



The Role of Public Procurement in Low-carbon Innovation

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EXECUTIVE SUMMARY

The Paris Agreement under the United Nations Framework Convention on Climate Change has set the ambition for global actions to reduce greenhouse gases. In effect, all sectors must now engage in a low-carbon transition to bring net emissions to zero in this century. As signatories to the Agreement, governments must start showing the way through a better alignment of their policies with the climate imperative. This means leading by example in their everyday actions and investments.

Public procurement expenditures amount to 13% of OECD countries' gross domestic products, and a higher share in some emerging and developing economies. The role of public procurement in fostering more sustainable growth is also acknowledged in the Sustainable Development Goals (SDG 12.7). No occasion should be missed to guide public procurement expenditures towards efficient low-carbon choices in products, services and public works. The integrity and economic efficiency of procurement remain critical.*

Public procurement is recognised as an important instrument of innovation policy. Beyond bringing existing low-carbon solutions to market today, it can create 'lead' markets, for instance where government demand is significant (e.g. transport, construction). Like other demand-side innovation tools (regulations and standards), procurement can spur innovation without engaging new spending – a plus in times of fiscal consolidation (OECD, 2011).

Sustainable public procurement has been introduced by at least 56 national governments and many more local governments, who have long understood how public procurement can improve sustainability, including through lowering greenhouse gas emissions (UNEP, 2013). It is by no means a universal practice, however, and many barriers stand in the way of mainstreaming green purchasing, including: fragmented national systems, limited access by SMEs, the technical capacity of procuring officers, and budget practices. Better monitoring and evaluation would also help improve green procurement (OECD, 2014b).

A number of practical solutions can make green procurement more effective, including for low-carbon innovation even in sectors and products that are indirectly involved in procurement contracts (e.g. construction materials). Tenders now include life-cycle costing in value-for-money assessments, i.e. including the cost of externalities such as CO₂. Market dialogues help both procurers and potential suppliers in formulating innovative tenders. Public procurement can also encourage new business models through the provision of services, rather than products, that could support lower material use and environmental impacts. There may also be opportunities to increase the impact of procurement through international collaboration.

After the Paris Agreement, governments must start formulating ambitious low-carbon innovation strategies where public procurement can play a more prominent role.

* A number of countries have agreed to subject their procurement systems to international regulation (Kunzlik, 2003; 2015b; European Union, 2014; WTO, 2012).

I. INTRODUCTION AND SCOPE

1. The Paris Agreement reached in December 2015 requires the full mobilisation of stakeholders if the global community is to hold “the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels” and “achieve a balance between anthropogenic emission by sources and removals by sinks of greenhouse gases in the second half of this century” (Articles 2 and 4, UNFCCC, 2015). As capital stocks of high-emitting technologies turn over, opportunities arise to introduce new technologies and practices in support of the low-carbon transition. These opportunities should not be missed.

2. Innovations are emerging that lower the use of fossil fuels and greenhouse gas emissions in the provision of basic end-uses or functionalities (shelter, health, nutrition, mobility, etc.). Economic development on a global basis remains fairly carbon-intensive, but existing technologies can improve the picture in a number of sectors, provided that appropriate policies and incentives send coherent signals to consumers and investors.

3. Not all technical solutions and organisational changes to fully decarbonise our economies are onstream, however. Much of the industry that produces infrastructure and materials has yet to invent, let alone deploy, carbon-free production modes, and solutions for a circular economy are just starting to appear. Low-carbon innovation, the broad diffusion of low-carbon solutions, must be encouraged even more than it has been so far, even if dedicated policies in renewable energy technologies or energy efficiency have had some success, and carbon pricing is making progress in a number of jurisdictions around the world, sending a coherent signal to lower CO₂ emissions.

4. Initiatives introduced in the margins of the Paris Agreement negotiation show that governments and the private sector comprehend the size of the innovation challenge. They include:

- *Mission Innovation*, a group of 20 countries¹ pledging to double their governmental and state-directed research and development investment on low-carbon energy over the next five years (Mission Innovation, 2015).
- The *Breakthrough Energy Coalition*, a group of private sector donors mobilised to solve climate change through identification of and investment in breakthrough innovations. Their diagnosis is that “current governmental funding levels for clean energy are simply insufficient to meet the challenges before us” (Breakthrough Energy Coalition, 2015). The Coalition intends to work with Mission Innovation.
- The World Business Council on Sustainable Development’s *Low-carbon Technology Partnerships Initiative* (LCTPi), which aims to create public-private partnerships for the low-carbon transition in energy supply and demand, materials and land-use, and explore “game changing new technologies” (WBCSD, 2015).

5. These pledges, however significant, cannot by themselves bring innovations to global markets. Many policy frameworks and regulations that pre-existed the climate change challenge inadvertently hinder low-carbon choices (OECD-IEA-ITF-NEA, 2015). Public procurement, the

¹ Australia, Brazil, Canada, Chile, China, Denmark, France, Germany, India, Indonesia, Italy, Japan, Mexico, Norway, Saudi Arabia, South Korea, Sweden, United Arab Emirates, United Kingdom, United States.

purchase of products, services and works by governments, is often no exception. Unless adjustments are made, governments that have signed the Paris Agreement will continue investing in carbon-intensive products and practices.

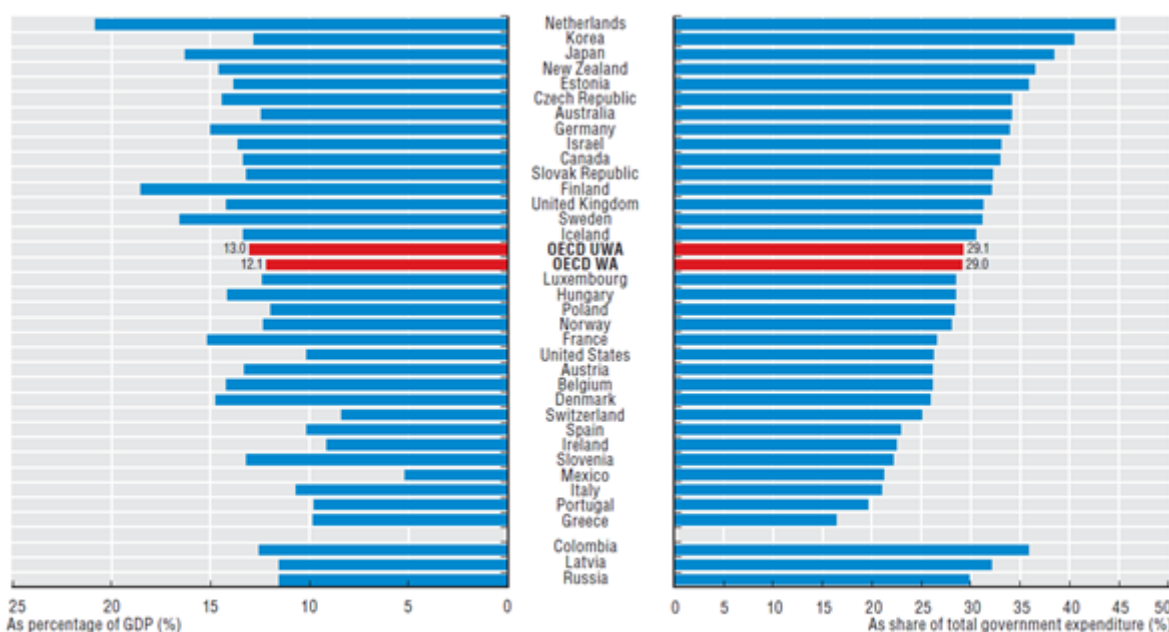
6. This paper considers public procurement as a driver of ‘lead’ low-carbon markets and an important tool in the low-carbon innovation chain. It indicates barriers that sometimes prevent public procurement from achieving this role, and presents some of the solutions put in place by pioneers in this area.

II. WHY PUBLIC PROCUREMENT MATTERS

Public procurement refers to the purchase by governments and state-owned enterprises of goods, services and works. (OECD, 2015a)

7. Through the sheer size of their expenditures, governments are major actors in countries’ economic lives. Public procurement accounted for 13% of the gross domestic product of OECD countries in 2013, and more in some emerging and developing countries (OECD, 2015a, Bosch et al. 2012). How governments decide to spend such vast amounts of money is important for the emergence and diffusion of new products and services.

Figure 1. General government procurement as percentage of GDP and as share of total government expenditures, 2013



Source: OECD National Accounts Statistics (database). Data for Australia are based on a combination of Government Finance statistics and National Accounts data provided by the Australian Bureau of Statistics.

StatLink <http://dx.doi.org/10.1787/888933249013>

Note: The above estimates represent the sum of intermediate consumption, gross fixed capital formation (i.e. investment less sales of fixed assets) and purchases by general government of goods and services supplied to households (see OECD, 2015a for full definition). They include central, state, and local government procurements, but exclude social security funds. UWA: unweighted average. WA: weighted average.

8. The primary objective of public procurement is to find and buy products and services with good value for money. It is also important to avoid waste, fraud and corruption, well-known risks in different stages of the procurement process (see for instance, OECD, 2016). The general stages of public procurement are:

- assessment of a need (goods, works and services);
- formulation and issuance of a tender;
- awarding and management of a contract;
- delivery of the good or service;
- monitoring (OECD, 2015b).

9. Figure 2 further details the procurement cycle.

Figure 2. The Typical Procurement Cycle



Source: UNEP, 2013.

10. Governments, recognising that public procurement can be prone to misuse, have established several instruments to encourage an efficient and proper use of public procurement, including, at multilateral level:²

- The 2014 EU Directives on Procurement (European Union, 2014).
- The OECD Recommendation of the Council on Public Procurement (OECD, 2015b). The Recommendation promotes transparency, integrity, open competition, stakeholder participation, an appropriate procurement workforce, risk management and appropriate integration in overall public finance management, as well as specific measures to ensure accountability throughout the procurement cycle. The Methodology for Assessment of Procurement Systems, currently in revision, supports its implementation (see Box 1).
- The World Trade Organization’s plurilateral Agreement on Government Procurement (GPA). Parties to the GPA agree to avoid discrimination against other Parties’ entities in access to public procurement. The GPA includes schedules that detail the coverage of the Agreement for each Party (e.g. procuring entities, goods, services and construction services covered by the Agreement) (WTO, 2012, 2016). Public procurement is also in the scope of other trade agreements. Overall, “there does not seem to be significant constraints on the use of environmental criteria in various stages of the procurement process” (Kunzlik, 2003). Of course, the use of environmental criteria should not be used to discriminate between foreign and domestic suppliers.

Box 1. Methodology for Assessment of Procurement System (MAPS):

MAPS was developed in 2003 and 2004 by the World Bank and the OECD Development Assistance Committee as a tool to assess procurement systems, which are important instruments in development assistance. Among its objectives are identifying strengths and weaknesses and encouraging procurement system reform.

The Methodology includes indicators on baseline (i.e. a comparison of the system against international standards in areas such as legal framework, institutional infrastructure, operation and competitiveness, and integrity) and on compliance and performance (including quantitative indicators on many aspects of the procurement process). The compliance and performance indicators have been used less frequently.

MAPS has been used by over 60 countries. Users have now called for an update, and the revised version will support the OECD Recommendation on Public Procurement, i.e. apply to OECD countries. This is also in line with the now-universal Sustainable Development Goals (in particular SDG Goal 16.6: “Develop effective, accountable and transparent institutions at all levels”).

Source: Paulo Magina, Lena Diesing (personal communications) and OECD (2006, 2010).

Greener public purchasing (GPP) policies have a natural appeal, as they couple increased concern about environmental quality with a not-unreasonable belief that governments ought to lead the way by improving their own purchasing habits. (Marron, 2003)

² See UNEP (2013) for a fuller picture.

11. As a government-operated instrument, public procurement ought to be aligned with a country's broad policy objectives. This sometimes leads governments to use public procurement to address economic and societal needs, such as sustainability, innovation or support to small and medium enterprises. In such cases, public procurement is called on to support other policies by adjusting its market signals.

12. Though the promotion of such secondary objectives is generally acknowledged by public procurement schemes, some caveats apply (e.g. in OECD, 2015b):

- The achievement of secondary objectives should “be balanced against the primary procurement objective” (e.g. a new building, IT systems, mobility services, etc.).
- The procurement workforce should have the capacity to support the secondary objectives.
- The benefits and costs of using procurement to achieve the secondary objectives should be monitored to inform policy-makers.
- Governments should be mindful of the risk of an overload of objectives.

13. From an economic perspective, the design of public procurement to promote green, sustainable or low-carbon innovation can be justified on three grounds:

- structural inefficiencies in government purchasing, e.g. a focus on upfront acquisition cost when the inclusion of operation costs could lead to a more environmentally-conscious choice;
- an environmental market failure, e.g. the absence of a price on CO₂ emissions due to political constraints, while a government may choose to include a CO₂ price to guide its own decisions;
- insufficient support for innovation in light of positive externalities related to the demonstration and adoption of new technologies, learning and network externalities, etc. (Marron, 2003; Johnstone, personal communication).

14. When these conditions apply, they can justify that taxpayers bear costs through green public procurement that do not otherwise apply to consumers in the economy.

15. In summary, public procurement is a well-established government tool, subject to much scrutiny to ensure integrity and best value for money. A recent OECD survey shows that public procurement in most OECD countries is changing from a more limited administrative procedure to an instrument of strategic innovation, including achieving sustainable development goals. The question is whether governments can use public procurement to develop and drive effective innovations for the low-carbon transition.

III. PUBLIC PROCUREMENT, INNOVATION AND SUSTAINABILITY

Public procurement in the innovation chain

How public procurement can foster innovation

Policy makers can and should do better in marshalling the power of innovation to help achieve core objectives of public policy. Treating innovation as a central tool of policy making will help ensure policy coherence, since innovation policies cross government portfolios and affect a wide range of stakeholders. (OECD, 2015c)

16. Innovation is defined by the OECD Oslo Manual on collecting innovation data as:

***Product innovations** involve significant changes in the capabilities of goods or services. Both entirely new goods and services and significant improvements to existing products are included. **Process innovations** represent significant changes in production and delivery methods. **Organisational innovations** refer to the implementation of new organisational methods. These can be changes in business practices, in workplace organisation or in the firm's external relations. **Marketing innovations** involve the implementation of new marketing methods. These can include changes in product design and packaging, in product promotion and placement, and in methods for pricing goods and services. (OECD, 2005)*

17. Innovation can be hindered by low economic returns such as barriers to competition, technology lock-in, capacity constraints (lack of skills or infrastructure), and difficulty for innovators to capture the value of their investments, such as preference to incumbents, policy uncertainty, split incentives and market failures such as environmental externalities (OECD, 2015c). A range of policies restore the innovative capability of an economy, going from competition to environmental policies and dedicated innovation policy.

18. Innovation policy includes technology push (the supply-side of innovation, which includes support to research institutions and private sector R&D), demand-side innovation (innovation-oriented regulations and standards, policies to guide consumer choices, and innovation-oriented public procurement), as well as measures to build innovation networks and co-operation (OECD 2015c, Aschhoff and Sofka, 2009). This broad definition matches the notion of innovation systems, going much further than the earlier 'linear' model of basic to applied research and the eventual development of new products (Edquist et al., 2015).

19. The role of public procurement in innovation is echoed in the preamble of the recent EU Directive on procurement: "Public authorities should make the best strategic use of public procurement to spur innovation ... [which] plays a key role in improving the efficiency and quality of public services while addressing major societal challenges" (European Union, 2014).

20. Well-designed demand-side innovation policies can also be attractive to governments from a budgetary perspective, as they are generally cheaper than direct support measures, even if indirect costs should be considered (OECD, 2014). There is some evidence that public procurement (or state demand for innovation) can be a more cost-effective instrument to trigger innovation than traditional technology push measures such as R&D subsidies (Edler and Georghiou, 2009; Aschhoff and Sofka,

2009³). Such evidence is limited, however, and public procurement for innovation (PPI) suffers from a lack of impact evaluation (Dutz and Pilat, 2014).

21. Public procurement can be used for different innovation purposes (Edquist and Zabala-Iturriagoitia, 2012):

- **Pre-commercial procurement** (PCP), a practice in the United States and Asia for many years, is targeted to the R&D stage. It does not lead to immediate delivery of a commercial product; it is best described as contract research (Edquist et al., 2015). PCP also differs from regular public procurement approaches in that it allows for more interaction between the supplier and the government agency. “To preclude [monopoly] resulting from pre-commercial procurement, at least two competitors should enter the field-test stage” (Edler and Georghiou, 2007). In the EU, PCP is defined as a financial instrument to foster joint cross-border public service contracts for R&D. It is also meant to share risks and benefits between procurers and suppliers, e.g. through making intellectual property rights from R&D available at market prices (EC, 2015a). The commercial development of new products is not part of PCP, but public procurement of innovative solutions (PPI).⁴
- In **adaptive PPI**, procurement is used to diffuse an innovative product or service that has been used in other regions.
- **Developmental PPI** creates and diffuses a new product or service (see the example of the Ampere electric ferry, following).

22. Public procurement can effectively support innovation by:

- identifying an unsatisfied need and creating a market to respond to it;
- aggregating demand from various agencies in a country, creating a larger market and economies of scale for a new product or service;⁵
- providing a reputational boost to the selected product or company, which can facilitate market penetration beyond the procurement contract (IISD, 2012).

³ This study considers 1149 companies in the German industry and service sectors and finds that “public procurement has a positive and significant effect on innovation success (measured as sales with new-to-the-market products) ... Results suggest that only knowledge spill-overs from universities have equally strong positive effects on market success ...”

⁴ Pre-commercial procurement is not covered by the 2014 EU Directives on procurement, an indication that it is different from standard public procurement.

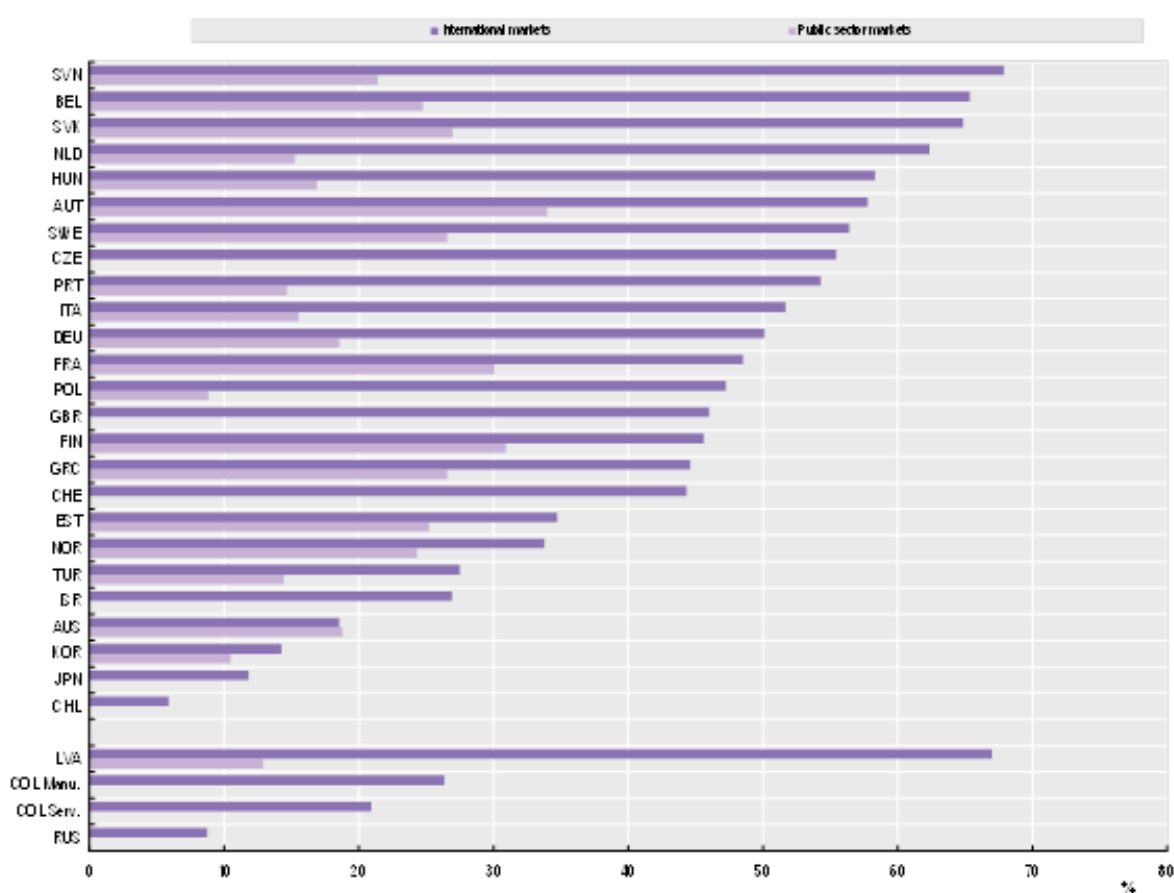
⁵ In some cases, public procurement organisations also inform private sector procurers of their tenders so that the latter can benefit from the triggered innovations. See Edler et al. (2005), for a case study of the procurement of new lighting systems in Hamburg.

General barriers to effective public procurement of innovation

Attracting small and medium enterprises

23. Public procurement procedures are generally more accessible to large incumbent companies with well-established market presence and the resources to submit a tender with an uncertain market outcome. SMEs sometimes perceive that they have too little legal and administrative capacity to engage in procurement contracts. And yet start-ups and small and medium enterprises (SMEs) may have innovative products and services to offer; in somewhat black and white terms, one could argue that incumbents are responsible for today's carbon footprint and are therefore less likely to bring radical solutions. Another upside of engaging SMEs is their ability to respond to local government procurement needs with positive impact on local development, which may be a policy goal in some jurisdictions (OECD, 2014b). Figure 3 shows shares of enterprises taking part in public sector markets; these shares do not necessarily match a country's high or low share of public procurement in GDP. A relatively low share generally shows engagement by mostly large companies and potentially less competition in these markets. Innovation would get a boost from easier access of SMEs to procurement contracts.

Figure 3. Enterprises operating in international and public sector markets



Source: OECD (2015f).

24. A few public procurement for innovation programmes facilitate participation by SMEs. Through the Small Business Innovation Research (SBIR) programme, the United States contracts companies with 500 employees or less for pre-commercialisation R&D; the contracted company is awarded the intellectual property right of its innovation, hence facilitating commercialisation. The Netherlands and the United Kingdom have created similar programmes. An important feature is the provision of 100% financing when access to finance by SMEs with risky R&D projects is limited. Other practical measures can facilitate SMEs access:

The Small Business Act encourages European Union Member States to: use electronic portals to increase access to information on public procurement; break contracts into smaller lots where appropriate and make sub-contracting opportunities more visible; avoid disproportionate qualification and financial requirements; and promote dialogue and mutual understanding between SMEs and large procurers. (OECD, 2014b)

Fragmentation of public procurement systems

Capacity constraints and problems of limited scale economies are often especially marked in subnational governments. (OECD, 2014b)

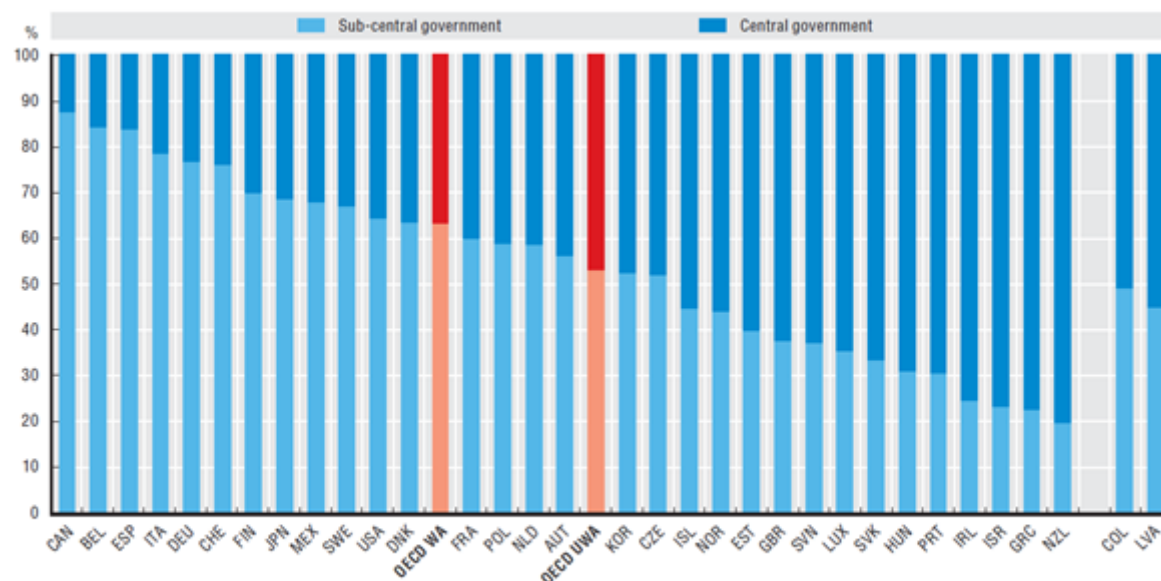
25. Figure 4 shows the breakdown of spending in public procurement between central and sub-central governments in selected countries. The implementation of public procurement for innovation can be hindered by the fragmentation of public procurement systems when sub-national procurement bodies are less equipped, or lack the skills necessary to integrate strategic objectives alongside their standard procurement duties. According to a recent survey of OECD countries on public procurement systems, motivations to adopt a central purchasing body included: better prices (100%), lower transaction costs (96%), improved capacity and expertise (81%) (OECD, 2015a).

26. There may be downsides to centralised systems, however:

The quest for economies of scale may affect the structure of the market, typically favouring large suppliers providing standard goods and using established technologies. It may also affect integrity negatively, e.g. through tacit or explicit market sharing and pricing collusion between a few, dominant suppliers. (OECD, 2014b)

27. In Denmark, the Partnership for Green Public Procurement gathers procurers from national and local government to develop common procurement criteria, facilitating the diffusion of best practice nationwide (Fischer-Bogason, personal communication). Other examples include Ireland's National Public Procurement Policy Unit, which established a national framework for public procurement and guidelines for local governments, or Sweden's Ecologically Sustainable Procurement tool, which includes information such as life-cycle cost calculations for various products and training material (OECD, 2014b, 2015e).

Figure 4. General government procurement by level of government, 2013



Source: OECD National Accounts Statistics (database).

StatLink <http://dx.doi.org/10.1787/888933249020>

Public procurement for sustainability and low-carbon innovation

A widely recognised practice...

28. In 2002, the OECD Council issued a recommendation to improve the environmental performance of public procurement (OECD, 2002). Indeed, public procurement for innovation, both adaptive and developmental, has been used in the broad sustainability field for some time now (see in particular UNEP’s global review of sustainable public procurement, 2013; OECD, 2011). In the OECD, 27 out of 32 countries had developed a green public procurement (GPP) strategy at central level, and two others had procuring entities engaged in GPP as of 2014 (OECD, 2015a). UNEP (2013) estimates that 56 countries have adopted green or sustainable public procurement programmes at national level; in addition to most OECD countries, the list includes Brazil, China, India, Indonesia, and South Africa.

29. Governments have formally recognised the role of public procurement to support sustainability, including an explicit reference in the Sustainable Development Goals (12.7): “Promote public procurement practices that are sustainable, in accordance with national policies and priorities” (United Nations, 2015).^{6,7} Another development is the recent World Bank initiative to reform its

⁶ SDG 12 is to “Ensure sustainable consumption and production patterns” (United Nations, 2015).

⁷ This is part of an ongoing effort which includes the 10-year Framework Programme on Sustainable Consumption and Production Patterns and its programme on Sustainable Public Procurement (SPP). For more information on the history of the SPP Programme, see www.unep.org/10yfp.

approach to public procurement and to introduce value for money and sustainability as criteria.⁸ If successful, this reform could diffuse sustainability public procurements practices in these countries.

30. Examples of low-carbon and other forms of sustainable procurement are found in the supply of the following goods, works or services:

- information technology (efficient office equipment);
- paper (certified, recycled) and printing services;
- office furniture;
- vehicles (e.g. low-emission buses, electric vehicles, ferries) and mobility services;
- postal services;
- street and indoor lighting;
- water services;
- buildings and building services, including energy audits, heating services, retrofitting or reconstruction;
- renewable energy supply, urban energy systems;
- road and other infrastructure (e.g. bridges).

... supported by groups of practitioners

31. National and international organisations have gathered best practice information and developed various guidance documents and online systems to support the deployment of public procurement for sustainability innovation.

- The GPP 2020 consortium (Procurement for a Low-carbon Economy) brings together local and central government practitioners from some European countries. The consortium provides examples of low-carbon procurement projects and best practice examples, as well as open tenders. <http://www.gpp2020.eu/low-carbon-tenders/>
- Among its many activities in supporting more sustainable cities, ICLEI (Local Governments for Sustainability) has established a Public Procurement for Innovation Platform and a Sustainable Procurement Resource Centre. <http://www.sustainable-procurement.org/>
- The above-mentioned UNEP SPP maintains a Sustainable Consumption and Production Clearinghouse which contains country-level information on sustainable public procurement. <http://www.scpclearinghouse.org/>. Under the Sustainable Public

⁸ In the past, a similar procurement system was applied in all client countries and the lowest bid won. From now on, client countries will develop procurement for World Bank projects with assistance from Bank staff, and include selection criteria such as risks, potential bidders, value for money, and sustainability. Critics of the new approach note the additional skills-sets required for procurers to appropriately integrate new criteria (CIPS, 2015).

Procurement Programme of the 10-Year Framework of Programmes (10YFP SPP), UNEP conducts detailed analyses and shares experience on various aspects of procurement, e.g. monitoring implementation, measuring impacts and communicating benefits, private sector aspects, technical barriers or capacity building tools, to name a few (UNEP, 2015a).

- In North America, the Sustainable Purchasing Leadership Council brings together public and private procurers and suppliers. The Council is developing a self-assessment and benchmarking tool for procurers (<https://www.sustainablepurchasing.org/rating/>).

Case studies in green and low-carbon public procurement

32. This section gives examples of innovation in sustainability driven by public procurement systems and innovative approaches to drive such progress.

33. There is a wealth of experience on low-carbon, green, or sustainable public procurement, as well as case study material that shows important success factors in this area. Among these, IISD (2012) and OECD (2015e) consider experience in different countries and cities. Going beyond individual examples of an innovative green product or service, they give insights on important elements of public procurement systems.

Procuring the world's first electric ferry⁹

34. In 2010, the Norwegian Ministry of Transport launched a competition for an energy efficient and low-emission car ferry to link two villages in the Sognefjord. The successful bidder would be awarded a ten-year concession contract. The Norwegian Public Roads Administration, in charge of the competition, required a minimum 15-20% improvement in energy efficiency over that of the existing diesel-powered ferry.

35. Four consortia, each comprising a ferry operator, a shipyard and an engineering company, competed for the contract. Bids were evaluated on the basis of the following criteria and weights:

- Price (60%).
- Quality (40%), as the sum of:
 - energy use per passenger car-km (18%);
 - total energy use per year (6%);
 - tons of CO₂ emitted per year (6%);
 - kilograms of NO_x emitted per year (4%);
 - innovation (6%).

⁹ This section is based on personal communications with Guro Nereng (ZERO), and Joachim Rønnevik (Norwegian Public Roads Administration), and on Cleantechnica.com, consulted on 23 Feb. 2016.

36. The winning consortium, which gathered Norled, a ferry operator, the Fjellstrand shipyard and Siemens, proposed Ampere, the world's first electric car ferry. Ampere offers a 37% reduction in energy use per passenger car-km, a 60% reduction in total energy use, the elimination of NO_x emissions and an 89% reduction in CO₂, accounting for the electricity mix in Scandinavia's NordPool. Unlike most others, the ferry is made of aluminium and is therefore lighter than steel-made vessels. A catamaran (i.e. two slim hulls instead of one), it also offers less resistance than traditional ferries, allowing total engine power to be cut by half. The charging system brought another innovation: batteries are replaced at each pier, saving the higher voltage necessary for a single battery onboard and the time it would take to recharge it.

37. The 80-meter long ferry, which can transport 120 cars in 34 daily trips across the Sognefjord, is now in operation. Making all future ferries low-carbon is now under discussion. Tenders opened recently for second electric ferry and an unspecified zero or low-carbon emissions ferry which could run on biogas, biofuel, electricity or any combination thereof. The procurement of the Ampere ferry clearly triggered these opportunities and helped to launch the market for low-carbon ferries.

38. The ferry tender did not specify a technology but rather a clear objective (higher energy efficiency) and sustainability criteria with a significant weight in the final evaluation (40%). Competition was also encouraged with a compensation of NOK 3 million to the three unsuccessful bidders.

Lowering the carbon footprint of infrastructure¹⁰

39. The Department of Public Works of the Dutch Ministry of Infrastructure and the Environment (Rijkswaterstaat, hereafter RWS) has developed an approach to encourage the minimisation of environmental impacts related to infrastructure building. The policy direction was given by the House of Commons, asking that public procurement be 100% sustainable by 2015 – i.e. the inclusion of green criteria in all tenders.

40. RWS works from the Most Economically Advantageous Tender (MEAT) methodology which includes both price and quality attributes. In RWS tenders, however, quality attributes are fully monetised in the quoted price; the contract is awarded to the bidder with the lowest adjusted price.

41. RWS tenders combine two sustainability criteria in the quality attribute¹¹:

- “The CO₂ Performance Ladder rates companies on a scale from one to five on the basis of energy savings, efficient use of materials and use of renewable energy” (Bosch et al. 2012). This motivates companies to monitor their performance, formulate ambition and evaluate effects. A rating of five requires that the evaluation be conducted together with an environmental NGO. More ambitious contractors, as rated by the ladder, benefit from a discount applied to their tendering price, going from 1 to 5% (OECD, 2015e).
- The Sustainable Building Calculator (DuboCalc) is provided to tenderers to assess the environmental impacts of the use of materials specified in a contract. DuboCalc was developed to provide a transparent assessment of environmental impacts, and to help

¹⁰ This section is based on OECD (2015d) and personal communications with Cuno van Geet and Evert Schut (Rijkswaterstaat). See also article by A.W.W. Eversdijk in IISD (2012).

¹¹ Other quality attributes include: public-oriented approach, project management, and design and risk management.

contractors ‘optimise’ on the basis of various environmental costs rather than mandating specific levels of performance. The costs are derived from an authoritative life-cycle analysis of materials (from extraction to demolition and recycling) including CO₂ emissions and ten other impacts. The aggregate environmental cost is translated into a monetary value which is combined with the tender price to award the contract.¹²

42. Other requirements encourage more energy-efficient, sustainable bids, such as the inclusion of energy consumption in the submitted price of maintenance contracts and the obligation to use certain technologies or products (e.g. LED, sustainable timber).

43. From the RWS staff perspective, DuboCalc has been effective in facilitating the introduction of low-carbon materials for public infrastructure. This is an example of adaptive innovation – i.e. the diffusion of environmentally-friendly products (e.g. low-clinker cement) that are already available, rather than driving breakthrough innovation. A more integrated set of policy instruments is needed to achieve more ambitious reductions in the carbon footprint of materials such as cement. At the initiative of industry, a Green Deal policy framework is in development with RWS with the aim of bringing breakthrough innovations seen as beyond the reach of public procurement.

Using labels and standards

Without credible standards that determine what products count as green or sustainable, governments find it difficult to implement [sustainable or green public procurement] (UNEP, 2013)

44. Public procurement must work within the broader policy environment and can sometimes benefit from policies that apply to markets, goods and services beyond government expenditures. Following are brief case studies of public procurement systems in China and Korea that feature standards or labels (OECD, 2015c; see UNEP 2013, for other examples, including the United States, Japan and Chile).

Korea

45. The Government of Korea strengthened its green public procurement programme in 2005 by mandating central and local governments and public organisations to report on the implementation of their green procurement plans. The programme was introduced together with the Korea Eco-label and Good Recycled Mark, which cover appliances, office supplies, furniture and construction materials, to name a few. Procurers can order labelled goods or require contractors to do so. Other criteria may be used as well: the use of labelled products is not the only way to meet green procurement objectives.

46. The labelling system is intended to save time and administrative costs to 870 umbrella organisations and 30 000 subsidiaries (including the Korean Public Procurement Service, which orders goods and services for amounts above set thresholds). The green procurement system included guidance, dedicated training for procurers, best practice sharing and awards. A monitoring and reporting system was also introduced whereby 60% of green procurement data was automatically reported. This also allowed the Korean Environmental and Industry Technology Institute to estimate CO₂ savings and job creations related to the programme.

¹² Penalties are applied if performance is less than promised, for both the CO₂ Performance Ladder and the environmental cost evaluated with DuboCalc (OECD, 2015d).

47. Green purchases grew seven-fold from 2005 to 2012, but only amounted to 5-6% of public purchases by 2012. Among the problems in increasing green purchases are high prices (furniture and construction materials) and complaints on quality. Procuring organisations are also subject to other overlapping criteria such as energy efficiency or social responsibility, and may put these ahead of green procurement.

China¹³

48. In 2006, the Chinese Ministry of Finance and the former State Environmental Protection Administration issued Recommendations on the Implementation of Environmental Labelling Products in Government Procurement. The Recommendations were accompanied by the Government Procurement List for Environmental Labelling Products, which included 14 product categories and was accessible by the general public. Products on the list are certified based on environmental performance, technological advancement and market considerations. According to the Recommendations, listed products with similar performance, technology and service attributes but lower environmental impact should be preferred. Reliance on the list is entirely voluntary, however.¹⁴

49. The list of certified products has grown significantly, from 800 to 37 953. Categories include: passenger cars, home and office appliances, cement concrete products and various construction materials, windows, and plastic products.

50. OECD (2015c) reports a relatively high level of green procurement when it comes to purchases through a competitive procedure (60% in 2011, and 82% for energy efficient products), although these amount to a modest total of RMB 165 billion (USD 25 billion) in light of the country's GDP. Monitoring and evaluating green public procurement has proven difficult, however, due to the decentralised nature of public procurement and the many organisations involved. In addition, green public procurement was seen to lack a powerful legal basis (OECD, 2015c). Furthermore, the environmental awareness of procurers is limited, despite evidence that such awareness increases the environmental performance of procurement organisations in the country.

From lists of products to lists of labels?

51. Experience with the use of standards and labels shows that they can greatly facilitate the tasks of procurement officers, as they avoid the need to define appropriate qualifications, award criteria and contract clauses (see Öko Kauf case study in OECD, 2015c). Overall, labels and standards can be used in procurement to verify a product's 'green' credentials, as a minimum requirement, or as a method to create sustainability criteria (UNEP, 2013). A particular concern relates to small and medium enterprises' ability to take part in the certification process to be included on product lists used by procurers. Foreign suppliers may face a similar barrier (Colverson, 2012).

52. From an innovation perspective, a critical issue is whether standards can be reviewed frequently enough to ensure technical progress and avoid the 'innovation freeze' that such regulations are blamed for. In the case of China's environmental product lists, Colverson (2012) notes that "once on the list, there is little to encourage a product's further development." Such lists can be updated, recognising that this is a cumbersome process, probably not at pace with feasible improvement in

¹³ In addition to OECD (2015d), this section relied on Colverson, in IISD (2012).

¹⁴ Eight of the 28 categories on the list of Energy Savings Products (introduced in 2004 and continually updated) are compulsory for procurement agents (Colverson, 2012).

environmental performance. A related problem is the adequacy of listed products when it comes to market maturity in local government areas.

53. An alternative to long lists of specific products (which present difficult challenges for updating and a risk of corporate capture) is providing guidance to public procurers on which environmental labels and certification schemes may be used for green public procurement. For example, the US Environmental Protection Agency is drawing up a list of criteria that will allow federal public procurers to discriminate between all environmental labels available on the market. Endorsing certain standards and labels (whether government-run or otherwise) for public procurement can bolster the credibility of those schemes for users in the rest of the economy, another form of positive spill-over from procurement into the broader market (Prag, Lyon and Russillo, 2016).

Barriers and solutions: how public procurement policy integrates sustainability

Studies in the EU and the United States have shown compliance rates with sustainable acquisition requirements below 50 per cent. (Payne, 2012)

54. There is no detailed information on the destination of public procurement expenditures. A survey of government expenditures of seven EU countries showed that “government demand is particularly important in sectors such as transport (where government is a large purchaser of equipment), education, office equipment, research and development as well as construction” (OECD 2014b).¹⁵ Estimates of public procurement’s direct carbon footprint are not available, but given its share in total GDP the figure must be significant, and policy-makers at national and local levels recognise that their purchases can contribute to the low-carbon transition. Maybe more important than the direct impact on emissions is the indirect impact of low-carbon procurement through the creation of lead markets for low-carbon products and services, along with demonstration, learning, network and reputation effects.

55. As public procurement is subject to much scrutiny by central governments to avoid misuse, one might assume that it could easily be steered to drive other policy objectives. The reality is that public procurement is a process with many steps (technical, legal and financial), methods and dialogues. Gearing this sophisticated instrument toward ‘green’ procurement requires a change of mindset, including among procurement officers who traditionally focus their attention on direct financial costs *excluding* climate change and other externalities. This section presents some of the challenges faced by public procurement when it comes to driving green innovation, and solutions that have been brought forward.

From least cost to full cost

56. The primary role of public procurement is to meet a specific need of a public organisation (or the general public, via a public organisation) “in a timely, economical and efficient manner that allows for fair competition” (OECD 2015e). For a long time, ‘cost’ has been defined as that of acquisition of the service, product or works; it is conceivable that equipment with mediocre energy efficiency performance could win a public procurement contract even though its lifetime cost to the government could be higher than another’s. Even with a carbon tax in place, the lowest bid price criterion could favour a high-emissions choice. In its review of best practices in public procurement, OECD (2015e) noted that in China the least-cost criterion sometimes has the upper hand over the

¹⁵ The countries are Denmark, Finland, France, Germany, Netherlands, Sweden and the United Kingdom.

voluntary use of environmental standards in the final choice. There also remains a perception that better environmental performance automatically inflates a product's price.

57. When surveyed by UNEP, 43% of procurers still identified price as the “dominant awarding rule” in national procurement, ahead of value for money (34%). This is a problem from a low-carbon perspective as long as more energy efficient, low-emissions equipment carries a higher upfront cost. Edler et al. (2015), in their 2011 survey of UK suppliers, identified excessive emphasis on price as the most important barrier to innovation in public procurement.

58. Solutions to this general problem have been introduced in many jurisdictions, with the inclusion of quality attributes as part of a value-for-money approach: the use of performance standards, total cost of ownership (TCO) or life-cycle costing (LCC). In the example of the electric ferry, higher energy efficiency was a necessary condition and environmental performance was an important criterion in the tender's quality attribute, though not directly monetised. TCO and LCC make various types of costs more visible to both the supplier and procurer.

59. The Danish Ministry of the Environment (2015) defines total cost of ownership as the total of all costs resulting from acquisition of a product and the costs involved in using the product during its period of use. As an example, TCO would explicitly allow comparison of two products on the basis of their associated energy expenditures once in use.¹⁶ TCO usually relates to actual financial costs.

60. Life-cycle costing tends to broaden the scope and can include the cost of externalities (the shadow price) related to upstream and downstream activities, cost of disposal, etc. When LCC is used, public procurers need not wait for the introduction of a carbon tax in order to take a project's carbon footprint into account in the assessment of the tender. A number of governments are in fact already including monetary carbon values in their evaluations of public investments (Smith and Braathen, 2015). In the case of the Netherlands infrastructure procurement, all tenderers use the same method to cost externalities on a life-cycle basis and to monetise them in their bids. This means taking into account trade-offs between different types of externalities and other ‘real’ costs. Putting environmental costs on par with others should lead to the selection of the supplier with the economically superior technical solution, whereas a strict financial cost indicator could lead to a different choice.

61. International legal texts authorise this practice: article 68 of the EU Directive on life-cycle costing explicitly mentions: “such costs may include the cost of emissions of greenhouse gases and of other pollutant emissions and other climate change mitigation costs” (EU, 2014). Similarly, the WTO Revised Agreement on Government Procurement (WTO, 2012) says that “the evaluation criteria ... may include, *inter alia*, price and other cost factors, technical merit, environmental characteristics and terms of delivery.” Though these better costing methods are allowed, they are not universally applied. According to UNEP (2013), only 38% of respondents indicated a systematic or frequent use of life-cycle costing. Best practice LCC methods also may not be easily transplanted to other jurisdictions – e.g. if environmental pressures differ – but they can be adapted.

62. Obviously, TCO and LCC will have a more sizeable impact on sustainable innovation if they are given important weights in the final assessment. As such, these methods do not stymie competition: they do not exclude certain products or technologies *a priori*. This argues in favour of giving equal weight to externality costs and upfront costs alongside other quality attributes. Put differently, in a value-for-money approach, the bid price should reflect costs to the society as a whole.

¹⁶ In the case of IT equipment, the Danish guidelines allow the costing of waiting time when comparing computers working at different speeds, on the basis of the employee's salary (Danish Ministry of the Environment, 2015).

Budget rules

Flexibility, through multi-year financing options ... should be provided to prevent purchasing decisions that do not properly allocate risks or achieve efficiency due to strict budget regulation and inefficient allocation.

(OECD Recommendation of the Council on Public Procurement, 2015b)

63. A survey of procurement officers showed that budgetary and resource restrictions are important barriers for sustainable public procurement (UNEP, 2013). In general, single-year budget reporting does not facilitate a strategic use of budgets; there has been progress in this area, however, with the use of medium-term and long-term budget frameworks. Budget rules that allow carry-over, borrowing from future years and retention of savings tend to favour more resource-efficient choices (OECD, 2003).

64. Whenever there is a split responsibility for capital and operational costs, there is a risk of minimising investment cost (e.g. the procurement of goods and services) at the expense of operational costs (e.g. energy use), with detrimental impact on the environment.¹⁷ The integration of TCO and LCC in bid evaluation, as well as a value-for-money approach, can mitigate this effect, provided that resources are available to match higher acquisition costs.

65. Accounting systems also matter. Accrual (or cost) accounting, rather than cash accounting, reflects future costs arising from purchasing decisions made today, which is coherent with the TCO and LCC methods.

Information barriers

... despite governments' efforts to make procurement more strategic, in practice public procurers still have the bigger imperative of accountability to complex administrative procedures over strategic goals (Corriea et al., 2013)

66. Although this quote refers to work published in 2005, transparency, objectivity and non-discrimination remain important in framing the day-to-day activity of procurers. Secondary objectives may be fully in line with a country's policy priorities, but their integration in public procurement can be challenging. How public procurement is organised also has repercussions on its effectiveness as an innovation policy instrument – this has been found to be “more challenging in OECD countries with de-centralised procurement systems” (OECD, 2014).

67. A first challenge relates to the availability of resources and skills-sets to conduct green public procurement. The addition of an important secondary objective such as the promotion of low-carbon solutions, whenever standards are not used for selection, implies changing the technical specifications of procured services and goods, and a capacity to assess the new information provided by tenderers. Procurers must also define their needs in a way that is most likely to trigger market innovation, and ensure that users are ready to adopt the procured innovation (Edler and Yeow, 2016).

¹⁷ Incentives for a rational use of equipment can also be lost if the actual operating costs are borne by a central purchasing body rather than by agents who actually use the equipment (OECD, 2003).

68. In best practice cases, multi-disciplinary teams are established to evaluate the market's ability to respond innovatively to environmental criteria in addition to guidance for procurement officers. For instance, the government of Canada develops and updates green procurement plans elaborated by procurement officers and client agencies; it also gathers information from suppliers through multiple channels to enhance the ambition of the environment criteria. These criteria are announced to suppliers in advance, to facilitate an effective and competitive response in the next procurement cycle (OECD, 2015e).

69. Ease of access to tools for sustainable acquisition appears to be an important factor in the success of green public procurement (Payne, 2012, UNEP, 2013). The introduction of e-procurement, replacing paper-based procedures, can be an opportunity to streamline the process. E-procurement also facilitates the monitoring of green public procurement objectives, which is important in evaluating their real impact on society and justifying their possible extension.

Regulatory capture versus innovation dialogues

70. A second challenge lies in the possibility of regulatory capture, with the risk that a secondary sustainability objective could hinder competition. As illustrated earlier, governments often rely on standards and product lists to guide procurers in their selections. But standards are usually elaborated by industry bodies that already hold the engineering and manufacturing knowledge (OECD, 2014) and may not reflect the innovation frontier. On the other hand, the criteria elaborated for standards can be used as technical specifications, allowing suppliers to compete without limiting their environmental performance to the minimum set by the standard. The US Department of Energy provides its sites with a list of products that go beyond minimum compliance, encouraging the achievement of stretch goals. In turn, sites can propose green products for addition to the list (OECD, 2015e).

71. A tender can be preceded by market dialogues that allow procurers to gauge the innovative capacity of the market, and to organise procurement and technical specifications so as to best benefit from available know-how. Consultations can take different forms: public or private meetings or via online tools; they must end prior to issuance of a tender. Care should of course be taken not to bias technical specification to match a single supplier's technical solution. Overall, this process gives suppliers a better understanding of a government's innovation priorities, and procurers more information on the technical frontier as well as technical specifications needed to best direct innovation.

72. The EU Directive also includes a procedure called competitive dialogue, in case of particular "technical difficulty" or "legal or financial complexity". The illustration of a technical difficulty may well fit situations in which the contracting authority is seeking low-carbon breakthrough technologies or solutions:

Let us take the example of a contracting authority wanting to create a connection between the shores of a river – it might well be that the contracting authority cannot determine whether the best solution would be a bridge or a tunnel, even though it would be able to establish the specifications for the bridge (suspended, metal, in pre-stressed concrete, etc.) or the tunnel (with one or more tubes, to be constructed under or on the riverbed, etc.). In this case, use of a competitive dialogue would also be justified. (EC, 2005)

73. The revised 2014 Directive also allows innovation partnerships:

The innovation partnership shall aim at the development of an innovative product, service or works and the subsequent purchase of the resulting supplies, services or works, provided that they correspond to the performance levels and maximum costs agreed between the contracting authorities and the participants. (European Union, 2014)

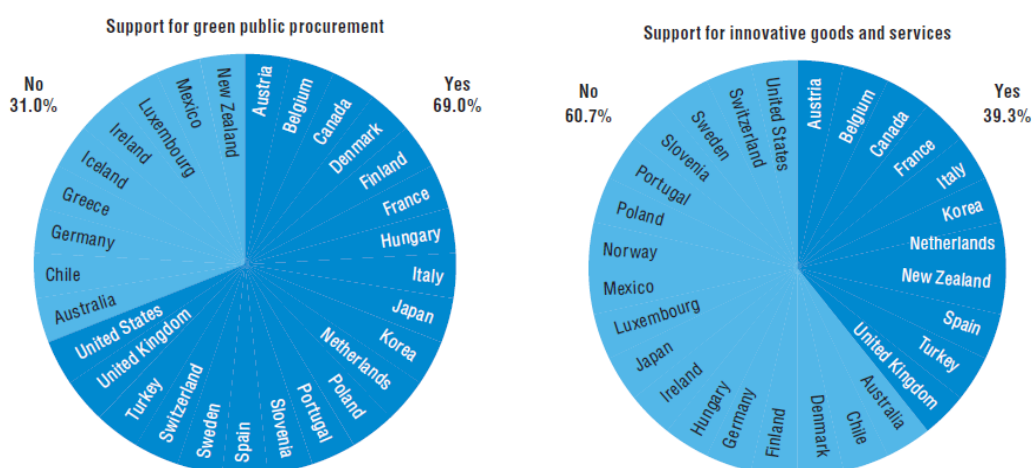
74. Procurers can also announce future needs to encourage innovation. The United Kingdom's Forward Commitment Procurement programme includes “an agreement to purchase a product or service that currently may not exist, at a specified future date, providing it can be delivered to agreed performance levels and costs” (Dutz and Pilat, 2014). EU legislation also allows procedures to give advanced warning for such consultations.

The result of a tender procedure can be greatly improved when market parties are informed sufficiently far in advance about the environmental requirements public authorities intend to set. One way of initiating such a dialogue is by publication of a Prior Information Notice (PIN) in the Official Journal, in which the public authority outlines its requirements and describes the consultation process. (EC, 2015b)

Measuring impacts of public procurement on environmental objectives

75. The case for the use of public procurement for low-carbon innovation would benefit from a clear track record. Unfortunately, not all countries that have implemented GPP have established good monitoring systems to review their effectiveness, either to promote green objectives or, even less so, to support innovation (see Figure 5). Governments should collect more information on their GPP objectives while recognising that beyond measuring the share of public procurement expenditures meeting environmental objectives, evaluating the actual impact on the environment may prove difficult. In particular, it is difficult to quantify the knock-on effects of innovation driven by public procurement, i.e. when an innovation penetrates the market beyond the procurement contract segment (OECD, 2014b).

Figure 1 - Are countries measuring results of strategic public procurement’s policies and strategies?



Source: OECD, 2015a.

76. On this issue, UNEP's Sustainable Public Procurement Programme recommends, *inter alia*, that countries integrate "SPP aspects in their general procurement assessment tools, such as MAPS", the OECD-World Bank methodology for assessing procurement systems, which is commonly used by procurement practitioners and is now under review (UNEP, 2015b, see Box 1).

IV. BROADENING AND DEEPENING PUBLIC PROCUREMENT FOR LOW-CARBON INNOVATION

77. The above overview indicates that public procurement is being used by a growing number of countries to support sustainability objectives, something which has been recognised by international policy frameworks. The Sustainable Development Goals also encourage the use of public procurement to support sustainability. There are many communities of practice and valuable information-sharing at national and international level, an acknowledgement that public procurement can be a powerful tool to promote various public policy objectives. The starting point of this paper is that, at the very least, public procurement should not contradict a country's climate policy objectives; even better, governments could become market leaders whenever they can make a difference.

78. The previous sections show, however, that implementing sustainability objectives through public procurement does not happen overnight, as it requires new procedures and tools, training and raising the awareness of procurement officers at national and local government level, and most of all transforming the culture from a least-cost to a total-cost approach (see also UNEP, KEITI and SPLC, 2015).

79. These are by no means unsurmountable barriers, and already 56 countries are using public procurement to lower the environmental impact of government expenditures. The pledges that countries have made as part of the Paris Agreement should be an opportunity to enhance the use of sustainable public procurement for the low-carbon transition where it exists, and to encourage its introduction where it does not. For instance, EBRD noted in 2011 "... the sustainability of public procurement is a totally new concept, very seldom implemented in local procurement practice by contracting entities in the EBRD countries." The World Bank's overhaul of its public procurement policy could also foster better integration of sustainability and low-carbon objectives.

80. The supply side of the equation (the private sector engaged in public procurement) must also evolve and be ready to innovate in response to public procurement calls for low-carbon solutions. In some cases this is a matter of bringing a solution that exists in a market to other markets and whether fair competition is facilitated in doing so. The WTO Agreement on Government Procurement ensures, *inter alia*, that companies are given access to foreign public procurement markets, but the urge to favour domestic suppliers remains. As discussed in an earlier meeting of the Round Table on Sustainable Development, there will always be a delicate balance between fair competition and policy-makers' interest in harnessing domestic industry for the low-carbon transition.

81. What more could we expect from public procurement in support of the low-carbon transition? This section offers a few leads, including on the role of public procurement in the broader innovation chain.

From national to international public procurement?

82. Market scale can be a limitation for most countries' or local governments' procurement of breakthrough innovations. In cases where the need to be satisfied by procurement is not country- or economy-specific, procurement offices could link efforts across borders to issue common technical specifications, or even to issue a single tender, hence creating a larger market and mobilising a greater number of private suppliers to compete. Efforts along these lines have been successful in the past, for example in the case of Energy Star, the efficiency standard created by the US Environmental Protection Agency, now in use in Australia, Canada, the EU, the European Free Trade Association, Japan, New Zealand, Switzerland and Chinese Taipei (EPA, 2016). Governments may also co-operate to improve the inter-operability of environmental information and labelling schemes across borders, as it appears “that a key determinant of the cost impact of multiplication on producers is the level of interoperability between systems (e.g. similar audit procedures)” (Prag, Lyon and Russillo, 2016).

83. On the margin of COP21, cities gathered under the C40 umbrella committed to shift 45 000 out of 175 000 of their city buses to low-emissions technology by 2020. Though it sends a signal to private sector manufacturers, this commitment has not taken the form of a common public procurement (see also Box 2). The question is whether some of the public procurement steps could be elaborated in collaboration, and for what value added. Another approach to scaling up may be the development or broader usage of international performance standards as criteria of procurement contracts in different jurisdictions.

84. Some form of international co-ordination of public procurement in low-carbon may also help lower the risk of favouring national manufacturers and of locking-in of specific low-carbon designs, as each supplier may otherwise cater to an isolated market segment of the global demand.¹⁸

85. Obviously, care should be taken not to add a complex international layer of processes on top of what sometimes remains a fragmented activity at domestic level.

Box 2. International co-ordination of public procurement for innovative transport solutions

The City of Paris worked with ten cities in seven EU countries to co-ordinate the procurement of new, environmentally-friendly garbage trucks running on natural gas. The city governments recognised that only by collaborating could they reach the critical mass required to get suppliers to invest in an innovative new model. At the same time, each city had to reflect the specificity of its garbage collection system (e.g. street sizes). The cities issued individual tenders that included the requirement of CNG-fuelled vehicles, while accommodating their other specific needs. The co-ordinated tenders represent a volume of demand that is sufficient for potential suppliers to generate this innovation at acceptable cost – with the prospect of later adoption by other local governments.

Source : Guillaume Cantillon (personal communication).

¹⁸ On a related issue, OECD (2015f) reported that “local-content requirements have been planned or implemented in solar and wind energy in at least 21 countries, including 16 OECD countries and emerging economies, mostly since 2009. This has prompted five World Trade Organization (WTO) disputes since 2010.”

Procuring new business models

86. Public procurement, through innovative formulation of markets, has shown the ability to create new business models which, if replicated beyond procurement markets, could diffuse lower-carbon technologies and behaviour. An approach for such innovation is to go from procuring products to procuring services – also known as product-service systems. This model of procurement moves away from the acquisition of a product to the purchase of a service (e.g. from owning, maintaining and operating vehicles to mobility, the purchase of detergents to cleaning services, etc.) With proper incentives embedded in the procurement design, this can result in lower resource use (the supplier does not get revenues from the sale of new products but from the performance of a service which may be provided by older, well-maintained products). This format also encourages the supplier to reflect on the total cost of ownership: it is indeed in the supplier’s interest to minimise energy use during the performance of the service. “The incentives of the supplier and buyer to decrease costs are aligned” (UNEP, 2015c).

87. Product-service systems represent a departure from standard procurement practice, but if done well hold the promise of lower material use and better aligned incentives for a lower environmental impact. Further considerations in the choice of product-service systems over traditional procurement include:

- the perceived role of government in an economy and its ability to outsource certain services;
- alignment of government budgeting with contracts involving regular payments as opposed to investments;
- transfer of risk to the service provider;
- the fiscal system, e.g. where both the principle contractor and sub-contractors are taxed on income from the same work;
- legal aspects: the EU Directive allowing market dialogues and the use of life-cycle costing in public procurement is seen as facilitating a proper use of product-service systems. (UNEP, 2015c)

Public procurement as a driver of deployment of breakthrough innovations

88. There is an obvious limit to the contribution of public procurement: the market size represented by public expenditures and the level of engagement of companies in public sector contracts. There are only partial estimates of the sectoral spending of governments through public procurement, with indications of significant spending in construction and transport, information technology and health services. Governments are more likely to be able to create ‘lead’ markets in these areas than when their demand accounts for a few percent of total demand. On the other hand, many innovation markets start ‘small’, so no activity, to the extent that it affects CO₂ emissions, can be ruled out *ex ante*. Pooling demand at international level could, as mentioned above, broaden the impact of public procurement, with useful spill-over effects into the rest of the economy.

89. Coherent policy signals are required to diffuse innovations developed through procurement to the rest of the economy. Beyond carbon pricing, other demand-side innovation policies can complement public procurement, such as standards and regulations that guide demand. The low-

carbon transition requires that innovation happen continuously, so static standards and regulations will always be looked at suspiciously from this perspective.

90. Given the magnitude of the low-carbon transition, countries need to reflect on their innovation policy strategies; including targeted research and development funding, e.g. via pre-commercial procurement.¹⁹ Public procurements that announce performance goals some years in advance can help to create the right dynamic for sustained low-carbon innovation. In light of the decarbonisation challenge, *not* sending such signals would be a blatant misalignment with our collective climate policy objective.

91. In discussion with procurers that have reached the limit of adaptive procurement (using innovations currently in the market), it seems that other policy instruments are also needed to spur breakthrough innovations and to allow procurement to play its full role.²⁰ Once developed through other measures, innovative technologies and products could then be deployed via standard public procurement, on conditions of performance and cost. Sectoral technology roadmaps can provide a starting point of a discussion between industry and government on what breakthrough technologies should be pursued.²¹

¹⁹ Lessons could be drawn from the examples of the Advanced Research Projects Agency of the US Department of Energy (ARPA-E), or Ultra Low Carbon Dioxide Steelmaking (ULCOS).

²⁰ For instance, Finland's Tekes provides R&D subsidies to public procurers and to SMEs via a programme for Innovations in Public Procurement; another example is Korea's insurance-based system to reduce risks from innovative procurement for SMEs R&D (OECD, 2014b).

²¹ This is based on personal discussions with Van Geet and Schut.

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