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The purchasing behavior of public organizations and its impact on city logistics

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Abstract

This paper presents three studies on public procurement and its impact on city logistics. The studies aimed to give an insight into the transport volume related to the delivery of products and services - at a university in Newcastle, two academic institutions in Amsterdam, and the municipality of Rotterdam. Furthermore, the role of the public organisations as large receivers and promoters of sustainable transport is discussed. The paper concludes that public organisations play a key role in the organisation and extent of city logistics planning, albeit they may not be making beneficial use of their impact. Key barriers are the lack of standardised logistics information in procurement information systems, and incentives that promote sustainable and efficient delivery among purchasers.

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Keywords: public procurement; city logistics; sustainable purchasing

1. Introduction

Public institutions such as the police, academic institutions, municipalities and ministries are large organisations that initiate a considerable number of freight flows and service trips, in cities. Eight of Amsterdam's top 10 largest employers are public institutions (OIS, 2012). The municipalities of Amsterdam and Rotterdam are the largest employers in their respective cities, with their universities falling in the top 5. In Newcastle, the NHS is the largest employer, with the universities second. Every day, office supplies, post and parcels, food, construction materials, services (including facility maintenance and repair), and reverse flows are transported to and from their buildings,

which are often spread out over the city, or over a multi-building campus.

At the same time, these public institutions promote sustainable transport and aim for a liveable (i.e. safe, clean air) and accessible city. Many academic institutions are involved in research on freight transport and mobility. Municipalities provide and develop urban freight regulation and policies. Hospitals promote health and quality of life and usually have sustainable travel plans for staff and visitors. But what of the freight flows caused by their own demand? How sustainable are their procurement processes and purchasing behaviour? Do civic organisations practice what they preach? The ambition to lead by example is growing. In Newcastle, Amsterdam and Rotterdam, research on urban freight and city logistics has focused on their own organisations.

Before logistics improvements can be made, situational awareness is needed - often lacking when it comes to purchasing behaviour and its role on transport activity. Such public organisations generally lack knowledge about their transport volumes and cannot even tell how the transport is organised, let alone understand the degree of transport efficiency. Purchasing is usually done based on delivered-duty-paid (DPP) terms, where the supplier is responsible for organising deliveries. The following numbers and observations suggest that there is much to gain in the efficiency of freight flows and service trips to and from the public institutions:

- The AUAS and UvA have more than 15,000 different suppliers and 20 different locations in the city (Balm, 2014).
- The municipality of Rotterdam has about 2,300 suppliers annually (Ypenburg & Habers, 2015).
- Newcastle University has about 3,000 active suppliers, delivering to over 200 locations in 80 buildings across the city of Newcastle (Zunder, et al., 2014).

Delivery costs are usually included within the total price of goods and freight is an activity managed by the seller, who bears the planning costs, risks and operational choices for transport (delivered duty paid). The purchasers at public organisations often have, or choose to have, no insight into (last mile) transport costs. As a result, they lack any financial incentive to organise the last mile more efficiently. At the same time, the need to organise traffic and transport flows more efficiently and more sustainably is growing, from an economic, environmental and social perspective.

Efficiency gains in transport will lead to more room for innovation, less pollution, and a safer, more attractive environment. However, before improvements can be identified, insight in the purchasing and delivery activities is needed. To obtain this, Newcastle University, the municipality of Rotterdam and AUAS/UvA in Amsterdam are working with their in-house research groups for a methodology, an analysis and next-steps guidance.

The following section of this paper discusses previous work in the field of public and sustainable procurement. Next, it presents the approach and results of the studies in Newcastle, Rotterdam and Amsterdam. In the last part, we compare the three studies and give recommendations for further research.

2. Previous research

Measures of the impact of public procurement are often economic. For example, The World Trade Organisation estimated that public procurement represents around 10-15% of most economies (WTO, 2012). This impact is the value of the production of the purchased goods and services, represented in GDP. Others have argued that the impact should also be measured in terms of employment, social wellbeing, community cohesion and public confidence (Tizard, 2012). This is in particular mentioned as a reaction to cuts and redundancy programmes. The impact of public spending on traffic and freight flows has however never been measured.

The role of “logistics receiver” in promoting sustainable delivery has recently been discussed in urban freight literatures (see for example: Zunder et al. 2014; Leonardi et al. 2014). A coordinated delivery and servicing plan, the reorganisation and management of building(s) facilities, and sustainable purchasing, are some of the policy initiatives being promoted to improve the efficiency and sustainability of logistics operations. Despite the novelty of such initiatives in urban freight literature and research, organisational purchasing literature has long been the major concern for business and management disciplines. Socially and environmentally responsible procurement (SERP) (Hoejmose & Adrien-Kirby 2012), also known as sustainable procurement, is the pursuit of sustainable development objectives through the purchasing and supply process, incorporating social, environmental and economic aspects (Walker & Brammer 2009). SERP is an important issue for practitioners as it has the potential to both harm a firm’s

reputation (Roberts 2003) and improve its competitive performance (Carter et al. 2000). The topic has been a predominantly post-2000 issue, replacing earlier concerns in the procurement arena about ethics in a broader sense, such as bribery, corruption and the general ethical behaviour of purchasing personnel (Hoejmosé & Adrien-Kirby 2012).

The principles of SERP come into play in the “most economically advantageous tender” (MEAT) approach. The MEAT approach prescribes that, next to price, qualitative and sustainable aspects can be part of the award decision. This enables authorities to take into account a (non-exhaustive) list of additional criteria, such as service-level, competency, and environmental characteristics, with each assigned a relative weight for the assessment of submissions. However, research in The Netherlands shows that sustainable procurement remains difficult to apply in practice, because of a lack of knowledge and commitment (Grandia et al. 2014).

Logistics is an induced activity and derives from purchases. The strategic importance of the purchasing function in the business environment, notably in the private sector, has been acknowledged and recognised to contribute to economic advantages (Björklund 2011). Management, company image, customers, carriers and public policies are some of the key drivers of sustainable purchasing (Björklund 2011). Meanwhile, within the public sector’s sustainable purchasing practices, factors such as environment, diversity, human rights, philanthropy and safety are key drivers for the sector (Walker & Brammer 2009). For public sector procurement, the basic principles are transparency, accountability, and achieving value for money, for citizens and taxpayers (Walker & Brammer 2009).

A survey of sustainable procurement in the UK public sector has shown that, relative to other sectors, local authorities have a particularly strong emphasis on buying from local and small suppliers; and education appears to have something of an emphasis on recycling, buying from minority (e.g. women-only suppliers), waste reduction, sweatshop labour, and reduced packaging (Walker & Brammer 2009). What we do not know is how these activities, promoted by large public organisations following the SERP guidelines, are impacting city logistics.

Certainly, greening transport operation is part of the SERP agenda - and can be part of the MEAT approach - but where various other factors are taken into account, we know very little about the degree to which sustainable purchasing influences sustainable city logistics.

2.1. Newcastle University

The first step to look at the demand of freight transportation on Newcastle University was via engagement activity with a number of key functions within the University structure, who deal with the purchasing and receiving of goods. In such a large organisation it was first considered important to identify any issues or concerns within these functions. The Procurement and Estate Services Departments were interested to collaborate, due to their agendas, and have supplied both data and active involvement. Newcastle University has recently adopted a Coherent Campus initiative to improve spaces between buildings and to create a sense of place that is welcoming, with well designed, well-linked social space (Zunder et al. 2014). The University employs about 5,000 staff and serves 20,000 students. On the main campus, there are organisations that are autonomous or semi-autonomous to the University proper, including Student Union buildings and a theatre. The campus aims to be pedestrian permeable, cyclist friendly, safe, and clean, which has led to road closures on campus, parking space reduction, new buildings and pedestrianisation. To this end, the University’s Procurement department has come under pressure to adopt sustainable purchasing, while the Estate Services department has adopted sustainable travel to work. Increasingly, both departments are receiving complaints from the executive management about freight delivery traffic around the increasingly pedestrianised campus.

Methodology

Historic procurement data were used to analyse the pattern of purchase ordering, in a year. Within the University’s 144 units (i.e. schools/departments/institutes), purchasing function is highly decentralised, with 466 expert buyers (who would normally raise purchase order on behalf of a unit) plus a further 1058 individual buyers (faculties/researchers/technicians/etc.) who are also able to raise orders. Not all University staff can directly raise purchase orders, so would requisition goods via this pool of staff. The University’s central purchasing team focuses its effort on the 80% of spend which (in line with pareto) is with about 20% of suppliers. One year (2011/2012 academic year) of purchasing data demonstrated catering supplies, facilities maintenance services (e.g. electricity services, taxis, etc.), travel, and medical equipment/substances to be among the highest number of purchase orders

raised. At the aggregate level, the data suggest a split of 70% goods and 20% services (10% other); however the volume of purchasing data does not necessarily correlate to delivery activity, so a traffic survey was needed to identify the volume of freight delivery to the University sites.

The Estates Service department helped identified key hotspots across the University buildings and traffic count data (2012-2013) were used to capture and analyse the freight delivery volumes entering University sites. The volume of freight vehicles visiting the University was relatively high at over 25% of total vehicles in 2012, increasing to over 29% in 2013 - despite a reduction in vehicles entering/exiting the University premises (18,500 counted in 2012 vs 16,100 in 2013). The largest proportion of freight traffic is made up of light goods vehicles (LGV), at over 80% of all freight vehicles. Despite clear baseline data of freight within the academic institution, there is very little known about how deliveries are actually made. Surveys of University staff and suppliers were therefore carried out, to gain insights into behaviour and decision making in engaging freight activity.

Results Newcastle University

The survey of University purchasing staff was carried out in March 2014 using an online survey tool (SurveyMonkey) and distributed by the researchers, using mailing lists held by the human resources department. The completion of the questionnaire was voluntary, with a random prize as an incentive. 735 completed questionnaires were drawn and represent about 15% of the University staff. The majority of respondents (= 62%) were administrative and professional (i.e. library, clerical, administrative, managerial), indicating the main responses were coming from the 'expert buyers'. The typical purchase order reported by the respondents was for travel tickets or documentation (59%) followed by catering supplies (46%), office stationery (45%), books, etc. (42%) and repair or maintenance services (40%). Over half of the respondents ordered only twice monthly, while over a third raised a purchase order at least once a week. A very small core of 50 staff purchased at least once a day. These purchase orders were made from over 70 different locations across the University (out of a potential of circa 230). Less than 50% of the respondents reported actually seeing the goods or services being delivered to their delivery point. The distribution of purchase order volume per individual is not apparent from the survey.

The University supplier survey was carried out in January 2014, also using SurveyMonkey, and was distributed by the researchers, using mailing lists held by the procurement department. 709 suppliers reported on their freight operations in serving the University (26% response rate). The majority of the respondents (67%) reported delivering physical goods, while 32% reported non-physical services. The respondents reported that, on average, 56% of deliveries to the University were carried by the supplier's own fleet. On average, the responding university suppliers delivered almost 5 times per month, per individual location and slightly more than 5 times per month to the University site. The questionnaire also asked about the willingness of suppliers to engage with the University's Coherent Campus initiative, via a workshop, but only a small number of respondents responded positively to this call (about 10% 'yes'; 22% 'maybe'). However, the main message from suppliers was their willingness to make efforts to comply with the University's terms and conditions, in order to maintain their contract to supply goods.

Impact and next steps

Both surveys at the University have increased the awareness of the University staff and suppliers of the increasing role of managing urban freight in helping to promote sustainable logistics and the high response rate demonstrates the degree of interest from all stakeholders in improving the current situation. An on-going activity within the University is the demonstration of the use of electric vehicle and freight consolidation facilities, as discussed partially in (Leonardi et al. 2014); this requires suppliers to change their freight deliveries to the campus. The demonstration pilot, running for a period of 9 months, has invited selected suppliers to deliver to a freight consolidation facility, instead of direct to the University. So far, a number of suppliers have changed their delivery pattern to comply with the University procurement function's invitation. Since taking part in the pilot is voluntary, a workshop with expert buyers (procurement managers, at department level) was held at the University, to encourage suppliers to participate. The target impact of this activity is a 25% reduction in freight vehicle entering the University campus.

Both surveys helped the city logistics researchers gain insights into the behaviour of the University's freight stakeholders, with regard to purchasing; this information can help to identify the necessary steps to move forward. The purchasing survey was dominated by responses from the 'buying' population of administrators and clerical staff,

which makes it a very well represented sample of that group. The supplier survey was hampered by the essentially financial nature of the contact mailing lists held by procurement, meaning many emails went to financial departments, who tended to ignore the survey until chased multiple times.

2.2. Municipality of Rotterdam

Rotterdam, the second largest city of the Netherlands, is home to 618,109 citizens (Publiekszaken Rotterdam, 2014). The municipality of Rotterdam employs approximately 11,000 people. As Rotterdam faces serious air quality challenges, reducing air pollution is one of the main objectives of the mayor. Various restrictive measures and stimulating initiatives have been introduced in recent years to ban polluting freight vehicles and to promote the use of clean vehicles (Gemeente Rotterdam, 2014). In October 2014, the municipality of Rotterdam signed the Green Deal 010 Zero Emission City Logistics. This green deal is an agreement between government, industry and research institutions to strive for zero emission distribution in the inner city of Rotterdam, by 2020. To become aware of their own impact and influence on city logistics, the municipality of Rotterdam conducted research into their inbound transport flows for goods and services. The research took place in the second half of 2014 and considered the flows of 2013.

Methodology

Two type of sources were used: from inside and from outside the organisation. First, procurement data and purchase records were collected. This included a list of accounts payable and supplier information. Second, input from suppliers was gathered. An online survey was sent to 770 suppliers, of which 245 (32%) responded. This was due to a proactive approach, including phone calls and reminders by e-mail. The survey included questions on delivery frequency, time, organisation of transport (e.g. type of vehicle) and possibilities for improvements. In addition to the survey, there were several interviews and a key supplier provided detailed data on the exact transport volumes and destinations per trip.

Results

The 245 respondents were responsible for about 37,600 deliveries in 2013. Many of the respondents have been a supplier to the municipality for quite some time - 72% for more than five years. Of the respondents, 31% deliver a product, 60% a service and 9% both. Most respondents (44%) deliver construction/maintenance (incl. installation) services and products. This includes (among others) work on utilities, land and infrastructure. The second largest group of respondents (12%) deliver automation/ICT products and services.

Most suppliers deliver less than 50 times a year; 42% deliver at least weekly, and 6% deliver more than 1,000 times a year. Suppliers with high frequent deliveries are overrepresented in the dataset, as they have been approached more actively. Most deliveries take place between 10am and 4pm. Only a very few deliveries take place after 6pm. Most suppliers organise transport themselves; only 23% of the respondents outsource transport to a third party.

A considerable number of deliveries are carried out by relatively old vehicles, especially when it comes to light vehicles, where 56% is EURO 1, 2, 3 or 4. Of the heavy vehicles this is 40%. The majority of the respondents state that they greatly value sustainability; 88% of respondents scored the importance of sustainability 8 out of 10 or higher.

Consolidating deliveries is the most favourite (potential) sustainability measure among the respondents in Rotterdam (see Fig. 1). Only 27 respondents (about 10%) indicated that a central delivery address would be a suitable solution for them. This may be due to the high amount of service deliveries among the respondents. The majority (78%) accepted to receive further inquiries from the municipality, regarding the survey.

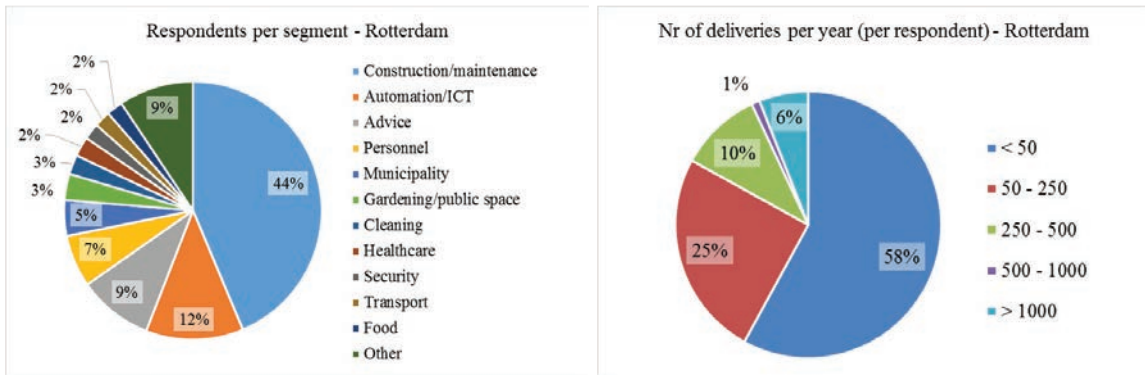


Fig. 1. (a) Respondents per segment; (b) Yearly amount of deliveries per respondent

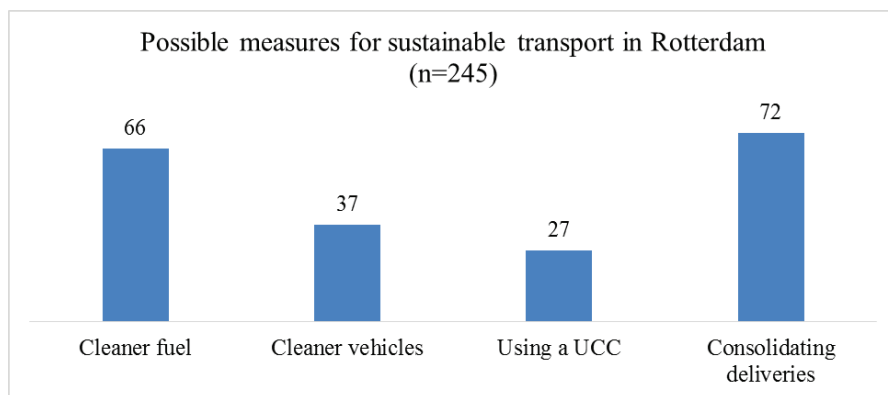


Fig. 2. Possibilities for improvement in Rotterdam

Impact and next steps

Together with the ministry of Economic Affairs, the municipality of Rotterdam organised a seminar in November 2014, themed “Mobility, innovation and public purchasing”. During this day, the survey results were presented and several interactive workshops took place. The municipality of Rotterdam identified the following steps for 2015:

1. Improvement of the purchase data to facilitate the monitoring of logistics performance. It should also allow purchasers to take into account logistics criteria.
2. Look whether the AUAS/UvA and the municipality of Rotterdam have suppliers in common, to start a joint initiative.
3. Promote the research among other public organisations in the region, such as the Erasmus University and the Rotterdam University of Applied Sciences, for cooperation in implementation, where possible.

A strength of the research has been the positive attitude of suppliers to contribute to the subject. Suppliers are clearly willing to do this, given the high response rate, their high regard for sustainability and high acceptance of receiving further inquiries. A weakness of the research is the use of procurement data for the categorisation of respondents per sector. As the accuracy of this information is uncertain, it would have been better to ask the respondents directly. Another weakness is the limited possibility for respondents to comment on the current situation and sustainability efforts.

2.3. Universities of Amsterdam

The University of Amsterdam (UvA) and Amsterdam University of Applied Sciences (AUAS) are two academic/educational institutions in Amsterdam, with about 30,000 and 50,000 students respectively. UvA employs 5,000 and AUAS 3,593 people, in educational, research and staff functions. The institutions work together for most of their central services, such as Facility Services. Facility Services is responsible for all the facilities in and around the campus buildings and aims to contribute to more efficient and sustainable transport to and from the buildings. They asked the Research Program Urban Technology (previously Logistics) to conduct research into the current situation and possibilities for improvement. This research took place in Oct-Dec 2014 and considered the deliveries between Nov 2013-Oct 2014.

Methodology

The research in Amsterdam was built upon the methodology of the research in Rotterdam. In total, 108.644 purchase records were analysed. Next, a new version (2.0) of the questionnaire was established. A question about sector was added, and the survey included more open questions on sustainability measures, including the current situation (“what do you already do with regard to efficient and sustainable transport?”). The survey was sent to 1,724 suppliers, of which 278 (16%) completed the survey. Of these, 12 respondents did not have a delivery in the last year and were therefore excluded from most of the questions. A total of 44 respondents only delivered by e-mail, meaning that questions on transport improvements were not shown to them. Quantitative, qualitative and geographic analyses were carried out.

Results

The 278 respondents were responsible for about 35,000 deliveries in the previous 12 months. 38% of the respondents delivered a service, 38% a product and 24% a combination of both. The diversity of suppliers is very high (see Fig. 3). The largest group are suppliers of ICT products/services, laboratorial products/services and advice. About a quarter of the respondents did not identify their product/service with one of the 11 predefined segments. About 75% of the respondents delivered fewer than 50 times per year; all of this means that a small group is responsible for a large share of the deliveries (also following the 80/20 Pareto rule that 80% of the outcome is caused by 20% of the input). Based on the purchase records, this economic rule applies. Based on the respondents, the top 20% largest suppliers were responsible for even 85% of the deliveries. Suppliers with a high delivery frequency are overrepresented in the dataset.

Most of the transport takes place between 9.30 am and 2 pm. Only a very few deliveries take place after 6 pm. Overall, 55% of the respondents use their own fleet for the delivery. However, there is a huge difference between service and product suppliers (see

Table 1). Almost all service suppliers organize the transport themselves. Most of them travel by bike/public transport (43%) or personal car (37%). Product suppliers outsource the transport more often (63%), either to a party that bundles deliveries from multiple suppliers or to a party that transports dedicatedly. Products are often transported by van (44%) or truck (33%). The average weighted distance of all deliveries is 34 km. More than half of the deliveries come from an origin within 30 kilometres.

Respondents have been asked about measures for improvement. According to the respondents, the favourite measures for efficient and sustainable transport are consolidating deliveries, clean fuel/vehicle fleet and central delivery address (see Fig. 4). When we asked about the current situation, many respondents mentioned their clean fleet and their use of public transport/bike. When we asked about the role of the UvA/AUAS, the respondents mentioned most often that UvA/AUAS could help by: bundling orders internal, reducing the number of delivery addresses and reducing pressure on delivery time.

Table 1. Results from service versus product suppliers

	Service suppliers	Product Suppliers
Who carries out transport?	Mostly own transport (90%)	37% third party bundled 33% third party dedicated 27% own transport
Which mode is used?	Mostly bike/public transport (43%) Personal car (37%)	Mostly van (44%) or truck (33%)
Distance	Avg. weighted distance 27 km	Avg. weighted distance 38 km
Favourite measure	Using public transport or bike	Bundling deliveries

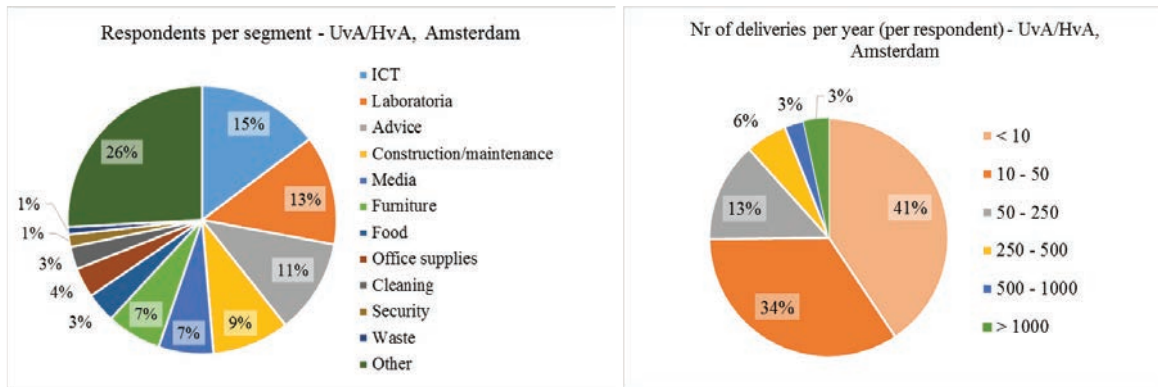


Fig. 3. (a) Respondents per segment; (b) Yearly number of deliveries per respondent

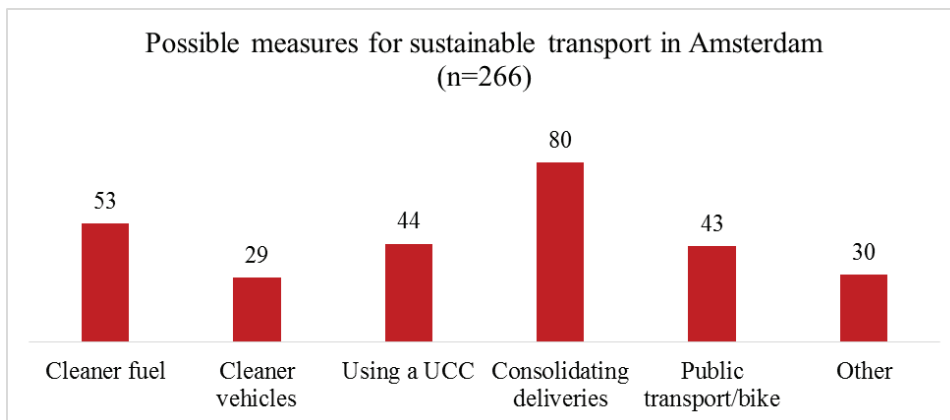


Fig. 4. Possibilities for improvement in Amsterdam

Impact and next steps

Based on the results and discussion with the project's steering committee, three possible solutions have been selected. These solutions will be further examined, and where possible, tested and implemented in 2015:

- Consolidating at the source. This means that deliveries from various suppliers, within a region, will be combined and carried out by one transport provider. This requires harmonisation of planning and transport across suppliers.
- Delivery at a central address (i.e. an urban consolidation centre), followed by efficient and clean last mile delivery. For this solution, the AUAS/UvA will explore potential business model concepts and quantify the costs and benefits. The financial feasibility of urban consolidation centres are extensively discussed in city logistics research projects, e.g. in STRAIGHTSOL (2013), SMARTFUSION (2014), LAMILO (2014). Unlike previous small scale pilots, the volume of the universities may be the key to a viable business case.
- Change of purchase behaviour and procurement policy. With more than 10.000 individual purchasers within the organisation, there is much to gain by harmonising purchase moments. The AUAS/UvA could also impose a certain level of sustainable transport in tender procedures.

Next, the AUAS /UvA aims to cooperate with the municipality of Amsterdam, in particular when it comes to the second solution "delivery at an urban consolidation centre". The municipality of Amsterdam has already shown interest in a similar survey among their own suppliers. This research is expected to take place in 2015.

A limitation of the research has been the lack of email addresses. As a result, only a limited amount of suppliers were reached. Another limitation of the internal data is that the purchase records do not give any logistic or transport information. You cannot tell from the purchase data whether it includes a single or multiple transport flow or none. This makes it difficult to generalize the survey results. A strength of the survey research is the use of open questions. Suppliers gave valuable input that could not have been obtained with multiple choice questions alone. Another strength is the separate analysis for service and product deliveries, as they appear to be very different in terms of distance, vehicle type and potential improvements.

3. Comparison

In this section we compare the research methodologies that were applied in the different cities and their results. An overview is given in

Table 2. One of the studies was carried out for a municipality and the other two for an educational institute.

The universities in Newcastle and Amsterdam show similar percentages when it comes to the share of service deliveries (33 and 38%), use of own transport (55 and 56%) and willingness to cooperate with further inquiries (32% and 33%). The municipality of Rotterdam has a considerably higher amount of service deliveries, namely 60%. This may also be the reason that much more of their suppliers use their own fleet for the transport (77%). The high rate of respondents that accept further inquiries from the municipality (76%) is striking.

The response rate is much higher in Rotterdam, probably due to the reminders by phone and email, which did not take place for the supplier survey at UvA/AUAS in Amsterdam. In Newcastle, similar approach was done with email and phone reminders for both surveys, with a prize incentive for the purchasing staff. Here, we also see a higher response rate among suppliers than as compared to UvA/AUAS. Contact records in Newcastle were predominantly biased to financial contacts not sales or account management staff at suppliers.

All three researches have faced difficulties and limitations with the historic purchase data of the organization. The purchase records do not give any logistic or transport information on origin, volume, frequency or efficiency. It is not possible to derive from the purchase data whether it has led to a single or multiple transport flow or none. At this moment, supplier surveys and physical traffic counts seem to be the best methods available to get an estimate on the impact on city logistics. However, these methods are time consuming, especially for comparison over time or between organizations.

Enrichment of purchase data is clearly needed to make logistic performance measurable in an accurate way. Next, purchase data should include logistics characteristics such that efficiency and sustainability can be taken into

account prior the moment of purchasing.

Table 2. Comparison of research

	Newcastle	Rotterdam	Amsterdam
Type of organisation	University	Municipality	Cooperation of two universities
Yearly spending	GBP 411 million EUR 555 million	EUR 400 million	EUR 350 million
Survey target	Purchasing staff (n=735) Suppliers (n=709)	Suppliers (n=245)	Suppliers (n=278)
Response rate	15% purchase staff 26% suppliers	32% suppliers	16% suppliers
Service/products suppliers (per respondent)	67% product 33% product	77% own fleet 23% outsource	55% own fleet 45% outsource
UCC as potential solution	Demonstration is running 20 suppliers have used the UCC	11% positive	17% positive Feasibility will be explored in 2015

4. Conclusions and further research

Public organizations have been using their power to influence transport mostly by imposing restrictions on the use of vehicles (e.g. environmental zones, minimize parking space) or by purchasing clean vehicles for their own fleet. When it comes to the procurement of day-to-day products and services, guidelines are defined that promote the use of sustainable materials and social return. However, the purchase behaviour of public organizations is not guided by logistics criteria for sustainable and efficient delivery. Relevant standardised information to support purchasing in sustainable and efficient delivery is lacking in procurement information systems.

Considering their size and spending, public organizations are an important customer for many of their suppliers. As a result, suppliers are likely to comply with the organizations demands. Hence, if purchasers order daily and in small amounts, the supplier is likely to deliver without complaints about inefficiencies. Similarly, if the purchase organisation asks to deliver less frequently, more sustainable or at a central consolidation address, the supplier will adjust its delivery process in order not to lose its customer. Public organizations have a lot of power - as well as impact - on the amount and organization of city logistics, from which they and society do not benefit at this moment. In fact, by not making logistics considerations in the purchase process, cities currently face unnecessarily and inefficient transport.

The research in Newcastle, Amsterdam and Rotterdam has shown that many suppliers are willing to contribute to more efficient and clean transport. They are open to share data and feedback and to discuss about potential improvements. It should be noted though that the answers that were given during the surveys probably include a high level of socially desirable responses that may not be observed in practice. Further practical oriented research and demonstration projects should prove whether these suppliers are also able to change their operations in practice and are able to further improve the sustainability and efficiency of transport.

Inevitably, public organisations can benefit from the knowledge and experiences of their suppliers. Inviting them to propose their ideas and solutions through a survey or interactive workshop could be a first step.

Suppliers in Amsterdam and Rotterdam mention consolidating deliveries as most important measure for more sustainable city logistics. Newcastle suppliers were keen to conform to the wishes of the University as the final customer however specified. This can be done within the purchase organization (e.g. make agreements on ordering

day), at the source (e.g. assign one transport operator to pick up the deliveries from a certain area), or for the last mile (e.g. using an urban consolidation centre). Cost, benefits, effect on service level, transport distances, and risks should be taken into consideration for implementation of these solutions. ‘Logistics quality’ should become part of the approach when awarding contracts. The legal implications and public private partnerships need to receive attention in further research. Finally, behavioural aspects will play a key role in the success of the solutions on both strategic management and purchasing operations level. Methods and tools to make sustainable purchasing measurable, financially attractive, “fun” and embedded in the organisation, should be explored.

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