



Climate Market Accelerator – Pilot Study: Public Procurement and Innovation

Final Report

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Executive Summary

Purpose of the Study

- This project is a scoping study that explored the role that public procurement processes play in enhancing innovation. The impact of public procurement on innovative activity in economies is a critical issue. In 2009 total public expenditure on works, goods and services was estimated to be 19.4% of the GDP of the EU 27 (European Commission 2009), but the process through which the majority of this spending is executed tends to be driven by a focus on low cost and low risk purchases to the detriment of innovation.
- By reviewing the existing research and policy literature and undertaking research in three European cities, this study explores the role that different forms of innovative public procurement play in encouraging innovation amongst supply chains and in stimulating demand-side activity and looks at current procurement practice across Europe.

Key Findings

- The study found that there are a range of procurement methods that are labelled as having the potential to support innovation, some of which are easier to implement than others.
- The cities visited were familiar with most if not all of these methods and had tested or implemented them to varying degrees.
- Local and national politics and policy agendas were important determinants of the procurement practice being used, and can be viewed as filters through which European Commission Procurement Directives and policy and practice initiatives are fed.
- The cities are demonstrating and testing a range of innovations relating to climate change mitigation and adaptation, including retrofitting domestic and commercial properties with energy efficiency technology; local energy generation; and integrated transport solutions. There is scope for knowledge exchange and even joint-procurement in these fields, providing that complementary procurement timetables and funding opportunities can be identified.
- The lack of overarching best practice guidance (e.g. on how to link together different public spending interventions to create a strategy for shaping markets) means that similar issues are being tackled in different localities, but national regulations and policy programmes may create barriers to international best practice transfer.

Actions to Follow the Study

- The pilot was proposed as the first step in the development of a Climate-KIC network of agencies. This network should be able to better define the demand for innovative solutions and challenge the private sector to innovate to produce new products, technologies, processes and services in response. The study has informed a proposal for the establishment of a Climate-KIC Smart Procurement Network as a follow-on project for the Climate Market Accelerator programme of work within Climate KIC.



Introduction

Description

The scoping study was funded by the Climate Market Accelerator programme and will make an important contribution to the development of the Climate-KIC, as understanding the barriers, enablers and impact of alternative forms of public purchasing activity will enhance understanding of and ability to use the relationship between public sector procurement and innovations related to climate. The study builds on an existing Climate-KIC pathfinder project to understand how large procurement agencies such as city authorities use procurement to stimulate local and regional economic development through innovation.

The study, which took place between July 2012 – November 2012, was proposed as the first step in the development of a Climate-KIC network of agencies that would be able to better define the demand for innovative solutions and to challenge the private sector and supply side research agents to innovate to produce new products, technologies, processes and services in response to this demand. The study suggests a framework for supporting public authorities to use their procurement activities to catalyse innovation, including proposals for how this can be delivered within the Climate KIC and the activities being developed by other agencies, e.g. EU Directorates.

Partners

The scoping study involved data collection in city authorities that are part of the Climate KIC network. The project was led by the University of Birmingham, where there is also an on-going pilot project funded by the *Economic and Social Research Council (ESRC)* and *Birmingham City Council* that is exploring different forms of innovative public procurement in the UK related to climate. The project was also supported by the RIC office in Brussels.

Deliverables

The key deliverables of the scoping study will be an interim report that explored a number of potential actions for the Climate KIC to consider, a final report, and a proposal for future Climate KIC activity to promote the role of public procurement as a driver of innovation.

Future Climate KIC activity following from this study could contribute to Climate Market Accelerator (CMA) Key Performance Indicators (KPIs) in a number of areas. Some examples are given below, but these should be refined once the CMA Board has taken decisions about the next phase of activity.

1. International knowledge transfer.
2. Number of products or services launched.
3. Number of new graduates (if PhD students used in further activity).
4. Attractiveness of educational programmes (if PhD Students used in further activity).
5. Number of policies or standards co-developed and implemented.
6. Amount of capital attracted: the network could apply for capital funding streams for joint procurement/pre-commercial procurement.



7. Tons of GHG reduced: via new products and services and new procurement strategies.

Structure of the Report

The report starts with a review of the literature relating to public procurement and innovation, including its theoretical roots, associated policy literature, examples of implementation and literature on the initiatives that have supported implementation (**pages 6-17**).

The second part of the report will describe the analysis based on the interviews and in-depth interviews that took place with representatives from the Pioneer Cities that explored the procurement practices taking place in each of these localities and the factors influencing public procurement in these locations (**pages 18-32**).

The third part of the report sets out a proposal for future Climate KIC activity intended to support public authorities to use public procurement to stimulate innovation in climate markets (**pages 33-36**).

Section 1: Innovation and Public Procurement: A Literature Review

“If all public authorities across the EU demanded green electricity, this would save the equivalent of 60 million tonnes of CO₂, which is equivalent to 18% of the EU’s greenhouse gas reduction commitment under the Kyoto Protocol” (European Communities 2004).

Public procurement accounts for an important share of GDP in developed economies (OECD, 2002). In 2009 total public expenditure on works, goods and services was estimated to be 19.4% of the GDP of the EU 27 (European Commission 2009), around a third of which is spent through public procurement. Furthermore, in particular industries the public sector accounts for major shares of national expenditure, e.g. in construction public spending is 40% of total spending in this sector¹.

Public procurement can be considered from two standpoints.

1. A means of acquiring the goods, services and works required by public authorities to meet their objectives at the right price, timing, and location.
2. A mechanism through which trade relations, economic operators, and the processes used to deliver public services and policies convene (Bovis, 2007: 445), which can be used to achieve a range of policy outcomes through changing the activities of the firms that win contracts (Erridge and Greer, 2002; Sykes, 2007).

One of the activities that can be altered by public procurement is the rate and direction of innovation activity in supply markets (Cave and Frinking 2003; Dalpé, 1994; Edler and Geoghiou, 2007; Edler *et al.*, 2005; Edquist *et al.*, 2000; Georghiou, 2006, 2007; Geroski, 1990; Hommen and Rolfstam, 2009; Nyiri *et al.*, 2007; Peng and Cai, 2008; Uyarra, 2010; Uyarra and Flanagan, 2010).

Most of the literature refers to innovation as the development of new technology, as opposed to process or service innovations (e.g. Edquist and Hommen, 1999; Nyiri *et al.*, 2007; Rolfstam, 2005; Bryson and Rusten, 2011; Love *et al.* 2012). This may relate to a recent policy focus on encouraging technological innovation to increase the international competitiveness of firms and stimulate economic growth (e.g. Lead Market Initiative), and the origins of this literature in studies analysing the impacts of Second World War defence technology procurement on innovation (e.g. HINDSIGHT project).

1.1 The Arguments Linking Public Procurement and Innovation

A number of studies conclude that market demand influences the rate and direction of innovation processes in firms (Schmookler, 1966; Scherer, 1982; Kleinknecht and Verspagen, 1990; Brouwer and Kleinknecht, 1999 as cited in Filippetti and Archibugi, 2011; and Geroski and Walters, 1995). Dalpé *et al.* (1992) evaluated the weight of the Canadian public sector as: (1) first user of innovations; (2) user of inventions patented by Canadians; and (3) buyer of manufactured products. They found that 25% of innovations found their first use in the public sector, as did 13% of patents and 8% of manufactured production, providing the state with a significant role in innovation, whether it applies

¹ http://ec.europa.eu/enterprise/policies/innovation/policy/public-procurement/index_en.htm

explicit procurement of innovation policy or not. More recently, two studies by Palmberg (2004) and Saarinen (2005, as cited in Edler and Georghiou, 2007) found that 48% of projects undertaken by Finnish firms leading to successful innovation were triggered by demand: either in the form of public procurement or regulation. Significant demand is considered to 'pull' innovation when it provides firms with guaranteed production levels to reduce the uncertainty associated with innovative activity (Edler and Georghiou, 2007). Demand can also influence the structure of markets (Kamien and Schwartz, 1975) and the life-cycle of industries (Utterback, 1994). Therefore, the scale and character of demand in a given location is cited as a major determinant of competitiveness and innovation dynamics (Porter, 1990). Myoken (2010) sought to investigate low levels of research and development (R&D) commercialisation in the Japanese economy since the 1990s and concluded that as the value of innovations are hard to assess at the early stages of development, the role of government should be one of using 'visible hands' to demonstrate technologies by supporting the creation of prototypes. Myoken also recommends that governments study global technology trends from the early stage of product development, and manage regulatory regimes and policy initiatives to facilitate markets accordingly.

Historically, procurement was considered to be a significant instrument for innovation policy, but this practice had virtually disappeared before the present cycle of interest (Georghiou, 2007: 2006; Edquist, 2009). The influential Aho Report (Aho *et al.*, 2006) on creating innovation-friendly markets to encourage investment in research and innovation, helped to reignite the focus on using public procurement to drive demand for innovative goods to improve the productivity of public services. The report argues for a cohort of "intelligent public customers" who are aware of potential new solutions to societal needs, and able to specify and manage contracts that house innovation throughout their lifecycle. Training, networks, a new attitude to risk, and an emphasis on whole-life costing were identified as the key supporting measures to develop such a cohort. The Lisbon Strategy also argued that member states and the Commission should consider public procurement as a pioneer market for research and innovation-intensive products and services, and stimulate markets for eco-innovations by acting as a launch customer to diffuse innovations and aggregate demand to create economies of scale. The strategy recommended that national and local authorities should create action plans for greening public procurement by 2006, focusing on renewable energy technology and new vehicle fuels.

Another related theoretical basis for linking public procurement and innovation comes from the subset of innovation theory focussing on inventive activity resulting from user-producer interaction. Cases demonstrating the impact of user-driven innovations in new scientific instruments and sports equipment led Von Hippel (1986) to coin the term 'lead user' to describe "*users whose present strong needs that will become general in a marketplace months or years in the future*" (Von Hippel, 1986: 791). Successful innovation is made more likely when producers have good understanding of the needs of users – which can be as important as knowledge about new technical opportunities (Freeman, 1982: 124 cited in Lundvall, 1988: 350), making structures for interaction and exchange between users and producers pivotal (Lundvall, 1988: 350). There is evidence that Government is more often a "lead user" of innovations than private actors (Dalpé *et al.*, 1992). Malerba *et al.* cite

the development of the internet and advances in aircraft design as examples of how new firms can gain a competitive advantage by selling to experimental users and indicate that links between new firms and public procurers present innovation opportunities (Malerba *et al.*, 2007: 373). Recently Bryson and Rusten (2011: 195) have argued for differentiation between processes of active and passive user innovation. ‘Active’ involves products and companies that develop procedures to exploit user innovation; and ‘passive’ occurs serendipitously’. At the moment, it seems likely that many of the benefits that come from public procurement are obtained from serendipitous interactions.

1.2 Public Procurement and Stimulating Innovation

Gershon (1999) defines public procurement as: “...*the whole process of acquisition from third parties and covers goods, services and construction projects. This process spans the whole life cycle from the initial concept and definition of business needs through to the end of the useful life of an asset or end of a services contract.*”

The process is governed by the public authority’s responsibility to achieve value for money through fair and open competition, and comply with legal obligations under the EU procurement rules, and EU Treaty principles. The actual purchasing process varies according to the subject of the purchase: low value, low risk, non-repeating purchases use minimal processes, governance or expertise, buying aircraft carriers or executing 25 year design, build and operate waste management contracts involves specialist processes and expertise in project management, procurement, law and finance and possibly HR or risk management, which if not available in-house, is bought in using consultancy (OGC, 2008:8). Procurements also may be part of interlinked projects so systematic project management is important². There are narrow and broader definitions of public procurement of innovation. A widely used narrow definition refers to the purchase of products that do not exist but are likely to be commercially available after defined publicly sponsored R&D (Edquist and Hommen, 2000). Broader definitions include purchasing innovative products, services or processes aimed at improving the performance and functionality of public services, or to solve important socio-economic challenges, which may or may not include publicly sponsored R&D within a contractual relationship as this may have already taken place (Norden 2011)³. Studies by Lember *et al.*, (2008) into procurement in Baltic cities and Yaslan (2009 - both cited in Uyarra and Flanagan 2010) into 30 IT related public procurement projects in Turkey found that most cases of innovation did not involve early-stage radical innovation of emerging technologies but were adaptations or improvements of existing solutions (creating new markets and providing a testing ground), or non-technological innovations such as organisational and process innovations. This evidence may indicate that the broader definition is closer to the common experiences of innovation by procurers.

² For UK public authorities, HM Treasury’s ‘*The Green Book: Appraisal and Evaluation in Central Government*’ (2003), and HM Treasury’s ‘*Managing Public Money*’ (2011) cover project management of procurement in detail.

³ Referencing OMC—PTP, Exploring Public Procurement as a Strategic Innovation Policy Mix Instrument (manual developed within an Open Method of Coordination (OMC) funded by the European Commission within the 6th Framework Programme, www.omc-ptp.eu)

Multiple studies and reports describe how public procurement can stimulate innovation and a summary of recommended mechanisms is provided in Appendix 1. These include: developing a more strategic approach to procurement and demand management; increasing the technological knowledge base of public procurers to affect the design of the procurement, discrete procurement methods (e.g. Pre-Commercial Procurement), amending the procurement process (e.g. specification types), and different approaches to relationships with supply chains. The discrete procurement methodologies - Pre-Commercial Procurement; Forward Commitment Procurement; technical dialogue and competitive dialogue; “challenges” and “competitions” are likely to involve a greater resource commitment than the amendments or additions to broadly ‘normal’ procurement process, such as performance based specifications; increasing visibility of demand; or using lifecycle costing. Concerns have been expressed that current recommendations are based on a limited set of examples which are not representative of the bulk of public purchasing and tend to downplay diversity in procurement practices and in the types of goods and services procured (Uyarra and Flanagan, 2010).

There are different modalities through which procurement of innovation techniques can be deployed. Different modalities of pre-commercial procurement are identified in the Rigby *et al.*, (2012) report, based on the work of (Gavras *et al.*, 2006).

1. Procurement is undertaken by the public user for the same user.
2. Procurement is undertaken by a public agent or partnership for another public user (e.g. the UK SBRI model);
3. Procurement is undertaken by a public agent for a possible private set of clients where there is a clear public benefit (assimilated to what is called a "catalytic procurement").

Evaluations of these techniques are underdeveloped. There has been some evaluation of the use of green or environmental standards as an innovation stimulant, e.g. Apostol (2010) describes how in 2006 the STEPPIN network (Standards in European Public Procurement Lead to Innovation⁴) analysed 500 tenders in search of good practice in the use of standards to stimulate innovation. Of the 500 tenders only a few provided evidence that using standards in the procurement process leads to the purchase of innovative products. Follow up interviews with suppliers confirmed the proposition that formal, performance-based standards provide scope for them to offer innovative products, but that functional or performance-based technical specifications (developed from standards) offer greater potential. The project concluded that open standards, formulated in terms of performance or functionality, give procurers more confidence in the performance and safety of innovative products; help to disseminate innovative products and services; and stimulate enterprises to invest in R&D. Workshops with procurers in several countries found that public procurers had limited knowledge of standards, used them rarely and did not associate them with innovation. Barriers to using standards included the absence of national level support for standards as an innovation instrument; lack of mandate for public procurers to be directly interested in promoting

⁴ The STEPPIN network was one of six standards networks set up by the European Commission to promote the innovation potential of standards in public procurement as part of the Europe Innovation Initiative.

societal objectives such as enhancing innovation; budgetary restrictions and risks of legal proceedings or accusations of corruption (Apostol, 2010).

Tarantini *et al.*, (2011) tested the application of Life Cycle Assessment (LCA) methodology to the procurement of wooden windows based on a case study from the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA). Whilst LCA identified the main impacts and critical processes in the window life cycle, giving a scientific framework to discuss 'Green Public Procurement' criteria with manufacturers associations and stakeholders, it could not identify detailed criteria for use in purchasing specifications including numerical thresholds to be used as a reference. The authors concluded that LCA information should be complemented by an analysis of the relevant market, voluntary industry commitments; existing and future legislative demands and current and evolving technical standards.

Research into the links between different types of procurement approach is underdeveloped, and the recent Rigby *et al.*, report (2012) on creating an EU-wide scheme for public procurement of innovation recommends further work to clarify these links and enable public authorities to develop more coherent innovation strategies and implementation plans. The report also highlights that some public procurement of innovation methods are more defined than others and that new methods are being developed. An integrated approach is being tested in the Netherlands based on the idea that the contracting authority should gather information on the available innovative solutions through a market dialogue and incrementally implement solutions through piloting to minimise risks and uncertainty and use value engineering clauses in contracts to encourage providers to propose cost saving innovations. Auditing would be used to evaluate the success of the project and the points of improvement (Apostol, 2012 forthcoming as cited in Rigby *et al.*, 2012).

There is agreement that the early stages of public procurement are most important in creating scope for innovation (OGC, 2009; Edler *et al.*, 2005); European Commission, 2007). Pre-procurement market analysis and technical dialogue, and the use of foresight approaches, are identified as setting the stage for the entire process in terms of identifying opportunities for innovation (Georghiou and Harper, 2011). Network building activity in the supply chain raises supplier awareness of forthcoming opportunities and also potentially increases opportunities for innovation in the procurement process.

1.3 Factors Affecting the use of Public Procurement as an Innovation Stimulant

The rationale for government intervention in markets is usually the presence of market and system failures in the generation and diffusion of innovations (Edler and Georghiou, 2007). Therefore, according to Edquist and Hommen:

“In capitalist economic systems, where markets are effective mechanisms for articulating and satisfying most economic needs or demands, the point of departure in the application of public technology procurement must be the satisfaction of genuine social

needs - in other words, specific societal needs unlikely to be met by the market." (Edquist & Hommen, 2000, p. 5 as cited in Edquist *et al.*, 2000).

Causes of market failure can be the result of poor user-producer interaction and communication, scattered or inarticulate demand (von Hippel, 1977, 1986; Gregersen, 1992; Lundvall, 1988; Moors *et al.*, 2003; Rothwell and Gardiner, 1989; Smits, 2002 as cited in Edler and Georghiou, 2007); a lack of trust or a lack of skills in the market, and high transaction and learning costs (Edler and Georghiou, 2007). The literature identifies the following characteristics of public procurement that can be used to address market failures:

1. Achieving critical mass to incentivise firms, structure manufacturing (Geroski, 1990: 189 as cited in Edler and Georghiou, 2007) and lower transaction costs (Edler *et al.* 2005, Edler and Georghiou, 2007).
2. Providing a demonstrator effect to help innovation diffuse to other public sector organisations and private users (Edler *et al.*, 2005, Edler and Georghiou, 2007).
3. Creating standards which enable knowledge spill-over and increase incentives to invest in R&D (Edler and Georghiou, 2007).

As such, the ability of public organisations to intervene in markets is affected by the technological capacity of their buyers, scale of demand, and political characteristics (Edquist *et al.*, 2000).

1.3.1 Scale of demand: value of orders

Guaranteed production levels that enable firms to benefit from economies of scale, technological investment and profits offset the uncertainty inherent in innovation (Dosi, 1988: 222; Uyerra and Flanagan, 2010). The scale of demand required depends on market relations between suppliers (Rothwell & Zegweld, 1981 in Edler and Georghiou 2007; Edquist *et al.*, 2000), and innovation and product life cycles (Edquist *et al.*, 2000; Edler *et al.*, 2005; Hommen & Rolfstam, 2009). Therefore, the scale of demand will be particularly important in industries characterised by heavy R&D requirements, substantial economies of scale in production, large generational leaps in technology or high levels of uncertainty (Porter, 1990 as cited in Uyerra and Flanagan, 2010).

Multiple buyers or a single buyer with sufficient purchasing power (e.g. the NHS) can constitute 'early markets' for innovations (Georghiou, 2006). Individual government agencies can be in monopsonistic positions⁵ in the defence, healthcare, transportation and communication industries but represent varying shares of the customer base in other markets (Dalpé, 1994; OFT, 2004). However, aggregating demand to create larger market share is accompanied by difficulties in coordinating the policy objectives of multiple organisations (Dalpé, 1994: 77). Consideration should also be given as to whether the early market represents a niche or requires very specific products or services as this limits possibilities for innovation diffusion (Edler and Georghiou, 2007; Aschoff and Sofka, 2009). Research analysing ex-ante the impact of public procurement on particular aspects of the defence industry found that public procurement enabled the aeronautics industry to develop

⁵ The definition of a monopsony in the Oxford English Dictionary is "a market situation in which there is only one buyer".

innovations that led to wider commercial profitability (Bellais and Guichard, 2006; Mowery, 2009), but these effects were not shared by the machine tools and IT industries due to the nature of the innovations being demanded or changes in government share of the market (Mowery, 2009).

1.3.2 Technological capacity of buyer

Research into the relationship between government expertise and supplier innovation link increased technical competence amongst buyers with increased innovation: e.g. the development of the telecommunications industry in the Nordic countries has been linked to the technological capacity of government buyers in setting the specifications and input into product development (Dalpé, 1994:69). Purchasing authorities will therefore need to acquire (or have access to) considerable technical expertise to establish innovation inducing performance specifications and evaluation procedures (Rothwell, 1984). Coordination between different public bodies is also needed to aggregate demand or determine the appropriate level of intervention (Rothwell, 1984). The Aho report states the key challenge in public procurement of innovation is how to aggregate and coordinate demand through common standards, regulations and joint procurement (Aho *et al.*, 2006).

To counter the uncertainty and risk associated with innovation the literature also emphasises good governance structures and strong management (Hommen and Rolfstam, 2009; Department for Innovation Universities and Skills, 2009). Some have suggested that entirely new forms of coordination and governance are required to reconcile the three different logics involved in public procurement of innovation: the efficiency logic (buyer value for money), the broader economic logic (direct effect on producers, value chains, spill-overs to private demand) and the policy logic (deliver better public service / societal effects) (EC, 2010: 29).

1.3.3 Political factors

Public procurement takes place in a politicised setting, which can influence procurement strategies and decisions. Three characteristics of elected officials that affect public sector demand are highlighted by Dalpé (1994: 74-75):

1. A preference for projects with a high probability of success (low risk) as the electoral cost of procurement failure could be high.
2. A preference for short-term projects: the impact must be visible before the next election.
3. A preference for sharing contracts among suppliers as the number of votes to be won in an area that wins a contract are perceived as much smaller than the potential votes lost in regions not selected.

These preferences potentially limit public procurement of innovation which involves a higher degree of risk, longer term investment and a close relationship with a single or small number of supplier firms. Possibilities for overcoming these limits may be found in the national and local policy context, executive leadership support for the procurement strategy, the commitment of individual champions and the use of external project funding which carries less political risk (Edler *et al.*, 2005). The Aho report argued for a public sector culture shift to one that celebrates innovation and

contains a desire to possess innovative goods and experience innovative services. This involves accepting the necessary level of risk (Aho *et al.*, 2005). After researching the procurement practices of local authorities and fire services, Rothwell (1984) argued that public purchasing procedures should be insulated from political considerations, especially during periods of budgetary constraint and cutbacks in public spending. Edquist (2009) concluded that although Sweden had widely used public procurement to stimulate innovation in earlier decades, this had decreased recently due to a change in the philosophy behind public services to one more focussed on cost savings.

1.3.4 Other factors affecting the demand dynamic: industry/product/firm specific characteristics

The public sector's primary use of innovation has been higher in R&D intensive industries such as aeronautics, telecommunications, energy, pharmaceuticals, scientific instrumentation (Dalpé, 1994) and defence (Mowery, 2009). Rates of innovation in these sectors will also be affected by supply side innovation determinants and appropriability regimes (the ability of firms to capture a significant amount of what the market is willing to pay for an innovation) (Dosi, 1988: 229).

The literature suggests public demand is more suited to innovations at the early phases in the product life-cycle (Herbert and Hoar, cited in Dalpé, 1994: 69) ideally when *"the functional requirements of the product/service being demanded are known but the realisation and design are not"* (Aschoff and Sofka, 2009). Rothwell (1984) argues that procurement can be used to stimulate incremental innovations in the case of mature products and that the greatest impacts are when public procurement can be used to create wholly new products, stimulating major technological changes. However, approaches based on product development stages are criticised for a neglect of demand in post-dominant design developments, an over-reliance on the linear model of product to process innovation and the assumption that a clearly dominant design will always emerge (Uyarra and Flanagan, 2010). Morris (1990) considered how Japan, the UK and US tried to develop public technology procurement in the semiconductor industry between 1970s and 1990s and concluded that the effectiveness of procurement as a stimulant ebbs and flows during technology lifecycles and that it is not always obvious to public authorities when to use public procurement as an innovation catalyst.

Firm specific characteristics may also influence the effectiveness of procurement as an innovation catalyst. To Aschoff and Sofka (2009) public demand may be a particularly effective stimulus for smaller firms in regional areas under economic stress and in distributive and technological services. Rothwell (1983) also supported the idea that public technology procurement was potentially most powerful for regions undergoing economic development, as technology based small firms are more affected by local technical and market deficiencies than larger firms. Therefore, stimulating innovation by creating new markets, creating demand pull, and providing a testing ground for innovative products and services using public procurement benefits these firms more.

Storper argued that firms weigh the uncertainty and risk associated with demand for innovation based on whether it relates to products that are specialised or standardised, generic or dedicated (as cited in Uyarra and Flanagan, 2010: 134), indicating whether the market will be sufficient to justify

the investment and whether the firm can master the required capabilities, knowledge and skills (Uyarra and Flanagan, 2010: 134). The Falk Innovation Project (FIP) explained the success and failure of innovations in the electronic medical instruments industry using the concept of ‘market determinateness’ which is explain as follows: *“the degree of specificity of the market signals received by the innovating firm and consequently to the extent to which it anticipates (instead of responding to) demand”* (cited in Mowery and Rosenberg, 1979: 134). This notion is similar to the concept of active and passive innovating firms developed by Carter and Williams that contends that only passive firms fit the “demand-pull” paradigm (Mowery and Rosenberg 1979: 134).

1.4 Evidence of Implementation

1.4.1 Case studies of individual projects

Appendix 2 contains 13 cases from the policy and practice literature demonstrating the use of public procurement to stimulate innovation in climate related markets. These cases will not be the only instances of this type of public procurement which have taken place, but these are the cases highlighted in policy and practice guidance and that public authorities across Europe may be aware of.

The cases listed relate to transport planning and information services (Helsinki, UK Highways Agency, Swedish Rail Administration); lighting (Hamburg, Manchester, Rotherham General Hospital); waste management and refuse derived fuel (Manchester and Vaxtkraft Project, Sweden) energy procurement frameworks (Italy); ‘passive houses’ (Växjö Municipality, Sweden), an Ethanol-Fuelled Pickup Truck (Stockholm), and an Environmental City District (Hammarby Sjöstad, Sweden).

The innovation characteristics of the cases include the integration of new or existing technologies into new settings, for example the £3.5 billion Manchester Waste Management PFI was concerned with introducing a combination of technologies in a way that was new to the UK, but not to the European market. The ‘Journey Planner’ introduced in Helsinki appears to be a case of incremental innovation to improve services, the ethanol fuelled pick-up truck procured in Stockholm was also concerned with introducing existing technologies into a new setting. The generation of entirely new products and services are also evidenced in these cases, for example the variable signage system procured by the Highways Agency (UK) involved a design competition and staged development and testing of two prototypes before final selection and installation of a new product and service. The street lighting column in the Manchester case study also involved the design, production and installation of an entirely new product.

The cases contain information that suggests that the procurement strategies used were selected based on market consultation prior to the procurement exercise and the authority’s previous experiences with a particular market or procurement process. For example, the staged multiple contractor process used by the Highways Agency was used to manage supplier dominance in the innovation process and to encourage competition in a small market based on a previous contract in which supplier dominance meant that the Highways Agency found it difficult to secure the right outcomes at the right price. A performance-based contract was chosen by the Italian energy

procurement consortium to manage a high degree of market complexity and low technical knowledge within the procuring the authorities.

It is difficult to judge from these cases the extent to which the practices were considered unusual by the authorities engaging in them, and whether the purchases were part of wider strategies by the public authority(ies) to stimulate innovation in particular markets. Edquist *et al.*, (2000) describe two environments for public procurement of innovation: ‘immature environments’ and ‘innovative environments’, and argued for different policy interventions in each (described in Table 1 below). It would therefore be useful to have a more detailed account of the environments in which these cases are situated. Only one of the cases demonstrates joint procurement although a number involve the identification of potential markets for dissemination of the innovation.

Table 1: Policy Actions to Support Public Technology Procurement

Environment	Policy Action
Immature: contact between procurers and suppliers avoided and organisational and technical competence in relation to innovation process required.	<ul style="list-style-type: none"> a) Tackle the view that informal contact between public procurers and suppliers inhibits the impartiality of public procurement, by establishing mechanisms for contact and awareness raising activity with the public and politicians to change cultural and institutional norms. b) Strengthen the ability of public authorities to time their interventions into markets by creating legal and administrative frameworks to make fast and flexible decisions and hold public procurers accountable for delays. c) Increase technical competence relating to the state of the art and develop organisational learning capacity as a precursor to buyer-supplier interaction (via recruitment or cooperative relationships with other organisations). d) Strengthen organisational competence. This can be held centrally to be drawn upon when required.
Innovative: innovation process and organisational learning embedded, complex buyer – supplier relationship accepted. Legal, regulatory and I institutional and cultural norms allow public technology procurement perspective.	<ul style="list-style-type: none"> a) Strengthen mechanisms to reduce danger of overspending of time and money. b) Create acceptance that uncertainty associated with innovation means that plans may change but that this is not ipso facto corruption or mismanagement. c) Accepting that institutions are different and path-dependent, build each system around its own strengths and the fit with national or regional innovation systems, development blocks and ‘focal organisations’ specific to each context. d) Balance the competencies of buyers and suppliers.

Source: Edquist *et al.*, 2000.

The following section will review the literature on the uptake of public procurement of innovation practice and policy interventions designed to support it.

1.4.2 Strategic approaches and support for public authorities

An overview of uptake of public procurement of innovation policies and strategies across Europe was undertaken by Kahlenborn *et al.*, (2011)⁶. The research identified no systematic policies on public procurement and innovation among member states, but National Action Plans (NAPs) for sustainable public procurement in Austria, Belgium, Finland, Norway and Poland explicitly include

⁶ The research involved a large scale review of national policy approaches, legal provisions, and initiatives compiled through desk research and interviews with national representatives, budget estimations, a web survey of European contracting authorities CAs and selected follow up interviews with procurement practitioners and representatives of supplying companies.

innovation objectives, as do NAPs for green public procurement in Portugal and Sweden. Broader policies, research and environmental technology strategies call for public procurement to drive innovation in Austria, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Lithuania, Luxembourg, Malta, Norway, Poland, Portugal, Slovakia, Spain and the UK. Portugal is the only country to have adopted a legal approach, where 20% of substantial public procurements must legally be allocated to R&D and innovation, but this type of approach is more common regarding green public procurement. Public procurement of innovation was often linked to product groups: environmental technology (for waste and water sectors), office IT equipment, renewable energy, energy-efficient technologies, transport, construction and urban planning, health sector and medical equipment, and defence and security technology. Specific procurement criteria were not identified but broad considerations were found that often focussed on the promotion of SMEs. 48% of contracting authorities responding to the survey said they addressed innovation in their tender documents (particularly in the UK, Finland and Norway, however these countries may be overrepresented in the sample). Contracting authorities mostly used Economically Most Advantageous Tender (EMAT) (42%), functional requirements (38%) and the acceptance of alternatives (35%) to promote innovation. Eleven countries promote public procurement of innovation through dissemination activities. Few guidance documents were identified, but conferences, networks and helpdesks were found in Finland, Norway, the Netherlands and the UK. The research also confirmed that no systematic monitoring and reporting of public procurement of innovation is undertaken in any Member State, although the need to do so is broadly recognised.

The first systematic survey of sustainable or green public procurement practices globally was undertaken by Brammer and Walker (2010) and obtained 283 responses from 20 countries. Perceived costs were the most regularly cited barrier (sustainably produced products were seen as more expensive by one third of respondents), along with familiarity with policies, lack of support from senior managers and devolved procurement structures. Facilitators included support among an organisation's leadership; concrete strategies and plans enshrining and articulating sustainable procurement goals; and a supportive governmental/legislative climate. A survey of local government procurers in England identified that despite the policy developments and recent inclusions and amendments to the EU rules, there is evidence to suggest that making procurement selections on the basis of social, green or sustainability criteria is still difficult and uncomfortable for procurement staff. The inclusion of green (sustainability and energy efficiency) criteria in public contracts was cited as a difficulty by 70% of respondents and the process of determining selection and award criteria was cited as "difficult" by 63% (Local Government Association, 2010).

The Final Evaluation of the Lead Market Initiative (Oxford Research for European Union, 2011) demonstrates that procurement networks (in this case relating to 'sustainable construction' and 'protective textiles' markets) can be effective in creating best practice guidance and knowledge transfer among their members, but that it can be difficult to achieve national government and industry approval of a network's outputs. Accelerated adoption of existing technologies was achieved by the 'protective textiles' network and this network was also judged to have created coherence in market demand signals. Neither of these networks addressed the early stages of the

innovation cycle, in which creating change requires more complicated and resource intensive interventions such as Pre-Commercial Procurement.

A recent report for the European Commission on the development of a European scheme for public procurement of innovation (Rigby *et al.*, 2012) highlighted the following implementation issues:

1. Evidence of significant differences in member state's procurement rules even with common directives for procurement that were clearly leading to different views of what actions were legal, making European policy difficult to implement. E.g. procurement law in Belgium and Denmark makes particular difficulties for those who have developed prototypes and who then wish to supply the final good at Phase 4 of the innovation cycle.
2. While total public sector procurement budgets within Member States are large, demand is distributed and fragmented and budgets and possibilities vary widely across the EU.
3. An aversion to risk is widespread, and considered a virtue by many, as risk is associated in the public imagination with wasting public money rather than improving the quality of public services.
4. Silo budgeting, capability shortcomings, and lack of interaction between suppliers and public buyers create further barriers to success.
5. Continued legal uncertainty over the relationship between PCP and ongoing procurement activity is hindering the take up of PCP. E.g. procurement law in Belgium and Denmark makes particular difficulties for those who have developed prototypes and who then wish to supply the final good at Phase 4 of the innovation cycle.
6. Legal uncertainties also create barriers to cross-border and joint procurement activity that gives substantial added value.

1.5 Conclusion

There are strong theoretical arguments for using public procurement as a mechanism or process to stimulate innovation in local economies and there are also large expectations associated with this approach. These expectations largely originate in data on the size and scale of public budgets, but research indicates that significant work is required to plan, coordinate and operationalise scattered and sometimes inarticulate demand to create effective innovation interventions. Across the European Union the technical capabilities that public authorities have access to, their political characteristics, and the legal and regulatory context of different member states are likely to be the key variables associated with contracting authorities for successful use of public procurement as an innovation stimulant. There are also a range of market, firm and product/service specific variables that will affect the scope of public procurement to stimulate innovation. The case studies in the policy literature demonstrate that these variables are considered in the pre-procurement market assessment and dialogue. Whether this is best practice is difficult to assess.

The literature review has identified a range of suitable methods and adaptations that can be used to make procurement more innovation focussed or innovation friendly. However, how these methods can be used as part of a sophisticated procurement strategy or market shaping portfolio is



underexplored, but represents an interesting opportunity for the Climate KIC. More evaluation of these methods in action is needed to ensure that they are in fact good practice.

The evidence from Kahlenborn *et al.*, (2011) shows that more public authorities are aware of the idea of using public procurement to stimulate innovation than use it and that best practice guidance is very limited.

Section 2: City Authority Based Research

2.1 Summary of Research

Visits to three European city authorities were undertaken during July-September 2012. The city authorities were located in a north west Europe, southern Europe and an eastern European member state. Using a designated contact, the researcher asked the host city to set-up meetings with people who were associated with work being undertaken in relation to public procurement and/or innovation. In-depth conversations were subsequently held with public procurers, politicians, service directorates, innovation agencies and business support organisations. Appendix 3 contains the text used to arrange the visits, and the questions that were used as a framework for discussions. Local variations in participants and their roles and responsibilities means that variations of these questions were asked, and in different orders, and conversations developed based on elements of the local context not anticipated by the researcher. As this was a scoping study these developments were welcomed and included in the data. Data was made available to the Researchers on the use of standards in public procurement in a northern European city, but a visit to this city to collect further data was not possible.

Analysis of the data collected identified primary themes affecting approaches to procurement in the different localities: city strategy and leadership, management and governance of procurement, policy and political context; and markets seen as strategic to the economic wellbeing of local citizens. Analysis was structured according to variables suggested by the literature review: aggregation of demand, familiarity with different techniques, and market specific factors.

2.2 Discussion of Findings

There were immediately apparent differences between the three public authorities visited. For example differences in size and capacity to engage with strategic procurement practices. One of the city authorities represents one of the biggest local authorities in Europe, with 22,000 staff, £1billion annual external spend and £3.5bn annual spend overall. The other cities are much smaller, with one employing 1400 staff, 400 of which are the police force. However, there are also similarities: each city is engaged in pilots and demonstrator activity in transport, building and local energy production innovations; each city has a central procurement department and procurement activity taking place outside this unit; and each city identified external policies driving them to engage in public procurement of innovation activity. The demonstrator projects emerged in the analysis as an activity that is likely to inform future procurement activity in climate markets as these projects potentially familiarise contracting authorities with industry, product and firm specific characteristics that could influence future procurement design.

Approaches to public procurement can be placed on a scale that begins with those primarily concerned with cost control and risk reduction and culminates in the integration of public procurement as a policy delivery function (Telgen *et al.*, 2007). A recent report for the European Commission (Rigby *et al.*, 2012) describes a range of public procurement of innovation interventions,

in which application of more complex interventions requires corresponding increases in organisational capability. Data from the pilot study indicates that there are some interventions that city authorities are implementing on a tactical basis (although support could increase the pace or spread of adoption amongst cities), and other interventions that require a strategic, coordinated joint-authority approach, e.g. where the market requires aggregated demand to incentivise innovation and distribute risk.

A tactical tool being implemented in the cities (independently of each other) is the use of 'green' or sustainability standards or criteria in the procurement process, which is strongly encouraged by the European Commission. The range of products and criteria included differs in each city in accordance with green public procurement strategies set at national, regional and local levels, and their application to markets is affected by other procurement trends such as whether or not collective purchasing frameworks are used. There remains uncertainty about the use of these standards in the eastern European city, linked to legal arbitration of challenges to procurement decisions made by unsuccessful bidders. Other literature links this uncertainty to rulings from the European Court of Justice (Randall, 2007). A procurer in this city expressed a strong desire to exchange cross-border knowledge with procurers in other cities about these practices. However, a procurer in the north western city remarked that interpreting best practice from other countries would require technical and legal expertise to ensure the practice met national regulation and local priorities. An intervention that requires a more coordinated approach is the use of Pre-Commercial Procurement. The north western city was launching a programme of work funded through FP7 funding to develop the capacity to undertake a Pre-Commercial Procurement (PCP) project related to energy efficiency solutions. The southern city had also been involved in a multi-national bid for Pre-Commercial Procurement funding in the ceramics sector. Both of these projects required the development of a multi-city partnership with a high level commitment to jointly purchase R&D to meet a common challenge. The FP7 funding for PCP includes substantial financial support for the development of a common procurement approach (this can be up to one third of project time), illustrating the complexity involved in negotiating the multi-party governance, legal and political frameworks involved in undertaking PCP projects.

Table 2 lists the practices in use in the city authorities, including a brief description of the mechanisms involved and their effects. The table also includes a reference to what type of innovation catalyst the intervention is likely to be used as: ('developmental' procurement in which completely new products, processes or systems are created, or 'adaptive' procurement whereby goods and services new to the unit of procurement are acquired (Edquist *et al.*, 2000: 21)). The table also indicates the likely type of market interaction mechanisms based on Hommen and Rolfstam's (2009) taxonomy⁷.

⁷ Hommen and Rolfstam's taxonomy describes the different market mechanism interactivity levels as: a) *direct*: users exert a direct demand-pull on suppliers e.g. through long-term contracting agreements; b) *cooperative*: aggregation of public and private demand to stimulate private sector innovation, and c) *catalytic*: public sector buyer is not the (only) intended end-user but public sector wishes to stimulate innovation on behalf of the wider user community.

Table 2: Types of Procurement Intervention, innovation effects and barriers

Type of procurement intervention	Market mechanisms involved	Innovation effect	Market mechanism	Barriers/issues	City using
Environmental standards in specifications and assessment criteria	<ul style="list-style-type: none"> Diffusion and codification of knowledge. Create consumer confidence, enlarging the market, increasing innovator's supply chain power, reducing production and distribution costs. Encourages R&D investment. 	Adaptive.	Direct.	<ul style="list-style-type: none"> Still elements of legal uncertainty. Timing and openness of standardisation is crucial for innovation. 	<ul style="list-style-type: none"> Northern Eastern Southern North Western
Functional or performance based specifications	<ul style="list-style-type: none"> Procurement is open to new products/services that may improve efficiency or effectiveness of public service delivery. Supplier creates technical specification. 	Adaptive.	Direct; Co-operative; Catalytic.	<ul style="list-style-type: none"> Require strong links with policy/delivery function. May be more difficult for bidders to price offer and assess risk. Technology risks due to end user refusal/rejection of innovation (diffusion prevented); niche demand; technological lock-in too early; changes in external environment. Contracting under uncertainty affects value for money. 	<ul style="list-style-type: none"> North Western
Innovation or value engineering clauses in contracts	<ul style="list-style-type: none"> May achieve continuous potential for incremental innovations in products/services. May help to avoid technological lock-in. 	Developmental and Adaptive.	Direct.	<ul style="list-style-type: none"> Contracting under uncertainty affects value for money. 	<ul style="list-style-type: none"> Southern
Pre-Commercial Procurement/ SBRI	<ul style="list-style-type: none"> Competitive procurement of R&D services related to societal challenges. Purchaser doesn't retain IP. Staged process to development of market-ready prototypes/limited series of products. Doesn't involve actual purchase of products/services produced – this is subject to a further procurement competition. 	Developmental.	Direct; Cooperative.	<ul style="list-style-type: none"> Should be part of wider procurement strategy. Transaction Cost Economics: lead time, complexity and costs high so need large demand (i.e. over a long period of time or aggregated) and political certainty regarding societal challenge to be met. End user refusal/rejection of innovation. 	<ul style="list-style-type: none"> North Western Southern
Forward	<ul style="list-style-type: none"> Public authority provides 	Develop-	Direct; Co-	<ul style="list-style-type: none"> Lead time, complexity 	<ul style="list-style-type: none"> North

Type of procurement intervention	Market mechanisms involved	Innovation effect	Market mechanism	Barriers/issues	City using
Commitment Procurement	<p>“credible demand” for innovation, reducing uncertainty and risk.</p> <ul style="list-style-type: none"> • Functional specifications and procurement strategy developed using consultation and engagement with the market. • Staged process: market analysis, staged competitions and final procurement of new solution. • Increases pace of market entry and engages multiple firms (competition). 	mental.	operative.	and costs high so need large demand (i.e. over a long period of time or aggregated) and political certainty regarding societal challenge to be met.	Western undergone training but haven't used yet.
Procurement Compacts	<ul style="list-style-type: none"> • Multi-agency public commitment to buying innovative solutions within a specified period of time if available at a price commensurate with their benefits. • Market alerted early to need for new solutions. • Market given information about likely future demand to use in developing innovation strategies. 	Developmental.	Cooperative.	<ul style="list-style-type: none"> • Is demand tangible enough to stimulate activity? • Long-timescales leave agreement vulnerable to political, structural and organisational changes. • Can it account for radical/destructive innovations? • Long term planning may be a more suitable stimulus for large firms (rather than SMEs). 	<ul style="list-style-type: none"> • North Western
Aggregated demand	<ul style="list-style-type: none"> • Joint procurement across public agencies. • Joint procurement within public authority. • Use of framework or management/delivery agreement to facilitate future purchases of a wider user community, e.g. a group of public authorities or a group of citizens. 	Adaptive.	Catalytic.	<ul style="list-style-type: none"> • Risk of end user refusal/rejection of innovation (diffusion prevented) • niche demand; technological lock-in too early; changes in external environment. • Judging scale of aggregation required. 	<ul style="list-style-type: none"> • North Western • Southern
Unbundling of demand	<ul style="list-style-type: none"> • Use of lots or sub-contracting to encourage/enable smaller innovative SMEs to successfully bid for public contracts. 	Adaptive and developmental.	Direct.	<ul style="list-style-type: none"> • Transaction Cost Economics. • Association with protectionism. 	<ul style="list-style-type: none"> • Northern • North Western

This range of activities highlights two things. First, the concept of public procurement of innovation is being interpreted along a scale of both the type of intervention and innovation axes. Secondly, it could be possible for a public authority to take a portfolio approach to stimulating innovation, using different interventions for different technologies at different stages of their evolution and different societal challenges. However, to develop the capacity and expertise to do this would require a strong

political and strategic commitment to innovation as a public procurement deliverable. We should therefore consider the characteristics of public procurement as the contextual basis for developing such a commitment.

The empirical data from the pilot study provide a snap-shot of the context and scope of procurement activity taking place in particular cities at a particular time. Each public authority has its own set of internal procurement clients; buying needs; approach to innovation, and policy drivers, and supporting innovative public procurement involves multi-agency and cross-functional characteristics and a series of localised interactions. *In all cases, the data indicates that the procurement context is evolving and being influenced by policy responses to local, national and international social and economic contexts and the economic context of their supply markets.* For example, issues affecting procurement practices in the cities include reductions in public sector budgets, challenges to decisions from unsuccessful bidders, and supporting local economies. Therefore, changes to procurement activity are likely to follow a pathway that is influenced by both internal and external pressures (Smith-Gillespie and Wittig, 1999).

Classing innovation as a policy area that public procurement has delivery responsibility for is complicated by the financial and policy basis for supporting innovation being cross-functional and sometimes multi-agency. This has been supported by the pilot study research that indicates that supporting innovation through public intervention involves a range of actors beyond the public authority and the market. Both the southern and eastern city authority data demonstrated the importance of wider innovation networks in supporting innovation policy and providing a framework to develop partnerships with public organisations for specific projects, for example, to help procurers with technological and organisational capacity requirements and to link industry with strategic innovation partners in the public sector (e.g. an intelligent glass pre-commercial procurement project in the southern city). Demand for goods and service often originates in service directorates, which are separate units to the procurement function which necessitates cross-functional coordination and negotiation over the specifications used. For example, the demand base for vehicle leasing in the North Western city authority comes from the Children's Services Directorate, environmental department and adult services. This relationship, between the procurement function and the 'internal client', often involves conflict over specifications and levels of aggregation (Lonsdale and Watson, 2005). The following agencies were identified as influencing activity relating to public procurement of innovation.

- City Authority:
 - o politicians;
 - o central procurement departments;
 - o service departments (e.g. transport), and
 - o service department procurement teams (devolved).
- Chambers of Commerce.
- Geographically focussed innovation agencies and business co-location facilities, e.g. science parks.



- Industrial sector innovation agencies and sector networks and clusters.
- Environmental/sustainability agencies.
- Expert bodies.
- Regional Authorities.
- Central Government funded agencies.
- Central Government departments.

2.3 Presentation of Data

An analysis of the interview responses, discussions and documentation provided by the cities is represented over the next few pages, grouped according to the themes outlined above. The responses are presented in a table (Table 3) to make it easier to compare the differences and similarities between cities under each theme, and a discussion box highlights the most important issues or analytical significance in responses.

Table 3: City Authorities Scoping Research: Summary of Discussions with Respondents

Strategy and leadership	
<p>North Western City: The Commissioning & Procurement Strategy 2011-14 links procurement to a 16 year Sustainable Community Strategy, connects procurement and commissioning (community needs assessment, service design and delivery) and states the intention to <i>address innovation through joint procurement</i>. Procurement and commissioning is part of the portfolio of an elected politician and the MEP for the area is championing public procurement of innovation.</p>	<p>Southern city: The researcher is not aware of an organisation specific procurement strategy. Procurement activity is driven by the needs identified by Councillors and service directorates through policy agendas and service delivery.</p>
<p>Eastern city: The researcher isn't aware of an organisation specific procurement strategy. The main strategic driver cited is delivering procurement in line with national government procurement regulations. An annual plan for all procurement activity is created and the central procurement unit (CPU) monitors whether activity is in accordance with the plan. Infrastructure is planned on a 3-4 year basis and has an accompanying 'Business Plan', which is published. Forecasted spending data for infrastructure is available until 2040.</p>	<p>Discussion: the recognition of the strategic importance of procurement in the North Western city is accompanied by a strategy that provides a longer term view of its role. A longer frame of reference is likely to be important for using procurement as a market shaping intervention. The infrastructure data available in the Eastern city could be used for demand forecasting by firms and potentially to plan their R&D, if the likelihood of innovative specifications is indicated.</p>
Management and governance of procurement	
<p>North western city:</p> <ul style="list-style-type: none"> - Elected members sign off procurement strategies, and Chief Operating Officers or Directors authorise spending. - A CPU is accountable to the 'Cabinet Member for Commissioning and Procurement' and responsible for the procurement processes used by the Council. It works with service directorates on contracts, changing practice, and category management (used widely for consistency and efficiency). Areas such as residential care and construction are considered specialist and are therefore more independent. - Large Directorates manage their own contracts, others are managed centrally. - Examples of where demand for innovation come from include 'The Carbon Management Board', a municipal company, targets, service reviews and budget reductions. - The procurement process involves market assessment at the beginning. Service users are involved in needs assessment as part of the commissioning strategy. Knowledge about new product/services tends to come from supply chains. Procurers don't seek information during the life of the contract, suppliers keep them informed. - The city 'frequently' experiences the situation where they have identified a need but there are no products/services available in the market to meet it. Specifications are usually amended to reflect the state of the market. 	<p>Southern city:</p> <ul style="list-style-type: none"> - Councillors within the Mayor's department establish the needs that drive procurement activity. Needs are divided into political needs (policy and outcome related) and technical needs (needs that will inform the specification and design of the procurement). - Portfolios are divided into: Police; Culture; Economy; Social issues; Elderly; Youth; Sustainability; Mobility; Urban. - The Councillors create a needs report which is co-signed by a civil servant and developed with the assistance of technical and legal advisors and a committee of 3 Councillors. - The Department of Public Procurement serves the whole city for supplies and services. It is organised into: 'buildings'; 'public services' and 'supplies'. - Each grouping has a financial threshold indicating the procurement route to be used. For Supplies: up to 18k – simple procedure; 18k – 60k use negotiated procedure; 60k-200k use open procedure and publish in Province and state publications and OJEU. Buildings: up to 50k – simple procedure; 50k – 200k use negotiated procedure; 200k-5m use open procedure and publish in Province and state publications and OJEU.
<p>Eastern city:</p> <ul style="list-style-type: none"> - Central Procurement Unit (CPU) is responsible for legal execution of procurement undertaken by Municipal units and the entire process for centrally bought items. - Before the tender public procurers are legally required to undertake price comparison research. - Head of the municipal unit applies to CPU to start the procedure. - CPU has 2 weeks to assess and correct the application and 	<p>Discussion:</p> <ul style="list-style-type: none"> - Identification of the needs that drive procurement tends to happen outside of the procurement function, with the involvement of elected members, policy agendas and political priorities, community needs and public sector spending patterns. Therefore, encouraging procurement of innovation means encouraging these groups to think in a complementary way and to provide the right

<p>start publication of the tender. If there is a problem/the procurement is 'new' or 'complex', it may take longer than 2 weeks.</p> <ul style="list-style-type: none"> - If under 200,000 Euros and using the 'Open Procedure' the tender is published via national channels for a minimum of 7 days for services/supplies and 14 days for construction. If it is over 200,000 Euros the tender is published via OJEU for 40 days (can be shortened to 22 days if prior information given). - Both the Municipal Unit and CPU are responsible for contract management. - Municipal Companies (Ltd companies owned by Municipality) are used to deliver transportation; environmental innovation and technology (EIT+); and Waste Water and must follow the same procedures when spending public monies. 	<p>information to procurers and accounting for wider economic activity.</p> <ul style="list-style-type: none"> - Central ownership of the process may help to support innovation in the procurement process itself. - The use of Municipal Companies to deliver public services may offer opportunities to test new procurement approaches as they use the same regulatory structure but may have different cultural and institutional contexts that are more risk tolerant.
Policy and political context	
<p>North western city:</p> <ul style="list-style-type: none"> - The Public Services (Social Value) Act 2012 obliges public authorities to consider how service contracts can improve the economic, social and environmental well-being of the geographic area related to their remit and how procurement process can secure that improvement. - A "Community Right to Challenge" gives voluntary/community groups, parish councils and groups of 2 or more council staff the right to request to take over management of local services. If the challenge is 'valid' a procurement exercise is automatically triggered. - The UK sustainable development strategy 'Securing the Future', commits the public sector to leading sustainable development through commissioning and procurement of buildings, goods, works and services. Provides context for procurement and commissioning strategy. - The Energy Act 2011 included provisions for the 'Green Deal', repayment mechanism for installing energy efficiency measures in domestic properties. This is the supporting legislation for a local large scale energy efficiency retrofitting programme. - A new local political administration has renewed the emphasis on using procurement to achieve policy outcomes relating to the economy and social cohesion. - The unique size and history of the City Council may mean it operates differently to other local authorities: innovation has been driven by the middle layers of the organisation. - Budget cuts create incentives for new delivery models, e.g. partnerships. - Local environment and carbon reduction targets driving activity. - A localised devolution agenda in the city may affect commissioning and contract management in the future. 	<p>Southern city:</p> <ul style="list-style-type: none"> - 5 levels of public administration affect the activities of the City Authority: National Government; Regional government; Provincial government; the Deportacion; and Municipalities. Each level has elected representatives and each community can make its own laws. - The alignment of political allegiances between the different levels of administration is important for passing laws and making policy. If there is an alignment it is easier to implement policy initiatives. - Sectoral policy is made at different levels of government: environmental policy derives from regional laws, state laws and EU laws. Infrastructure policy is made at state level. - The city has ambitions that innovations, such as a ceramics and energy programme, can help with urban mobility, efficient public services, create a recognised sustainable city within Europe, increase local energy efficiency, and attract new people with new skills and ideas to the area. - A regional energy agency's Sustainable Building Plan was referenced by the central procurement department as influential in their work. - The national government has published a National Guide on different types of procurement which has been used by the Deportacion to inform their new collective purchasing framework.
<p>Eastern city:</p> <ul style="list-style-type: none"> - National Action Plan on sustainable public procurement 2010-2012 aims to create demand for products meeting environmental standards and innovative environmental technologies. - National strategy for Pre-Commercial Procurement is 	<p>Discussion:</p> <ul style="list-style-type: none"> - The eastern city was the only authority to emphasise the wider European policy context on green procurement. - The southern and eastern cities referred to national government guidance on public procurement. The

<p>being developed (the only other country with one of these is Portugal), and the government is introducing technical dialogue as a pre-procurement procedure for innovation related procurement.</p> <ul style="list-style-type: none"> - Municipality hasn't taken up Green Procurement yet as central government guidance is contains some uncertainty and regional government recommendations are not legally enforceable. - Regulations can be interpreted differently by buyers and suppliers. Potential suppliers that disagree with a decision (often due to price based disputes) can appeal to a special commission within the Central office of Public Procurement that rules whether a decision is correct or not. Legal uncertainty is high. - EU obligations to increase the number of bids undertaken in accordance with 'Green Procurement' rules were referenced. 	<p>national political context affecting the north western city is focussed on local devolvement from central government influence, which may indicate why they didn't reference national procurement policy in discussions.</p> <ul style="list-style-type: none"> - The emphasis on legality in the eastern city wasn't matched in the other cities, where more emphasis was placed on local/regional economic and community policy, suggesting institutional differences in context. - EC procurement directives are interpreted differently in different national contexts and the EC Directives are not completely interpreted into the national law of the eastern city yet, particularly those on complex procurement. Interpretation is linked to the legal systems of different member states.
Joint purchasing and scaling up demand	
<p>North western city:</p> <ul style="list-style-type: none"> - Collective purchasing is used to purchase products and services where the city is a small customer in the overall market, e.g. wholesale energy and fleet vehicles. The city council is experimenting with community based budgets (coordinating budgets of the council, health services, police, and the voluntary, community and private sectors) and supporting households to buy energy collectively. - Using aggregation and bigger firms goes against the local sustainability agenda and the city set up a social enterprise to help SMEs form consortia and bid for public contracts. - The city is involved in an international project using CIP funding to develop, design and deploy a joint procurement on retrofitting buildings with energy efficiency measures. 	<p>Southern city:</p> <p>Joint working between public authorities, academia and business is common in the region but the Spanish administrative structure creates strong fragmentation of demand. Two projects were mentioned that tackle this issue.</p> <ol style="list-style-type: none"> 1) 'Smart Cities': 24 cities will try to jointly procure certain items. 2) A centralised procurement service has been set up by the Deportacion to aggregate demand. The city council can decide whether to adopt the arrangements on behalf of the municipalities. Agreements include public lighting and electricity, and will include sustainability criteria.
<p>Eastern city:</p> <ul style="list-style-type: none"> - Joint purchasing with other public authorities isn't common. - There is a national plan and a body containing expertise but contracting authorities like to retain control of procurement activity due to the emphasis on the legal characteristics of procurement in the national setting. - Exceptions are sometimes made for complex procurement and this activity would be handled by the central procurement unit rather than the municipal units. 	<p>Discussion:</p> <ul style="list-style-type: none"> - Joint purchasing is used to differing extents by the cities and is more common for some types of contracts than others. - The use of framework agreements achieves efficiency, but unless the managing agent considers the innovation potential of contracts there is a risk that large sections of public demand are not meeting their innovation potential. - The north western city is directly involved in a project using joint purchasing to stimulate innovation in climate markets.
Activity in climate markets	
<p>North western city:</p> <ul style="list-style-type: none"> - Local businesses are speculatively investing in retrofitting technology (e.g. photovoltaics) as expectations of contracts are currently high – probably as a result of the large scale local ener4gy efficiency retrofitting progamme, which is viewed as a big opportunity for the regional economy. - Low Carbon Vehicles (LCVs) offer potential as there is an extended car manufacturing supply chain in the region. The city has signed a procurement compact for low carbon vehicles (more details below). Research in the region is 	<p>Southern city:</p> <ul style="list-style-type: none"> - The "CityLab" aims to create new demand markets for ceramics environmental technology innovation (e.g. 'Bionic Dye' which converts polluted air to oxygen). - There is a large sector of production technology services, and other sectors include ICT, games; smart materials and nanotechnology; energy, clean tech; and health. - A major car manufacturing company is funding companies in the regional association of electric



<p>focussing on fuel cells, fuel types, aircraft engine technology, electric charge points and hydrogen refuelling, and diffusing existing LCV technology.</p> <ul style="list-style-type: none"> - The city is seeking to consolidate its position as a manufacturing centre by diversifying and modernising into high-technology, high value-added products and processes. There is a focus on business spinouts from local universities. - Over 41,000 LED street light fittings (50% of total) are being deployed in the city as part of the council's £2.7 billion initiative to upgrade the city's road network. Ultra Efficient Lighting research and product development programme is also taking place in the city. - Local Energy Generation: examples have been installed e.g. Combined Heat and Power (City District Energy Company), Energy from Waste project (in partnership with a waste management company), and similar projects are planned to increase local energy resilience. A 5 year plan to reduce energy consumption, is forthcoming, which will include installing automatic meter readers for electricity, gas, and water, on all large council sites and using renewables. 	<p>vehicles and parts suppliers to develop electric cars and car sharing schemes.</p> <ul style="list-style-type: none"> - The regional energy association and a multinational electric utility company are installing 10 electric vehicle charging points. - A multinational electric utility company is supplying Smart Meters to households across the city. - The regional Association of Energy Companies support a cluster of 200 companies (largely SMEs), representing 80% of the energy economy in the region by encouraging exports, maintaining a regional R&D cluster and raising municipality awareness of energy efficiency opportunities. This includes promoting Energy Saving Companies (ESCOs) that install domestic energy efficiency measures which are funded by residents energy bills. ESCOs have suffered since the collapse of private lending market. - Electrical TRAM: there have been difficulties installing electrical catenaries in some parts of the city centre, because of narrow streets. An innovative energy storage solution is required to solve this issue. - The City Council is supporting a Business Incubator and Eco-Innovation Centre to co-locate companies creating low carbon innovative products and services to encourage knowledge exchange and synergies. A multinational oil company has agreed to locate some of its development projects here.
<p>Eastern city:</p> <ul style="list-style-type: none"> - Strategic industries in the city region include copper mining; electric scooter manufacturing; cabling; motor industry; and multinational ICT companies, who have been attracted to the area by an agglomeration development agency. - A local energy innovation technology agency (municipal company) is scoping the potential for a bio-waste plant in the area that will use the waste generated by the green spaces directorate. - 20 electric vehicles charging points are installed, and free of charge. The operator is developing a service for users to reserve charging stations or be alerted to their nearest charging point using the internet or via a smartphone. - Intelligent Transport System: integrating 153 traffic lights, installing dynamic information at tram stops. - Supercapacitor Electricity Recuperation System (SERS): experimental project to test SERS in trams that theoretically saves 40-50% of electricity consumption by storing and using the kinetic energy lost during braking. If successful will be installed in all 220 trams. - Retrofitting: renovation of elevations in 100 historic buildings in the old town area (owned by the municipality) to reduce heating requirements and CO2 production. 	<p>Discussion:</p> <ul style="list-style-type: none"> - The local authority as a single customer may be too limited to change markets but they can help to shape the market because of their size and the ability of councils to help change perceptions associated with technology. - There are inevitable overlaps in projects being undertaken in climate markets as cities have similar concerns about energy efficiency and low carbon solutions in transport, housing and infrastructure. Much of this activity is in the demonstration phase and hasn't entailed significant procurement activity yet. However, there are likely to be similarities in the steps and timing each city will take from demonstration to diffusion and potential for joint procurement. - Some cities have more experience buying innovations in particular sectors that the others could benefit from. - Ownership of public resources may vary, e.g. the extent that the cities own infrastructure, and affect the opportunities and structure of joint procurement and investment.
<p>Examples of public procurement of innovation activity in climate markets</p>	
<p>North western city:</p> <ul style="list-style-type: none"> - A partnership project led by the city council to offer energy improvements to the households and businesses in the city, 	<p>Southern city:</p> <ul style="list-style-type: none"> - The regional government is promoting the use of sustainability criteria in public procurement. There

<p>through insulation and small scale power generation. It was initially launched as a pilot project but now has a five-year target for 1 in 5 homes in the pilot area to take up the offer (5,000 homes). If successful, the project will save 3750 tonnes CO2/annum and create 270 jobs. The project is considered to involve experimental procurement and has involved securing private finance and a 'Delivery Partner' using a 12 month competitive dialogue process with four bidders. The procurement process encouraged the bidders to interact with local supply market. There is a risk that households and businesses won't take up the measures that will be offered.</p> <ul style="list-style-type: none"> - A project using outcome based procurement to test out new energy efficiency and carbon reduction technologies, which are close to the market but experiencing entry barriers and new to the city region. The project is funded using ERDF monies and national obligations on energy companies (CESP). 4 procurement competitions have been held so far: insulation products, efficiency devices; boilers, and a design competition for portable energy efficiency solutions for high rise buildings. - A free-of-charge web-based service for SMEs in the region to access council and private-sector initiated business opportunities. The database also helps BCC to identify supply chain opportunities. The Council's Standing Orders relating to contracts requires all quotations and tenders to be advertised on the site. - Procurement Compacts: statements of commitment from public and private sector customers to buy progressively lower-carbon goods and services providing they meet operational needs and can be delivered cost-effectively. Organised by a national government department to demonstrate a 'credible and organised market demand for low to zero carbon goods and services' to encourage suppliers to differentiate on the basis of environmental credentials. The city is a signatory to the 'Low to Zero Carbon Transport Compact' and the 'Heat and Power from Renewable Biomethane Compact'. - A joint authority alliance using CIP funding to exchange procurement knowledge, identify buyer groups, build demand and supply capacity and then design and deploy a joint procurement relating to retrofitting of housing stock, municipal buildings or commercial property. The alliance is identifying a roadmap for procurement of innovative solutions likely to be needed in coming years. Partners will identify gaps in technology and integrate findings into existing municipal procurement processes. 	<p>was some resistance from firms at first.</p> <ul style="list-style-type: none"> - Promoting employment opportunities for long-term unemployed in 2 environmental contracts: 1. Battery recycling and 2. Paper recycling. 15% of contracted days worked must be undertaken by long term unemployed. Using a performance based specification and contract. - Procurement of street lights using funds from the regional government will include environmental standards in criteria. Used national Government Guide on Innovative Public Procurement to develop the procurement model. - ICT procurement project to move to a paperless government being undertaken. Stage 1: tender to develop contract; Stage 2: implementation and maintenance of contract. - A Traffic Management System installed in 1992 has been evolving using incremental innovation since. Software and hardware are provided by a firm called ETRA and the system has been modified to prioritise the tram to enable the City to promote it as environmentally friendly and convenient. Citizens can also track bus locations via SMS in real time – an idea that was suggested by an R&D subsidiary of the supplier. The contract has been segmented into periods of 2 years + 2 years, then 4 years + 2 years. The length was increased to encourage investment by the firm. Contract criteria stipulate the application of new technology as it comes on stream (supplying companies must use best technology to guarantee the system does not become obsolete or the switching costs don't become too high). The contract for maintenance of the infrastructure, such as traffic lights and for video wall is separate from the contract for the software (which is where the innovation has been). - The local Chamber of Commerce is supporting the development of consortia of firms to create economies of scale and link local firms to international partners to increase size of the market they can access and increase opportunities to win international procurement contracts with their innovative ceramic products. Using a consultancy firm to identify opportunities. - 'Smart Cities': 24 cities will jointly procure certain items. The cities are currently engaged in preparatory mapping activity reviewing software purchasing and the text used by the different city authorities in specifications and contracts.
<p>Eastern city:</p> <ul style="list-style-type: none"> - Furniture tender using environmental criteria received 5 responses, and 3 bids met the requirements (including FSC and PEC). Winning company was an SME. Not many SMEs in that country are thought to be able to fulfil these criteria. It was the first time that the big companies had seen FSC and PEC requirements in a tender - they were surprised. - Energy innovation agency (municipal company) are not using price as their only criteria where possible: use a formula to 	<p>Discussion:</p> <ul style="list-style-type: none"> - Public procurement of innovation activity involves building capacity on both the demand and supply sides. - Procurement activity is not as adventurous in terms of technology as the demonstrator activity evidenced in the section above. - The cities are using external guidance or partners to facilitate their activities relating to public

<p>weight different criteria, especially when functionality is important. E.g. a tender for waste burning plants included parameters for exhaust fumes.</p> <ul style="list-style-type: none"> - City used guidance in the national strategy for green and social public procurement on non-price mandatory tender evaluation criteria in an open procedure to purchase vehicles. Green aspects are often included in construction tenders, e.g. energy certificates, and good practice is likely to be found in private organisations like the waste water treatment sector. - Public Transport Company tried to implement new source of fuel (LNG) and developed a solution with a private company. Further resources required for implementation and further testing. City seeking external support. - Extension of tram service: city researched new technology and visited sites abroad as wanted new equipment – better, cheaper, greener. Described requirements to Public Procurers in application to central unit and they implemented it. Bought 36 trams and new lines. 	<p>procurement and innovation.</p> <ul style="list-style-type: none"> - SMEs barriers to accessing public procurement opportunities were cited in all cities. - May be an issue moving from pilots to large scale procurement of innovations without external funding sources.
Use of different public procurement methods associated with innovation	
<p>North western city:</p> <ul style="list-style-type: none"> - The council indicates it has probably used all of the methods associated with innovation⁸. - Procurement processes are described as generally orientated towards innovation, either through the use of outcome/functional specifications for service contracts and consumables, or by using particular methods for strategic projects. - Strategic projects involving procurement were the result of a foresight exercise organised by Corporate Procurement to anticipate the need for innovative products and services in different areas of council activity. - Undertook training on FCP but felt the method was overly complex and haven't applied it yet. - Market engagement is frequent, both formalised within the procurement and informal. Informal engagements still carefully structured and suppliers are asked to sign a document acknowledging the engagement won't necessarily lead to a procurement. 	<p>Southern city:</p> <ul style="list-style-type: none"> - The regional institute for buildings undertook one of the first Pre-Commercial Procurements (FP7 funded), which was related to e-health. - Innovation is seen as always being important in the procurement process. Bids that contain innovative ideas, products and services get more points in the assessment process. However, some contracts are more related to innovation than others, e.g. ICT contracts. - Firms can request meetings with local Councillors and inform them of new products/services and discuss their concerns with them.
<p>Eastern city:</p> <ul style="list-style-type: none"> - The use of environmental standards in procurement the most referenced method. - The legal requirement to assess the market before the procurement has a cost emphasis but its potential to identify new products and services is recognised. - The national government is setting the policy context to use procurement to stimulate innovation but the procurers expressed a desire for much more certainty and tangible examples to persuade them to take the practice up. - The city tends to have recurring relationships with the same local firms, suggesting barriers to market entry may be an issue for innovating firms. 	<p>Discussion:</p> <ul style="list-style-type: none"> - Both the north western city and southern city expressed a more business as usual attitude towards stimulating innovation, e.g. associated with contract management. - A foresight exercise in the north western city triggered multiple projects that use different methods and are focussed on different markets. Keeping these projects going has involved high levels of commitment and resources to follow up actions and identify funding and technological opportunities. - Relationships with supply chains are described differently by the cities.

⁸ The interview question refers to general procurement, PCP, FCP, standards and regulations, design competitions, functional specifications, market engagement/dialogue, technical dialogue, competitive dialogue, negotiated procedure, value engineering/clauses in contracts.

Barriers	
<p>North western city:</p> <ul style="list-style-type: none"> - Early intervention in markets needs specific funding and risk management approaches not always present in public services. - The way budgets are organised can hinder the ability to develop and test new ideas. E.g. schools manage their own finances so have to put the case to them and fund pilots to demonstrate benefits before rolling out. - Payback periods need to be considered if using an invest to save business model. - Performance management does not incentivise innovation <ul style="list-style-type: none"> - a good public manager delivers expectations within budget and to time. 	<p>Southern city:</p> <ul style="list-style-type: none"> - Public procurement is largely focussed on price. - Innovation is a question of encouraging politicians, and public workers to think differently. However, sometimes public workers have a lack of incentives to innovate. - The engineering and environment departments in particular offer great potential to innovate and develop their approaches.
<p>Eastern city:</p> <ul style="list-style-type: none"> - The main issue is the specification and technical documentation, which has to be very detailed and cover all possibilities as procurers are legally bound to accept the lowest price offered, even if the solution doesn't meet the organisation's needs. This also means that larger firms, who can offer lower prices tend to get contracts more often. - Specifications also need to be universal and open to all companies as challenges from unsuccessful firms are common. If the Ministry finds an error in the specification or documentation the city can be forced to return funding. This may predispose procurers towards 'safe' and proven procurement methods, goods and services. - No information is exchanged post tender. Modification and negotiation is only allowed under very prescribed circumstances. - Public authorities don't share information about demand or coordinate procurement with each other. - Procurers emphasise national rather than European guidance, e.g. the guidance on using non-price related criteria. This may make cross-border joint procurement difficult. - Investors and companies are also need to consider their own practices regarding innovation and public contracts. - Procurement departments feel isolated. 	<p>Comments:</p> <ul style="list-style-type: none"> - Prioritising price above all criteria is the most pervasive barrier. - There are different barriers depending on whether trying to stimulate innovation using a business as usual approach or as a specially funded external project. - Information sharing between public authorities about procurement activity is not very common. - The importance of specifications as a means of communicating with the market is emphasised and this needs particular attention in contexts emphasising the legal aspects of procurement. - Existing supply chains may not want to innovate and new supply chains may be required – does this present further barriers?
Solutions and support needed	
<p>North western city:</p> <ul style="list-style-type: none"> - Barriers are managed by driven individuals – people who want to push innovation find ways to deliver it. - Supplier-buyer networking events have been successful in raising local interest about the opportunities in climate markets. - Taking a long term approach to technology needs, identifying gaps in technology provision and matching these to funding opportunities (in 'normal' procurement activity and extra projects to take bigger technological leaps) would be beneficial but bigger leaps need to be matched by outside funding. - Central funding for innovation should include a public customer rather than just R&D. Instead move 10% of resource to public service delivery to test out the 	<p>Southern city:</p> <ul style="list-style-type: none"> - The challenge is to change the mentality of public workers. - Linked partnership work with other public authorities, e.g. working together as consortium, to creating bigger impacts, products and results. - Sharing best practice is very important.

<p>innovative products/services.</p> <ul style="list-style-type: none"> - Help identifying opportunities to collaborate. - If taking on best practice from an organisation in another country would need specialists to check legal and technical angle. - Support checking potential of different products and services. 	
<p>Eastern city:</p> <ul style="list-style-type: none"> - Maybe agencies like municipal companies are implementing ideas instead of the government as they don't have the funding and organisational barriers that act as barriers. - EU project meetings to exchange good practice would be welcome – would like more international information exchange as international knowledge supports good investments. - Central Office of Public Procurement organises meetings and training as a side activity for public procurers. Lots of training given on legal aspects but would prefer to meet other procurers as the trainers often don't have practical experience and are not focussed on practical solutions. - Need policy on international exchange of best practice in public procurement. - Interested in sharing and exchanging practice with other service directorates, e.g. swapping example tenders and information on the types of companies that other municipalities work with to deliver their objectives. 	<p>Discussion:</p> <ul style="list-style-type: none"> - Practice transfer may not be as easy as we'd like it to be given different contexts, management and governance arrangements. - There is a strong thirst for practice exchange between procurers based on very tangible aspects – e.g. sharing real specifications, contracts etc. - Linking public procurement to supply side innovation support is potentially highly insightful idea, provided you get sufficient scale of involvement relative to market so not creating uncompetitive niche products/services. - External support to identify when collaboration is beneficial and verifying the potential of different products and services would be a tangible way of supporting public authorities.



Section 3: A Framework for Future Climate KIC Action

Proposed future Climate KIC activity to support public procurement of innovation could be conducted under the umbrella of a procurement network to ensure the appropriate level of commitment and long term engagement in the activity needed to integrate innovative approaches. The network would undertake activity under different work streams that have incremental resource implications. These activities are summarised below.

3.1 Climate KIC Smart Procurement Innovation Network

A Climate Innovation Procurement Network would provide a forum for identifying and diffusing best practice, enabling knowledge transfer, support groups of public authorities to identify and set-up joint-procurement and innovation arrangements, and identify opportunities to implement foresight activity.

The network could start with a smaller core membership (e.g. the Pioneer Cities) which would expand once the objectives and terms of reference of the network were clarified and tested - although resources produced should be openly shared with other public authorities and the supply market. ***The network should include members of procurement teams as well as policy and strategy leads, to make it more likely that solutions developed are workable and implemented.*** The scoping study has identified common implementation issues that could be addressed including: assessing technology trajectories in markets; using standards to diffuse innovations, creating functional specifications.

Network work stream A: Best Practice and Implementation

The procurers interviewed as part of the scoping research expressed a desire for more practical best practice information, including actual specifications, contracts and procurement strategies that have been used to stimulate innovation by public authorities, whilst simultaneously acknowledging that best practice information requires local interpretation and 'checks' before it could be implemented. The cities had differing familiarity with the range of procurement methods that can be used to stimulate innovation, and peer learning and support would be beneficial to achieve a more standardised level of knowledge. The network would also identify opportunities for joint procurement of innovation where the demand profiles of network members overlap, which could be built into on-going purchasing activity over an extended period of time, or network members could jointly applying for funding (e.g. Horizon 2020) where a common shortfall exists.

Work Stream A Activities	Issues addressed:	Climate KIC KPIs:	Resources:	Suggested costs:
<ul style="list-style-type: none"> Identify common procurement activity and shared implementation problems and exchange knowledge and experience. Develop best practice materials. Identify opportunities for joint purchasing. Links demonstrator projects and procurement programmes. Bid for CIP/FP7/Horizon funding or combine funding. Urge EC and national governments to develop new or amend existing practice recommendations. 	<ul style="list-style-type: none"> Increase confidence about innovation and risk and using methods like non-price criteria. Coordinate demand and market signals. Encourage diffusion of innovations. Reduce effort required to spread best practice/policy. Lack of best practice guidance. Support other Climate KIC work on cities and innovation. Lack of funding for implementing innovation. 	<ol style="list-style-type: none"> <u>International knowledge transfer.</u> <u>No. of products or services launched:</u> create new products or services via joint procurement or commercialising demonstration activity via public procurement contracts. <u>No. of policies or standards co-developed and implemented:</u> contribute to the development of new/diffusion and implementation of existing policies or # of standards used in procurement. <u>Amount of capital attracted:</u> the network could apply for capital funding streams for joint procurement/pre-commercial procurement. <u>Tons of GHG reduced:</u> via new products and services and new procurement strategies . 	<u>Salary costs</u> of Network Coordinator – two year post.	2 years @ up to 100,000 Euros/annum.
			<u>Travel</u> for Network Coordinator	2 years @ 10,000 Euros/annum.
			<u>Advisory Board:</u> 4 meetings/year (2 x teleconferences, 2 x face-to-face) and on-going availability for advice and support. 3 days/ quarter/member?	2 years @ 10,000 Euros/annum.
			<u>Recruitment costs</u>	1 instance. Cost depends on route
			<u>Facilities for hosting meetings</u> with national policy makers, funding bodies etc.	2 years @ 5,000 Euros/annum.
			<u>Developing best practice materials</u> from network expertise for C-KIC website and electronic distribution.	2 years @ 15,000 Euros/annum.
			<u>Communications</u> , e.g. promotion of network, and web-hosting and translation of resources into multiple languages	2 years @ 10,000 Euros/annum.
			<u>Travel and expenses</u> of network members	40,000 Euros/annum x 1? Year two possibly funded by network members.
			<u>Network launch event.</u>	1 event @ 10,000 Euros.
				Year 1 total: 200,000 Euros
				Year 2 total: 150,000 or 190,000 (depending if network members fund in year 2).

Network Work Stream B: A capacity building programme for public authorities committed to a whole organisation, multi-intervention and portfolio approach to encouraging innovation throughout their supply chains.

It is widely acknowledged that using public procurement to stimulate innovation requires specialised knowledge and capability; however, there are few training or development programmes available, and none that cover the entire range of procurement methods to enable a strategic approach to managing innovation through procurement across organisations. Developing such a programme should support public bodies to assess their current procurement activity and supply chain relationships and progress through a series of stages of capacity building support. Two implementation options are presented below and a decision is needed about the amount of funding and risk that Climate KIC are willing to manage in relation to this activity as there is a level of uncertainty about the level of demand for this sort of programme and the best way to incentivise public authorities to engage with it. Further research is required to cost this more accurately.

Work Stream B Activities	Climate KIC KPIs:	Resources:	Suggested costs:
<p>Option 1: Create and test a Climate KIC Public Procurement of Innovation Development Programme.</p> <ul style="list-style-type: none"> • Research and map competencies and capacity required for public procurement of innovation. • Create ‘Development Programme’, including incentivisation and implementation scheme, delivery mechanism possible links to qualifications and procurement performance reporting and governance methods. • Test ‘Development Programme’. 	<p><u>1. No. of new graduates</u> (if PhD students used). <u>2. Attractiveness of educational programmes</u> (if PhD Students used) <u>3. No. of policies or standards co-developed and implemented:</u> the training could lead to take up of existing procurement of innovation methods, innovation policies and # of standards that are incorporated into procurement practice. <u>4. International knowledge transfer (Know How type):</u> tailored knowledge transfer consultancy from other public agencies holding expertise in public procurement of innovation into network members (if option 2 pursued).</p>	<p><u>Option 1: Development Programme using PhD Student)</u> Creating the development programme is likely to involve pilots and a number of stages. Using a PhD student could control the resources required and create a 3 year frame for development and testing. The PhD students could also support the work of the network under the direction of the network coordinator.</p>	<p>PhD Student bursary: 21,000 Euros x 3 Fund for student’s travel = 18,000 Euros Total cost: 81,000 Euros (subject to funding route and type of PhD student). If done outside PhD student route costs are likely to be significantly higher and further investigation would be required to quantify them, but the timescale is likely to decrease.</p>

Work Stream B Activities	Climate KIC KPIs:	Resources:	Suggested costs:
<p><u>Option 2: Accessing External Development Resources via the Network</u> Use the network as a fulcrum for exchange programmes (e.g. Pioneers into Practice) and knowledge transfer agreements with organisations such as: (UK) Department for Business Innovation and Skills (Forward Commitment Procurement and functional specifications); DG Environment (green public procurement); DG Enterprise and Industry (PCP and strategy) etc</p>		<p><u>Option 2: Integrate into general network activity</u></p> <ul style="list-style-type: none"> • <u>Meetings</u> with public agencies that own best practice guidance. • <u>Travel costs</u> for best practice guidance holders to attend network meetings to disseminate practice. • <u>Exchange visits</u> between network members and other cities (Pioneers into practice route?) 	<p>Meetings and travel costs of experts/trainers: 20,000 Euros</p> <p>Exchange visits: Possibility of integrating into 'Pioneers into Practice' should be investigated.</p>

Network Work Stream C: Climate Procurement Foresight Activity

Supporting network members to conduct demand and technology foresight exercises potentially increases the scope for procurement activity to be designed to provide opportunities for innovation. Foresight analysis of technologies or markets that future purchasing activity will focus on can help public authorities make better informed decisions about the length and type of contracts they let (e.g. using information about the lifecycle of technologies to assess transaction costs and the likelihood of technology lock-in), and the level of ambition or potential of specific sectors to meet societal challenges which can inform spending plans. Procurers interviewed during the scoping research said that they usually rely on incumbent suppliers to inform them of technology developments during the life of a contract and conduct a market survey when the contract is being re-tendered. Conducting foresight work *during the life of a contract* would enable a more independent and wide ranging analysis of future market and technology trends to inform procurement strategies. However, cost can be a barrier to accessing the required expertise and there are choices to be made about methods, goals and organisational issues that have not been explored in relation to city-level public authorities in detail. Conducting foresight work with Climate KIC procurement network members provides a means of testing this activity at sub-national level and sharing this learning throughout the implementation communities. This could also inform policy and practice debates in the wider EC context. We would suggest setting up a competition fund for foresight activity as this creates flexibility for network members to decide when and in what circumstances to undertake the exercise, and it enables Climate KIC to judge how successful

this activity is in stages, and what the wider demand for this activity might be before committing larger amounts of resources to support it. Learning and development activity should be shared as widely as possible as this activity has potential to create significant changes in the ways that public authorities manage the relationship between their purchasing activity and directing innovation in supply markets.

Work Stream C Activities	Issues addressed:	Climate KIC KPIs:	Resources:	Suggested costs:
<ul style="list-style-type: none"> • Mapping contractual and commissioning cycles and future demand in areas of climate technology spending to identify opportunities for foresight activity – support is likely to be required as this is a resource intensive task. • Network members to bid for funding to carry out foresight work for a specified area of spend – jointly or as single authorities. • Network Coordinator to support set up and implementation of foresight exercise. • Network members to share learning from foresight activity. • Network coordinator to make links to policy and practice development. • Could create a series of ‘evolving specifications’ for technologies based on foresight activity to be hosted by the Climate KIC and regularly updated. 	<ul style="list-style-type: none"> • Regular procurement is tied to periodic need assessments, existing contracts, infrastructure planning, and sunk costs associated with technologies. • Procurers usually wait until end of contract to undertake market assessment. • Foresight provides a mechanism to manage barriers caused by silo budgeting, capability shortcomings and lack of interaction with suppliers. 	<p><u>1. International knowledge transfer:</u> KIC partner provides tailored consultancy to foresight programme, transferred to participants.</p> <p><u>2. No. of products or services launched:</u> over the long term, foresight work can change investment decisions and provide opportunities for new products and services. In the short term, we could measure the number of public authorities engaged in the programme, the number and type of technology areas and aspects of public spending reviewed, and the type and quality of knowledge exchanged.</p>	<p><u>Network Coordinator</u> to develop expertise in foresight exercises and develop an outline foresight framework for public authorities to assist them to bid for funds.</p>	Time: (amount dependent on candidate recruited and their skills and experience)
			<p><u>PhD student</u> (supervised by Network Coordinator and University of Birmingham and Climate KIC) to support mapping of contractual and commissioning cycles of network members in climate related categories of spending and assess the societal needs and problems that will inform future demand of these authorities over the next 1-3, 3-5, 5-10 and 10-15 years. Student would also capture learning from the foresight activity and assist in disseminating this widely, e.g. by publishing mapping methodology. Network members develop in-depth understanding of technique through supporting research.</p>	<p>PhD Student bursary: 21,000 Euros per annum x 3 The possibility of research council funding should be investigated. Fund for student’s travel = 18,000 Euros total <u>(subject to funding route and type of PhD student).</u> Cost: 81,000 Euros</p>
			<p><u>Competition fund</u> for foresight work. Network Coordinator to facilitate applications. To fund:</p>	<p>Up to 25,000 Euros per round and up to 3 rounds. 75,000 Euros maximum</p>

Work Stream C Activities	Issues addressed:	Climate KIC KPIs:	Resources:	Suggested costs:
			<ul style="list-style-type: none"> - Hire technology experts, if none are available within KIC (day rates approx. £500/day) - Expenses for suppliers and other public authorities to engage. - Assessing technologies and buying needs could be a largely electronic exercise to reduce travel and time requirements. 	cost.
			<p><u>C-KIC subject level expertise and entrepreneurs</u> – likely that C-KIC experts in technology field and C-KIC partner entrepreneurs would be asked to contribute to foresight activity.</p>	<p>C-KIC subject experts time (no cost attached?)</p> <p>Entrepreneurs time (cost to be covered from competition fund).</p> <p>Total cost over 3 years: 156,000 Euros</p>



Activities November 2012- January 2013

The following activities will be undertaken between the end of the scoping study and the final decision about implementing a Climate Procurement Innovation Network and associated work streams.

Main preparatory actions for 2013

1. **Network Membership.** The pilot has been based on three cities. The network would need to be expanded to provide broader coverage across Climate-KIC. KIC Partners will be approached to discuss potential membership.
2. **Network positioning.** There is increasing activity across Europe in this particular area given recent policy announcements. It is important that the Climate-KIC network and activities are coordinated with these emerging activities. A first meeting has been held with DG Enterprise and Industry in the European Commission. Further meetings are needed with organisations like ICLEI to scope the potential for collaboration.
3. **Network Leadership.** The network needs to be anchored with a KIC partner who will (i) provide strategic support in shaping the network membership and positioning, and (ii) chair the procurement network meetings when established and provide support to the network coordinator.
4. **Network Coordinator – job spec.** A coordinator would be appointed to manage the running of the network and day-to-day activities and a job specification for this post is required.
5. **Fit with Making Transitions Happen platform** to be established.

Appendix 1: Mechanisms for Using Public Procurement to Stimulate Innovation Described in Policy and Academic Research

The mechanisms detailed are procurement methods, strategies and approaches that are advocated as means of using public procurement as an innovation stimulant and have been summarised in the table below. These mechanisms are primarily found in policy documents and research reports commissioned by policy-makers.

Theme	Mechanism	Source
Demand and Procurement Strategy	Aggregate demand.	Aho et al, 2006; Edler <i>et al.</i> , 2005a; Gavras <i>et al.</i> , 2006; DBIS and Prince of Wales's UK Corporate Leaders Group on Climate Change, 2012.
	Standardise demand (improve export potential).	DBIS, 2012
	Smooth demand cycles.	
	Increase visibility of demand: publicise rolling pipelines of opportunities and future capabilities.	Cabinet Office, 2012; Lord Sainsbury, 2007; DBIS, 2012
	Use joint procurement compacts to stimulate longer term innovation activity.	DBIS and Prince of Wales's UK Corporate Leaders Group on Climate Change, 2012.
	Take long term approach to value for money not lowest cost.	Lord Sainsbury, 2007; Rothwell, 1984
	Adopt more risk in public services.	Lord Sainsbury, 2007.
	Coordinate policy, regulations, standards and procurement.	Lord Sainsbury, 2007
	Use procurement policy to consider environmental impact of purchases.	HM Government, 2007.
	Support certain sectors or industries: including transport, energy and low carbon (including biomethane).	DBIS and Prince of Wales's UK Corporate Leaders Group on Climate Change, 2012; Cable, 2012; EU, 2011.
	Use public procurement to rectify market failures.	Aho <i>et al.</i> , 2005; Edler <i>et al.</i> , 2005; Georghiou, 2007. EU, 2011
	Use explicit strategies to drive demand for innovative goods and services and mobilise procurement.	DBIS, 2012; Aho <i>et al.</i> , 2005
Information and foresight;	Increase information exchange between public and private sectors – create long term strategic dialogues based on outcomes.	DBIS, 2009; Cabinet Office, 2012; DBIS, 2012.
	Include industry experts in the formulation of procurement plans.	Norden, 2011.
	Increase visibility of demand: publicise rolling pipelines of opportunities and future capabilities.	Cabinet Office, 2012; Lord Sainsbury, 2007; DBIS, 2012
Process	Pre-procurement market intelligence gathering and supplier engagement.	CEC, 2007; CEC, 2008; OGC, 2009; Myonken, 2010; Georghiou and Harper, 2011; Edler and Georghiou, 2007; DBIS, 2009; Norden, 2011.
	Use functional/performance based	Aho <i>et al.</i> , 2005; Fraunhofer Institute, 2005;

Theme	Mechanism	Source
	specifications.	Edquist, 2009; Bryson and Rusten, 2011; CEC, 2007; EC 2010.
	Use staging or lots to manage risks where technological risks high or technical capacity of buyer is low, and to encourage SMEs.	Aho <i>et al.</i> , 2006; CEC, 2008; Cabinet Office, 2012.
	Use value for money and/or innovation as decision making criteria (not lowest price).	Rothwell, 1984; Aho <i>et al.</i> , 2006; CEC, 2007; OGC, 2009; Lord Sainsbury, 2007.
	Use Lifecycle Costing.	Rothwell, 1984
	Use e-procurement.	CEC, 2007; Rolfstam, 2009.
	Transfer intellectual property to suppliers.	Aho <i>et al.</i> , 2005; Gavras <i>et al.</i> , 2006; EC, 2005a; CEC, 2008.
	Share risk through closer relationships with suppliers and performance contracts.	Lord Sainsbury, 2007; NIST Research Directors Forum Working Group (2006).
	Use contractual incentives to encourage innovation (benefits to the supplier need to be sufficient).	Rothwell, 1984; CEC, 2007; EC, 2005a; OGC, 2009; Gates <i>et al.</i> , 2004.
	Use methods in EC Procurement Directives 2004: options to permit variants; technical dialogue; competitive dialogue; “challenges” and “competitions”.	Aho <i>et al.</i> , 2005; Lord Sainsbury, 2007
	Use Forward Commitment Procurement.	HM Government, 2007; DBIS and Prince of Wales’s UK Corporate Leaders Group on Climate Change, 2012
	Use Pre-Commercial Procurement where R&D is required to create market ready products/ services.	EC, 2011
Supply chain	Consider environmental impact of purchases and supply chains.	HM Government, 2007
	Build supply chain capability and improve public sector understanding of supply chains.	DBIS, 2012
	Increase visibility of demand: publicise rolling pipelines of opportunities and future capabilities.	Cabinet Office, 2012; Lord Sainsbury, 2007; DBIS, 2012
	Establish direct links between producer and user to provide feedback to suppliers on product performance and changes in public demand, and enable suppliers to inform users about technical developments.	Rothwell, 1984

Appendix 2: Case Studies of Individual Climate Related Public Procurement of Innovation Projects Described in Policy and Academic Research.

These case studies have been sourced from research projects commissioned by policy makers.

Case Study 1: New lighting systems (Hamburg), Germany. Reported in Edler *et al.*, (2005) and VINNOVA (2007).

Objectives: save energy, improve working environment, reduce life cycle costs.

Cost: €19 million.

Innovation: Deploy existent, relatively new technology, with some product development to meet the specification.

Procurement Process:

- Pilot experiment based on similar technology 10 years earlier.
- Informal discussions with all potential suppliers 6 weeks before procurement to inform them of the City/State's needs, and in particular to discuss various possibilities for cost reductions. For parts of this process, the authority engaged an external source of technical expertise, but supplier contacts were also facilitated by the knowledge, contacts and experience of the authority's own electricity supplier. These discussions assessed whether the volume and complexity of the procurement was manageable.
- Procurement conducted at EU level, on the basis of the MEAT criteria, and divided into several sections: project design, logistics, lighting systems, recycling to reduce risk and cost.
- Cost was most important factor as deploying not developing new technology with predefined technological requirements for the system. However, the cost was based on a life cycle calculation, taking into account the cost of purchase, installation, maintenance and energy consumption.
- Several suppliers were selected for each section of the procurement to spread risk and benefit, and so small enterprises were engaged. This in turn led to demands for professional project management.
- The products were supplied from a 'global market' and the installation and maintenance were provided locally

Notable points:

- Well-developed lifecycle cost culture
- Clear Political support
- Systems procured for 1,500 public buildings creating scale and critical mass.
- Spill over effect towards private businesses created by the environmental partnerships and support programme.
- Project was criticised by the public and regional business community, because the initial costs were high (and electricity prices at the time were low) and because the contract for the electric lighting system did not go to a regional supplier. The first problem was resolved by a clear investment plan and the second disarmed through the dominance of local service enterprises in installation and maintenance.

Case Study 2: Procurement of Variable Message Signage for UK the Motorway Network (Highways Agency, UK). Reported in Edler *et al*, (2005) and VINNOVA (2007).

Objectives: procure new signage system; ensure that future innovation is not hampered when suppliers become too dominant

Cost:

Innovation: promote innovation in design and prototyping finance to produce specific market intelligence and feasibility testing before final selection.

Procurement process:

- Stage 1: design competition. Open specification of requirements for a new generation of variable message signs along motorways, including funding for development of prototype and operation for a year. Two enterprises took part and the winning design was innovative mainly in the sense that it was graphics rather than text based.
- Stage 2: complete design for the signs. Questionnaire to potential suppliers to determine their qualifications and the financial impact on the enterprise of the award of any contract with Highways Agency. Two potential suppliers took part, with their development work being financed by HA.
- HA retained intellectual property rights and supplier paid a nominal licensing charge.

Notable points:

- The Highway Agency routinely procures large amounts of technically sophisticated equipment and is concerned constantly with technological development and innovation. This competition increased technical understanding within the purchasing agency further.
- Sourcing and delivery practices attempt to prevent supplier dominance and manage risk through the control of the supply chain (HA has had problems previously with suppliers who retained the intellectual property rights and subsequently went bankrupt) and the IP generated within contracts.
- Message system developed was subsequently sold to foreign markets and won design awards.

Case Study 3: Energy Conservation (Italy) Reported in Edler *et al*, (2005) and VINNOVA (2007).

Objectives: rationalise procurement of heating services across government

Cost: the total value of the procurements will amount to €855 million and the total volume will comprise nearly 5,000 buildings.

Innovation: was a secondary criterion but was stimulated by the functional specification.

Procurement process:

- Consip (state-owned Italian central procuring agency) wished to rationalise the heating of public buildings and proposed a function-based framework agreement that was extended to all ministries and local authorities
- Consip analysed existing technological solutions in national and international markets to inform the specification. This involved supplier market consultation and gave advanced notice of the scope and intentions of the forthcoming procurement exercise.
- The procurement was divided into 12 lots, corresponding to different geographical areas, with a fixed number of suppliers per area.
- Evaluation was according to MEAT criteria using the functionality of the heating systems (temperature, volume to be heated and hours per day the systems were to be in use). Innovation was not an evaluation criterion, but because no particular technical solution was specified, innovation was nevertheless encouraged. The contracts were signed between the

suppliers and Consip on behalf of the public authorities, and included operations for five years, which offered the suppliers further incentives for innovative solutions.

Notable points:

- Clear political mandate.
- A performance-based contract was chosen as the degree of market complexity is high and the authorities lacked technical knowledge.
- A function-based procurement incorporating systems of reward for functionality creates scope for innovations.
- Shows the value of regular industry contacts before and during the preparation of the specification.
- Horizontal coordination of the needs of a large number of authorities, administered by a central procurement agency, creates critical mass and economies of scale.
- Splitting large-scale procurements into several smaller sections reduced risks to public authority and suppliers.

Case Study 4: Lighting Replacement (“The Slipper Column”), Greater Manchester, UK. Cited in Uyarra (2010) and European Commission (2010).

Objectives: to replace deteriorating lighting columns with a new design that removes need to involve electricity supplier in repairs and maintenance (accounts for around 30% of cost).

Cost: Around £5 million. Savings cited as £2 million, between 31 and 46 per cent savings per unit replaced.

Innovation: design and installation of over 7,000 units of a new product

- The new design offered significant innovative features with benefits including operational savings per unit replaced, reduction of the number of visits to the site, speed of replacement (crucial for traffic safety, crime reduction and in emergency cases) minimal disruption for pedestrians and local residents and environmental benefits, with reduction of waste going to landfill and CO2 emissions.

Procurement process: (not described in the case study narratives)

- Phase 1: the local authority contracted lighting engineers to work with lighting installation and repair contractors to devise a new design, the ‘slipper’ column to fit over the base of the old concrete column making maintenance and replacement easier.
- Consultancy fees were paid to the University of Manchester to reduce technical risks but an explicit quantification of risk management could not be made.
- Phase 2: Over 7,000 units of the column were installed.
- Risk was shared between the procurer and supplier. Technical risks were minimal and only associated with the design selection, financial risks were related to the diffusion rather than the implementation of the project there were no societal risks but the institutional risks, including the non-cooperation among different local authorities were higher
- Further improvements and potential market creation has been prevented by lack of diffusion and coordination across local authorities.

Case Study 5: Glass recycling solution in Tameside, Greater Manchester, UK. Cited in Uyarra (2010).

Objectives: increase glass recycling to meet targets by providing a convenient glass collection service for residents

Cost:?

Procurement process:

- Engineering and Environmental services directorate in the local authority were asked to find ways of introducing wheeled bins for the collection of glass and an outlet for the mixed cullet collected.
- Research identified that sand (from pulverised glass) could be used as a cover for winter sports pitches.
- Further work was commissioned to assess the possible market for this sand, and the investment required and British engineering companies were also approached to investigate the use of their hammer mills for the pulverisation of glass.
- The council commissioned the building of a processing plant with automated feed to the hammer mill and a system of filters beyond the milling process to sort the sand and remove plastic, metal and paper from the bottles.
- To house the plant, the Ash Road Environment Centre was created as an environmental and educational facility.
- Collected glass can be delivered to the traditional recycling market or processed through the pulveriser. The end product can be used for other applications including golf courses, shot blasting, engineering, filtration and aggregate.

Notable points:

- Involved different stages of research and establishing the market potential of the new service.
- Extent of involvement of procurement in the market analysis and development process not specified.
- Innovation characteristics of service commissioned is not specified.

Case Study 6: Greater Manchester Waste Management Authority Private Finance Initiative. Cited in Uyarra (2010) and European Commission (2010).

Objectives: divert waste from landfill and meet recycling targets.

Cost: £3.8billion

Innovation: incremental/architectural, based on combinations of existing proven technologies.

Procurement process:

- Procurement which started in 2005 and the contract was awarded in 2009.
- Procurement conducted by Greater Manchester Waste Disposal Authority.
- A contract notice and prequalification questionnaire were used before launching the tender.
- Outcome specifications were used in terms of recycling performance and performance in terms of diversion of waste from landfill.
- The successful bidder was the one that was able to put forward a proposal to accept contractual risk on the achievements of substantial improvements in respect to these targets.
- The contract value was £3.8 billion over 25 years (the single biggest waste management PFI in Europe) to a consortium of Viridor Waste Management and John Laing Infrastructure to provide an integrated waste management solution. This involves:
 - Construction and upgrade of 2 mechanical biological treatment plants, one materials recycling facility, one composting plant and one CHP (Combined Heat and Power) energy from waste plant (total construction costs around £640 million).
 - Refuse-derived fuel (RDF) from waste will be transported by rail to an 'energy from waste' CHP plant to be built in Runcorn, which will provide energy for the INEOS chemical manufacturing operations plant.

- Two special purpose vehicles (SPV) were set up for the PFI, one responsible for the waste services and another one responsible for the delivery of the thermal power station to ensure the right technological solutions at a known cost were obtained.
- Project included complex risk management arrangements to deal with the risks associated with the design, construction and operation of the waste facilities and three areas of risk particular to waste management PFIs: 1) fluctuations in the demand for waste within the life of the contract; 2) the complexity of planning policy and the uncertainties over timescales and outcome of planning applications, and 3) changes in the law affecting the waste management sector.
- Public and stakeholder acceptance of the technological solution attained through continuous engagement eased the planning process.
- Extensive dialogue with industry helped mitigate market risks and develop the existing marketplace for RDF. In relation to regulatory risk, a Procurement Director was seconded from DEFRA, with expertise on procurement and national environment policy.

Notable points:

- The project reached financial close later than foreseen due to the collapse of the PFI market in the wake of the credit crunch. Eventually the Treasury stepped in to support this and other PFI projects in 2009 with an additional capital injection. Despite the delays, the project is held to be a success for its management and execution of the procurement process, and follow-up projects are now underway in other regions in England on smaller scales.
- The procurement tried to stimulate a new market and catch up technologically with more advanced countries in the EU.
- The number of actors called for close cooperation, and public participation in recycling and good leadership to assure implementation.
- Risks of regulatory change were specifically high in this case. A waste management procurement pack has been developed by the Public Private Partnerships programme (4Ps) to provide specific assistance to local authorities in England with the procurement of waste management projects through PFI.

Case Study 7: Journey Planner for Public Transportation, Helsinki Metropolitan Area, cited in European Commission (2010).

Cost: 160 000 EUR (price of the product)

Innovation: incremental innovation, based on specifications of similar services elsewhere, combined to create a new more advanced service.

Procurement process:

- Start in 2000.
- An initial attempt failed.
- Direct procurement by the local authority.
- Used a three stage approach and consultancy and research costs (approximately 25-30% of the investment).
- Staging approach used for risk identification and risk reduction respectively.

Notable points:

- Primary risks were technology failure (a similar system failed in the past), potential lack of public acceptance (privacy concerns about sharing travel information) and potential cost overrun in the provision of maintenance (did not occur).

- Suggests good planning helps mitigate risks and whole life-cycle cost considerations justify similar procurement cases.

Case Study 8: The Environmental City District, Hammarby Sjöstad in Stockholm, cited in European Commission (2010).

Objectives: an attempt by the local government of the City of Stockholm to test and implement a set of environmentally friendly technologies used in buildings (partly tested in exhibitions and small projects) by a number of different technical system suppliers developing domestic technology and infrastructure.

Cost: 8.5 million Euros (or 75 MSEK) over the years 1998–2004

Innovation: testing and installing existing close to market technologies.

Procurement process:

- Catalytic public procurement (i.e. procurement to stimulate private markets to take up the products/services).
- Used environmental criteria in the assessment.
- 30 public procurements were carried out during the project.
- Buyers groups were created of representatives, both public and private (e.g., housing companies), and the LIP council aided procurements.
- Consultants were hired for technical expertise.

Notable points:

- Holistic ideology with large ambitions and very strong political backing
- There was a lack of suppliers for an environmentally friendly asphalt and asphalt-laying process.
- Implementation problems occurred because of inadequate overall planning processes, making implementation of some of the solutions difficult or impossible. This was partly due to legislative uncertainty around the use of environmental impact as selection criteria in public procurement.
- Central government's Local Investment Program (LIP) and the city of Stockholm funded 100% of the project management and expertise. The total government subsidy for Stockholm LIP was about 21%.
- The entire project management was considered to be an exercise in risk management and the problems that emerged proved the need to apply market dialogue and assure involvement of all stakeholders wherever possible.

Case Study 9: Ethanol-Fuelled Pickup Truck, Stockholm. Cited in European Commission (2010).

Cost: 600 000 SEK, including management of the project (survey, seminars, meetings with the car industry, etc).

Innovation: the technology was proven in similar products, except in the case of the acceptance of standards and certification (no standards exist for the E85 cars).

Procurement process: procured by Stockholm Environment and Health Administration in 2006.

- Did not involve direct procurement, was a market creation exercise.
- VW was the incumbent supplier offering incremental innovations using ethanol (already used in cars) to trucks. A Biogas vehicle was due to be available on the market at a later date than the city required.

- The City intervened in the market through a framework agreement, aggregating demand and lowering the price per unit sold without guaranteeing the supplier a pre-agreed volume of sales.
- SKL Kommentus AB agreed to carry out the procurement and entering into a contract with the selected supplier through a framework agreement, based on a fee from the suppliers as a percentage on the actual sales.
- Volkswagen agreed to take the technological and also trust risks.
- Risk management was very thorough on feasibility study for market demand.

Notable points:

- The highest risk was associated with the market, possibly not generating enough demand, especially for all types of ethanol-fuelled pickup trucks.
- While the project was an overall positive experience, considering the risks that have been realised, a stricter contract should have been prepared with compensation clauses regarding non-delivery.

Case Study 10: Passive houses in the Växjö Municipality, Sweden. Cited in European Commission (2010).

Cost: 108,318,000 SEK (EUR 11 million)

Innovation: the idea of passive houses was not in itself new; however the project was innovative in terms of size (eight floors) and the building material used (wood). User innovation was also required in the sense that the ‘users’ of the new homes, the inhabitants, would have to adjust somewhat their behaviour in terms of ventilation habits as compared to living in conventional houses and get fire safety training.

Procurement process:

- Direct public procurement with catalytic elements (2007)
- The procurer was an agency owned by the municipality and supplier a consortium led by a leading large Nordic construction company.
- The contract applied functional specifications,
- Different research activities funded by Swedish national agencies and the European Commission were involved in the project.
- Several experts were consulted to solve specific problems that emerged as the project continued. For instance, expert on energy efficiency was used to set up environmental criteria. An expert in measuring air tightness was consulted to figure out how to establish adequate air tightness.
- The procurer carried the risks initially; the suppliers in the development phase, and once the project finished, the procurer again. After the contract had been signed, the procurer and the supplier had a series of meetings where different solutions were discussed. However, risk management was not explicit
- The local political leadership was prepared to accept some financial losses if the homes would not attract tenants, as planned. The procurers acted on directives from the local political leadership.

Notable points:

- Tensions were not avoided during the project (e.g. The procurer tried to suggest as a part of the delivery, that the supplier should develop brand new technology for additional heating, which was a risk that the supplier did not accept) but in general there seems to have been lot of interacting learning between the procurer, supplier and different experts attached to the project.

- A speculative reflection could be that maybe, if some kind of innovation insurance existed, a radically new piece of technology could have come out of the project.

Case Study 11: Biogas and Upgrading Plant (the Vaxtkraft Project) in Sweden. Cited in European Commission (2010).

Objectives: a complete system for handling waste has been integrated with a production facility for bio-fuel. As a direct consequence of the procurement project, local public agencies could introduce vehicles that would run on bio-fuel, as the system would be able to provide sufficient volume of bio-fuel.

Cost: 170 million SEK (EUR 17 million)

Innovation: a demonstration of state-of-the-art technology innovativeness comes somewhere between 'radical' and 'new combinations'. The project involves innovation defined as the creation of new markets

Procurement process:

- Started 2001-2002
- Procurer was a multi-owner (users and suppliers) company and the main suppliers a German subsidiary of a Spanish firm and a Swedish subsidiary of a Finnish company.
- Direct procurement, which could also be considered cooperative procurement, because the procuring organisation has multiple owners. It also involved creating a market for organic waste and agricultural crop
- Used performance-based procurement, as design and implementation was to be carried out by the supplier. The contract included clauses defining fines that the supplier would pay should they fail to deliver.
- No formal organisation or person dedicated to risk management but a de-facto risk management structure in the project reflected conditions that had to be met regarding the expected outcomes and anticipated cost, long-term agreements with local farmers for supply of ley crop, long-term agreements with local bus company for buying bio-fuel.
- Legal compliance with environmental laws and food industry regulation on fertilisers was obtained.
- People who lived near the location for the planned system were consulted.
- A very experienced public procurer acted as a consultant to the project.

Notable points:

- A market for supply of ley crop from local farmers was established.
- The sharing of risks between procurer and supplier the general principles applied through the project was that a certain risk is carried by the partner best suited to deal with the risk. This typically means that the supplier deals with the risks connected to his responsibility to deliver required functionality. The procurer should bear risks related to risks of political type such as tax changes, changes in legislation, new mandatory standards.
- A lot of effort was invested in arranging meetings and establishing acceptance for the new system. Examples of categories involved in this interaction were procurers, farmers (as suppliers of ley crop), farmers (as customers of bio fertilisers), other public agencies, NGOs, people who lived nearby.

Case study 12: The SIR/GSM-R Case, Swedish Rail Administration. Cited in European Commission (2010).

Objectives: the final product was the world's first GSM-R radio communication system for railroad traffic management and operative maintenance.

Cost: 835 000 000 SEK (EUR 90 million)

Innovation: The project included incremental innovations and new combinations and resulted into increased security and efficiency/better time keeping and shorter and more frequent transportation.

Procurement process:

- Procuring institution was the Swedish Rail Administration.
- Planning commenced in 1990, project termination 2006. A variety of events (personnel changes, bankruptcies etc) occurred, which delayed the process.
- 1990-1997 information gathering and specifications; tender documents to three potential suppliers following a pre-qualification procedure.
- The Suppliers were a consortium including Siemens, Sagem and others.
- The procurement was strictly public but expanded later to private users (catalytic)
- The contract put pressure on the supplier to deliver quality in time. However, since the specifications were not 100% developed from start, there were loopholes, which lead to some extra development costs for the buyer. The ex ante agreements were not sufficiently detailed and quality level disagreements were settled in negotiations.

Notable points:

- Operational risks included time to delivery (indeed some functionalities were delayed and software not fully developed according to plan),
- the institutional risks was higher than anticipated because some analyses were based on wrong assumptions, regarding coverage, technical capacity
- Financial risks, in particular in the form of cost overruns were possible and occurred indeed in selected cases. However, the total cost for the project was not exceeded, considering an index adjustment of approximately 4 %.
- The supplier was concerned about their credibility.

Case Study 13: Ultra-Efficient Lighting, Rotherham General Hospital. Cited by Department for Business Innovation and Skills (DBIS) (UK)

Objectives: a step change in the patient experience, and a step change in the efficiency of lighting.

Cost:?

Innovation: The product will be an integrated smart 'future ward' modular built solution with integrated (bio-dynamic) lighting, trunking and storage. The solution transforms the appearance and functionality of wards from a cluttered, hard to clean and poorly lit environment with little storage, to one that is stream lined, easy to clean and welcoming, with smart lighting that responds to patient and environmental needs and follows the circadian rhythm. The environment will use one third less energy than the previous environment and require less maintenance and is designed to be able to take new lighting technology as it becomes available.

Procurement process:

- The opportunity for innovation was presented by a 7 year refurbishment programme beginning in 2010 and the vision of the CEO for a 'Hospital of the Future'.
- The Trust worked in partnership with the Department for Business, Innovation and Skills and the Department of Health to undertake the procurement and undertook training on FCP methods provided by BDIS.
- Identified unmet need in terms of lighting and used an outcome based specification to conduct a market sounding exercise. This was communicated via a Prior Information Notice

in the OJEU 2 years before the solution would be needed on site to give the supply chain a chance to organise and innovate.

- Extract: *'The Trust wish to achieve a step change in the patient experience; creating a patient centred environment, including the incorporation of highly efficient, smart lighting systems that can deliver economical carbon reductions while at the same time contributing to a pleasant and healthy environment for both patients and staff'.*
- The project team used the Photonics and Plastic Electronics Knowledge Transfer Network and other supply chain intermediaries to ensure all parts of the supply chain were aware of the opportunity and used consultation workshops, site visits and published a directory of companies that expressed interest to facilitate cross supply chain collaboration.
- The market consultation process was enthusiastically received and culminated in a refined outcome based specification.
 - Extract: 'Innovative, value added, smart, ultra efficient lighting systems that can deliver the Trust's vision for Future Ward lighting, meet the operational requirements and provide added value functionality, in a cost effective way. The core requirement outcomes are: 1. A step change in patient experience – i.e. creating a pleasant healing environment with patients being in control of bed zone lighting levels and ambience whilst providing the lighting to perform clinical requirements and incorporating measures to reduce the risk of hospital acquired infections; 2. A demonstrable step change in energy efficiency with progressive improvements in energy efficiency and operational performance over the life of the project; 3. A fully installed, maintained and future-proofed service, for example to facilitate upgrading to more energy efficient or better products as they become available.
- Procurement began in 2009 using the competitive dialogue process
- Participants included medical lighting companies and a pan-European consortium of companies including a lighting designer, architect, building systems manufacturer and lighting manufacturers. The consortium was awarded the contract.
- A demonstration pod was built at Rotherham Hospital in March 2011 to undergo clinical and facility assessment. Following this it was installed at the Building Research Establishment.

Other FCP cases cited by DBIS:

- Nottingham University Hospitals NHS Trust (UK) is using FCP to test the market for an ultra-low carbon energy solution to replace their coal fired boiler plant.
- Estates and procurement staff at the Scarborough and North East Yorkshire NHS Trust (UK) are embarking on the FCP Know How programme as part of their carbon reduction programme.
- The Rotherham NHS Foundation Trust (UK) is looking to stimulate the market to provide zero waste zero infection mattresses.
- Erasmus MC, Rotterdam is looking for a more energy and resource efficient bed cleaning solution.
- Rawicz Hospital, Poland is looking for innovative low carbon refurbishment technologies.
- In Norway, SINTEF Health Research are working with a new build acute hospital (Nye østfoldsykehuset – NØS) to understand how the current planning process influences the introduction of innovative, energy effective solutions in the hospital and how the process presents barriers for innovative solutions and change.



- These projects all received support from the European Commission Lead Market Initiative as part of the Low Carbon Buildings (LCB):HEALTHCARE Public Procurement Network programme.

Appendix 3: Interview Methodology and Data Collection

Selection of Participants

Emails were sent to Pioneer Cities representatives in advance of the visit requesting the following.

“During the visit I would like to acquire knowledge and understanding about the following.

1. *The types of procurement practices used by your City, how procurement is managed and how procurement fits into the City authority.*
2. *The links that are made between procurement activity and climate market innovation in your city, e.g. specific strategies on using procurement to stimulate innovation, or aspirations for the future, or improvement/innovation clauses in contracts with firms.*
3. *The relationships between the city and the climate market – e.g. the type of firms that you have contracts with, current spending with the climate market and the city’s aspirations for its relationship with the climate market, for example is the City seeking to develop specific markets or technologies?*

I would like to collect this information by interviewing 4 or 5 key people from the city authority, including people with political, managerial and operational responsibility for this work. I would be grateful for your suggestions about who it would be most beneficial to talk to. This could include:

- * a politician or city leader,*
- * 'Head of Procurement' or procurement manager, or procurement officer,*
- * an officer responsible for economic development or business,*
- * an officer responsible for climate change related projects, e.g. pioneer cities projects,*
- * a business that is contracted to deliver climate market related services for the City.*

The interviews would be up to 1 hour and (as I mentioned to you Cristina) I might need one of you to attend to help with translation. If there are any documents that you think I would benefit from reading please feel free to email me a link or a copy of the file.”

The lead contact for the city arranged a timetable of meetings with the local representatives they thought would be able to talk to the researcher about these topics.

Data Collection Guide

The topics guide inserted below was used for each discussion and is divided into themes. The discussions were guided at a general level as this was a scoping study and the researcher didn’t want to preclude discussion of topics that were relevant to the respondents and their settings but that may not have been identified during the literature review.

Discussion Topics

These topics are a guide to prompt conversation with the interviewees and to ensure the same type of prompts are used in each City. The actual prompts used will be tailored to the interviewee and their position within the City and the development of the discussion.

Public Procurement Practice

- The organisation of procurement in the City and its relationship with other municipal departments, other municipalities, regions and the national government.
- The City’s procurement strategy (if applicable).

- How has demand for climate market related goods, products and services been identified and used?
- How has supply capability for climate market related goods, products and services been identified and used?
- Any climate market acceleration procurement practices used by the City/or that the City has been involved in (see definition of public procurement below), the drivers for these and the impact of this activity.
- Any barriers to climate market acceleration procurement practice in the City?
- Future opportunities for climate market acceleration procurement practice in the City.
- The amount of regular procurement spending with firms in the climate market.
- The types of climate market firm that have procurement contracts with the City.
- The types of contractual relationship the city has with climate market firms:
 - utilities contracts,
 - framework agreements,
 - retrofitting works/energy technology installation and maintenance contracts,
 - innovation activity, e.g. R&D projects.

The Role of the City

- The role of the city in facilitating the exchange of goods, products and services related to climate change adaptation and mitigation.
- The role of the city in determining the prices (or values) of these goods, products and services related to climate change adaptation and mitigation.
- The role of the private firms in relation to climate change mitigation.
- Encouraging the take up of climate market products and services among the city's residents/businesses.
- How the city decides which markets or firms should benefit from its support and the relative importance of the climate market.
- The city's aspirations for the climate market innovation.

Stimulating Climate Markets

- What are the main activities (procurement or other) through which the city engages with climate markets?
- The type of firms or sectors in the climate market that have benefitted from support from the City (or could)?
- Specialist climate markets in the City's boundaries or surrounding regions.
- Funding sources for activity that supports climate market acceleration work.
- The type of innovation activity that the city is supporting, or wishes to support, e.g. products, processes, services.
- The range of other organisations, institutions and processes involved in supporting climate market innovation in the city: e.g. business incubation and support, events and competitions, buying consortiums, technology hubs.
- The involvement of public procurement with this wider innovation environment.

Definitions

For the purposes of this scoping study a 'Climate Market' is defined as: the systems, institutions, relationships and infrastructures through which the exchange of goods, products and services related to



climate change adaptation and mitigation takes place and by which the prices (or values) of these goods, services and works are established.

For the purposes of this scoping study 'market acceleration' is defined as: demand side measures that influence the rate and direction of innovative activity (e.g. research and development), shorten the time to market for new products and services, or increase the adoption and diffusion of climate related products and services.

For the purposes of this scoping study public procurement activity related to climate market stimulation can include (but is not limited to): early market engagement; dialogue between suppliers and procurers; forward commitment procurement; pre-commercial procurement; competitions and design contests; procurement process modifications; buyer consortiums and networks, the use of climate market related standards in procurement, the inclusion of climate market or innovation related criteria in contractual relationships between public organisations and private firms.



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