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USING PRODUCT-SERVICE SYSTEMS TO ENHANCE SUSTAINABLE PUBLIC PROCUREMENT

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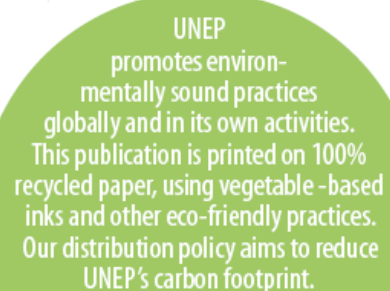
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Foreword

Sustainable or green public procurement is a growing trend that is beginning to lead vast supply chains towards implementing more sustainable practices and achieving environmental, social and economic objectives. The use of product-service systems (PSS) by public entities can also result in sustainability benefits. PSS are an innovative business approach that shifts the traditional business focus from selling physical products only (e.g. a washing machine) to selling a mix of products and services (e.g. cleaning services) that are jointly capable of meeting specific client demand (clean clothes). The key idea behind PSS is that consumers do not demand products per se, but are seeking the utility provided by products and services. One value-added of PSS lies in their potential to decouple consumption from economic growth, as they offer the possibility of meeting more needs with lower material and energy requirements.

This technical report, *Using Product-Service Systems to Enhance Public Procurement*, examines the nexus between product-service systems and sustainable public procurement, drawing together international experience. The aim of this report is, in particular, to demonstrate how product-service systems can be used by governments in the context of sustainable public procurement (SPP) policies and initiatives, thus contributing to a more resource-efficient, low-carbon and inclusive green economy. Some examples of the use of product-service systems by government organizations are given in the case studies in Annex I.

The 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP) is a global framework that enhances international cooperation to accelerate the shift towards sustainable consumption and production (SCP) in both developed and developing countries. One of the key objectives of the 10YFP is to encourage innovation and cooperation among all countries and stakeholders. This technical report is a direct outcome of activities that were part of the 10YFP Sustainable Public Procurement Programme – the first formal programme launched under this new framework of international cooperation. The report was developed by partners in the Sustainable Public Procurement Programme of the 10YFP, in Working Group 3A on “product-service systems and their insertion in sustainable public procurement”.

This technical report is intended to assist governments in evaluating the potential of product-service systems to act as a driver in achieving their sustainability goals. The authors believe the report provides a basis for more research to determine the effectiveness of various PSS schemes and related products in regard to sustainable public procurement.

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Sincerely,



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Acronyms

10YFP	10-Year Framework of Programmes on Sustainable Consumption and Production Patterns
CMS	Chemical management service(s)
CSR	Corporate social responsibility
DBFO	Design, build, finance and operate
DBO	Design, build and operate
EHS	Environment(al), health and safety
ESCO	Energy service company or energy savings company
GDP	Gross domestic product
GWh	Gigawatt hour
ICT	Information and communication technology
IT	Information technology
ISO	International Organization for Standardization
kWh	Kilowatt hour
LCA	Life-cycle assessment
LCC	Life-cycle costing
LCM	Life-cycle management
MSDS	Material Safety Data Sheet(s)
MW	Megawatt
MWth	Megawatt thermal
PPP	Public-private partnership
PSS	Product-service systems
RHI	Renewable Heat Incentive
SCP	Sustainable consumption and production
SME	Small and medium-sized enterprise
SPP	Sustainable public procurement
SPPI	Sustainable Public Procurement Initiative
TCO	Total cost of ownership

Introduction

One prerequisite for achieving **sustainable consumption and production (SCP)** is to ensure that the public sector uses its purchasing power to drive the market for sustainable products and services. Government procurement spending represented 29% of total general government expenditures (or 13% of GDP) on average in 2011 in the developed countries that belong to the Organisation for Economic Co-operation and Development (OECD, 2013).¹ The share of public procurement in GDP is slightly higher in developing countries, while procurement is estimated to account for 60-70% of all government expenditure in fragile states (Perera and Colverson, 2012).

As part of sustainable public procurement (SPP) activities, this large-scale demand is increasingly being targeted towards the supply of products, services and works that limit environmental impacts and promote social and economic benefits. At the Rio+20 Summit in 2012, UNEP and several partners launched the **Sustainable Public Procurement Initiative (SPPI)** to support worldwide implementation of sustainable public procurement. The SPPI aims to promote better understanding of the potential benefits and impacts of SPP. It also facilitates increased cooperation among key stakeholders through the establishment of working groups that address specific issues.

In early 2014, the SPPI was transformed into the **Sustainable Public Procurement Programme** of the **10-Year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP)**. The 10YFP SPP Programme was formally launched on 1 April 2014 in New York.²

This technical report was developed by Working Group 3A within the Sustainable Public Procurement Programme. It consolidates available information on PSS and shares experiences with respect to the advantages and challenges of using these systems, in the context of SPP policies and initiatives. This is the Working Group's first effort to gather knowledge and experience on the subject and make it available to practitioners – from both the procurement and business perspectives – in order to highlight what is already happening and enable practitioners to develop their own models, procedures and policies.

1. What are product-service systems (PSS)?

Product-service systems (PSS)³ are service-oriented **business models** that replace selling products with selling services – or with selling a mix of products and services. These systems focus on fulfilling customers' needs (e.g. 'I need a clean home') rather than on product purchases (e.g. 'I need cleaning products to clean my home'). They essentially shift the perspective from product ownership towards product utility and, consequently, towards a product's impacts throughout its life-cycle. **This shift enables cost reductions and efficiency gains, and can be used to further environmental objectives (e.g. energy and resource efficiency).** A range of possible product-service combinations is possible, with increasing levels of service intensity, as shown in *Figure 1*.

¹ The total value of public procurement in the European Union was recently estimated at about 19% of European GDP ('European cities to address climate issues through sustainable procurement,' Sustainable Procurement Resource Centre, <http://www.sustainable-procurement.org/newsroom/special-features/>).

² More information about the 10YFP is available at <http://www.unep.org/10yfp/>.

³ Product-service systems are also referred to as servicizing, resource-efficient business models, green business models, or circular business models. The procurement of product-service systems may be referred to as circular procurement.

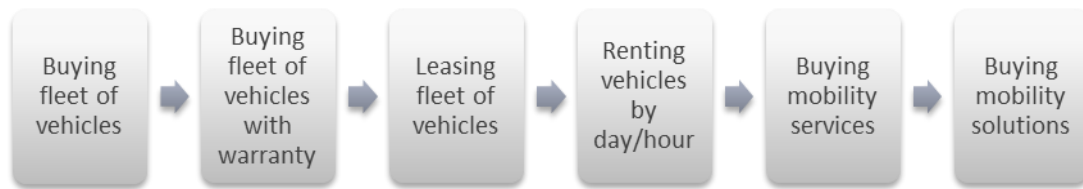


Figure 1: An example of product-service combinations, with an increasing shift away from product ownership towards the provision of services to fulfil mobility needs (Turley, 2013)

The 10YFP on SCP

The 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP) was adopted at the United Nations Conference on Sustainable Development (Rio+20) in June 2012. Rio+20 reaffirmed that sustainable consumption and production (SCP) is a cornerstone of sustainable development. The well-being of humanity, the environment and the economy ultimately depends upon responsible management of the planet's natural resources. These challenges are increasing, as the world population is forecast to reach 9 billion by 2050, with 1 billion people needing to be lifted out of absolute poverty and an additional 1 to 3 billion middle class consumers joining the global economy by 2030. A key strategy for ensuring future prosperity is to decouple economic growth from the rising rates of natural resource use and the environmental impacts that occur in both the consumption and production stages of product life-cycles.

SCP can be defined as 'the production and use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life-cycle of the service or product so as not to jeopardize the needs of further generations'. SCP involves doing more – and better – with less. It is about increasing resource efficiency and promoting sustainable lifestyles. SCP, which can make important contributions to poverty alleviation and the transition towards low-carbon and green economies, requires enhanced cooperation among different stakeholders, as well as across sectors in all countries.

The challenge is to define a service contract with the right incentives to ensure sustainable outcomes for both the customer and the service provider.

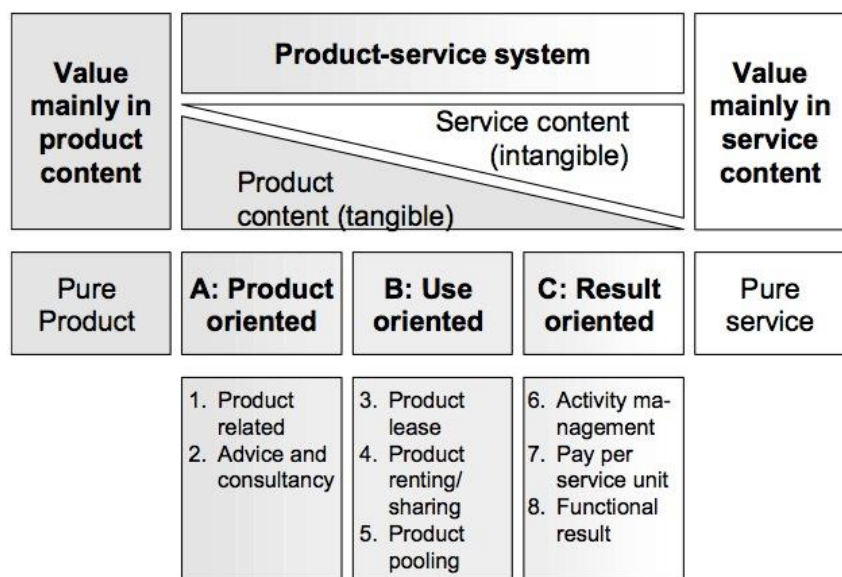


Figure 2: Eight types of product-service systems (Tukker and Tischner, 2006)

Figure 2 shows another way to categorize product-service systems. Different forms of PSS operate between the two extremes of 'pure product' and 'pure service'. Distinctions among the different forms are based on the extent of product ownership, the products involved, and the value-added of the service level.

- Product oriented services (A): The user owns the product (e.g. a vehicle, a building, carpeting, information and communication technology – ICT), but the product is accompanied by a service (e.g. a maintenance contract) or by training/instructions (e.g. a training course or manual on eco-driving, or on proper cleaning and use).
- Use oriented services (B): There is no longer exclusive ownership; the user obtains temporary possession of the product and uses it when needed (e.g. through vehicle leasing or sharing). Ownership and maintenance tend to reside with the service provider, but can also be shared in the case of product pooling or transferred after a certain period of time, as in the case of 'lease-to-own' agreements.
- Result oriented services (C): The focus is on the user's need, which can be fulfilled by a variety of products. For example:
 - Where users pay to be transported from their home to a restaurant, this need can be met in a number of ways (e.g. with a taxi, train or bicycle). Users choose the way that best satisfies their need;
 - Where users pay for flooring, this need can be met by a range of materials, including carpets, tiles and wood. The service provider retains ownership of the flooring materials (e.g. carpet tiles), maintains them (e.g. by replacing individual tiles as they wear out) and is responsible for end-of-life management (e.g. recycling);
 - 'Design, build and operate' (DBO) and 'design, build, finance and operate' (DBFO) type contracts are used in a variety of ways in countries. They differ from 'design and build' contracts by including operation and maintenance as well as project financing. These contracts are mostly used for large-scale construction projects. An example is the Millau Viaduct described in one of the case studies in Annex I.⁴

Additional categories also exist or are being developed. However, they share the concept of moving away from product ownership towards the function of the product and performance of the service.

These distinctions are derived from a theoretical approach. Buyers or users will ultimately decide which form fits their needs best. For a transformation towards more sustainable patterns, users will need to be well-informed (and aware of options and their consequences) in order to make a choice that is not just better in terms of cost and direct fulfilment of needs, but also in terms of sustainability impact.

2. How do product-service systems work?

In a traditional relationship between a supplier and a customer, based on the sale/purchase of a product, parties have opposed interests. The customer's primary intention is to reduce the product's acquisition cost, while the rationale behind a standard business model is to increase sales, which often goes hand in hand with greater use of production materials. This conflict, at the core of what traditionally defines the sale/purchase of a product, is further aggravated for the customer by the additional costs of product management (i.e. the procurement process itself, storage, use, repair, cleaning, maintenance, and end-of-life management), which are not

⁴ Often, DBO and DBFO contracts (sometimes also including maintenance) are concluded between government organizations and market parties and are a type of public-private partnership (PPP) that the government can use for building and infrastructure projects. Under these types of contracts, the government commissions a private consortium to build, maintain and operate a project, with the private party also arranging the project's financing. The contractor is not only responsible for designing and building the project, but also handles administration and maintenance. These contracts are frequently concluded for a period of 15-30 years. In this way the contractor takes responsibility for a large part of the life-cycle costs.

typically considered during the decision-making process. Importantly, these ignored or 'hidden' costs can often exceed the product acquisition cost.

Product-service systems realign the relationship between suppliers and customers by taking a product's life-cycle costs into account. In the case of PSS, the supplier often retains ownership of (and therefore responsibility over) more of the product life-cycle, while the incentives of the supplier and buyer to decrease costs are aligned. *Figure 3* shows how an alignment of incentives can reduce costs and benefit the environment when chemical management services are provided by a service provider.

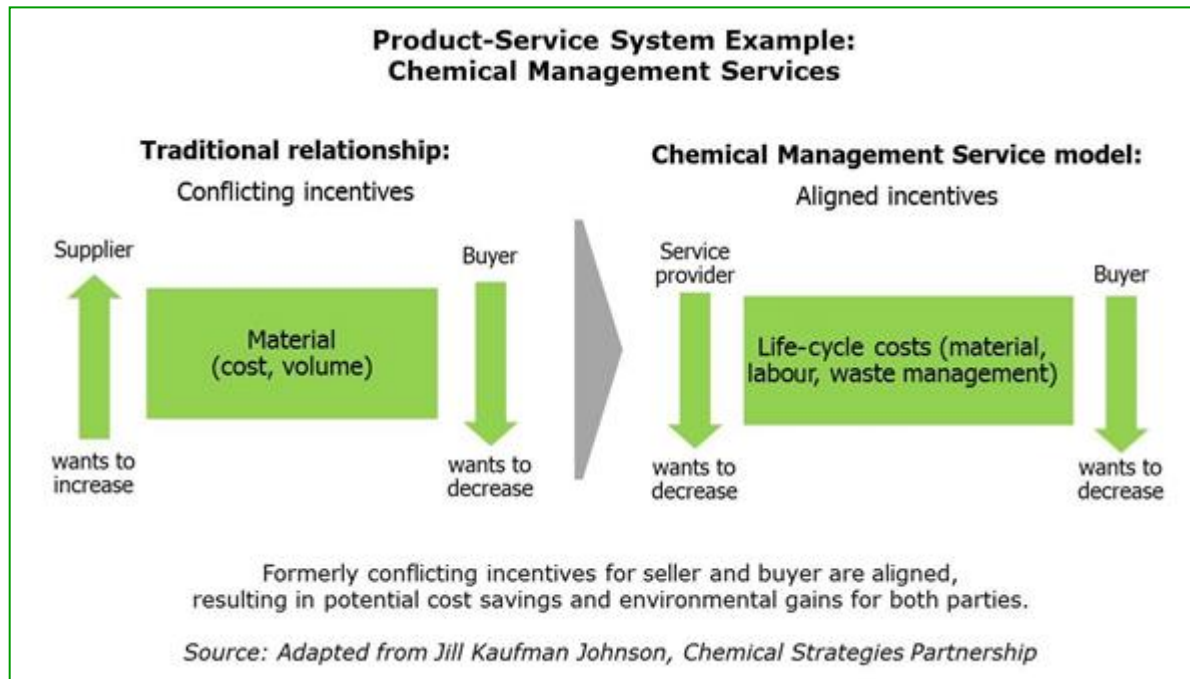


Figure 3: How use of chemical management services can align buyers' and suppliers' incentives

Furthermore, if manufacturers or retailers retain ownership of their products, planned obsolescence (e.g. in the case of mobile phones that may be considered out-of-date within a couple of years of purchase) could become less desirable.

Product-service systems thus have great potential to decouple consumption from economic growth. When consumers receive the full benefit of a product as part of a service, it is no longer in the interest of the providers to maximise production and sales. Instead, they have incentives to focus on quality and durability.

Nevertheless, sustainability benefits are not inherent in PSS. These systems are not automatically greener or less resource intensive than traditional product procurement models. The right approach needs to be taken to ensure that there are economically and environmentally preferable outcomes for buyers and suppliers alike.

Research by Agrawal et al. (2012) and others indicates that leasing does not necessarily have a positive impact on the environment in terms of environmental impacts over a product's life-cycle. In some cases disposal fees and other measures that encourage reuse and remanufacturing⁵ can lead to greater environmental impacts. However, educating consumers to use the products provided under a service contract more efficiently or responsibly can improve the environmental performance of leasing.

Agrawal et al. (2012) found that the two main factors which need to be considered to ensure that leasing (or renting) is a more profitable and greener strategy are: 1) product durability, and

⁵ Remanufacturing is the rebuilding of a product to the specifications of the original manufactured product, using a combination of reused, repaired and new parts (see, for example, Johnson and McCarthy, 2014).

2) the environmental impact of the use phase. This study looked at leasing models that involved products with varying levels of durability and use phase impacts. It concluded that:

- Leasing can be good for business and the environment when products (e.g. personal printers, photocopiers and lighting) have a higher use phase impact (compared to production and disposal impacts) and low durability.
- In the case of products with a high use impact but higher durability (e.g. washers, dryers and refrigerators), leasing can be beneficial for the environment when product durability is higher under leasing.
- Leasing may turn out to be more profitable – but worse for the environment – when products (e.g. laptops and carpets) have a higher production and disposal impact. However, the environmental impact will be less when recycling and remanufacturing take place.

Efficient and careful use of leased products by customers can be facilitated through the provision of clear instructions or training, especially when this benefits both the customer and the leasing company. One example is training in eco-driving, which can result in lower fuel costs for the customer and less vehicle wear and tear for the leasing company. Another is the provision by the leasing company of instructions, and/or the use of default print settings, which can reduce paper consumption by the customer and wear and tear on equipment. Leasing that entails a per-use charge (e.g. per kilometre, per printout) also gives customers an incentive to minimize consumption.

Vezzoli et al. (2014) argue that PSS should be specifically designed and developed to deliver sustainability. They suggest that PSS incentives require redesign of the production and consumption cycle and conclude that, when properly undertaken, 'PSS development seen as a whole presents great potential for generating win-win solutions that promote profit and environmental benefits. It has the potential to provide the necessary, if not sufficient, conditions to enable communities to leapfrog to less resource-intensive (more dematerialised) social and economic systems.'

Further work is needed to develop a practical manual clearly outlining the cost and sustainability benefits of PSS options, and to give some direction with respect to contract language, metrics and standards to help ensure that PSS are both economically and environmentally preferable.

Dahmani et al. (2013) have identified the key dimensions of industrial transition, using PSS, as the following:

- **PSS technical design:** The technical design should be based on a whole life-cycle assessment of the product itself and its use within the PSS model. This assessment should take into account sustainability aspects, as well as the (apparent) costs and benefits of the PSS, in order to be able to design the optimum solution and factor this solution into the procurement process.
- **PSS business model transformation:** Business models need to incorporate the right incentives to support the technical design and create added value for all parties involved. There is no 'one size fits all' approach; several business models may be applied and fine-tuned according to each situation. For example, solar panels are sometimes rented by customers for regular fixed amounts based on installed capacity. If payments were instead determined on the basis of the amount of energy generated, this would incentivize regular maintenance of the panels by the rental company, which would want to optimize the panels' output. Such a shift in approach would provide environmental benefits (in terms of energy efficiency) as well as economic benefits for the customer.
- **Organizational changes required to support PSS implementation:** The organizational structure of both the leasing company and the contracting authority needs to support the transformational changes in order to be effective. That is, service providers should consider restructuring their traditional sales approach and interlinked functions, such as financing and project/contract management. Public sector organizations also require organizational

support for changes to, for example, financing, contract management, tendering procedures, asset management and risk management. Good collaboration is a prerequisite.

3. How do product-service systems enhance sustainable public procurement?

Public procurement is increasingly perceived by governments as a useful instrument to achieve policy goals and take wider responsibility for supporting sustainable consumption and production (SCP). Sustainable public procurement (SPP) is a process whereby organizations meet their needs in a way that achieves value for money *and* produces benefits for society, while minimizing damage to the environment.

Sustainability-related benefits are sometimes an unintended by-product of product-service systems (PSS), but they may also be intentional. PSS models such as product leasing, or selling products with take-back guarantees, can encourage 'closed-loop' production and consumption cycles. These models have the potential to lead to significant resource efficiencies, reduce risks, and encourage circularity in production and reuse. Governments can also maximize these benefits through the careful formulation of contracts. There are several examples of service contracts for PSS (e.g. chemical management services and vehicle sharing) which include an incentive for sustainability. When acquiring or purchasing PSS, procurers need to verify that the whole life-cycle is taken into account. (This could be ensured by using contract templates.) For example, contracts could include requirements for end-of-life management, the use of environmentally preferable products, supply chain indicators of sustainable practices, or provision of information on potential environmental impacts. The contract could also stipulate that certain sustainability standards be met and include appropriate metrics.

PSS also require new relationships between government organizations and the market in agreements to share risks and cooperate in a new way. Maximizing benefits requires careful attention, communication and experience, as well as time to shape the relationship in the best way.

Social benefits may also occur throughout the whole life-cycle. Depending on the specific product group, PSS could generate jobs in, for example, repair, maintenance or recycling services.

4. Drivers for the adoption of product-service systems by government organizations

Reducing the government's costs, the number of contracts, and the size of staff required for contract administration and contract management are among the reasons for government organizations to adopt PSS. In addition, the public sector can motivate change within and across economies through 'leading by example' and transforming the sectors where government purchases are among the largest. This could also reduce the market risks of innovation investments, especially when government organizations effectively communicate their needs and intended approaches with the market. Government organizations generally procure a wide range of services, including security, ICT, banking, travel, arrangements for meetings and other events, cleaning services, waste management and building maintenance. PSS can help them meet their environmental, social and financial objectives, while governments can provide PSS with a stable market for maturation of sustainable PSS, which can then be replicated by businesses and consumers.

A significant amount of public procurement is undertaken through tenders and contracts. The main objectives of public procurement are: to provide a range of necessary services to citizens,

prioritized in terms of local and political contexts; to achieve societal goals; to secure value for money for the taxpayer; and, increasingly, to outsource activities that are not part of core government activities.

The main criterion for choosing a particular service is typically the quality and cost-efficiency of that service. In many sectors specialized companies are better equipped than a government entity to do the job and are therefore more efficient. Technical complexity (e.g. that of servicing various types of installations), seasonality or irregularity of activities (e.g. maintenance of green spaces) or temporary use (e.g. renting vehicles or hosting events) are other reasons to contract for a service. When activities are considered essential, or for reasons of security or when safeguarding employment is deemed important, government organizations may choose to undertake these activities themselves. Some services may also be undertaken through a public-private partnership (e.g. with energy companies, or for building construction or rail projects).

Using services that include life-cycle management of associated assets (e.g. stock management, maintenance, the repair of equipment and components, and end-of-life management) relieves government entities of these tasks. This allows resources to be focused on core government activities.

5. Drivers for the development of product-service combinations by companies

In the private sector the initial move to PSS was largely motivated by the need for traditionally oriented manufacturing firms to cope with changing market forces, together with the recognition that providing services in combination with products could generate more profit than selling products alone. Faced with shrinking markets and the increasing commoditization of their products, some firms have seen service provision as a new path towards greater market share and company growth.

PSS models restructure the economic relationship of how businesses provide value-added to their customers' purchases. PSS help businesses:

- capture more market share by providing value-added services that set them apart from their competitors
- tap into new markets that capitalize on new customer needs and demands, and initiate new and valuable relationships with customers that help service providers anticipate their changing needs
- achieve a level of flexibility that allows them to adapt more easily to changes in the market and competitor actions.

Benefits that may be realized in the longer term, but are less tangible, include the following:

- The life-cycle approach and value chain cooperation inherent in PSS provide new opportunities for sustainability improvements, such as increasing the durability or reparability of products within the supply chain and balancing risk factors among actors. Through working on joint solutions to common problems, significant shared gains can be made, such as pooling of knowledge.
- Product-service systems can be an important part of a firm's corporate social responsibility (CSR) or environmental strategy through the introduction of thinking and working in terms of life-cycles. This allows companies to evaluate strategically where significant progress can be made with respect to the major challenges faced by industry, as well as to anticipate and avoid potential future risks.

- Regulations and standards in the policy domain are becoming increasingly stringent in response to the growing sustainability imperative. Companies that use life-cycle thinking will often be significantly ahead of regulatory requirements, as well as able to influence a regulation under development. This, in turn, can provide a competitive advantage. When a regulation is implemented, these companies will have anticipated the change; made innovations with the right materials, technologies and processes; and tested new solutions.

6. Considerations when procuring product-service systems

The procurement of services is not new. Today public entities often acquire various forms of product services (e.g. IT and photocopying). However, ensuring that PSS are the more sustainable procurement option requires special attention and a new way of thinking beyond traditional services – such as preparing for a different way of operating across an organization, driving innovation, and preventing technological lock-in.

Assessing the sustainability potential of PSS as a procurement option is challenging. A decision needs to be made about which product groups are appropriate, and how all elements of the life-cycle may be captured across the government organization. This includes aspects such as procurement, labour, product storage, transportation, use, and end-of-life disposal. There is also the issue of how to include life-cycle elements beyond the organization (e.g. sourcing of materials and their processing, the fate of IT hardware or vehicles when they are taken back by a service provider) and how it can be guaranteed that products are actually reused or recycled in the intended way. Such insights and experiences are not unique to one organization or country; therefore, learning from one another can be valuable, as can undertaking procurement/supply chain management training.

The current market needs to be explored for existing **product-service combinations** and challenging business offerings that focus on sustainability through market consultations, innovation programmes or pilots. Such exercises can help provide insight into viable options in the short and longer terms.

Factors to take into account when switching to PSS – the larger context

Do the PSS under consideration conflict with the country's view of inherently governmental functions? In some cases, a switch to PSS may shift a government service to the private sector. Moreover, an employment shift may have government function ramifications. Countries' views on the role of government vary widely. Procedures and policies need to be in place to ensure that acquiring PSS does not conflict with these views. For example, in the United States there are national government policies concerning inherently governmental functions, and procedures are in place to guard against outsourcing of these functions. Contracts for cleaning buildings are common since this activity is not considered inherently governmental. However, in some countries government policy may be directed towards creating more low-skilled jobs (e.g. cleaning, some types of maintenance and repair) in the public sector. Outsourcing such jobs would conflict with these countries' policies.

Understanding the rationale behind the functions a country considers inherently governmental can help determine whether the use of PSS could be a procurement option. Is the concern related to societal responsibilities (e.g. employing the disadvantaged, preventing environmental harm, and creating a thriving, healthy community)? Outsourcing may mean a government has less control over achieving a societal goal since businesses, understandably, may have different motivations and goals. However, many pressures (e.g. related to customers, stakeholders or standards) are motivating businesses to become more socially and environmentally responsible. If a concern relates to societal responsibilities and attaining goals, are there legal requirements? Can the government create procurement policies and include contract language and metrics to overcome concerns?

Can the government's budgeting process align with the type of financing that characterises PSS? Addressing **the administration of cost and the planning of government budgets** is another challenge to the public and private sectors. Both buying and selling organizations are generally geared towards administering investments, rather than longer-term contracts that include services with different payment systems (e.g. monthly).

How will risk sharing be handled? In the case of larger projects, such as in construction, **risk sharing** is a key issue. Risks in traditional tenders are generally borne by the government organization. With PSS, the technical and financial risks may be (at least partly) transferred to the service provider. It is important for the party best equipped to address risks to do so. For example, in public lighting or construction projects technical and maintenance risks may be handled best by a private contractor, while government organizations may be best equipped to handle potential external damage (banks can cover financial risks).

Are there economic incentives that create disincentives to the use of PSS? The **fiscal system** may not yet be prepared for new business models. Fiscal incentives are generally directed towards new investments. Thus reuse, recycling or services are not currently considered. Sometimes existing laws may work against PSS (e.g. where taxes are structured so that both the principle contractor and sub-contractors are taxed on income from the same work). This makes PSS a less attractive and more costly option since these systems often involve relationships with sub-contractors. Finally, tax advantages are generally based on annual budgets rather than on annual payments.

How do legal or regulatory requirements affect PSS procurement? The impact of **legal requirements on PSS** is hotly debated, as these requirements can often constitute an obstacle. On the other hand, many of the cases investigated show that public procurers often find a way to deal with legal issues. Though legal aspects can complicate the use of PSS, they do not appear to hinder the leading actors in the field. However, in order to achieve wider implementation, adapting legislation to include further incentives for the sustainable use of PSS will be required. For example, current European public procurement legislation provides additional options for contracting services, including market dialogue. These options can be promoted in practice. New EU directives include further provisions to encourage life-cycle costing (LCC) and to include the costs of externalities. These directives might be considered a means to facilitate further development of more PSS-friendly national legislation. Legislation might still need to go a step further by providing a stronger framework **for making companies more accountable** along the whole product life-cycle – from acquiring raw materials and resources, through production, to recycling, reuse and final waste management.

What can be done to ensure that **small and medium-sized enterprises (SMEs)** are not potentially disadvantaged when they seek to respond to public tenders requesting PSS? SMEs may struggle to compete effectively for PSS contracts, for example with respect to structuring long-term contracts that include guarantees/warranties, participating in a time-consuming pre-competitive process, or the significant lag time for contract pay-out. Companies need banking solutions to pre-finance their investments. This is especially true in the case of SMEs. The risks involved in participating in PSS are proportionally larger for SMEs because they have fewer financial resources to invest. Support and collaboration can help to develop mutual experience and knowledge, as well as risk sharing.

What metrics/tools can be used to assess whether PSS have been the better procurement choice? Experts have highlighted the lack of simple tools to **assess the sustainability performance of services** and the lack of experience with these new forms of performance-based contracting.⁶ They also often cite innovative procurement techniques as more pressing

⁶ For example, the experts who took part in the Working Group 3A Meeting on Product-Service Systems and their Insertion in Sustainable Public Procurement, held in Seville, Spain, on 21-22 October 2013 (see Annex II of this report). A complete summary of the findings of that meeting can be found on the Global Sustainable Consumption and Production (SCP) Clearinghouse website (<http://www.scpclearinghouse.org/c/5-sustainable-public-procurement/event/114-meeting-of-the-sppi-working-group-on-integrating-products-service-systems-in-sustainable-public-procurement-.html>).

obstacles. This is corroborated by the cases studies in Annex I. These obstacles, however, can be remedied by building up experience over time, exchanging lessons learned, and creating the required tools on an empirical basis.

Factors to take into account when switching to PSS – the tender procedure

Concerning the **tender procedure** itself, the most important aspect yet to be addressed is how to define need, the functions that services will fulfil, and the most appropriate performance indicators. This implies procurement undertaken using functional specifications with related performance indicators, as opposed to the use of detailed technical specifications. Both companies and public sector procurers need time to become accustomed to their new roles. For the procurer, this involves relinquishing a certain amount of control over detailed operational aspects and learning to manage contracts with external organizations by using performance indicators effectively. Experience also shows that the time required to undertake certain stages of the procurement procedure tends to shift from the tender specification to the preparation phase (the actual definition of need and market engagement) and the contract management phase.

In defining the performance expected from the PSS, the procurer can require bidders to provide different compensation and equipment/product management options for comparison, such as pay-per-use, cost-sharing, take-back, and traditional sales.

Tenders require details on contract duration, distribution of ownership, risk management and guarantees. Furthermore, explicit descriptions of the equipment/products, maintenance, operation, and end-of-life management of the equipment/products associated with the service are generally necessary.

It will be a new experience for many public procurers and companies to include contractual provisions for much longer periods than in the past (e.g. valuing equipment/products over 15 years, or even including options for reuse, refurbishment, recycling and waste management).

Several barriers and challenges are faced by both procurers and companies. These may be addressed effectively as part of long and close relationships, with the parties working together. In shorter, more arms-length relationships the parties will (and should) be more careful and explore possible risks and rewards first.

This is a learning process for both parties, which requires ongoing dialogue and the intention on both sides to develop reasonable solutions. The key to success is information sharing.

7. How can sustainable public procurement help businesses to develop a PSS offer?

Governments can help to expand business opportunities by developing PSS-related policies and making them part of existing procurement policies, and by creating clear markets for companies' offerings.

It is not sufficient to produce a policy paper. A common complaint by businesses is that they develop services based on policies, but in practice the expected change lags behind. Policy-makers and/or organizations that undertake public procurement have a duty to turn their policy goals into practical guidelines for considering the procurement of PSS, adjusting the procurement process (including tenders) accordingly.

This requires a coherent top-down approach, supported by both policy and practical activities such as:

- embedding commitments in corporate policy
- raising awareness of the use of PSS among all relevant stakeholders

- coordinating and sharing international research, knowledge and experience, including through training and communities of practice
- using market engagement and dialogue before and during the procurement process
- developing contract templates and examples of specifications to ensure that environmental criteria are included in PSS
- developing structural tools (e.g. annual product category plans) for implementation on an organisational level
- sharing pilots and lessons learned from PSS tenders already undertaken (not only successes: we also learn from our mistakes)
- publishing annual market assessments, providing an overview of the new services businesses can offer, and stimulating competition and innovation, which can also help procurers to look beyond familiar services and companies
- facilitating collaboration, in particular addressing the position of SMEs.

Conclusions

In this brief overview of PSS, available information has been consolidated and presented alongside concrete experiences of the use of this approach by government organizations. Public procurement can nurture and harness the potential of PSS to drive environmental sustainability and trigger market transformations towards more sustainable business models.

However, PSS can only truly contribute to sustainable development when they are consciously designed over the whole life-cycle. This requires different ways of thinking and working throughout the procurement process and supply chains, acquiring experience on how to encompass all important aspects of the life-cycle and putting the adequate organizational and business models in place. The authors would like to reiterate the observation in Vezzoli et al. (2014) that, when done properly, 'PSS development seen as a whole presents great potential for generating win-win solutions that promote profit and environmental benefits. It has the potential to provide the necessary, if not sufficient, conditions to enable communities to leapfrog to less resource-intensive (more dematerialised) social and economic systems.'

Care must therefore be taken not to promote product-service systems (such as leasing) without qualification. PSS are not automatically greener and can sometimes have an even greater environmental impact than traditional models. Obtaining more knowledge about the ways PSS can be organized to deliver sustainability benefits – ideally on all three levels: social, environmental and economic – as well as more clear-cut cost savings requires more work. Putting sustainability benefits to the test also requires further research. Finally, there is a strong need for the development of practical tools, including checklists and model contracts, to enable practitioners to supply or procure PSS that deliver what is expected from them.

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Annex I: Case Studies

Introduction

Product-service systems (PSS) build on the concept of ordinary services, but they introduce a shift towards functionalities and use orientation. Many examples of PSS are available on a product level, such as imaging equipment (paying by the number of copies), lease or rental of magnetic resonance imaging (MRI) equipment and other cost-intensive medical appliances used in hospitals, vehicle sharing, or even leasing of clothes to individual consumers.

At the system level, PSS are still quite new. Some examples are available of the provision of lighting in office buildings, such as Philips' 'Pay per lux' service in which customers pay for the lighting in the building while the firm maintains ownership of the materials and can offer maintenance and upgrades to the customers.¹ Another example of PSS at the system level is the so-called 'servicizing' of a street, whereby the supplier takes responsibility for the street's construction as well as surface maintenance, lighting, street furniture, etc.

Several examples of PSS at product and system levels are described in the case studies in this annex:

1. Biomass heating services for public buildings (Finland and Scotland)
2. Car sharing as part of public fleet management (Bremen, Germany)
3. Supplying office furniture and carpeting in a circular model (the Netherlands)
4. Designing, financing, building, maintaining and operating the Millau Viaduct (Rhône Valley, France)
5. Chemical Management Services at the Stanford Linear Accelerator Center (United States)
6. Construction of a temporary office for a period of 20 years, Brummen Town Hall (the Netherlands)
7. Other examples from the public sector (Göteborg, Sweden, and Perth and Kinross, Scotland).

¹ Rau, T., 'Intelligent lighting: designing with responsible consumption in mind', *Guardian* (London), <http://www.theguardian.com/sustainable-business/intelligent-lighting-designing-responsible-consumption>.

1. Biomass heating services for public buildings (Finland and Scotland)

Product-service concept

Biomass heating services for public buildings and for local district heating.

Sustainability: Biomass replaces oil; contribution to reducing greenhouse gas emissions; use of local wood as a fuel source; new employment/income for local farmers and heating service enterprises.

Business model: Selling heat instead of wood; ownership of heating plants is shifted from public authorities to local enterprises. The service can cover the whole chain from production of raw material to production of heat, operation and maintenance, or only parts of the chain.

Project description

Finland

In Finland local heating companies often produce heat for local district heating systems. They mainly use fuels based on wood originating from their own forests or others nearby. Heating companies work alone, or as part of cooperatives, to run the local district heating systems in practice. Companies' income is derived from the payments made for heating premises.

At the beginning of the 1990s some Finnish municipalities started to invest in biomass heating systems for municipal buildings such as schools and homes for the elderly (output < 1 MWth). At the same time, farmers established a new form of rural enterprises, so-called 'heating service enterprises', aimed at supplying customers with heat produced from wood fuels.

It is estimated that wood chip production alone, excluding work carried at the heating plants, employs 0.22 persons/GWh annually.

The service provided by heating service enterprises is comparable to that provided by an energy service company (ESCO) whose objective is to design and implement energy savings projects with their remuneration directly tied to the energy savings achieved. Because this service is provided on a small scale through the involvement of local entrepreneurs, farmers and foresters, it could prove an interesting concept for use elsewhere, especially in developing countries.

Recently the defence authority, together with the government property agency,² issued a call for tender for heating services for several public defence buildings in eastern Finland. This would be the largest heating service procurement in Finland so far.



² The government property agency, called 'Senate properties', is a government-owned enterprise under the aegis of the Finnish Ministry of Finance. It acts as the government's expert on the working environment and working premises. Thus it manages, builds and operates government properties and working premises.

Scotland

Scottish Procurement has put a framework in place concerning agreements for the provision of biomass energy supply that can include design, build, finance, maintenance and operation (DBFMO). This PSS is another example of a heating service based on the provision of heat from biomass (wood waste and chips) rather than procurement of the fuel itself. A life-cycle approach, from sustainable forest management (beginning of the life-cycle) through to sustainable waste management (end of life), is taken into account and included in the tenders.

The Scottish Government's Renewable Heat Incentive (RHI) pays participants in the framework to generate heat for its buildings using renewable energy sources. The framework assists local authorities, registered landlords that provide social housing, police and fire departments, and the Third Sector³ in realising the financial benefits of the RHI. This also reduces the administrative burden on public sector and third sector organizations that would otherwise need to establish their own heating service contracts.

The Scottish example differs considerably from the Finnish one, in that the heating suppliers in Scotland operate on a larger scale. The Buyers' Guide under the Framework provides suggested criteria and guidance for the whole process of building, maintaining and operating boilers. It includes standards for fuel testing, storage, and avoiding technical accidents such as burn-back. The Buyer's Guide also provides several detailed methods for measuring fuel efficiency.

Procurement considerations

Finland

The procurement of heating systems is usually conducted separately by each municipality and for each public building. Heating services can replace the traditional procurement of the heating system itself and the separate purchase of fuel.

The service can consist of the whole chain from production of raw material, production of heat, and operation and maintenance, or only parts of it. The service provider may be required to establish its own site or use an existing municipal facility. The system itself (i.e. the boiler, pipes, raw material) is owned and managed by the service provider. The public entity only buys heat.

The mode of operation is typically such that the heating company assumes responsibility for sourcing the wood fuel and using it to heat municipal buildings. Heating companies either produce the biomass themselves, or buy industrial wood residues from the local wood processing industry, and carry out operational and maintenance work at the heating plant. The heating service provider is paid according to the amount of heat generated. The price of heat is usually bound to the price of light fuel oil.

In the procurement of heating services, common criteria/performance indicators are:

- price in kWh
- life-cycle costs (investment, operation, repair, waste residues)
- energy source/amount of renewable energy
- size of production (neither too much nor too little)
- energy efficiency
- production certainty.

³ The Third Sector comprises community groups, voluntary organisations, charities, social enterprises, cooperatives and individual volunteers.

Service contracts are usually in effect for up to 10-15 years. This is especially important in circumstances where the service provider is required to invest in new production plants.

Scotland

The operation of biomass heating systems can be more complicated than that of conventional fossil fuel systems. It therefore implies additional risks for public authorities unfamiliar with such systems. Scottish Procurement's national framework for biomass (renewable heat) was designed to reduce these risks, for example by transferring responsibility for operating the boiler and sourcing of fuel to the supplier, which then sells heat as part of a service. This model also helps simplify the switch to renewable heating systems for public authorities that use the framework agreement.

The framework went into effect on 7 January 2013 for a period of two years, with the option of being extended for a further two years. There are nine suppliers, each of which must be invited to compete for all work under the framework.

Users of the framework will achieve best value by running a 'mini-competition' between the suppliers, although a 'direct-buy' option is available for urgent fuel orders.

The Buyers' Guide developed for public authorities buying under the framework agreement provides a detailed method for using the procurement process, along with the information that should be requested from potential contractors. A pre-commercial stage involving all framework service providers is included in the recommended procurement process to enable development of the project brief and criteria and their weighting in a particular situation.

Apart from a price quote, information is required on:

- fuel quality, extraction, feed, sampling and storage
- boiler/heat efficiency/heat metering
- maintenance regime
- plant size and other specifics.

Environmental and social value

Finland

Biomass heating is a good alternative to oil heating, especially in areas where there is no district heating. Locally available biomass energy resources are supporting Finland's efforts to increase the use of renewable energy and reduce emissions from fossil fuels, in line with the country's national climate and energy strategy.

Biomass heating systems require more expertise in the use phase in terms of transport, quality of the biomass, and operation of the heating installation. The heating companies are therefore best equipped to manage these activities, and heating services are a natural choice. This type of heating service is mainly provided by small local firms and replaces the purchase of imported fossil fuels from large multinational corporations. These firms help to enhance local economies by providing employment and promoting energy self-sufficiency and energy security.⁴

Scotland

The environmental benefits of using a biomass heating service include:

⁴http://www.motiva.fi/en/areas_of_operation/renewable_energy/bioenergy/heating_businesses_in_finland/energy_from_the_local_forests_benefits_for_the_local_economy_-movie.

- supporting delivery of a 'Low Carbon Scotland' by reducing net CO₂ output
- contributing to the attainment of the Scottish Government's target of meeting 11% of total heat demand with renewable solutions by 2020
- replacing fossil fuel with more sustainable, renewable wood fuel
- creating demand within a fledgling market.

In terms of social benefits, up to 275 jobs could be supported if uptake reaches the 70 MW of capacity expected to be installed through the framework.

Financial value drivers

Finland

In heating systems generating at least 1 MW_{th}, the costs saved by using wood chips instead of oil can be up to 50%. Smaller systems also save costs, but proportionally less (see page 13 in *Biomass Heat Entrepreneurship in Finland*, EUBionet, 2013⁵).

Scotland

Reducing costs for the public sector is also a driver in Scotland through:

- enabling public sector bodies to take advantage of the Renewable Heat Incentive (RHI) and to facilitate a move away from volatile energy commodity prices
- allocating financial risk where it can be managed most appropriately (e.g. boiler efficiency and related fuel quality issues are managed by specialist suppliers within the heat service provision).

SPP challenges and considerations

Contracting a heat service might bring some unfamiliar challenges, but it is already commonplace in traditional district heating systems in Finland.

In countries with less experience the challenges of conducting efficient and successful procurement can be reduced through the support of a large-scale framework agreement established by national or regional entities on behalf of smaller organisations with fewer resources, as in Scotland.

Risk management (Finland):

- **Sources of raw materials:** The user might want to guarantee the sustainable sourcing of the wood-based fuel or its origin. When using wood chips as fuel, it is not profitable to transport the fuel very far, which ensures that the fuel used is normally local (however, in eastern Finland some of the wood chips used come from Russia).
- **Use of raw materials:** The customer can demand, for example, a yearly report on the fuels used. In that way the customer can be satisfied that the heating service provider is fulfilling the requirements set out in the tender or the contract. This can be guaranteed through verification (e.g. spot checks or external audits) where appropriate.
- **Financial risk for the service provider:** The contract between the customer and heating company is for a long period, usually about 10 years. The minimum annual amount of

⁵<http://www.enersilva.org/areasubir/informes/Informe%20proyecto%20Eubionet%20biomass%20heat%20Finland.pdf>.

heat to be produced and bought is defined in the contract, which guarantees that the business will obtain a certain amount of revenue. Although the risk is small, securing financing is still quite difficult.

- **Low fuel quality:** Since heating service providers are responsible for the operation and maintenance of the boilers that are part of the heating system, it is in their own interest to ensure that the biomass used is of high quality. This is reinforced by the fact that they are paid for heat output, not per weight of fuel used (i.e. fuel efficiency is their objective, not trying to sell the maximum quantity of wood possible). Service providers are able to ensure fuel quality when they cultivate and process their own wood chips. Quality standards for wood chips (ISO 17225-4:2014⁶) can also be used when service providers subcontract the supply of fuel as part of the contract.
- **Damage to plant:** Heating service companies have insurance which can be used to replace damaged equipment. In larger heating plants there is usually a back-up boiler that uses oil, ensuring that heat is produced even when the main boiler cannot be used. The backup system can also be used at the same time as the main boiler when demand for heat is high.
- **Fuel availability:** In many cases biomass plants can use more than one fuel or different mixtures of fuels, such as wood chips and peat. They also have a large fuel storage capacity to cover short-term problems with fuel deliveries. Back-up boilers can be used when the availability of the main fuel source is compromised.
- **Price setting and volatility:** As in the case of district heating, the customer pays an amount per MWh of used heat and a basic monthly or yearly fee. These fees are indexed. The price of wood chips has remained stable in Finland, so price volatility has not been a problem to date.
- **Targets for renewable energy:** One potential concern is that oil companies (with their size and associated capacity to secure wholesale prices for fuel) may be able to compete with smaller-scale biomass providers. However, the share of renewable energy used to produce the heat can be established as part of the tender. In addition, the lower price of wood chips and pellets compared to that of oil and electricity is an incentive for heating service companies to increase their profitability using renewable energy.

Other remarks

A critical factor for success is to have enough suitable forests close by. If not, transport costs and the CO₂ emissions associated with transport will outweigh the benefits of this system, including local social benefits.

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⁶ http://www.iso.org/iso/catalogue_detail.htm?csnumber=59459.

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More information: "Heating Businesses in Finland"⁷ and *Biomass Heat Entrepreneurship in Finland* (EUBionet, 2013)⁸

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Photo: usfwsmidwest, Flickr.com

⁷http://www.motiva.fi/en/areas_of_operation/renewable_energy/bioenergy/heating_businesses_in_finland.

⁸<http://www.enersilva.org/areasubir/informes/Informe%20proyecto%20Eubionet%20biomass%20heat%20Finland.pdf>.

⁹<http://www.gov.scot/Topics/Government/Procurement/directory/Utilities/biomassesa/biomassbuyersguide>.

2. Car sharing as part of public fleet management in Bremen (Germany)

Product-service concept

The use of car sharing services by municipal organizations and other authorities to supply or substitute for their own fleet.

Project description

The concept and use of car sharing has spread across Europe (and North America) recently and has become quite popular in many cities.

Bremen's scheme has been chosen as an example to show the possibilities of integrating car sharing within public fleet management. In 2003 Bremen was one of the first cities in Europe to use car sharing to improve its fleet management. The city government uses the services of Cambio, the largest car sharing provider in Bremen. Cambio is also used by individuals and private businesses.

In 2009 Bremen adopted a new car sharing action plan, which aimed to combine previous achievements in this field and coordinate future developments. Thus car sharing would expand and become an integral part of Bremen's transport system. The overarching goal has been to reduce the negative impacts of transport on the environment. One specific aim has been to encourage 20,000 people in Bremen to become customers of a car sharing provider by 2020. To implement the Action Plan, the city recognized the need to strengthen interaction and the creation of partnerships between public transport operators and private car sharing schemes by:

- establishing common facilities
- considering car sharing when new development projects are designed
- offering viable solutions for both companies and public authorities
- developing a comprehensive public relations strategy.

Great progress has already been made towards achieving the city's car sharing goals. Cambio, Bremen's biggest car sharing provider, currently has around 10,000 members in the city. It has replaced more than 2000 private cars, saved 2.32 million kg of CO₂ emissions, and reduced parking infrastructure costs by at least EUR 30 million, according to the city's estimations.



Bremen's state law (Stellplatzortsgesetz) has now been revised to mandate consideration of car sharing as part of new development projects. This represents a step forward from the previous obligation for developers to guarantee parking space for vehicles and bicycles. A reduction in car parking space requirements was made possible by putting in place

special mobility management measures, such as car sharing schemes and public transport systems. By integrating car sharing into the planning of new developments, construction costs can be reduced, new options in urban design realized, and transport services improved.

Car sharing has also been incorporated into the city's administrative sector. Bremen's Senate Department for Construction, Environment and Transport made car sharing an integral part of the department's civil servant fleet management in 2003, helping to reduce the cost of vehicle maintenance, management and use. Currently, other public organizations (among others the Office of Finance, the library, the health service and the school for vocational training of the City State of Bremen) use car sharing as part of their fleet management. As of 2013, 332 civil servants were registered as authorized drivers. Further expansion of the use of car sharing is planned. By ensuring that diverse types of vehicle are available, the scheme can also be made more flexible.^{16,17}

Procurement considerations

In this case study, car sharing for business clients (including public institutions) is handled through framework contracts. Cambio's framework for its business clients has been specifically adapted for the contract with the city government. The city of Mannheim (Germany) has also concluded a framework contract with Cambio. The city's waste management company acts as the coordinating point through which other institutions can book cars.

The framework includes a Blue Angel ecolabel certificate. The main standard for the certificate is the carbon emission limit value. The Bremen framework states that no fleet vehicle bought during the term of the contract shall emit more than 230 g CO₂/km based on standard fuel consumption. The CO₂ emission requirement for the car sharing fleet of an operator is based on the adopted EU CO₂ legislation (Regulation (EC) No 443/2009, April 2009). This regulation defines an average fleet limit of 130 g CO₂/km. Plug-in hybrid cars and all electric vehicles may not be included into the calculation for the entire fleet.

The car sharing operator must also inform its customers about fuel-saving programmes organized by driving schools or other training providers in the area.

Environmental and social value

Car sharing reduces the use of natural resources by reducing the number of cars manufactured, and by establishing minimum environmental and energy efficiency thresholds. It controls and reduces CO₂ emissions and local air pollution.

To achieve its climate policy goals, Bremen aims to increase the number of users of car sharing to 20,000 in 2020. By including car sharing in the management of its own fleet, the authorities lead by example. The expansion of car sharing in Bremen has demonstrated the extent to which car sharing schemes can reduce traffic congestion. When integrated within a

¹⁶<http://www.senatspressestelle.bremen.de/sixcms/detail.php?gsid=bremen146.c.9456.de&asl=bremen146.c.25714.de>.

¹⁷http://www.gruene-fraktion-bremen.de/fileadmin/media/LTF/fraktionbremen_de/homepage/AntwKlAnfr_Mobilitaet_der_Verwaltung.pdf.

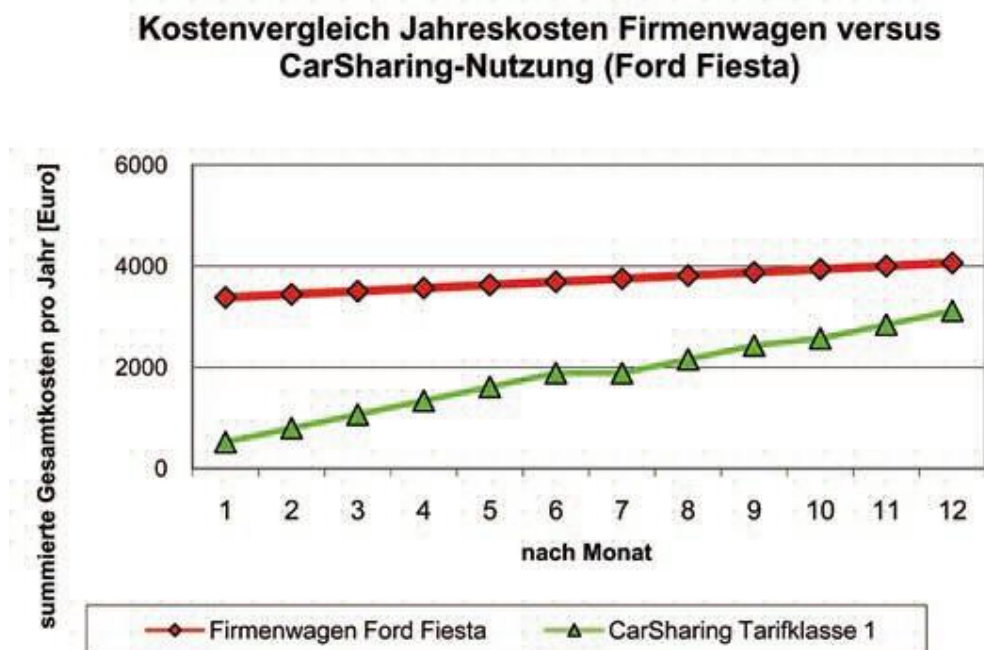
well-planned and reliable intermodal transport system (e.g. public transport services, bicycles), car sharing can help resolve existing parking and traffic problems.

Financial value drivers

The costs of purchasing, insuring, taxing and maintaining the vehicles involved in a car sharing scheme are distributed among the users. Use of a car is more intensive when the car is shared, so the financial benefits are clear. Public bodies have come to see car sharing as a viable cost-efficient alternative, especially if replacing previously under-utilized fleets purchased as part of standard procurement.

The graph below compares the cost of owning a small business car (red) and a shared car of this type (green) in the case of the German car sharing company Cambio.

Horizontal axis: months (1 = January). Vertical axis: cost in euros/year.



Source: *CarSharing für gewerbliche Kunden. Gute Beispiele der CarSharing-Nutzung in Unternehmen, Verwaltungen, Organisationen und Vereinen*, Bundesverband Car-Sharing, 2010), <http://www.carsharing.de/arbeitschwerpunkte/projekte/carsharing-fuer-gewerbliche-kunden>.

SPP challenges and considerations

Fees for car sharing include the total cost of use. To enable a fair comparison of costs by public procurers between the owned fleet and a shared fleet, it is important to include all costs related to the owned fleet as well: purchase, maintenance and fuel, but also parking space costs and, in particular, the cost of the staff administering the fleet.

Other remarks

The German car sharing organization cites the following success factors (from the private sector perspective) for above-average growth in the use of car sharing:

- Collaboration with public transport companies. Different options may be offered that can complement each other at any time. This encourages car users to opt for the most efficient and environmentally friendly option where possible;
- Car sharing for business. By spreading the usage time between private and business customers and across the day/evening, weekdays/weekend, the average use of vehicles is increased;
- Collaboration with communities and regions, as corporate customers and for political support.

Similar cases

The local authority of Mannheim is representative of the many local governments that have not only given car sharing in their cities political support, but are also using it for their own work journeys. After a one-year test period, participation by various city offices and departments was as good as that achieved by other institutions such as the national theatre and the political parties represented in the local council. The city parliament has also agreed on car sharing as its ongoing provider of work vehicles.¹⁸

The report *CarSharing für gewerbliche Kunden. Gute Beispiele der CarSharing-Nutzung in Unternehmen, Verwaltungen, Organisationen und Vereinen* discusses examples of good practice with car sharing in different contexts, including in the German cities of Mannheim and Wiesbaden. The report was published in 2010 by Bundesverband CarSharing.

In the United Kingdom, the London Borough of Croydon also uses a form of car sharing to meet its mobility needs but its procurement method has been different. To find a more efficient alternative to the traditional fleet approach, a competitive tender was launched. It quickly became apparent that a pay-as-you-go approach might be the solution. In 2010, a pilot scheme was begun with Zipcar, the country's largest pay-as-you-go car network. The idea is simple: rather than owning a car outright or leasing a fleet, council staff has exclusive access to 23 vehicles during standard working hours. These vehicles are available outside council working hours to Croydon's 1300 private Zipcar members, which means vehicle use is maximized.

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¹⁸ <http://www.stadtmobil.de/aktuelles/nachrichten/details/artikel/erstes-carsharing-hybridauto-faehrt-in-mannheim-an/>.

3. Supplying office furniture and carpeting in a circular model (the Netherlands)

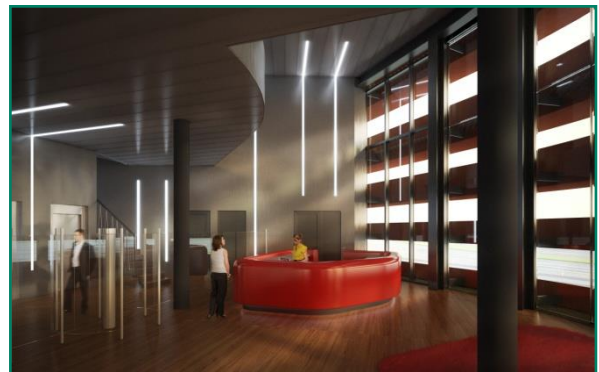
Product-service concept

Product-service model: Furniture and carpeting are supplied in a circular business model by the service provider, which offers cleaning and maintenance services combined with guidance on use. At the end of use, furniture and carpeting are returned to the service provider and then either reused or recycled.

Sustainability: Circular models imply a reduction in resource use and waste.

Project description

In 2013 a pilot was launched in the Netherlands with the aim of developing a more circular approach to carpeting and furnishing the office buildings of ProRail, the country's rail infrastructure company. The circular model, involving the reuse, remanufacture or recycling of end-of-life products, would replace the traditional 'take-make-use-waste' model. As circular procurement was still a new concept at this time, a pilot approach was taken in order



to test its application within a procurement procedure and learn as much as possible during the process. When responding to the call for tender, suppliers were requested to present both a traditional and a circular option to enable a comparison between the resulting costs and benefits. The tender included functional specifications, which provided more scope for suppliers to develop different solutions than a traditional procurement process. A precompetitive dialogue with several potential suppliers took place as part of the pilot. In the case of carpeting, the user buys the product, with a take-back guarantee after ten years. In the case of furniture, responsibility for the products remains with the supplier, so this is a type of lease.

Procurement considerations

The tender distinguished three aspects of awarding a contract. The following considerations were included.

Sustainability:

- possibilities for reusing the product

- possibilities for extending the life of the product
- possibilities for reuse (recycling) of materials or parts
- raw materials footprint
- CO₂ footprint
- closing the loop.

User value:

- assurance of the required level of quality
- product warranty
- flexibility of user wishes
- flexibility of use period
- unique product properties
- transfer at end of usage period.

Costs:

- total costs of ownership.

Environmental values

Products are specifically designed to enable reusability, refurbishment and recyclability and are therefore inherently more resource-efficient. Lower associated CO₂ emissions and other characteristics that promote sustainability are also 'designed into' these products.

Financial value drivers

At present, circular solutions often cost slightly more than traditional ones. This may change as waste collection services and landfill taxes increase over time.

In this pilot exercise circular carpeting solutions were offered at a comparable price to that of traditional solutions. However, circular office furnishing solutions were more expensive.

One reason for the higher cost of circular models is the small scale of these operations. In addition, several risk-related factors lead to higher price quotations:

- the difficulty of predicting the value of the product at end-of-life (in ten years)
- the continuity of the business in the long run (i.e. whether it will still exist in ten years)
- the complexity and associated risk of guaranteeing long-term performance and the quality of materials and parts supplied by upstream producers
- uncertainty about the cost of reuse and recycling in ten years time.

SPP challenges and considerations

Developing the tender with effective functional specifications requires dialogue with potential suppliers in order to gauge what the market has to offer and how best to stimulate innovation. This can be a complex and potentially time-consuming process.

Circularity can be a difficult concept for the procuring organizations to understand. The following conditions would facilitate an understanding of circularity and its insertion in SPP:

- developing criteria for evaluating/weighting the different aspects of offers (mainly circularity and sustainability versus cost)
- finding ways to compare different offers with slightly different business models
- producing Key Performance Indicators (KPIs) and defining quality throughout the life-cycle
- defining how to deal with risks (e.g. unintended damage to products)
- making life-cycle costs transparent
- fitting specifications for desired look and feel into the process of procurement.

Other remarks

A paradox exists in that functional specifications lead to custom-made and, in many respects, superior solutions, whereas standard 'one size fits all' products are easier to refurbish/reuse. Deciding how to deal with this paradox will determine the success or failure of the circular approach.

Upscaling the circular economy is a key condition for achieving truly competitive product-service systems.

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4. Designing, financing, building, maintaining and operating the Millau Viaduct (France)

Product-service concept

A design, build, finance, maintain and operate (DBFMO) contract for infrastructure.

Specific aspects: private funding; financing through a 78-year concession to collect tolls.

Project description



The Millau Viaduct (Viaduc de Millau) in France is the highest viaduct in the world. It carries a crucial southbound motorway across the Tarn Valley.¹⁹ Construction, which was funded privately, is financed through the collection of tolls. The contract (including design, building, operation and maintenance until 2121) was concluded in 2001 with a single partner.

Costs were:

- project development: EUR 15 million
- preliminary work: EUR 10 million
- construction and delivery: EUR 320 million (including 1% for economic and regional development).

The viaduct provides regional access and development, promotes tourism, and reduces traffic congestion in nearby urban areas. At the same time, the best solutions for the environment have been sought (e.g. reforestation, incentives to reduce noise and air pollution) as well as the best value for money and benefits for local employment.

Procurement considerations

The decision to procure the Millau Viaduct under a concessional/build-finance-operate-transfer (BFOT) scheme was made in 1998 by the French Minister for Transport. The concession was awarded by the Ministry for Transport to the construction group Eiffage.²⁰

The main features of the contract are:

- The concession is at the concessionaire's own risks and the profits are the concessionaire's.
- The total period of the concession is 78 years (three years of construction: 36 months plus three months without penalties; 75 years of operation).
- Respecting the architectural design is compulsory.
- The concessionaire is responsible for development of the technical aspects. The Ministry did not require a particular construction material, either steel or concrete.
- The toll rates must be approved by the Minister for Transport.
- The durability of the structure is guaranteed for 120 years.²¹

¹⁹ http://www.leviaducdemillau.com/en_index.php.

²⁰ <http://www.eiffage.com/en/home/le-groupe-1/our-projects/projets-acheves/le-viaduc-de-millau.html>.

²¹ http://www.omegacentre.bartlett.ucl.ac.uk/wp-content/uploads/2014/12/France_Millau_Summary.pdf.

Environmental and social value

As the State has entrusted the concessionaire with certain rights for the construction, including the capacity to buy land, it also supports compensation costs related to the existence of the infrastructure such as those associated with noise, protection of the environment and visual disturbance. These effects are dealt with at a fixed rate, so the concessionaire has an incentive to minimize them.

Financial value drivers

The decision related to the lack of public funds available to provide the A75 motorway's missing link (i.e. the Viaduct), which represented an investment of approximately EUR 400 million. During the initial planning stage this link was conceived of as a free highway without any toll.

As the public budget could not accommodate such expense, the only way to avoid postponing the project delivery – and its economic benefits – was to find a source of alternative funding.

Thus the Millau Viaduct came to rely exclusively on private finance. More precisely, the initial investment relied on the corporate funds of Eiffage, which then renegotiated a loan from the banks at a lower interest rate once construction risks were reduced.

SPP challenges and considerations

From experience with the DBFMO model, it is clear that risks have to be shared in a sensible manner to make this model work and provide benefits to both the public and private sector entities involved.

The total investment of about EUR 350 million was financed primarily through Eiffage's equity. Because the project was of European interest, the European Investment Bank (EIB) contributed to the financing. EIB awarded a loan to Eiffage on 28 October 2002. The capital expenses related to the Viaduct could be summarized as follows:

- Eiffage: 100% of financing of the site works (EUR 320 million)
- EIB: a loan of EUR 50 million to Eiffage
- State financing of the end of the A75.

The profitability of the infrastructure depends on the toll barriers. Revenue from the collection of tolls is the main source of income for the concessionaire.

In this regard, one reason for selecting Eiffage's offer was the absence of a subsidy from the government. The toll concession is aimed at compensating the concessionaire for the risks taken in such an ambitious construction project. The profitability of the infrastructure is based on it. The duration of the concession (75 years) was calculated on the basis of traffic/tariff. However, the duration can vary according to performance; indeed, this period can be reduced to 44 years in the case of increased levels of traffic. The toll rates are regulated by the contract and indexed to the retail price index.

Differentiated rates for the months of July and August were part of Eiffage's offer when the company bid for the concession. This is a way to discriminate between demand by charging more for the traffic generated by holiday trips and transit via the commune of Millau.

The concession period ends on 31 December 2079. Such a long concession aims to improve visibility and pay off the debt, ease amortization, and make the infrastructure more profitable for the concessionaire. However, it also creates an opportunity for the concessionaire to benefit from 'undue income' by generating excessive revenues from the operation of public infrastructure. The period of the concession can therefore be reduced at the concessionaire's request as soon as the accumulated income is greater than EUR 375 million (accounting for a discount rate of 8%) but not before 31 December 2044. In other words, if the generated revenues exceed EUR 375 million, the infrastructure could be transferred to the State after 44 years of private ownership (including the period of construction).

Once the construction risks had been reduced, Eiffage refinanced the Viaduct, calling on various banks and funding agencies.

Similar cases

The offices of the Dutch Ministry of Finance (with about 1750 employees) were renovated and partly redesigned through a design, build, finance, maintain and operate (DBFMO) contract. Renovation resulted in a modern building with the best available facilities.

The DBFMO contract made possible a total cost of ownership (TCO) approach. The party that won the tender approached the project from this point of view, enabling several beneficial possibilities. These included more durable materials, with a higher acquisition cost but a better life-cycle value (over the 25-year contract duration), along with more sustainable and economically effective (climatological and other) techniques applied and equipment operated and maintained by the contractor.

The DBFMO contract is approximately 15% cheaper than a conventional contract. DBFMO includes not just the initial costs, but also maintenance and operation of the building or structure. For the contract period of 25 years the initially more expensive alternative seems to be preferable, not only economically but also environmentally. The building's climatological performance meets the highest Dutch standards (thus also saving on energy costs). Furthermore, green public procurement was used for the purchase of materials.

Socially, the building appears to meet the work-related standards of employees much better than before renovation.

DBFMO in this case means looking 25 years ahead and taking all maintenance and operational costs into account. It requires procurement departments (and procurement systems) to be prepared for this kind of long-term contracting. An integral approach is also required, and more in-depth initial calculations have to be made. Risks are more difficult to assess in long-term contracts. Considerations include: Will the contractor still exist after 25 years? Might new, preferable technologies become available during the building's operation?

Contact

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5. Chemical Management Services at the Stanford Linear Accelerator Center (United States)

Product-service concept

On-time delivery, safe chemical management, and take-back of laboratory chemicals.

Product-service model: Laboratory chemicals are delivered on time in specified amounts. The laboratory no longer needs to maintain a stock of chemicals or deal with out-of-date inventories and hazardous waste management. There are many other benefits in terms of reducing labour costs and freeing space.

Sustainability: Less out-of-date stock means less is thrown away. A specialised company deals with environmental, health and safety issues.

Project description

The National Accelerator Laboratory at the Stanford Linear Accelerator Center (SLAC) is one of ten United States Department of Energy (DOE) laboratories. It is operated by Stanford University on behalf of DOE. SLAC performs basic science research for the government and is considered a federal facility, managed within DOE. SLAC houses thousands of researchers.

The chemical management services (CMS) provider warehouses chemicals commonly used by SLAC and provides next business day just-in-time (JIT) delivery of warehoused chemicals. The service provider provides all sourcing, purchasing, expediting and Tier 2²² vendor management support for all non-radioactive chemicals and gases used by SLAC.

SLAC launched its site-wide CMS programme in 2005. After two years of operation, 200 people were using the CMS programme on a daily basis. In the first six months of the programme, 170 users in 35 work areas requested more than 1600 different chemicals through a central ordering system provided by the CMS provider.



²² Manufacturers sometimes refer to companies in their supply chain as tier one and tier two suppliers. The terms indicate the commercial distance in the relationship between the manufacturer and supplier.

Procurement considerations

Chemical management services constituted a huge business change. In the contract SLAC included services that it felt were the “core” proposition of a CMS programme:

- e-commerce
- an online catalogue
- IT logistics
- an offsite, vendor-managed inventory
- point-of-use delivery
- Material Safety Data Sheet (MSDS) management
- An environmental, health and safety (EHS) reporting platform
- incentives for cost and waste reduction.

The CMS contract had a two-year base period, with two two-year options. SLAC worked with the service provider to develop a set of performance metrics to track the programme, with monthly reports on the following metrics:

- cost
- commodity cost reduction
- management cost savings
- quality/service
- on-time delivery
- mission critical products (e.g. helium and liquid nitrogen)
- acceptance rate
- shrinkage rate
- scrap/obsolescence rate
- environmental safety and health standards
- injuries/illness
- chemical spills/releases
- training
- participation in infrastructure improvement
- hazardous waste reduction.

Environmental value

The main environmental benefits realized by the CMS programme were reduction of wastage and spillage, and substitution of hazardous chemicals (e.g. Chromium 6) with less hazardous ones.

Financial value drivers

SLAC's CMS programme produced considerable cost savings. The system greatly simplified the chemical delivery process, making it more efficient overall. Savings were quickly realized in material purchase costs, inventory carrying costs, MSDS management, EHS labour, and annual hazardous material inventory activity. Prior to the CMS contract, SLAC faced 56 audits related to EHS in one year (more than one audit per person engaged in EHS-related work). The CMS system greatly eases the burdens of such audits.

SPP challenges and considerations

Some of the challenges SLAC has faced with its CMS programme are described below. While some are unique to SLAC, many others are likely to apply to government entities in general:

- support within the organization
- satisfaction of individual researchers, which can be increased by explaining turnaround time expectations to the service providers
- the need to get used to different ways of doing business (e.g. a different system of purchasing and paying, longer service contracts, integration of required software, dealing with data security issues).

Similar cases

Chemical management services are also used by Quaker, Henkel, ChemicoMays, PPG and the Haas Group International.

Source

A full case study was produced by Chemical Strategies Partnership and published in February 2008.²³

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²³ http://www.chemicalstrategies.org/resources_casestudies.php.

6. Building a temporary office for a period of 20 years, Brummen Town Hall (the Netherlands)

Product-service concept

Product-service model: Reusability and recyclability are taken into account in the design phase. Dismantling and take-back are included in the contract.

Sustainability: Reuse/recycling leads to less waste and retention of embedded energy.

Project description

The Dutch company Turntoo has an alternative business model based on retaining its products throughout the life-cycle rather than selling them to consumers. The Turntoo model fits into the broader trend of PSS or extended producer responsibility, which integrate services into a product offering.

With the launch of the new town hall in the Dutch municipality of Brummen, Turntoo delivered the first building conceived as a raw materials 'depot'. The building is a temporary arrangement of construction materials, of which all details are known including their destination in a subsequent second use phase or 'second life'.



In its request for proposals, Brummen asked for a temporary office for a period of 20 years. A Turntoo building turned out to be the answer: a design made for disassembly, consistent use of reusable and renewable high-quality construction materials, and a contractual approach that guarantees circularity at the end of the intended use period. The supporting structure, façade and floors are made from wood in pre-

fabricated components. The use of concrete has been minimized. The wooden components can easily be dismantled and reused in a next building. Interestingly, manufacturers requested several minimal yet important design changes so that the components could be used more easily in their second-life application.

Procurement considerations

- maximum sustainability within the available budget
- performance requirements
- making the greatest possible use of knowledge in the market.

Contract award criteria

- price
- design
- planning
- opportunities/risks
- quality management
- corporate social responsibility (CSR)/sustainability
- presentation.

Price and sustainability were each awarded a maximum of 30 points, so had equal importance.

Environmental and social values

This approach promises several environmental benefits:

- Producers retain ownership of a product and derive their profits from its use rather than its sale; therefore, they have an incentive to make the product as durable and efficient as possible. Materials are used as many times as possible before they have to be replaced.
- Once the building reaches the end of its life, the producer will disassemble it and the materials will re-enter the production loop, reducing the demand for virgin raw materials. 95% of the design consists of components that can be disassembled and reused.
- The energy embedded in the products at production is retained at the highest possible level by reuse.

Financial value drivers

With an estimated total cost between EUR 1 million and EUR 5 million, the building is 30% cheaper than two other comparable town halls recently built in the vicinity.

SPP challenges and considerations

The original design included maintenance by Turntoo. This was not included in the final contract, however, because of different choices in regard to the amortization (writing off) of the financial investment.

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7. Other PSS-related examples from the public sector: Göteborg, Sweden and Perth and Kinross, Scotland

There are a number of other **PSS-related examples** from the public sector. These examples do not necessarily include a service provided by a company, but they can be important in regard to the product life-cycle. They include the dedicated reuse of products, which may take place through internal marketplace initiatives such as product pooling.

In these two examples from Göteborg, Sweden, and Perth and Kinross, Scotland, government organizations do not procure PSS directly, but they indirectly stimulate the sorting, reuse and/or refurbishment of products and the creation of employment and opportunities for SMEs.

Kretsloppsparken in Göteborg, Sweden

In Göteborg, Sweden, a reuse and recycle park has been designed to look and function like an amusement park. It attracts 300 to 400 visitors a day, has sold end-of-life products for a value of EUR 1.1 million, has created 25 green jobs, and is radically reducing the amount of waste that would have to be disposed of otherwise.

The Swedish name for this recycling park is Kretsloppsparken, or 'circle park', emphasizing its aims, which are to achieve both circularity and amusement. Kretsloppsparken was created by the municipal waste management company, but it is far more than a sorting station.

At Kretsloppsparken donated items are repaired and cleaned and then sold in shops in the park area. The City Mission, for example, has a large second-hand shop at the venue selling items such as furniture and clothing. Återbruket sells donated building materials such as windows, doors and plumbing; heating and sanitation products; and household appliances. There is also Returhuset, which sells products made from recycled materials. Finally, there is a restaurant which serves mainly organic food.

More information:

<http://www.zerowasteeurope.eu/2011/08/kretsloppsparken-recycling-or-amusement-park/>.

<http://www.greengothenburg.se/open-access-recycling-centres>.

<http://tinyurl.com/p54gs4o>.

The furniture procurement policy of Perth & Kinross Council, Scotland

Perth & Kinross Council has set an example in its approach to providing furniture – avoiding the need to procure new furniture in all but a few cases, while satisfying the requirements of the organization. This has saved the Council money, reduced environmental impacts, and stimulated the development of new business models.

The Marrakech Approach on Sustainable Public Procurement introduces the 'procurement hierarchy', which encourages organizations and individuals to apply the principles of the waste hierarchy at the earliest possible stage of the acquisition process.²⁴ Over the past

²⁴ The principal objective of the Marrakech Approach on Sustainable Public Procurement is to promote and support the implementation of public procurement programmes that encourage the uptake of sustainable products and

three years, and with senior management support, Perth & Kinross Council has changed its policy on the procurement of furniture for its own use and is applying the principles of procurement hierarchy:

- Reducing the need to buy comes first, so that close examination of what is already available helps to reduce overall demand.
- Reuse comes next, so that if surplus furniture is available within the Council this will be used first. Perth & Kinross Council uses a third party facilitator to store and catalogue its surplus furniture. A flat rate fee is charged for storing these items, which are made available whenever required.
- Reuse can also involve using other people's surplus furniture. This means the Council has made use of furniture that was surplus to the requirements of other users but met its requirements.
- The next option is to buy reused furniture through an existing framework. Three providers are currently able to offer reused furniture. Finally, the 'buy new' option is reached, but only after all other alternatives have been explored.

Through its 'buy last' furniture procurement policy, Perth & Kinross Council has achieved cost savings and environmental benefits in the same package. The savings have been substantial:

<u>Year</u>	<u>Expenditure</u>
September 2010	£292,904
October 2011	£131,499
November 2012	£61,300
December 2013 (projected)	£33,000 (approximately)

These figures help to overcome the widespread misconception that sustainable procurement always costs more. Analysis indicates that over 92% of this expenditure is through contracts, showing again how a drive to achieve SPP helps support good procurement practice.

Source: *Sustainable Procurement in Scotland: A Collection of Case Studies*.²⁵

services. To view the main achievements of the Marrakech Task Force, please visit <http://esa.un.org/marrakechprocess>. The Marrakech Task Force on SPP, led by the Government of Switzerland since 2005, ended its mandate on 2011 and was replaced by the Sustainable Public Procurement Initiative (SPPI), launched in June 2012 at the Rio+20 Conference (<http://www.unep.org/resourceefficiency/Consumption/SustainableProcurement/SustainablePublicProcurementInitiative/tabid/130242/Default.aspx>). The 10YFP Programme on SPP further amplifies and extends the impact of the SPPI.

²⁵<http://www.scotland.gov.uk/Topics/Government/Procurement/policy/corporate-responsibility/CSR/examples/ZWS>; also see <http://www.gov.scot/Topics/Government/Procurement/policy/corporate-responsibility/CSR/Marrakech>.

Annex II: Report of the Working Group 3A Meeting on Product-Service Systems and their Insertion in Sustainable Public Procurement, Seville, Spain, 21-22 October 2013

The kick-off meeting of Working Group 3A on product-service systems and their insertion in sustainable public procurement took place in Seville, Spain on 21-22 October 2013. It was held in the context of the Sustainable Public Procurement Programme of the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP).

The meeting was organized as an interactive workshop for sharing practical experiences and discussing views on product-service systems (PSS) in terms of opportunities, challenges, and environmental and economic impacts. It was attended by 21 experts. A complete summary of the findings of the experts who took part in the Seville meeting can be found on the Global Sustainable Consumption and Production (SCP) Clearinghouse website.¹

The findings in the technical report *Using Product-Service Systems to Enhance Sustainable Public Procurement* (to which this meeting report forms Annex II) are for the most part based on the experiences and contribution of these experts.

Key findings and observations

1. Product-service systems (PSS) have the potential to be used in sustainable public procurement, especially in providing **new ways to reduce our reliance on materials and resource consumption** and new ways to create jobs and facilitate long-term economic competitiveness and security. However, the benefits have not been clearly articulated and their practical use in sustainable public procurement (SPP) requires groundbreaking work in redefining classic relations between supplier and customer.
2. **Different terminology** is used for product-service systems, e.g. 'servicizing', 'functional sales', 'green' or 'resource-efficient' business models, 'eco-efficiency' and the 'circular economy'. Greater clarity of the concept would help to generate a common understanding of PSS and incorporate it into SPP.
3. Product-service systems are **not by definition sustainable**. PSS can include incentives for sustainable practices, but this needs to be organized and specified in the right way. Details on what is needed to ensure sustainability within the services are required to maximize their potential.
4. More **research on an assessment framework is needed** to effectively determine the sustainability and economic impact of the different PSS options. Currently, research on PSS is fragmented, lacking data (both quantitative and qualitative) or not supported by a comprehensive assessment framework.
5. The objective of PSS is to gear consumption and production patterns towards **sustainability through enhanced company accountability and responsibility throughout the life-cycle**.
6. Inserting **life-cycle costing**, including environmental impacts, can help facilitate a shift towards sustainable product-service systems.
7. More **dialogue with the market** is required: How can we include functional thinking in the procurement process? What services are available? What are their sustainability and cost benefits? How can the life-cycle (e.g. the user and end-of-life phases of products/services) be considered in procurement? Also, for procurers, more guidance and training is required on how to formulate **performance based (functional) specifications**.

¹<http://www.scpclearinghouse.org/c/5-sustainable-public-procurement/event/114-meeting-of-the-sppi-working-group-on-integrating-products-service-systems-in-sustainable-public-procurement-.html>.

Suggested Working Group activities

1. *Define concepts*

- Provide definitions for product-service systems (PSS) and other related concepts so we know what we are talking about.
- Develop a better way of talking about PSS and these other concepts.

2. *Provide direction*

- Confirm the position of the Working Group on key challenges – what is real and what is not.
- State the ambition of the Working Group's overall effort (articulate the sustainability vision and the measures of success), the important policies, and the strategies and instruments (how we will do this).
- Develop a reward system that recognizes progress (e.g. removing toxicity).
- Help promote more sustainable priorities and ambitions among governments through information and influence.
- Use results of the gap analysis noted below to prioritize research and action.
- The Working Group should form a group to address sustainable supply chains (e.g. where are PSS available or where might they be encouraged?) and make a proposal to the Sustainable Public Procurement Initiative (SPPI).

3. *Share information*

- Host trainings and webinars to share information.

4. *Develop products and tools*

- Identify what tools are already available and build on them.
- Do research to assess the sustainability of PSS schemes and related products so that people can compare them (e.g. how does acquiring the service compare to acquiring the product?).
- Develop case studies that demonstrate the benefits of PSS, including costs, challenges, sustainability benefits and environmental impacts.
 - Expand on examples provided during the meeting (e.g. in Finland, Switzerland).
- Develop tools that help make the process for acquiring PSS more repeatable.
 - Help people understand how their cases apply.
 - Help people understand how to transfer ideas and processes to different situations.
- Develop a methodology for 'circular' procurement – the steps in the process, the skills needed and the capabilities people should have.
- Develop easy-to-use tools that help people understand when to use PSS – this could be through case examples or by expanding on existing models (e.g. Vishal Agrawal's work²).
- Identify lessons from private sector procurement that will inform public sector efforts.
- Conduct a gap analysis that helps identify where there are examples and where there are not.

² See, for example, Agrawal, V.V., M. Ferguson, L.B. Toktay and V.M. Thomas (2012), 'Is Leasing Greener Than Selling?', *Management Science*, Vol. 58, No. 3, pp. 523-533, <http://pubsonline.informs.org/doi/abs/10.1287/mnsc.1110.1428>.

About the UNEP Division of Technology, Industry and Economics

Set up in 1975, three years after UNEP was created, the Division of Technology, Industry and Economics (DTIE) provides solutions to policy-makers and helps change the business environment by offering platforms for dialogue and co-operation, innovative policy options, pilot projects and creative market mechanisms.

DTIE plays a leading role in three of the seven UNEP strategic priorities: **climate change, chemicals and waste, resource efficiency**.

DTIE is also actively contributing to the **Green Economy Initiative** launched by UNEP in 2008. This aims to shift national and world economies on to a new path, in which jobs and output growth are driven by increased investment in green sectors, and by a switch of consumers' preferences towards environmentally friendly goods and services.

Moreover, DTIE is responsible for **fulfilling UNEP's mandate as an implementing agency for the Montreal Protocol Multilateral Fund** and plays an executing role for a number of UNEP projects financed by the Global Environment Facility.

The Office of the Director, located in Paris, coordinates activities through:

- > **The International Environmental Technology Centre - IETC** (Osaka), which promotes the collection and dissemination of knowledge on Environmentally Sound Technologies with a focus on waste management. The broad objective is to enhance the understanding of converting waste into a resource and thus reduce impacts on human health and the environment (land, water and air).
- > **Sustainable Lifestyles, Cities and Industry** (Paris), which delivers support to the shift to sustainable consumption and production patterns as a core contribution to sustainable development.
- > **Chemicals** (Geneva), which catalyses global actions to bring about the sound management of chemicals and the improvement of chemical safety worldwide.
- > **Energy** (Paris and Nairobi), which fosters energy and transport policies for sustainable development and encourages investment in renewable energy and energy efficiency.
- > **OzonAction** (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition to ensure implementation of the Montreal Protocol.
- > **Economics and Trade** (Geneva), which helps countries to integrate environmental considerations into economic and trade policies, and works with the finance sector to incorporate sustainable development policies. This branch is also charged with producing green economy reports.

DTIE works with many partners (other UN agencies and programmes, international organizations, governments, non-governmental organizations, business, industry, the media and the public) to raise awareness, improve the transfer of knowledge and information, foster technological cooperation and implement international conventions and agreements.

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Government organizations and the private sector are beginning to use product-service systems (PSS) to insert direct incentives for sustainable thinking and acting into their procurement processes.

Growing interest in PSS is part of a more fundamental shift towards obtaining services that fulfil customer needs without the obligation to purchase a product.

This implies an essential change in perspective from ownership to use, taking into account impacts over the entire life-cycle of a service or product.