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**Promoting Sustainable Freight Transport in Urban Contexts:  
Policy and Decision-Making Approaches**

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**Partners:**

The University of Sheffield (UK)  
University of Extremadura (Spain)  
University of Gothenburg (Sweden)  
National Research Council (CNR)  
City of Bradford Metropolitan District Council (UK)  
Shaping Cloud (UK)  
Sheffield City Council (UK)  
Softeco Sismat SpA (Italy)  
Stockholm City Council (Sweden)

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## 1. Introduction

With 54% of the world's population living in urban areas, a proportion that is expected to increase to 66% by 2050 (United Nations, 2014), these trends are integrally linked to sustainable development. Thus, with good planning and governance, the increasing concentration of people in urban settlements can facilitate economic growth and social development, while also offering opportunities to mitigate against the adverse impacts of consumption and production patterns on the environment. In this regard, advances in urban logistics operations and improved local authority planning, especially in the field of the urban freight transport, can alleviate the associated negative environmental and economic impacts occurring in cities (Grosso et al., 2014). Over recent decades, interest and awareness in freight, and particularly urban freight activities, often referred to as urban logistics has been steadily growing in both the research environment and wider policy context (Lindholm, 2012; Ballantyne et al. 2013). This has prompted a variety of definitions (Hicks, 1977; Ogden, 1992; Taniguchi et al., 1999; Allen et al., 2000; Quak and de Koster, 2006; Dablanc, 2008) and understanding amongst academics and practitioners that demonstrates to some extent the complex nature of freight transport at the urban and city level, as well as the lack of consensus amongst researchers and local authorities on how to tackle the prevailing issues (Ballantyne et al, 2013). For the purposes of this project, urban freight transport is broadly defined as encompassing “all movements of goods (as distinct from people) into, out of, through or within the urban area made by light or heavy goods vehicles. Also included are service vehicle movements (refuse collection, utilities etc.) and demolition/ construction traffic” (Ballantyne et al., 2013).

Several types of actors and stakeholders are therefore involved in such urban logistics management processes (Ballantyne, 2013). Among them, freight carriers and shippers are interested in minimizing freight logistics costs in order to maximize their profits, while maintaining a competitive level of service to their customers. City administrators and residents are oriented towards a decrease in traffic congestion, social costs and environmental nuisances,

even though they are often direct beneficiaries of high quality delivery services. This leads to a multitude of differing and possibly conflicting objectives that are involved in urban freight transport planning and decision making, yielding a high level of complexity. This provides a main motivation for the development of tools for helping decision-makers to reach higher grades of efficiency.

Despite growing academic interest, the extent to which freight transport is acknowledged and formally considered in local authority transport planning varies considerably from country to country, and on a more local level, between towns and cities. Research has shown that until recently, despite growing interest and awareness of freight transport operations at local authority level, many urban transportation authorities have often overlooked freight, rather than concentrating their attention on the movement of people (Lindholm and Blinge, 2014). As a result, policy development with respect to urban freight and city logistics is characterised by a rather fragmented approach with many differences being found from one context to another. Even when motivated to tackle urban freight, many city authorities find it difficult to address the complex set of differing views of a large variety of stakeholders. Therefore, historically, the role of city authorities, or local authorities within cities, has been confined largely to one of regulation. At a European Level, the White Paper on Transport (European Commission, 2011) recognises transport in urban areas as an important area to focus on and presents goals of carbon free city logistics by 2030. Those goals cannot be achieved simply through regulation. Thus, it is timely to consider the wide range of policy initiatives available to local authorities and their potential impacts. This issue should not be addressed in isolation and it will be important to consider how the views of stakeholders from the private sector can be included in such policy development and urban transport planning. In the European context, some initiatives have been developed; in particular, ERTRAC (the European Road Transport Advisory Council) and ALICE (Alliance for Logistics Innovation through Collaboration in Europe) have identified the need to pool resources and develop jointly a research roadmap on urban freight and logistics. The ultimate

goal is the identification of research priorities related to urban freight, returns and urban logistics in order to improve the efficiency, the sustainability and the safety of these activities (ALICE-ERTRAC, 2014).

These priorities would require significant efforts in order to engage the whole range of stakeholders involved in freight transport in urban contexts; at a local level, this has been sometimes addressed by means of the creation of freight partnerships in a number of cities in Europe and in other regions of the world (Lindholm and Browne, 2014). Although, the extent to which stakeholder engagement through freight partnerships has been adopted remains fairly limited, as recent research has highlighted that a significant lack of freight stakeholder involvement in local authority transport planning processes remains (Ballantyne et al., 2013; Lindholm and Browne, 2013), as do the difficulties of finding suitable and sustainable solutions to common problems associated with urban freight (Quak, 2011). Since the consideration of freight transport is rarely addressed by local authorities in the planning and development of transport strategies, it is necessary to explore a more integrated and structured approach to include freight in transport policy and planning (Ballantyne et al., 2013; Lindholm and Ballantyne, 2016).

It has been noted that historically, local authorities have sought to overcome the negative externalities associated with urban freight transport operations by imposing restrictions on vehicle movements within a geographic area in order to manage the situation (Woudsma, 2001; Dablanc, 2007). Best practice data regarding urban freight transport projects and measures trialled and implemented in cities across Europe provide a useful bank of such potential solutions to urban freight problems (see for example BESTUFS, 2010; CIVITAS, 2012; and NICHES, 2012). The common thread between these projects however is information gathering, as opposed to the adoption of integrated approaches whereby stakeholders take a participatory role in the decision-making process and actively contribute towards local authority transport planning and policy making.

At the same time, despite an increasing number of advanced models and powerful algorithms presented in the literature for optimizing City Logistics, planning-oriented Decision Support Systems (DSSs) are seldom considered by private and public agents as software tools to be adopted for practical purposes. This is partly due to the fact that these models and methods rarely incorporate a multi-stakeholder perspective in their analysis, often resulting in centralised and hierarchical decision-making procedures that might be of little help in contexts where a more participatory approach is required. However, advancements in the scientific and technological development of DSSs, designed and implemented in strict cooperation with potential beneficiaries such as local authorities, transport planners and private sector logistics operators, have the potential to increase the adoption of innovative model-driven DSS approaches in real-world city logistics.

Within this context, this report forms part of deliverable D1.2 for work package 1 of the ProSFeT project. As an introductory report, the main objective is to provide some directional summaries from the review of literature on stakeholder engagement from both practical and academic perspectives. The report advances some preliminary recommendations that will support the attainment of the final deliverables for WP1, 2 and 4.

## **2. Literature Review**

City authorities are at the centre of SUL planning and implementation. city and regional authorities act as organisers of urban logistics systems, providing base infrastructure, incentives and frameworks for other stakeholders to operate.

In some regions within the United States of America, city authorities have been noted to provide policy and financial incentives that support co-opetition between different competitors as part of their sustainable logistics programme. (Ambrosini et al., 2013) For example, there is a truck sharing system in New York and New Jersey areas which support vehicle rescheduling and port cargo information. Such programs offer cost benefits in addition to optimised efficiencies for the

cargo companies through asset management. Similarly, local authorities benefit from reductions in the number of unnecessary trucks operating within cities, leading to emissions savings, reduction in congestion and improved highway utilisation overall (Regan and Golob, 2005).

The objective of authority interventions is to reduce the negative social, economic, and ecological impact of urban logistics (Stathopoulos et al., 2012). Policy and regulation remain useful tools for government to intervene in ensuring the sustainability of logistics activities.

## **2.1 Stakeholder Engagement**

Sustainable Urban Logistics planning processes have gained increasing importance on society and affect numerous actors, all with a variety of legitimate interests and, as such, legitimate stakeholders. For example, carriers seek lower operation costs and higher delivery rates, whilst the authorities have liveability and environmental impacts like noise and emission reductions as priorities. Customers commonly concentrate on on-time delivery of goods; while land owners worry about the optimisation of their assets. Planning is therefore complex, arduous and uncertain in some cases, incorporating challenges around policy, implementation methodologies and potential stakeholder reactions (Quak, 2011; Ballantyne et al., 2013).

In practice, legitimate stakeholder groups' interest often lead to conflicting objectives that create challenges for authorities. Such challenges are underlined by the critical nature of compromises that local authorities face, having to communicate and convince multiple stakeholders to embrace and participate in policy initiatives that support SUL targets. The key challenge is represented by the attainment of a balanced initiative where all stakeholders are willing to make behavioural and business changes in order to support sustainability targets (Hylén et al., 2014).

The literature highlights expertise challenges in this area, with many local authorities still lacking the requisite in-house technical expertise that is required to support their SUL planning and implementation (Ballantyne et al., 2013). The common practice is often that these functions are outsourced to third party consulting firms with a variation of outcomes.



Some reports have attributed the over-prioritisation of passenger transport as the leading cause of this imbalance in technical expertise within city authorities. Most city authorities have dedicated in-house expertise to deal with the planning, implementation and monitoring of passenger transport, however cities are increasingly distressed by the externalities of urban logistics, detracting from the passenger experience (Anderson, Allen and Browne, 2005). However, several factors remind us of the importance of SUL to cities, including but not limited to its support of contemporary lifestyles e.g. online shopping for both able and disabled persons, underpinning of industrial and trading activities, cost implications for consumers, contribution to local, regional and national GDPs as well as attendant externalities.

The literature highlights how dialogue between local authorities and carriers, during the planning phase, can generate an advantageous starting point where to base the foundations of a successful urban logistics strategy (Gonzalez-Feliu and Morana, 2014); Italian examples from Padua (Italy) and Parma (where the delivery of perishable products by the means of an Urban Consolidation Centre is demonstrated as efficient and economically sustainable) are testament to the importance of stakeholder engagement and consensus (Morganti and Gonzalez-Feliu, 2015).

It has also been suggested that the concept of '*supply chain thinking*' should be adopted in addressing SUL challenges (Friesz et al., 2011). This concept focuses on optimising the efficiency of the entire supply chain as a whole rather than that of some individual components within the chain. Accordingly, there needs to be an alignment across the range of stakeholders in order to provide robust solutions that incorporate the interests and objectives of different stakeholder groups.

The alteration of urban policies can influence stakeholders' preferences in the supply chain, as well as the logistics activities in urban areas (Hensher and Puckett, 2005), although reports suggest that whereas financial incentivizing may reduce congestion in some cities, financial interventions do not always lead to improved traffic conditions, leading to resistance, dissatisfaction and compounded outcomes in the urban logistics network (Jarl, 2009).

Importantly, financial considerations are critical to the success of SUL initiatives and this is demonstrated in the case studies that are included in this report. Inadequate financial considerations across different cases have become leading transitional/ operational failure causes in many of the SUL initiatives reviewed. This is important when pursuing medium/long-run sustainability in the absence of dedicated public funding as is increasingly the case where public funds are scarce and competing with other critical tangibles like housing, security, welfare and pensions.

Beyond financial considerations, policy-makers must pay attention to stakeholders' preferences and as such, good communication between city authorities and logistics companies can help to formulate a rational policy, especially in terms of land use and time-windows. Even *minor* stakeholders should be involved in the policy design procedure, in order to make sure their needs are recognised in the decision-making systems that develop policy (Gatta and Marcucci, 2016; Muñuzuri et al., 2005; Anderson, Allen and Browne, 2005).

Effective engagement of the private sector requires creating mechanisms to discuss freight issues with the private sector and communities, both to identify potential solutions and the role of the various stakeholders, and to secure commitments to a strategy of improvements.

The success or otherwise of SUL has been linked to the specifics of the 'involved' stakeholders, their perceptions and their activities and this further exacerbates the challenge of compromise in the development process (Gatta and Marcucci, 2016). A good reference here is the Vicenza UDC example where strategy was implemented without stakeholder consultation by the local authorities who elected for top-down approach of strategically using policy to 'force' compliance. One major stakeholder group; carriers, united against the decision and this led to a long and protracted legal battle; the project was costly and had failed (Ville et al. 2013).

The preceding suggests that the scope of the involved stakeholders, level of trust in relationships between them and persuasive compromise are key considerations for the development of stakeholder based SUL policies. However, to date, there has been little involvement of private

companies and small retailers in local transport policy-making processes, mostly because they have a limited understanding of policy design activities and because urban freight policy is often regarded as having an insignificant impact on their businesses (Lindholm and Browne, 2013; Ballantyne et al., 2013).

## **2.2 The Triple-Helix approach**

There is a developing trend that incorporates the tripartite partnership planning framework whereby third-party institutions like Universities are included in the freight planning process alongside private and public sector organisations which may or may not have business relationships with the other stakeholders in the local logistics network as authorities seek more acceptable outcomes. These triple-helix based approaches can achieve some quasi-representation for some stakeholder groups that may have been previously overlooked in earlier consultations. This is also useful for increasing the acceptance levels of outcomes since some educational institutions may be perceived as objective stakeholders with interests beyond the private and public sector benefits, thus providing a balanced representation of minor stakeholder groups that may be unique to different cities (Ballantyne et al., 2013).

Accordingly, more educational institutions are involved in SUL based studies involving a number of city authorities and private firms. For example, the CIVITAS (2012) and BESTUFS (2010) projects all underline the increasing roles and relevance of academic institution to the SUL discourse.

Overall, addressing SUL objectives remains challenging for many city authorities and governing agencies. This nature and scope of these challenges vary across cities and the literature places emphasis on adequately engaging stakeholders in the development processes that underpin SUL initiatives. SUL initiatives still have relatively high levels of rejection or partial compliance from a range of stakeholder groups and adequate engagement is critical to improving acceptance.

Collaboration across academic, public and private institutions is offering promise in terms of innovation and acceptance of policy outcomes, however such approaches will require comparative evaluation overtime in order to evaluate their efficacy for optimising the policy development processes and outcomes in terms of policy acceptance and compliance, representation and overall benefits.

In the next section of the report, we look at some of the methodologies that have been applied to engage SUL stakeholders as reported in the literature reviewed.

### **3. Methods**

Methods and approaches to engaging stakeholders in the development of SUL policies vary, although they are all based on the recognition that greater stakeholder inclusivity and expanse can promote acceptance of policies and the success of the attendant outcomes.

In this section, the following methods will be discussed as highlighted by the literature; experimentation, interviews (case studies), surveys, focus groups, consultations and workshops

#### **3.1 Experimentation**

This refers to the real time implementation of an initiative in order to observe the reactions of stakeholders within real and usual conditions. Often in the form of pilot trials such as driverless cars, off-peak deliveries, they do not serve as final policy positions but offer real time tasters of potential policy initiatives in the respective areas. A useful example is the City of Stockholm's off-peak project that was trialled between 2014 and 2016 with some specific objectives to be facilitated. One of the emergent outcomes was the uninvited feedback from non-user stakeholders (landlords and tenants) who complained about noise disruptions to their sleep as a result of the off-peak scheme (KTH, 2016). A similar project in New York City found that stakeholder engagement yields multiple benefits, can provide useful bases for policy hypothesis

confirmation or rejection and also afford sustainable implementation paths thereby bridging the partnership gaps between public and private stakeholder divides (Holguín-Veras et al., 2014).

### **3.2 Stakeholders' Interviews**

Interviews can represent an important outreach mechanism, as they enable extended discussions with key individuals. Typically, one hour in duration, interviews afford useful and experiential insight on a range of issues. Used by trained personnel, they are useful mechanisms for gaining insight from a range of stakeholders and extending opinion discourses into perspectives and rationales that inform opinions. This is also a very common form of stakeholder engagement technique where select individuals are chosen for interviewing and their responses applied to analysis to establish stakeholder perspectives, expectations, concerns and objectives. Interviews will additionally include consultations with identified stakeholders using a number of different instruments.

### **3.3 Focus Groups**

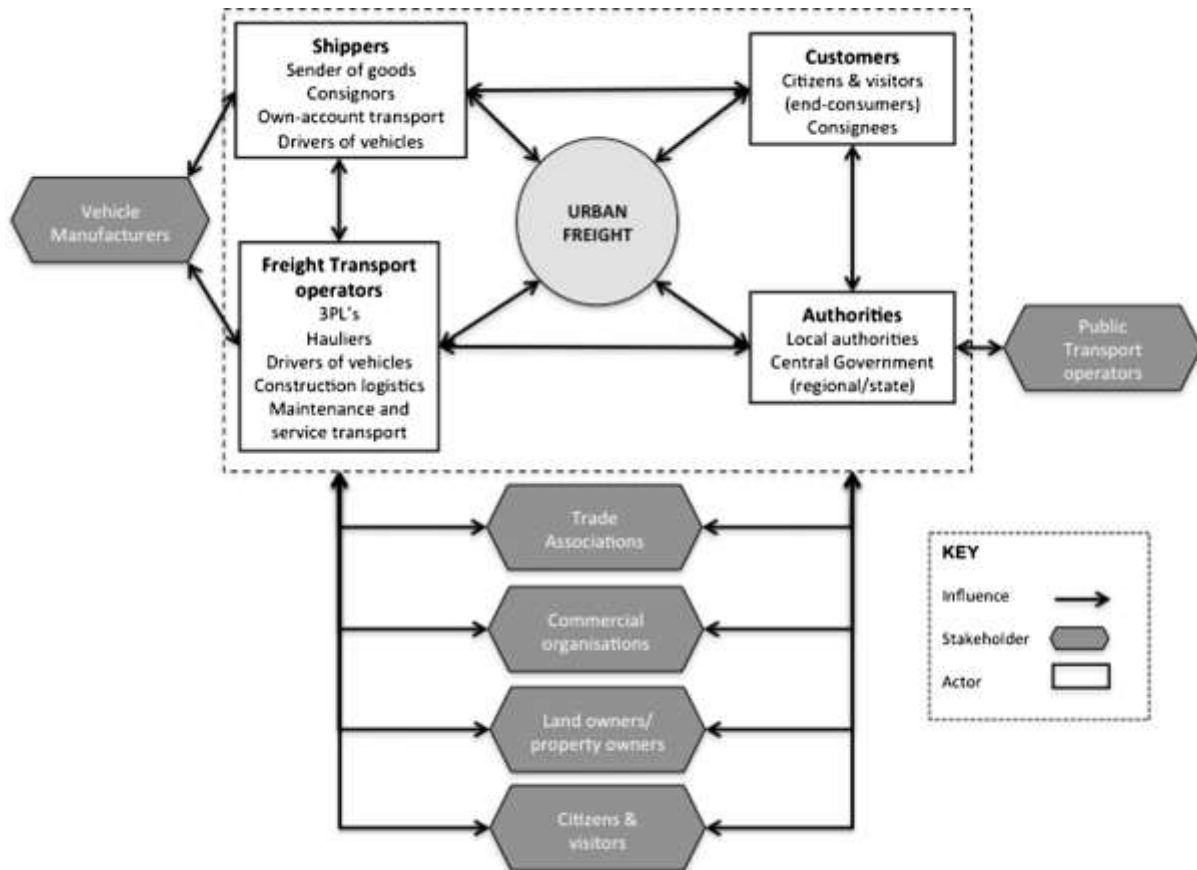
Focus groups follows a pre-selection strategy, where different categories of stakeholders are identified and then representatives selected to participate in sessions where they engage in dialogue around specific policy questions. There are tangible benefits that come out from the exchange and potential dialogic contexts, perhaps speeding up the stakeholder compromise process as everyone is within reach and can exchange views, perspectives and learning with the help of the moderator. A significant draw-back to the use of focus group discussions is the idea of selection bias and group think where the 'representatives' may not be truly typical of their wider group perspectives and in some cases, participants may not freely express themselves in the face of other more powerful stakeholders. E.g. driver's view on worktime practices by their company where the managing director of the company is present in the group session (Lagorio et al., 2016; Ballantyne et al., 2013).

### 3.4 Participatory Workshops

Recently, participatory engagement and decision-making mechanisms based on a workshop-format have been proposed (Ballantyne, 2013; see Figure 1). Such workshop design facilitates team working and group problem solving is supported by decision analysis theory, where freight stakeholder representatives from both the public and private sectors are encouraged to collaborate to solve a common problem, regardless of their differing perspectives, with the aim of achieving consensus driven outcomes that can be used to inform future urban transport policies. The workshop design incorporates an adaptation of the nominal group technique (NGT) (Spencer, 2010), together with the general format of a focus group style session as opposed to a more traditional formal business meeting approach.

This is combined with elements of positional analysis (Söderbaum, 1982, 2003) that helps to construct a neutral environment where all participants are heard and subsequently each proposed solution is given equal consideration in the discussions that follow. The workshop format aims to produce a ranked list of potential solutions to the problem or issue discussed that local authorities can consider the feasibility of implementing. The facilitated workshops format therefore provides an innovative method for bringing together a variety of freight and local authority stakeholders to tackle the central problem of insufficient engagement between these parties.

An example of similar procedures is provided in Lindholm and Ballantyne (2016); in this study, authors apply a Delphi method for maximising stakeholders' involvement in the planning stage of urban logistics strategies. In this case, the Delphi panel consisted of twenty experts representing local authorities, academia and other relevant freight stakeholders; the paper proposes a refined theoretical framework that enables freight to be fully considered in local authority transport planning.



**Figure 1:** Stakeholders' identification framework for Urban Freight Transport  
(Source: Ballantyne et al. 2013)

### 3.5 Surveys

This technique accommodates a wider range of respondents and focuses on the numerical outcome estimates of how different stakeholders view policy initiatives. They can be executed through a variety of mediums and can support significantly larger numbers of respondents compared to any of the other techniques. Data from surveys can provide raw descriptive pointers or be subjected to further modelling analysis to support the development of advanced behavioural outcomes and predictors.

### 3.6 Scenario Planning and Modelling

Scenario planning examines sensitivity to changes in the environment, using a range of models to explore how different scenarios may affect current and planned initiatives. It allows the

opportunity to incorporate some resilience planning into the SUL framework. For instance, by developing a city logistics literature review, we may understand how different countries tend to implement different strategies for managing urban circulation of vehicles (Bozzo et al., 2014). They can also highlight similarities and differences at local levels as was highlighted by the examples of Rome and Padua cities, where scenario planning tools were used to illustrate the impact of city layout changes on existing logistics strategies (Comi and Rosati, 2015). Scenario planning and modelling tools can also support impact calculations, allowing for evaluation of vehicle types on freight strategies. Some

- Agent-Based Models (ABMs) have been used to investigate the configuration of stakeholders' networks in urban logistics systems (Piotte and Jourquin, 2011). A remarkable feature of ABM is the capability to simulate the impact of multiple stakeholder objective dimensions such as private interventions in urban logistics planning, behavioural tendencies of groups, market factors, freight channel flows and performance of delivery channels between different agents in the system (Baindur and Viegas, 2011; Boussier et al., 2011; Taniguchi et al., 2003; Teo et al., 2014; Maggi and Vallino, 2016). However, we know that ABMS and current decision support models face validation challenges as inconsistent output can limit the implementation of their recommendations in real world scenarios (Maggi and Vallino, 2016).
- Analytical Hierarchy Process (AHP) – These methods have been applied to explore urban freight challenges although the literature does not show a concentration on its application to UDC stakeholder mapping or interest resolutions. Some studies have adopted a combination of AHP and Pairwise Majority Rule (PMR) to rank sustainable mobility solutions in the Netherlands. Beyond the import of preference interaction for supporting the highest overlap, their findings support the application of computer-aided analysis (CAA) in MCDM with regards to stakeholder evaluation and preference overlap (La Pira et al., 2016).



### 3.7 Extant Gaps

A critical area that still subsists is the development and common deployment of engagement methodologies that support objective prioritisation. The plethora of methodologies support the identification and interaction with stakeholders but there are still very few documented methodologies that support decision making from prioritisation methodologies. More importantly, there are significant gaps in terms of empirical application of existing engagement methodologies to support SUL planning and decision making in local authorities.

One such recent extending methods is the “Q-methodology” which has been advanced as appropriate for freight stakeholder mapping. Its employs factor analysis and clustering to systematically elicit individual and shared perspectives. Although there have been concerns about its extrapolated validity frameworks, the Q-methodology focuses on identifying objective correlations between subjects across a sample of variables. It produces clusters and helps to rank rationales derivatively.

Although significant advances have been made with regards to stakeholder engagement methodologies, there are still gaps in terms of established MCDM methodologies for allocating costs, benefits, risks and other critical component of the decision process. Further, where methodologies have been developed, there is still very little evidence of impact in terms of transferability from academic or other design to local authorities where these tools are most needed.

## 4. Early Findings

Early findings from the ProSFeT project, corroborated by the extant literature and by interaction with stakeholders, demonstrate that:

- Stakeholder engagement is very crucial to the success of SUL initiatives.

- Although the literature is advancing, the access to and application instances of existing stakeholder engagement techniques in SUL remains relatively rare.
- Local Authorities require expertise or expert solutions that use decision support systems in order to obtain optimised stakeholder preference overlap in the mapping, consultation and decision process for urban freight solutions.
- Stakeholder engagement techniques currently utilised by local authorities require further development to support MCDM scenarios.
- Pathways for the implementation of stakeholders' engagement techniques in practice include tripartite collaboration between public, private and educational institutions.
- There is need for more participatory approaches that involve local authority participation in the development of MCDM frameworks that support real application of models and methods by a wide range of local authorities.

## **5. Recommendations**

- Participative / involvement processes are often complex processes and need a professional approach. Therefore, it is recommended not to let them run by one of the stakeholders, for example a municipality, but by independent professionals.
- Stakeholder involvement should be maximized from the planning stage as partnerships underpin the success of sustainable logistics measures.
- More collaboration is required between different stakeholders in order to optimise planning very early on, i.e. at the conceptualisation and design stages of various city logistics projects.
- More robust decision support systems can support stakeholder mapping, engagement and objective decision-making at local authority levels

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