municipal offices, but also for businesses with offices in The Hague (i.e., the businesses join the contract that the government has with the hub-operator). So by 'leading by example' the government has become a launching customer for sustainable logistics and inspired others (including businesses) to join this new logistics concept. The hub is located next to the A12 highway approximately eight kilometres from the city centre (most of the launching customers are located in closer proximity to the hub). In 2021, a total of 32 suppliers delivered their goods to the hub, from there the hub-operator

uses zero-emission vehicles to deliver the goods to 227 different locations in The Hague. CO_2 emissions and transport movements are reduced by using electric vehicles and by consolidating freight flows, including the collection of waste from the buildings on the way back. The receivers pay the hub-operator in the first years of operation. The ambition for new contracts is that suppliers will pay for the hub and integrate the costs in their offer to the receiver (i.e., the customer).

4.2. University of Amsterdam (UvA) and Amsterdam University of Applied Sciences (AUAS)

In 2014, the Facility Services (FS) department of the UvA-AUAS and the AUAS City Logistics research group started a collaboration to explore the potential of sustainable logistics for their own premises.

The UvA and AUAS have, respectively, 6000 and 4000 employees and 34,000 and 45,000 students and more than 70 buildings across the city, including seven campuses. After the results of a questionnaire among suppliers was published in 2015 [31], several research, implementation, and evaluation projects succeeded each other. The following solutions have been implemented between 2016 and 2021:

- The following large volume and predictable product categories are consolidated at a city hub: printing paper, sanitary products, cleaning products, office supplies, vending products, and materials for installation and maintenance. The city hub is strategically located at the edge of the low emission zone, next to the A10 ring road and approximately five kilometres from the city centre. The suppliers deliver their goods at the hub and pay the hub-operator for the last mile which is carried out with zero-emission vehicles.
- The reception of B2B parcels is centralised at a mailroom of the AUAS in the southeast of Amsterdam. From there, the parcels are distributed daily with zero-emission vehicles to the buildings of the UvA-AUAS, where they are delivered into parcel lockers. The designated employee can open the parcel locker with a unique code at any preferred time. This avoids the (ongoing) arrival of different parcel couriers during the day and saves workhours at the reception desks.
- Employees and students of the UvA-AUAS can use a central location for their B2C deliveries. From there, the parcels are delivered into parcel lockers at the universities. Of these deliveries, 80% are carried out by an electric cargo bike.
- Sustainable logistics has become a criterium in tender procedures. As a result, the window cleaning company uses zero-emission vehicles on their route to and between UvA and AUAS buildings.
- Delivery frequencies have reduced where possible. For example, office supplies are delivered twice a week instead of "within 24 h".

4.3. Business Improvement Zone (BIZ) Knowledge Mile

BIZ Knowledge Mile is a business community and innovation district in Amsterdam. The area stretches from the City Hall in the historic centre of Amsterdam to the high-rise office buildings at Amstel Square; in total, three kilometres long. The BIZ consists of 200 members (including hotels, restaurants, retailers, non-profit organisations, health care, education, amusement, etc.), located in 80 different buildings. Entrepreneurs, knowledge institutions, public professionals, and citizens work together to improve the liveability and sustainability of the local environment. They take collective actions to add greenery to the streetscape, aim towards zero waste, reduce plastic consumption, and to encourage sustainable procurement and supply. The AUAS is located in the area as well. The AUAS and impact organisation Bureau8080 assist BIZ Knowledge Mile in the realisation of sustainable procurement and sustainable city logistics. They have carried out the following initiatives since 2018:

- After the realisation of the city hub for the UvA-AUAS (see case UvA-AUAS), actions were taken to scale this concept to BIZ Knowledge Mile. After a workshop, a questionnaire, and several meetings, it appeared in 2020, however, that there was insufficient

willingness among the individual BIZ members and their suppliers to join this concept. The individual chain partners did not feel the responsibility and urgency to lead the change and expected the other to make the first move.

- In 2020, a Collective Waste Contract was drafted with one waste collector. BIZ members that joined this (non-mandatory) contract work together on the reduction of waste and related transport movements in the Knowledge Mile area. In 2022, the contract became available to neighbouring associations as well.
- At the end of 2021, a collective procurement platform for office supplies was launched for the members of both the BIZ Knowledge Mile and the neighbouring association De Plantage (which consists of mainly cultural institutions). The aim of the platform is to (a) make the procurement of sustainable and circular products easier, (b) realise financial benefits from procurement volume, and (c) reduce transport movements and emissions in the area by selecting a common supplier that delivers with zero-emission vehicles.
- In mid-2021, research was begun to explore the potential of multifunctional neighbourhood hubs. The BIZ Knowledge Mile envisions a physical location in the area where logistics functions are combined with economic and social functions (e.g., parcel pick-up point, shared e-mobility, repair café, etc.).

4.4. Green Business Club Utrecht (GBCU)

A Green Business Club is an impact organisation that stimulates local collaboration for sustainable development. There are 16 local Green Business Clubs (www.greenbusinessclub.nl (accessed on 21 April 2022.)), all situated in areas with a high density of offices. GBCU is focused on the area around the Utrecht Centraal railway station and has 19 participants including the Municipality of Utrecht. The participants are organisations that have offices or premises around Utrecht Centraal. They work together on projects that aim to improve the sustainability of the area and their own business processes. In 2018, members of GBCU signed the Green Deal for Zero Emission City Logistics to formalise their ambition to improve the efficiency and sustainability of freight deliveries to their own buildings. This project started with research exploring the volume and variety of the deliveries including food, waste, and facilities-related goods. Six participants stepped forward as frontrunners and used the research outcomes to identify the potential to reduce transport movements and emissions. Since 2020, the following measures have been taken:

- Delivery days and frequencies are harmonised among participants that use the same supplier for office supplies.
- Freight flows are consolidated at a logistics hub on the edge of the city. The hub is located next to the A2 ring road, four kilometres from the central station. The hub-operator uses zero-emission vehicles for the last mile and also serves organisations outside of the GBCU area. The first two suppliers that use the hub for GBCU participants are suppliers of hygiene products (e.g., toilet paper) and vending machine products (i.e., coffee, tea, snacks, and soft drinks).
- Parcel lockers are placed at the entrance of buildings to consolidate parcel deliveries for employees (B2C).
- Open dialogue is used by the Municipality of Utrecht as a tender method for catering. Ambitions and solutions for zero-emission city logistics are part of the dialogue.

5. Results

From the workshops' reports, the researchers extracted 28 factors (i.e., actions or circumstances) that support the realisation of sustainable logistics when using the procurement power of large organisations in cities. Each factor was coded, and then grouped in themes. The themes were identified by looking for codes that belong to the same topic, (e.g., "costs" and "savings" are grouped in "business case"), and by looking for codes that belong to a similar step (e.g., the identification of "problem-owners" and their "drivers" can be combined when "reaching stakeholders"). Table 3 presents the themes and codes.

Table 3. Codes per theme.

Theme	Codes That Were Grouped in This Theme	Number of Factors in Group
1. Networks and knowledge	Networks, guidelines	2
2. Reaching stakeholders	Problem-owners, drivers, interest	3
3. Baseline measurement	Research at the gate	1
4. Vision	Vision	1
5. Seed-group	Leading group, connect people	2
6. Ambassador	Ambassador, decision-maker	2
7. Covenant	Covenant	1
8. Monitoring	Measurement, communication, growth model	3
9. Market	Market consultation, stable collaboration, supplier and procurer needs	3
10. Variety of solutions	Local sourcing, synchronise delivery days, internal logistics	3
11. Business case	Business case, internal cost-structure, savings, incoterm, franco deliveries	5
12. Knowledge management	Information exchange, loss of knowledge	2
	Total distinct factors:	28

The process of coding and grouping and the validation of the results with the literature and the workshop participants resulted in twelve general lessons which are presented and explained below. Examples from the change agents are used, and where possible, a link to the existing literature is made.

Lesson 1. Use current networks and organisations to collect knowledge, share ambitions, and create commitment.

To prevent actors from 'reinventing the wheel', it is advised to become acquainted with similar initiatives and their lessons. This can, for example, be realised by attending meetups, reading documentation, asking for guidance, and by joining explorative projects or buyer groups. This lesson is linked to the need of gaining knowledge in order to be able to implement SPP [26].

Lesson 2. Identify who suffers from the current situation and/or desires improvement and start a dialogue with them to define their drivers and preconditions for change.

To make stakeholders willing to contribute to sustainable logistics, it is essential to know what drives them to change. A facility manager might be motivated by staffing gains for freight reception or improved safety, while a sustainability manager might be motivated by reducing and reporting CO_2 emissions, and a logistics manager by optimising delivery planning. A dialogue with supply chain actors can help to make them more involved and to identify what they require to change. This lesson is linked to the behavioural determinant motivation [29] and the willingness factor [26]. One of the change agents mentioned that the willingness to change (or to initiate it) among suppliers will increase once zero-emission zones are implemented, as this will force them to rethink their transport options. Other change agents mentioned that they would like to make sustainable city logistics a more fascinating topic among purchasers, as this would help to start the dialogue.

Lesson 3. Carry out a 'baseline measurement' through an onsite observation or a supplier survey.

Multiple change agents mentioned that a baseline measurement is helpful to create awareness and to identify potential for improvements to reduce transport movements and emissions. Possible options for such measurements are mentioned in the existing literature and guidance for SULP and DSP [12,16,19,21].

Lesson 4. Develop a vision for the area and/or logistics chain.

Starting with a clear and common goal, such as "in this area we strive for zero-emission, efficient and safe deliveries", was suggested by one of the change agents. Like Grandia [26] mentioned, the individual's affective commitment to change is higher when the behaviour is aligned with a higher strategic vision of an organisation. One of the change agents

emphasised that the vision should be realistic in terms of resources. Defining a common and widely supported vision is a key principle within SULP [12].

Lesson 5. Create a 'seed-group' of enthusiastic people and facilitate the connection within this group.

Several change agents started their initiative by inviting a group of frontrunners to make the first steps in realising sustainable logistics. For the UvA-AUAS, this seed-group consisted of four large suppliers and several UvA-AUAS employees. For Green Business Club Utrecht, the seed-group consisted of six receivers that had multiple suppliers in common (e.g., office supplies). The seed-group should not be too small to make sure that different interests and learnings are covered and to ensure sufficient volume for consolidation. The idea is that enthusiastic frontrunners can pave the way for implementation and scaling. By establishing an enthusiastic seed-group and by facilitating the connection within this group, change agents can avoid stakeholders waiting for the other to move first.

Lesson 6. Appoint one or more high-ranking ambassadors.

Alongside the seed-group, the change agents perceived positive effects when a high-ranking professional supported the initiative. For example, the director of Facility Services or an alderman. This ambassador should have the mandate to speak to opposing persons, to remove other barriers. It was mentioned that the presence of important ambassadors at meetings makes the initiative more attractive for internal and external communication channels (e.g., media) which in turn raises awareness. Additionally, higher support is perceived as a positive factor for the motivation to change among contract managers (receivers) and account managers (suppliers). Next, the ambassador can help to get in contact with the right people that make decisions about the implementation of solutions and budgets.

Lesson 7. Sign a deal, covenant, agenda, or letter of intent to formalise the commitment and increase awareness.

In The Netherlands, there have been several agreements for public and private organisations to state their ambition on zero-emission City Logistics. Examples are the Green Deal and Agenda for Zero Emission City Logistics [32] and the Covenant ZES Rotterdam [33]. Although these agreements are often non-binding, the change agents did experience that it can accelerate the realisation of change in practice. This lesson relates to the determinant 'opportunity' [29], as it creates a social norm and group pressure for the organisations that sign the agreement. Two change agents mentioned that it helps to make the ambitions concrete and to show that other organisations in the same neighbourhood are joining as well.

Moreover, as the signature represents the 'zero-emission vision' of the organisation, it can positively affect the motivation of individuals to change their procurement behaviour accordingly [26]. Signing a partnership agreement and ensuring political support is also advised in SULP [12].

Lesson 8. Determine who monitors the progress, how results are measured, and how stakeholders are informed.

Based on the stakeholders' objectives (see lesson 2), a list of key performance indicators (KPIs) should be developed as well as methods for enforcement and monitoring, measurement frequencies and responsibilities. One of the chapters in the DSP guidance of TfL [19] is dedicated to data collection and monitoring. Similarly, SULP (2019) provides guidance on how to collect urban freight data, presenting an extensive list of all types of data and survey techniques. The change agents advised not to make the KPI-list too long, and next, to give suppliers a responsibility in data collection as they often have better access to logistics data than procurers. Additionally, as it is often not feasible to immediately implement solutions in their entirety (e.g., a zero-emission fleet), it was advised to agree on a growth model and then monitor the progress.

The change agent of the BIZ Knowledge Mile emphasised the importance of communicating frequently to stakeholders (e.g., using newsletters, meetups, and online channels)

to raise involvement and awareness, already from the early start of new initiatives. This is in line with the DSP guidance that states that ongoing communication is needed to create ownership and responsibility.

Lesson 9. Consult the market for solutions; do not prescribe solutions as procurer.

While it is good when receivers feel responsible for the impact that they generate when buying products and services, it does not mean that they should prescribe the logistics solutions. One of the change agents mentioned that it would be "chaotic" for suppliers when each customer prescribes a different UCC, while it is also not desirable for receivers to be delivered to from many different UCCs. One of the steps in the BuyZET Handbook is devoted to market dialogue [24]. The engagement of supply chain actors in sustainable innovation should ensure that solutions are feasible, effective, and resilient. One of the change agents shared an example of a receiver, supplier, and truck operator that jointly explored the possibilities for zero-emission deliveries, which resulted in the use of an electric truck. Another change agent mentioned that suppliers should be "tempted" to work on sustainable logistics, instead of enforced.

Lesson 10. Do not limit your focus on one single solution to reduce transport movements and emissions.

The change agents experienced that a lot of attention is often paid to the development of a UCC while there are numerous ways to achieve sustainable logistics. They advised considering different measures, such as reducing delivery days, synchronising delivery days within an area, buying local, avoiding transport movements by eliminating certain purchases (e.g., mineral water), the use of efficient packaging materials, and joining procurement schemes. Most of these recommendations are also present in the existing literature [5,24].

The wish to have a broad focus also applies to the number of product categories and receivers that are considered. Most initiatives started logistics improvements for the following product categories: office supplies, cleaning and hygiene products, vending products, and parcels. The change agents wondered how improvements could be made for categories that are less predictable or subject to more conditions such as repair and maintenance services, ICT-products, waste collection, and food. One change agent advised not to forget to consider the logistics services "over the doorstep" (e.g., inventory in the buildings) as these processes might be affected when deliveries are consolidated, shifted in time, or carried out by others.

Lesson 11. Be aware that a feasible business case is made-to-measure.

The financial feasibility of sustainable logistics measures is of great interest to all actors, but not straightforward. Some of the change agents have made attempts to calculate the costs and benefits for the involved actors. One of the lessons is that it is very case- and actor-specific. The outcome depends, for example, on the accessibility of the receiver, the level of security checks that receivers impose for drivers (in that case consolidation saves more money), the services that are offered at a micro/urban consolidation centre (e.g., if there is storage capacity, this saves long-haul transport), the number of delivery days, the original logistics structure, etc. The initiatives in this study also showed that different business models can exist: (a) the receiver takes responsibility for the logistics measures, (b) the receiver requires the supplier to take responsibility for the measures, (c) the supplier voluntarily invests in the measures to have a better proposition to the receiver, and (d) an external stakeholder invests in the measures and allocates costs to receivers and/or suppliers. One of the change agents suggested that incoterms should be adapted accordingly to clarify responsibilities (i.e., tasks, costs, and risks to be borne by buyer and seller). A change agent experienced barriers as the costs and benefits of sustainable logistics were dispersed across different departments of the organisation and the internal financial structure did not support a better redistribution. The costs and benefits can also be dispersed across different supply chain actors, and furthermore, not all costs

and benefits are always clear or easy to make clear. One change agent suggested to avoid franco deliveries to raise awareness about transport costs among purchasers.

Lesson 12. Ask chain partners to frequently invite a colleague to meetings or organise specific sessions to share knowledge broadly across organisations.

The risk of losing knowledge, enthusiasm, and experiences when a person changes jobs was mentioned by several change agents. Another experience they mentioned was that within the organisation of suppliers, account managers do not always exchange knowledge and initiatives among themselves. It is advised to involve multiple persons per organisation in the 'seed-group' and to bring along colleagues to meetups.

6. Discussion

For this study, change agents in The Netherlands were asked to elaborate on the circumstances and actions that helped them to make progress in sustainable city logistics using the buying power of organisations in cities. In this section, we discuss the results in relation to the existing literature, the limitations of the research, and recommendations for further research.

6.1. Contribution to the Existing Literature

The majority of the 12 lessons gathered from change agents in The Netherlands are in line with the existing literature on sustainable procurement and the role of receivers in sustainable logistics. The handbook of BuyZET [24] and the DSP Guidance of TfL [19] cover information about objectives (lesson 2), baseline measurements (lesson 3), monitoring (lesson 8), market dialogue (lesson 9), and potential solutions (lesson 10). The need for knowledge (lesson 1), vision (lesson 4), motivation and opportunity (lesson 7) are covered in the literature on behavioural change and sustainable procurement behaviour [26,29]. The SULP guide of NOVELOG [12], which is written for local authorities, does include lessons 2, 3, 4, 7, 8, and 10, though without addressing the potential of (public) procurement power in accelerating sustainable logistics.

The exploration of real-life cases with a diverse group of change agents in The Netherlands has also brought several new factors to light. The change agents reflected positively on the formation of a seed-group (lesson 5), the involvement of a high-ranking ambassador (lesson 6), and knowledge and commitment sharing across colleagues (lesson 12). Next, the change agents emphasised the need to define the costs and benefits for the stakeholders to explain what measures can potentially bring for them. As the business case of sustainable city logistics solutions is very case- and actor-specific (lesson 11), examples in the existing literature and among the Dutch change agents are scarce.

These new lessons (5, 6, 11, and 12) are an added value to the existing literature on city logistics and can be included in future guides for SULP and DSP.

6.2. Limitations of the Research

A limitation of the research is that the data was only gathered in cities in The Netherlands. A valuable next step would be to compare the results with initiatives abroad. Another limitation is that the results reflect the opinions and experiences of those who participated in the workshops and the outcomes are only qualitative. The degree to which the mentioned circumstances affect the implementation of sustainable city logistics has not been objectified nor quantified in practice. For example, it would be interesting to see whether initiatives with a baseline-measurement, seed-group, and ambassador perform better than initiatives without these circumstances. Such quantitative research may need to be carried out over a longer period of time and with a different methodology.

The research has also been affected by the corona pandemic. All workshops were held online. To ensure the concentration of the participants, the allocated time for the workshops was less than it would have been offline. All participants did receive the opportunity to reflect on the written document, however, and agreed with the outcome. More importantly, the corona pandemic has had a significant impact on the organisations that were the focus

of our research (i.e., the 10 initiatives, see Table 2). For example, restaurant owners located on Amsterdam's Knowledge Mile were closed for several months in 2020 and received little to no deliveries in that time. This, combined with the uncertainty about their business, reduced their willingness to contribute to sustainable logistics. Many employees in the public organisations and offices worked from home, reducing the need to supply to these organisations as well (e.g., catering was closed, equipment was sent to employees' homes). Facility managers were concerned with corona-related priorities and were therefore less motivated or available to implement sustainable logistics. Base-line measurements were not carried out, as they would not have been reliable and formal agreements were not signed during high-profile launch events. Therefore, the change agents could not reflect well on the effectiveness of certain attempts that were made just before or in 2020, or on attempts that did not take place at all. However, 9 of the 10 initiatives had already started before 2020, some even in 2012 or 2014 (see Table 2), so the change agents were able to reflect on the years before corona which makes the data useful. The impact of corona on future supply and on the motivation, ability, and opportunity of actors to contribute to zero-emission city logistics was not taken into account in this study.

6.3. Recommendations for Further Research

From the three workshops, some unresolved questions were identified. These questions are interesting for further (applied) research:

- How can zero-emission city logistics become a fascinating topic for employees that procure or order products and services?
- What is the best approach to accelerate efficient and zero-emission logistics for repair and maintenance services, ICT-products, waste collection, and food?
- How can we overcome barriers that result from the fact that costs and benefits are dispersed over different actors and over different departments of individual organisations?
- How do concepts for sustainable logistics become attractive and accessible for smaller organisations with low procurement volume?
- Which chain partner takes the initiative in realising zero-emission city logistics and under which circumstances?
- Could a 'city-logistics incoterm' contribute to a better allocation of costs, benefits, and responsibilities?

7. Conclusions

The role of procurement in improving city logistics has received increased attention in the last 10 years, both in scientific literature as well as in practice. Powerful procurers, such as municipalities, universities, hospitals, and (clusters) of offices are acknowledging their responsibility as large buyers and starting to gain more insight in the amount of freight transport that they generate and appropriate measures that they can take to minimise the negative impact of transport. In the past years, more knowledge, guidance, and agreements have been developed that contribute to changing the mindset and behaviour of receivers in city logistics. These developments create more willingness, ability, and opportunities to change. Change agents play an important role in this by making procurers aware of the opportunities at hand, fostering dialogue between different stakeholders and facilitating progress. Looking at 10 initiatives in The Netherlands, we see that change agents can be internal staff members, researchers, advisors, or external staff that are hired to assist for a temporarily period. Despite the efforts of change agents, and the variety of measures that are available to procurers, the speed in which change occurs in practice is slow and limits scaling. Looking at the four cases that are described in this paper, it took three to six years before results became visible in practice. For this research, we facilitated knowledge exchange between change agents to explore what they encounter in the process of initiating, managing, and implementing change in the logistics processes between sender and receiver. The change agents had several years of experience with accelerating sustainable logistics in practice.

The aim was that their lessons would assist future initiatives to achieve their goals more quickly and with greater impact. A total of 12 lessons were derived out of three workshops in which 37 professionals shared or reflected on the experiences of change agents from 10 initiatives in The Netherlands. We can conclude that their experiences confirmed that change is supported by access to relevant knowledge, objectives that are in line with actors' motivation to change, a strategic vision, a baseline measurement, social pressure, progress monitoring, market dialogue, and a broad set of measures. These factors are in line with the existing literature on sustainable procurement and behavioural change. New insights that came to light were that the formation of an enthusiastic seed-group and the support of a high-ranking ambassador can pave the way for implementation. Next, a challenge that was mentioned is the risk of losing knowledge and commitment when change is built upon individuals. The change agents recommended that seed-group members should involve other colleagues (i.e., catch up with them regularly, invite them to meetings) and account managers should be asked to share knowledge with their peers to foster scaling. Lastly, the business case of zero-emission logistics solutions is very case- and actor-specific. The lack of examples in the literature and among the change agents makes it difficult to financially quantify what sustainable city logistics has to offer from the perspective of receivers and their chain partners.

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