EUROPEAN PARLIAMENT

DIRECTORATE-GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT A
ECONOMIC AND SCIENTIFIC POLICY

Economic and Monetary Affairs

Employment and Social Affairs

Environment, Public Health and Food Safety

Industry, Research and Energy

Internal Market and Consumer Protection

Leasing Society

STUDY

EN

2012

Leasing Society

EUROPEAN PARLIAMENT

DIRECTORATE GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Leasing Society

STUDY

Abstract

The vision of a *leasing society* is characterised by a new relationship between producers and customers. This new relationship is based on innovative and more service-oriented business models to meet customer needs with novel approaches to ownership and responsibility. This study explores the *leasing society* in four chapters. It (1) examines the basic ideas behind the concept, (2) presents a collection of case studies, (3) summarises strengths and risks, and (4) concludes with policy options that could support the transition to a *leasing society*.

IP/A/ENVI/ST/2012-10
PE 492.460

November 2012
EN

This document was requested by the European Parliament's Committee on Environment, Public Health and Food Safety.

AUTHORS

Ms Susanne Fischer, Wuppertal Institute for Climate, Environment and Energy
Mr Sören Steger, Wuppertal Institute for Climate, Environment and Energy
Mr Nino David Jordan, Wuppertal Institute for Climate, Environment and Energy
Ms Meghan O'Brien, Wuppertal Institute for Climate, Environment and Energy
Dr Philipp Schepelmann, Wuppertal Institute for Climate, Environment and Energy

RESPONSIBLE ADMINISTRATOR

Mr Lorenzo Vicario
Policy Department Economic and Scientific Policy
European Parliament
B-1047 Brussels
E-mail: Poldep-Economy-Science@europarl.europa.eu

LINGUISTIC VERSION

Original: EN

ABOUT THE EDITOR

To contact the Policy Department or to subscribe to its newsletter please write to:
Poldep-Economy-Science@europarl.europa.eu

Manuscript completed in November 2012.

This document is available on the Internet at:
www.europarl.europa.eu/studies

DISCLAIMER

CONTENTS

LIST OF ABBREVIATIONS

B2B Business-to-Business

B2C Business-to-Consumer

C2C Consumer-to-Consumer

CMS Chemical Management Services

EIP European Innovation Partnerships

EPR Extended Producer Responsibility

GDP Gross Domestic Product

IPM Integrated Pest Management

PSS Product-Service Systems

SME Small and Medium-Sized Enterprise

LIST OF BOXES

LIST OF CASE STUDIES

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The shift toward a *leasing society* could be one opportunity for business to increase competitiveness in an environmentally friendly way. While a *leasing society* could become a key element of a resource-efficient Europe, it is probably not a solution in and of itself. This study presents both (i) a vision of a leasing society, characterised by innovative business models and customers willing to make greater use of new product-service systems, and (ii) the risks if development follows conventional leasing models and business-as-usual trends.

The vision of a *leasing society* is characterised by much more than just a widespread leasing of goods. Rather, it is about finding the best way to fulfil customer needs, generally in new and more service-oriented ways. It implies a new relationship between producers and customers as it changes traditional notions about product ownership and responsibility. Increased producer responsibility may create incentives for more resource-efficient product design, especially to prolong product life, enable easier remanufacturing and optimise utilisation.

Case studies reveal that the theoretical advantages of service-oriented business models can result in real benefits. Especially examples of companies offering services, like chemical management and mobility, instead of selling products, like chemicals and cars, are widespread. Nevertheless, these kinds of business models are offered and requested by only a few enterprises.

Moreover, it is difficult to assess the potential macro-economic impacts based on single case studies. Product-service systems can be connected to considerable trade-offs. If a *leasing society* develops toward conventional product leasing alone, it could be more environmentally harmful (e.g. if it leads to rebounds in customer behaviour regarding the turnover of goods) and contribute to negative social impacts (e.g. outsourcing jobs at lower pay and worse conditions).

Strong policy direction is needed to mitigate risks and encourage development toward the vision of a *leasing society*. Current policies, like the Eco-Design Directive, could be enhanced to promote a *leasing society*. Policy instruments like taxes could also be used. For instance, a *leasing society* could be supported by a shift in taxation from labour towards resource consumption, reduced VAT rates for extended maintenance and repair, and extended depreciation rates.

In summary, this study concludes that a *leasing society* has the potential to bring economies onto a more sustainable pathway. However, economic, social and environmental impacts depend on both the choice of product-service systems and *how* they are implemented. Further research is necessary to expand knowledge and understanding of the complex macroeconomic impacts of service-oriented business models in a *leasing society*.

INTRODUCTION

The European Commission (EC 2011) has identified a dual challenge for Europe: "*of stimulating the growth needed to provide jobs and well-being to its citizens, and of ensuring that the quality of this growth leads to a sustainable future*." These challenges are rooted in the fact that business-as-usual patterns of production, consumption and disposal cannot be sustained in an equitable way over the long term.

Global resource extraction and use increased by 78 % between 1980 and 2008 (SERI 2011). The EU imports around 6 times more materials than it exports (EEA 2010) and per capita material consumption in Europe is around 40 % higher than the world average (Dittrich et al. 2012). The EEA (2010) highlighted the fact that the world is experiencing environmental change at an unprecedented speed and scale. Although many of the immediate impacts have been outside of Europe's direct influence, interconnected risks and increased vulnerabilities pose new challenges "*for the resilience and sustainable development of the European economy and society*" (EEA 2010).

Recognizing these challenges, the European Commission has made resource efficiency one of the seven flagship initiatives of the Europe 2020 strategy for smart, sustainable and inclusive growth. Activities to develop targets for reducing resource consumption are underway at the European level. The key question facing policy makers, industries, business and citizens is how to decouple primary resource use from wealth and well-being. A significant reduction of primary resource consumption will most likely require structural change in the way economies use resources. It will mean a transition away from linear models of increasing extraction, production, consumption and disposal to more resilient circular models of efficient as well as consistent resource use and re-use. This is the basic idea behind a green economy, a circular economy and a resource-efficient Europe.
A so-called "*leasing society"* could become one of the key elements of a green economy and resource-efficient society. The concept of a *leasing society* has received a lot of attention recently, especially as a win-win solution for increasing competitiveness in an environmentally friendly way. This report puts *a leasing society* into perspective by asking what it is, what it can achieve, where its limits are and how it can be fostered at a policy level.

This report argues that how *a leasing society* is implemented is key to maximizing economic, environmental and social benefits. While there are a number of success stories, evidence of potential macro-economic benefits or drawbacks is largely missing. Anecdotal evidence indicates that the type of leasing is important. Novel and innovative product-service systems to meet customer needs in a resource-efficient way are the pinnacle of a leasing society. Conventional product leasing may represent the beginning of such a society, but measures to ensure that activities progress toward more result-oriented and resource-efficient services are needed.

Chapter 1 begins by presenting a vision of a *leasing society*. It describes the implications of a *leasing society* on products and services, property and responsibility, and use and consumption. Chapter 2 takes a detailed look at actual business cases where leasing was made a successful part of business models. It summarises key barriers and drivers identified from the case studies. Chapter 3 assesses the possible strengths and weaknesses of a *leasing society*. It argues that different types of product-service systems have different economic, social and ecological impacts. Chapter 4 examines policy instruments with the potential to support the transition toward *a leasing society*. It highlights how existing measures could both contribute to and be enhanced, as well as what new instruments could be used, to promote development of a *leasing society* in the EU.

1. THE LEASING SOCIETY: A VISION

KEY FINDINGS

- A *leasing society* is characterised by a new relationship between producers and customers based on (1) new and more service-oriented business models and (2) new ways to define product ownership and responsibility.
- Changed ownership structures and increased producer responsibility may provide incentives for more resource-efficient product design, especially to prolong product life, optimise utilisation and enable easier remanufacturing or recycling
- In a *leasing society*, the aim of business is to meet customer needs in the best possible way. Both innovative business models and customers willing to make greater use of product-service systems are needed to turn the economic and environmental potential of a *leasing society* into a reality.

Leasing is not a new concept. In its original meaning, leasing refers to a special contract between the owner of an asset and the user of that asset, which gives the latter the right to use that asset for a certain amount of time. During the contract period, the owner, not the user, is responsible for maintenance and repairs. After the contract has expired, the owner receives the asset back.

A "*leasing society*"—as it shall be understood within this study—is much more than just a widespread leasing of goods in the conventional sense. Rather, **a *leasing society* stands for a society that is characterised by a new relationship between producers and customers**. It is based on (1) new and more service-oriented business models to fulfil customer needs and (2) on new ways to define product ownership and responsibility. As those kind of characteristics are also typical for traditional leasing contracts, this economy-wide change of producer-customer relationships could be called a *leasing society*.

A ***leasing society* would change the way business is done**. It could lead to changed production and consumption systems, and thus impact how resources are used and re-used. In the big picture, this could contribute to a more resource-efficient economy. This chapter presents a vision of a *leasing society*. It focuses on three key changes:

- **Products and services**: In a *leasing society*, what business sells to customers (their value proposition) is different. Products are still manufactured, but from the customer perspective they are complemented—if not substituted—by services. Product-service systems (PSS) will become a more mainstream element of typical business models.
- **Property and responsibility**: Changed ownership structures in a *leasing society* transfer responsibility for upkeep, maintenance and disposal from customers to producers/retailers. This creates incentives for more resource-efficient and durable production. It also re-orientates the value chains for physical goods toward more circularity (products are returned to the "owner" at the end of use instead of disposal). As such, the *leasing society* indicates a shift in both producer and consumer thinking that is more in line with the ideas of a circular economy (Braungart 1991).
- **Product use and consumption**: The vision of a *leasing society* implies changed ways of by whom and how the products are used or consumed. Exchange relationships between private customers could partly replace traditional business-customer relationships in the future.

The **vision of a *leasing society* is characterised by new economic structures and consumer behaviours**. It could contribute to shifting conventional production and consumption models, largely based on linear supply chains, toward more circular value-chains. Increased producer responsibility for products in their use phase may provide incentives to extend the life of products. Recent press articles suggest that the concept of a *leasing society* could play a role in making Europe more resource-efficient (Marsden 2012; Merkies and Lowitt 2012; Merkies 2012a; Merkies 2012b). The three characteristics of the vision, as well as their implications, are presented in more detail in the following sections.

1.1. Product-service systems and value-added services: Merging environmental and economic objectives

The ***leasing society* is a concept that merges environmental and economic objectives**. Under different terms, it has been explored from both the environmental sustainability perspective as well as the business management perspective and supported by several findings from specific sectors like the chemical industry (Lay, Schroeter, and Biege 2009).

On the environmental side, the concept of a *leasing society* is strongly connected with the concept of "product-service systems". The discussion about product-service systems was spawned by Stahel and Reday in 1976, who called for a shift of activities from manufacturing to service, that would concentrate on long-term leasing, maintenance and reconditioning activities (cited by Hockerts 2008). In 1999, the first paper on product-service systems was published by Goedkoop et al. and since then, a number of academic papers have picked up on and developed the term and the concept behind. Table 1 gives an overview of definitions that paved the way for the present understanding of product-service systems and that recent articles and studies about product-service systems are based on (Baines et al. 2007; Hockerts 2008; Lay, Schroeter, and Biege 2009; EPA 2009; Wimmer et al. 2007).

Table 1: Selected definitions of product-service systems and similar concepts

PSS and similar concepts within sustainability research
In 1997, **Stahel** launched the call for a "**service economy**", whose "*focal point is the optimization of use, i.e. of the performance and the results achieved with goods, rather than the goods themselves*" (Stahel 1997, 1310).
In 1999, **Goedkoop** et al. introduced the term of a "**product service system**", being a "*marketable set of products and services, capable of jointly fulfilling a user's need*" (Goedkoop et al. 1999, 18).
In 2000, **Mont** introduced the idea of a "**society of product-service systems**", meaning "*the change from a focus on producing and consuming to a society where the service components are increasingly replacing the more traditional material intensive ways of product manifestation, that provides individuals and organisations with the possibility to fulfil needs through the provision of more dematerialised system solutions*" (Mont 2000, 34).
In 2000, **Mejkamp** described "**eco-efficient services***" as "all kinds of commercial market offers aiming fulfilling customer needs by selling utilisation of a product(system) instead of providing just the product." These services relate to products where at least "some of the property's rights are kept by the producer*" (Meijkamp 2000, 35).
In 2000, **Manzini** defined a "**product-service system**" as "*the result of an innovation strategy, shifting the business focus from designing and selling physical products only, to selling a system of products and services which are jointly capable of fulfilling specific client demands*" (Manzini and Vezzoli 2000, 4).

In 2001, **Brezet et al.** used term "**eco-efficient services**", these are "*systems of products and services, which are developed to cause a minimum environmental impact with a maximum added value*" (Brezet et al. 2001, 8).

In 2006, **Tukker** et al. defined a "**product-service**" as "*a value proposition that consist of a mix of tangible products and intangible services designed and combined so that they jointly are capable of fulfilling final customer needs*" (Tukker, Berg, and Tischner 2006, 31).

In 2007, **Baines et al** spoke of a "**product-service system"** as a "*market proposition that extends the traditional functionality of a product by incorporating additional services. Here the emphasis is on the 'sale of use' rather than the 'sale of product.' The customer pays for using an asset, rather than its purchase, and so benefits from a restructuring of the risks, responsibilities, and costs traditionally associated with ownership*" (Baines et al. 2007, 1543).

Parallel to the development of the product-service continuum in environmental sustainability research, **the business perspective developed the concept of "value-adding services", which is very similar to the concept of "product-service systems"**. Research on value-adding services focuses on how business can change their value proposition to meet customer needs in more service-oriented ways. Environmental impacts here are rather subordinate, however the call for more service-orientation (e.g. through selling functionality or performance) implies a change of incentives on the producer side that could effect the environmental performance of production and consumption, indirectly. Table 2 presents an overview of definitions and concepts related to value-adding services.

Table 2: Selected definitions of value-adding services and similar concepts

Value-adding services within the business management research
In 1988, **Vandermerwe and Rada** presented thoughts regarding **"servitization"**, which is the movement from "*the old and outdated focus on goods or services to integrated 'bundles' or systems, as they are sometimes referred to, with services in the lead role*" (Vandermerwe and Rada 1988, 314).
In 2001, **Stremersch et al**. defined **"full service contracts"** as "*a comprehensive bundle of products and/or services, that fully satisfies the needs and wants of a customer related to a specific event or problem*" (Stremersch, Wuyts, and Frambach 2001, 2).
In 2002, **Toffel** introduced the term **"selling functionality"**, which "*change*(s) *the nature of the relationship between manufacturers and customers by aligning their incentives to reduce the total cost of product functionality over its entire life span, which has the potential to influence product design*" (Toffel 2002, 2).
In 2003, **Ölundh** defines **"functional sales"** as "*offers made to […] consumers, which included both goods and services and attracted payment that was connected with fulfilling a consumer need*" (Ölundh 2003, 5).
In 2004, **Davies** states that *"[s]ome of the world's leading suppliers are developing strategies to move into the provision of innovative combinations of products and services as '**high-value integrated solutions**' tailored to each customer's needs*" (Davies 2004, 727).
In 2005, **Markeset** and **Kumar** defined the **"functional product"** as "*an alternative to selling and supporting a conventional product"* and further *"the customers do not buy the industrial products/systems/machine, but instead buy performance such as drilled meter per shift, volume per hour, etc.*" (Markeset and Kumar 2005, 54).
In 2007, **Kim et al.** described that **"'performance-based contracting' is reshaping service support in capital-intensive industries […], it aims to replace** *traditionally used fixed-price and*

cost-plus contracts to improve product availability and reduce the cost of ownership by tying a supplier's compensation to the output value of the product generated by the customer" (Kim, Cohen, and Netessine 2007, 1843).

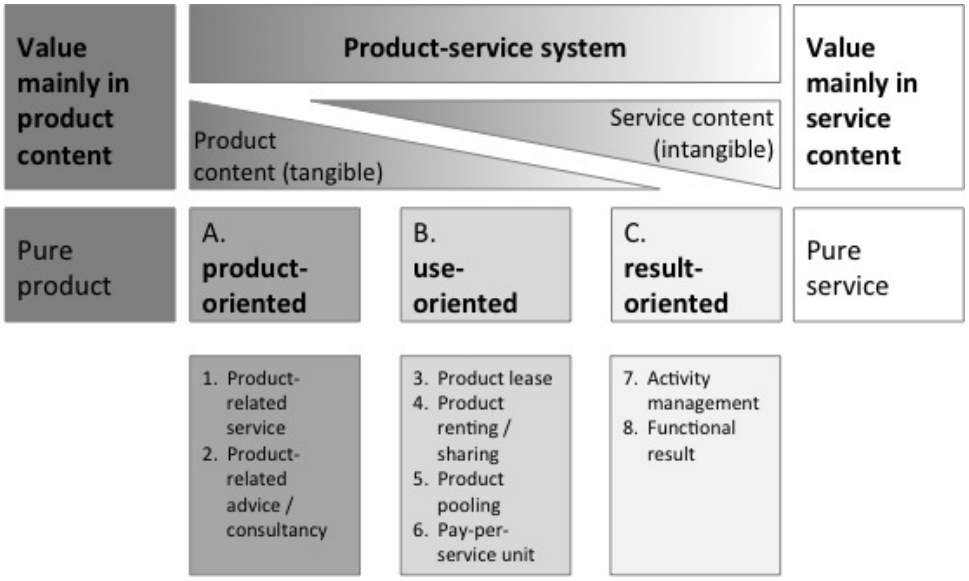
In 2010, **Ng and Nudurupati** define **"outcome-based contracting"** as "*a contracting mechanism that allows the customer to pay only when the firm has delivered outcomes, rather than merely for activities and tasks*" (Ng and Nudurupati 2010, 657).

Both the concepts of "product-service systems" and "value-adding services" emphasise the shift from products to services and the changed property rights in order to meet customer demands on a new level. The concepts span a wide range of activities on the continuum between pure products (tangible objects that exist in both time and space) and pure services (consisting solely of intangible acts or process(es) that exist in time only) (Shostack 1982). According to Baines et al. (2007), defining the type of a product-service is more than the dichotomous decision between products and services; it is more a "servitization" of products and a "productization" of services. A **number of typologies to analyse product-service systems have been developed** (Cooper and Evans 2000[1]; Hockerts et al. 1994[2]; White, Stoughton, and Feng 1999[3]). Three types of product-services have been identified by Tukker et al. (2006):

1. **Product-oriented strategies** put the product into the focus of the business activity. The customer buys the product and retains ownership of it, but also extra after-sale services are provided. These services could be product-related (e.g. financing scheme, maintenance, repair or take-back agreement) or include training and advice in order to optimise the product application.
2. **Use-oriented strategies** change the ownership structure of the traditional selling and buying activities—use, not products, is sold. Different forms of consumption (e.g. alone or shared with others) and payments (e.g. per time unit or service unit) are possible.
3. **Result-oriented strategies** meet customer needs in new ways. Instead of selling the product or selling the use of a product, the result of the product is sold. For example, the customer may purchase an outsourced activity from a third party (e.g. cleaning) or buy a predefined functional result (e.g. cooling). The producer remains the owner of the product used and the customer pays for the provision of the results.

[1] They classify product-service systems based on six elements: (1) sustainable product design, (2) comprehensive after-sales support, (3) eco-leasing, (4) collective consumption, (5) reduced need, (6) least cost supply.
[2] It is differentiated between (1) eco-rent, (2) pooling or sharing and (3) system optimisation.
[3] They distinguish between (1) product function services and (2) product extension services.

Figure 1: The product-service system and its subcategories



Source: Tukker et al. 2006

The more the focus switches from products to services within the product-service continuum (Tukker, Tischner, and Verkuijl 2006) and the more the property rights[4] are kept by the producer (Hockerts 2008), **the higher the theoretical potential for environmental improvements compared to the reference situation** (see also Chapter 4). Designing products in a way that they lead to a longer product durability, that they need less resources not only in the production but also in the consumption phase and that they can be easily remanufactured[5] and recycled could be the result of the value proposition shift from products to services and new product ownership and responsibility structures in a *leasing society*.

1.2. New business models: Creating incentives for resource-efficiency on the producer side

Especially the producers play an important role when it comes to the theoretical resource use implications of a *leasing society*. This section explores how a *leasing society* could contribute to increasing total resource-efficiency. It uses a hypothetical example of a washing machine producer, see also Cooper and Evans 2000; Ellen MacArthur Foundation 2012 and Manzini and Vezzoli 2000. The purpose is to demonstrate how different product-service systems might change the company-customer relationship, and the implications for resource use in an ideal case (see also Table 3).

[4] According to the theory of property of rights, the owner of the product obtains the right to use the product, to maintain and operate it, to retain profits from it, to sell or dispose the product and to exclude others from the use of it (Silver 1989).

[5] Remanufacturing is "*the process of rebuilding a product, during which: the product is cleaned, inspected and disassembled; defective components are replaced; and the product is reassembled, tested and inspected again to ensure it meets or exceeds newly manufactured product standards*" (Sundin and Bras 2005, 917).

Box 1: Five reasons why the leasing society could be an attractive business model

The added value of a *leasing society* no longer lies in the production of goods, exclusively. Products are manufactured, but not primarily to be sold to the customers but rather to use them for meeting the real needs[6] of a customer by offering different product-services. In addition, the economic and ecological benefit of business in a *leasing society* could increase by enhanced remanufacturing and recycling activities. Realising the transition from the present economy into a *leasing society* needs proactive and innovative partners in business. The question is, why should business engage in new ways of delivering products and services? A *leasing society* might emerge as an attractive business model for the following reasons:

- **Customer retention and loyalty**: Due to changed property issues and new modes of product use and consumption in a *leasing society*, additional communication between producers and customers is created, which intensifies and improves customer retention. As the new business model replaces the short moment of the actual sale transaction by a contractual relationship, customer retention and loyalty might be strengthened, which could be a basis of future sales.
- **New market opportunities**: A *leasing society* implicates a reinterpretation of customer demand. Resulting innovations in products and services could create new markets and gain new customers. Proactive business can be rewarded with first mover advantages and can co-determine "*the rules of the game*" (Sommer 2012, XI).
- **Saving costs for raw materials**: With longer product durability and life-cycles and a bigger focus on services, business may be less dependent on raw materials and fluctuating commodity prices.
- **New business opportunities**: Profit-generating activities in a *leasing society* are no longer exclusively based on the linear business model of manufacturing and disposing products. By integrating remanufacturing and recycling activities, business may pursue circular value-adding strategies that enable new business opportunities.
- **Improving social responsibility**: Finally, *leasing society* business models could help companies to improve their social responsibility.

Conventional business model of status quo: Selling washing machines

Business model and theoretical economic incentives

Like any other producers of consumer goods, also a washing machine producer strives for maximising profits. Profits in this conventional business model are mainly generated by selling washing machines at a competitive price, which is higher than the production costs. As the business model is based on the product sale, it tends to create incentives for designing the machine in a way that it just covers the warranty period. This can lead to an artificial reduction of the product's lifetime, so-called built-in or planned obsolescence (Fishbein, McGarry, and Dillon 2000; Hockerts 2008). It also motivates business to stimulate changing trends by means of advertising, to motivate a maximum exchange of products by new ones.

[6] „*What we want from these products is not ownership per se, but the service the product provides: transportation from our car, cold beer from the refrigerator, news or entertainment from our television*" (Hawken 1993).

Possible Environmental implications

Producing as many machines as possible is coupled with a high demand for resources. Accordingly, the economic incentives within a conventional, sales-based business model tend to steer the producer and consumer towards resource-intense behaviour.

Business model in a leasing society*: Leasing of washing machines*

Business model and theoretical economic incentives

In case the producer decides for a leasing business model that is based on certain contract arrangements (like agreements regarding maintenance), it still requires the production of a washing machine, but the producer is also responsible for additional services, like the installation and repair of the machine. In order to avoid the costs of repair or replacement of the washing machine, the producer has an interest in creating a product with a long life. After the contract expires, the machine is returned to the producer, who remanufactures it and either leases or sells it to another customer.

Possible environmental implications

The shift from selling to leasing washing machines in a *leasing society* business model could lead to more durable products and to an increased re-use of machines, machine parts or material. Environmental pressures could be decreased by a reduced number of manufactured—and increased number of remanufactured machines, resulting in less use of resources and less waste production.

Business model in a leasing society*: Delivering fresh laundry*

Business model and theoretical economic incentives

In case of a result-oriented business model with respective tailored contracts (like e.g. gain sharing mechanisms), the producer is neither selling nor leasing washing machines, but delivering a result or a performance in terms of fresh laundry. The producer—who is more a service provider now—operates the washing machine. The machine remains not only in the ownership but also in the possession of the producer. This has implications for the incentive structure. Due to his professional know-how, the producer is able to ensure the best possible machine utilisation, which reduces costs of use, maintenance and repair. Further, as operating costs for energy, water or detergent are now shifted from the customer to the service provider, this leads to an increased interest of the producer to design washing machines with low energy, water or detergent requirements. In order to be environmentally beneficial, it is assumed that the consumer demand does not increase to avoid a rebound effect e.g. having clothes washed more frequently because customers no longer have the work of doing laundry or because of attractive rebate schemes.

Possible environmental implications

As the washing machine is designed to be cost-effective also during the use phase, it meets resource-efficiency requirements. Due to capacity optimisation, the number of washing machines that need to be produced, decreases. Furthermore, a decreased amount of resources is required for maintenance and repair because of the knowledge driven optimum operation of the machine.

Table 3: Conventional and leasing society business models in comparison (hypothetical example)

Hypothetical example	Business model and theoretical economic incentives	Possible environmental implications
Conventional business model	• sell as many products as possible • planned product obsolescence	• economic incentives are decoupled from resource use (advantaging a resource-intensive behaviour on the producer side)
***Leasing society* business model**	• meet customer needs in the best possible way • prolong product life • product design for remanufacturing • resource-efficient product design (during consumption) • optimise capacity utilisation (during consumption)	• economic incentives are coupled with resource use (rewarding a resource-efficient behaviour on the producer side)

1.3. The role of consumers

For *a leasing society* to work, citizens also have a role to play. Customers will have to adapt their behaviours to use new product-service systems, instead of buying and owning products. This may require changes in value-systems (e.g. material wealth linked to social status) and lifestyles (how things are done). Citizens can also take an active role in driving the development toward *a leasing society* by creating a demand (market) for more sustainable solutions.

A *leasing society* may also exist within a non-commercial context by replacing traditional relationships between producers and consumers through exchanges between consumers, mainly in terms of sharing, but also bartering and donating ("Consumer-to-Consumer", C2C). New C2C patterns may be reinforced by increased use of the internet, smart phones and online applications. "Collaborative consumption" (Botsman and Rogers 2011) is a term which describes the phenomenon that consumers from all over the world are progressively sharing products and services. They are sharing their thoughts (Twitter), knowledge (Wikipedia), pictures (Flickr), friends (Facebook), files (BitTorrent) and experiences (YouTube), but also physical goods like their flats (AirBnB), accomodation (Couchsurfing), workspaces (Coworking), clothes (KleiderKreisel), cars (Tamyca), bikes (Vélib), land (Landshare), unused items (Netcycler) and many more. Although the idea of collaborative consumption is not new, as it can be seen by the existence from flat-sharing communities, libraries, self-service laundrettes, hotels or taxis (Bund 2011), it has been accelerated by mobile and fast information and communication Technology (ICT). Sharing has become a trend—*"[s]haring is clean, crisp, urbane, postmodern; owning is dull, selfish, timid, backward*" (Levine 2009, 36). Sharing and using instead of owning stands for a society, where the possession and accumulation of goods is rather seen as a burden than as an expression of wealth. Being mobile and flexible embodies a new type of welfare—e.g. car-sharing allows access to more car brands and models than traditional car ownership. Even though these activities take place in the private sphere of society, business could profit by providing the infrastructure like internet platforms etc.

2. A LEASING SOCIETY IN ACTION

KEY FINDINGS

- In the last years, business models based on product-service-systems have been partly implemented in practice with a stronger foothold in specific market segments and in commercial business-to-business activities.
- A selected choice of business cases reveal that product-service systems could be a successful business model in a *leasing society*, with the potential for greater diffusion across sectors and society.
- Numerous key drivers but also barriers that accompany the implementation of *leasing society* business models exist. They strongly depend on the combination of the chosen product-service system, the market segment and the producer-customer relationship (B2B, B2C or C2C).

Conventional leasing is a well-established practice in society. For instance, leasing is used as a means to finance the use of a product (like a car) or piece of equipment (like a copy machine). Box 2 reveals that around €224 billion worth of assets and equipment were leased across Europe in 2010.

Activities that go beyond conventional leasing are not as well-documented. Business models based on product-service systems have been partly adopted by firms in the recent years and a number of studies have highlighted successful examples of product-service systems (Cooper and Evans 2000; COWI 2008; EPA 2009; Fishbein, McGarry, and Dillon 2000; FORA 2010a; FORA 2010b; Goedkoop et al. 1999; Holliday et al. 2002; Intlekofer 2010; Leismann et al. 2012; Tukker and Tischner 2006a; Wimmer et al. 2007, Zaring et al. 2001). However, research activities dedicated to the quantification of implemented product-service systems and their economic and ecological effects still missing.

This chapter takes a detailed look at a number of product-service system examples. It mainly **distinguishes between two types of relationships:**

- **"Business-to-Business"** (B2B): This mainly includes contractually agreed services, lease of industrial equipment and sale of predefined results. Especially the result-oriented business cases may unfold new business opportunities associated with resource-efficiency potentials, e.g. if one company charges another company with the management of chemicals or waste streams.
- **"Business-to-Consumer"** (B2C): Conceivable constellations are the sale of products with additional services like prolonged guaranties, the products' installation, maintenance or take-back. Providing opportunities for sharing products with other customers, like car-sharing, or providing results, instead of selling products, like flooring, are further B2C arrangements.

The chapter concludes by summarising key similarities and trends as well as major barriers and drivers identified across the case studies.

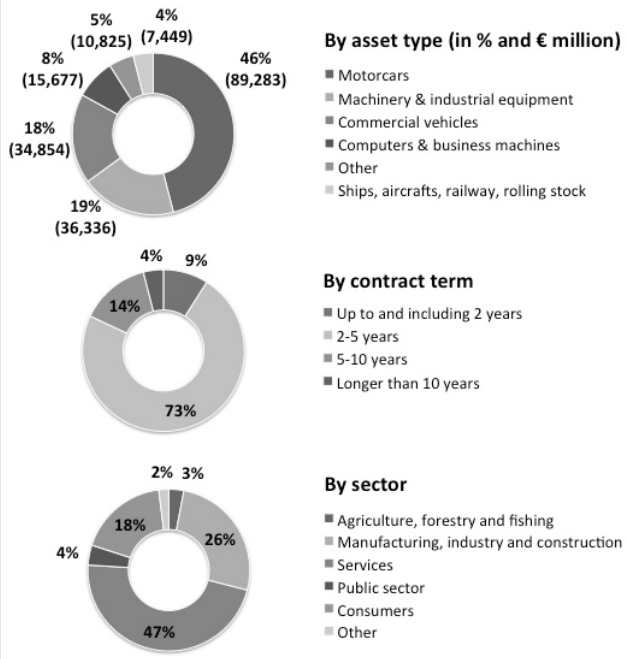
Box 2: Facts and figures regarding conventional leasing activities

Conventional leasing activities *"can include a variety of different products such as: cars, trucks, plant and machinery, yellow goods, planes, ships, real estate, ITC, equipment, renewable energy equipment, healthcare equipment, printing equipment, forklifts, production plants, office furniture, cranes, software applications and many more"* (Leaseurope and KPMG 2012, 11)[7]. **In 2010 assets and equipment of around €224 billion were leased by firms in 32 countries across Europe[8]** (Leaseurope and KPMG2012, 8ff.):

- This corresponds to a share of leasing investments in total investments[9] of 12.6 % (Small and Medium-Sized Enterprises (SMEs) have a rate of 16.7 %) in 2010.
- From the total amount of new leasing volumes, €30 billion (13 %) were related to real estate leasing and €194 billion (87 %) to equipment and automotive leasing (see Figure 2).
- Germany (€44 billion), France (€36 billion) and the United Kingdom (€34.9 billion) represent the largest European leasing markets.
- 62 % of the service sector apply leasing solutions, 33 % of the manufacturing and construction industry, and about 3 % of the agriculture, forestry and fishing sector (Oxford Economics 2011, 14).

A 2010 *Leaseurope* survey amongst European SMEs (Oxford Economics 2011, 6) revealed that 40 % of the SMEs surveyed used leasing—medium companies had the biggest share (53 %) followed by small (42 %) and micro companies (28 %). **Leasing is one of the most popular funding types of SMEs** (after personal funds and retained earning) and more popular than any form of bank lending (bank loans over 3 years have been used by 38 % of SMEs).

Figure 2: New equipment and automotive leasing in 2010



Source: Leaseurope and KPMG 2012, 9

[7] *Leaseurope* represents 44 associations with more than 1,000 leasing firms and short rental companies from 32 European countries (24 countries of EU-27 without Hungary, Ireland and Lithuania plus Morocca, Norway, Russia, Serbia and Montenegro, Switzerland, Tunisia, Turkey, Ukraine). *Leaseurope* represented around 93 % of the European leasing market (in terms of new leasing volumes) in 2010.

[8] EU-27 excluding Lithuania and including Norway, Russia, Serbia, Switzerland, Turkey, Ukraine.

[9] „European leasing penetration rate" (excluding dwellings), data for total investments are taken from Eurostat.

2.1. Business cases

2.1.1. From selling chemicals to chemical management services

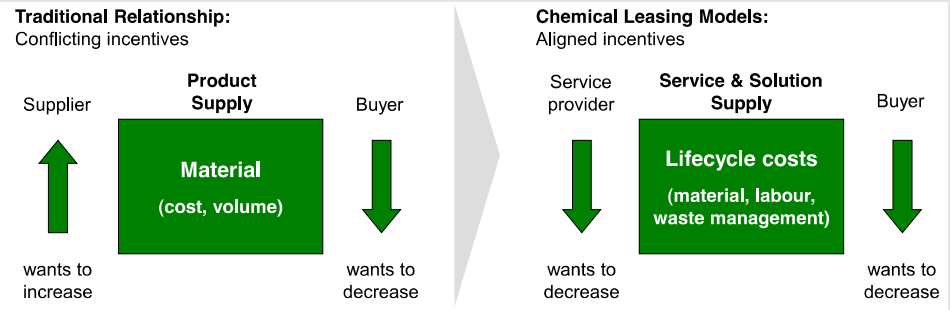
In a conventional business model, a chemical[10] producer/retailer sells chemicals. Incentives to help the customer use its chemicals more efficiently are limited. In contrast, the buyer is interested in a decrease of the chemicals' volume and costs (see Figure 3). By selling additional extra services (like e.g. inventory, storage, training, recycling, waste treatment), the conventional product offer is amended to a product-related product-service systems. In this business model, the customer is still responsible for the chemicals' application. With the contractual agreement on a special result (like e.g. a coated car), this activity can be outsourced to the chemicals supplier. The supplier still owns the chemicals and is responsible for an agreed performance and is paid on the basis of this performance (e.g. cost savings delivered). Within this business model, the volume cost of the used chemicals are shifted to the supplier. Thus they seek for an efficient use of the chemicals by reducing the lifecycle costs of materials, labour and waste management. This **contractual arranged performance orientation of the use of chemicals is called "Chemical Management Services"**[11] (CMS).

Similar to CMS is the result-oriented management of pesticides in order to remove pests ("Integrated Pest Management", IPM) e.g. on agricultural fields or in buildings. The pest management service provider guarantees a certain standard of pest control with the "*incentive to reduce the use of pesticides, as pesticides become a cost of service provision rather than a source of profit*" (EPA 2009, 51).

Case Study 1: SAFECHEM—from selling chemicals to chemical management services

After the new legislation on the obligated take-back of used chlorinated solvents (HKW-AbfV), which required companies to modify their chlorinated solvent-based cleaning technologies, the *SAFECHEM* Europe GmbH (a subsidiary of the Dow Chemical Company) started to provide sophisticated sustainable solutions for industrial cleaning of metallic surfaces in 1992. With the innovation of a so-called "SAFE-TAINER" (a reusable transport packaging and recuperation container), *SAFECHEM* provides its customers with performance-oriented chemical PS (selling not only solvent but solvent plus service). This includes the establishment of a closed-loop system of the solvent use (delivery, storage, operation, monitoring, quality adjusting, take-back, recycling, redistribution), the guarantee for high quality cleaning results and the optional provision of further services (like leasing of state-of-the-art cleaning equipment or customer assistance).

Figure 3: Conflicting and aligning incentives in the chemicals industry



Source: Saecker 2011, 8 see also Reiskin et al. 2000, 25

[10] Chemicals like e.g. solvents, paints and coating, industrial gases, agrochemicals, adhesives, inks, lubricants, tanners and water treatment chemicals (European Commission 2006).

[11] Similar expressions that can be found in the literature are chemical product services, chemical leasing, shared savings contracts, service contracts, servicing, performance contracts, contracting, total care and total gas and chemical management (European Commission 2006).

The *SAFECHEM* business model considerably increases resource-efficiency: The transition from a traditional business model of selling solvents to selling a closed-loop system of solvent delivery and take-back leads to 98 % of savings (e.g. 15 kg instead of 754 kg solvent). *SAFECHEM* is able to re-use and recycle their solvents more than 100 times. Today, *SAFECHEM* markets its successful *SAFE-TAINER* system across Europe.

Sources: European Commission 2006; Holliday u. a. 2002; Mont 2000; Saecker 2011; SAFECHEM 2012

- *Ashland* used to be a conventional chemical producing company. It is now a supplier of an entire chemicals management package, which includes the whole chemical management process: procurement, use training, testing, inventorying, addressing regulatory compliance, point-of-use application, waste management and disposal. Instead of focusing primarily on selling the highest amount of chemicals possible, it seeks to minimise losses and maximise recovery and recycling (COWI 2008; Mont 2000).
- *Castrol* is another example of a successful provider of chemical management services. Instead of only selling lubricants it has been providing lubricants expertise and services for around 30 years. Profits are generated from costs reductions that arise from a decreased use of lubricant (COWI 2008; Mont 2000).
- Changing the conventional pest control contract (1988) to a two-step implementation of IPM (1994, 1999) within 55 buildings (offices, storages, warehouses, archival facilities and others) by the *U.S. General Services Administration* (GSA), led to a 93 % decrease of services requests for pesticide application and to a 93 % decrease of pesticides applied in *GSA* building (Greene and Breisch 2002; EPA 2009).
- Since the early 80s, the Swiss pharmaceutical and chemical company *Ciba-Geigy* decided not to sell pesticides anymore but fields without pests and pest plants. Amongst others, the company started integrated pest management against spruce budworms in Canada, glasshouse white-flies in Spain or cockchafers in fruit gardens and forests in Switzerland and Italy. For rice farmers in Africa, *Ciba-Geigy* realised a decrease of chemical use of around 70 %, but its success was not compatible with local power structures (Sechser 1989; Stahel et al. 1994; Stahel 1998).

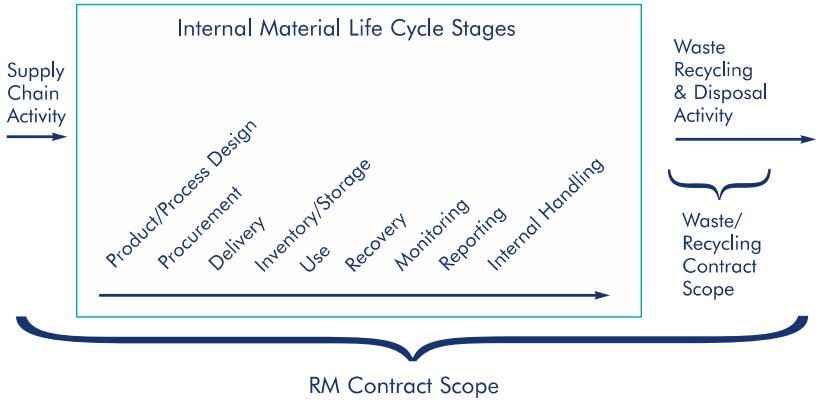
Drivers: Environmental and health regulations have been key to encourage application of chemical management systems. For example, the suppliers' obligation to take back used chlorinated solvents (German HKW-AbfV in 1989) and the solvent emissions directive (1999/13/EC), which required a limitation of the emissions of volatile organic compounds. The market for chemical products is characterised by increased competition and declining margins—CMS as a new business model for chemical producing companies has been an opportunity to improve their competitive position and to keep and gain new customers and profits (e.g. when supplier and customer agree upon contractual gain-sharing). CMS is also a concept that improves the supplier customer relationship, as it generates trust and leads to long-term contracts, from which both supplier and customer can benefit. Among others, the customer's incentives to establish CMS is the focus on its core competencies. Furthermore, customers can profit from efficiency improvements of the production processes and reduced chemical and production costs. The complexity of chemicals management also drives the customer to use an external, professional CMS service. Finally, besides reduced environmental pressure, CMS could unfold advantages for health and safety of the employees (COWI 2008; European Commission 2006).

Barriers to CMS business models can be found on the demand and supply side. Reorganising traditional business strategies implies uncertainties and internal resistance at the supply side going along the "*traditional mindset, where profit depends on the quantity of the chemicals they sell*" (COWI 2008, 77). In addition, the infrastructure investments and higher fixed costs have a deterring effect. The contractual agreed long-term dependency between supplier and customer is a barrier, as the supplier is coupled to the producer's economic success. But also for the customer, a change of the supplier is more difficult than in a conventional business model. It also requires more trust in the supplier as confidential process information including information on the product quality often needs to be shared. Furthermore, cost saving potentials may not be totally known by the customer, as pure chemical costs constitute only a small share of total costs, whereas chemical management costs can be up to ten times higher than the chemical purchase costs (European Commission 2006). Cost issues also arise when it comes to the outsourcing of the chemical management, which is only profitable for companies exceeding a certain size. A further barrier to the application of CMS is the diversity of chemicals regulations (COWI 2008; European Commission 2006).

2.1.2. From selling waste disposal to resource management

In another example of a business-to-business relationship, managing the resources and the waste of a manufacturing company is a business model that is based on an interesting modification of the involved actors' incentives. In the conventional business model, the manufacturing company manages its resources on its own and charges another company with the waste disposal. As this company is paid by the disposed waste volume—potential efforts of the disposing company to support resource-efficient structures within the manufacturing company do not exist. In a business model, in which the manufacturing and the waste disposing company set up a contract and agree on a resource management performance payment (that rewards resource-efficiency), they form a strategic alliance. Together, they have the same economic incentives: Savings through resource-efficiency efforts. Thus, instead of rewarding waste-creating behaviour, resource-efficiency and waste avoidance are recompensed. In addition to the traditional waste disposal, activities of the contractor in the new business model include services over the whole value chain activity of the producer, like the design of products and processes, procurement and delivery, inventory and storage, use and recovery of resources, monitoring and reporting and training, see also Figure 4 (EPA 2002).

Figure 4: Scope of resource management contracting



Source: EPA 2002, p 5

The scheme of resource management contracting corresponds to energy performance contracting, which guarantees in its simple form the supply of hot water or electricity at reduced costs and in a more sophisticated form the provision of services such as lighting, room temperature or comfort. "*In its most developed form, energy service contracting allows the client to minimise the total bill for the services that energy provides through a single contract with an energy services provider*" (Sorrell 2007, 507).

Case Study 2: General Motors—from selling waste disposal to resource management

In 1997, *General Motors* (GM) changed its waste management procedure due to corporate waste reduction goals and insufficient resource-efficiency efforts within its facilities. An audit of the waste management of its *Orion* facility plant, where vehicles were assembled from a large number of single components, showed potentials for improvement. It became the first site of *GM* with a resource management system. As *GM* had practiced similar performance-based contracting system already in the field of chemicals, the term "resource management" was a logical extension of "chemical management". "*GM's objective in executing RM contracts was to 'provide a systems approach to resource efficiency that motivates cost reduction and conservation of plant resources'*" (Warren Underwood quoted after Tellus Institute 2002, 5). Using the premise "*there are no waste streams, only wasted resources*" (Raj Mishra, *GM*), *GM* decided to quit its nine different waste management contracts and to replace them by a 3-years resource management contract. This included the traditional activities of hauling, disposal, waste pad management and comprehensive studies, but also additional services of two on-site resource managers, offsite support, comprehensive recycling, environmental reports, waste tracking systems and staff training. The contractor is paid by a single, total annual fee and is contractually required to realise a decrease of the waste management costs each year (having a gain-share of 30 % of the achieved savings of the first year).
The benefits of the introduced resource management contracting were remarkable. In the first three years the waste management expenses decreased by 30 %. The per-vehicle waste generation was reduced about 25 % and the per-vehicle non-scrap recycling rates increased from 7 % to 38 %. The *Orion* assembly became a pilot facility and *GM* started to implement resource management contracting in its other facilities.

Sources: COWI 2008; Tellus Institute 2002; EPA 2002

- In order to achieve high environmental performance and a reduction of waste disposal and management costs, the *Public Service Enterprise Group* (*PSEG*) started a pilot program in 40 of its 120 facilities in 1993. *PSEG* achieved considerable benefits from its integrated waste management programme: reduction of hazardous waste (from 1,460 to 103 tonnes within 8 years), reduction of total management costs ($6 to $4,25 million during 18 months), increased recycling (more than 94 per cent of non-hazardous waste) and a reduction of the waste management supplier base (from 40 to 1 vendor for hazardous waste and from 35 to 1 vendor for non-hazardous waste) (EPA 2002).

- Since 1996, the German *Innotec* consults and supports housing societies and their occupants regarding usage-related waste management systems. By offering special waste containers (that can assign disposed refuse bag and disposing household), by inspecting the refuse bags in terms of waste separation issues and by offering waste separation consultancy to the occupants, *Innotec* improves the waste separation behaviour, decreases the amount of residual waste and therefore also decreases fees for waste collection and disposal of around 20 to 50 %, in special cases even around 70 %. In the first five years, *Innotec* is rewarded by 75 % of the cost savings and afterwards with 50 %. In 2010, *Innotec* provides this waste management performance contracting to more than 670,000 households in Germany (Innotec 2012; Wilts forthcoming).

Drivers to the development of resource management contracting services on the producer side are the considerable economic and environmental benefits (e.g. proven by pilot projects), the support of top management, the reduced contract complexity (one instead of multiple contracts), the possibility to form a solid strategic partnership, smart regulations (that e.g. require recycling) and public demand for an improved Corporate Social Responsibility. Being able to concentrate on its core competencies also drives the decision for outsourcing resource management. Drivers that support a resource management contracting model on the contractor's side are improving competitive position, including a diversification of the offered services, and improved customer retention. Further low capital requirements on the one hand and a possible performance bonus make resource management contracting an attractive business model from an economic point of view (COWI 2008; EPA 2002).

Barriers to resource management contracting include variable client requirements that afford knowledge-based services and skills, capacity and flexibility from the contractor. A further challenge and thus potential barrier is the requirement of maintaining resource savings and the profit over a longer period of time. On the producer side, a lack of awareness and priority regarding resource-efficiency, waste management and of realistic expectations regarding resource management services is a barrier. Also, a lack of understanding could lead to an inner reluctant attitude of "we can do it better". The fear of loss of control might trigger such an internal resistance (COWI 2008; EPA 2002).

2.1.3. From selling printers to document management

A common example to demonstrate the transition from a manufacturing company to a function-providing company is in the area of office machines, like printers, copiers, and scanners. Instead of only producing and selling those products, they are instead rented or leased to the (typically business) customers. Customers use the product and pay, for instance, by use of service-unit (e.g. printed page), but are not responsible for the costs and work of maintenance, repair and updates.

Case Study 3: Xerox—from selling printers to document management

What began in 1906 as a company selling photographic paper, developed into a worldwide in document-management services.. Instead of just selling copiers, printers, scanners, fax machines etc., *Xerox* delivers the management of documents—taking care of the document since the moment they are created over copying, sharing and up to archiving or deleting. Hence, *Xerox* maximises its profit by delivering a certain result to the customer rather than by maximising the number of machines sold. *Xerox* introduced several product-services into its business model:

- Leasing: *Xerox* offers to lease its products (half of *Xerox*'s revenue is generated by renting and leasing). The lease includes full-service maintenance and a customer satisfaction guaranty regarding functioning machines. The customer pays a fixed price per copy.
- Product take-back: As part of the leasing strategy, *Xerox* takes its products back after the lease contract ends. Because the residual value of the used products is still considerable, products and their parts are remanufactured in respective facilities. When it comes to e.g. high-end laser printers, these are still of substantial value. Besides remanufacturing, *Xerox* also practices recovery of the products' material, in order to use it again within used, remanufactured and newly manufactured equipment. *Xerox* established a product design that allows easy disassembling and thus remanufacturing and material recovery.

Xerox achieved a 94 % recycling rate for non-hazardous solid waste, more than 2.2 million cartridges and containers are returned and 1.3 million pounds of toner are re-used every year.

Sources: CNNMoney 2011; Fishbein McGarry and Dillon 2000; Mont 2000; Xerox 2010; Xerox 2012

- *Pitney Bowes* is a provider of mailing systems, fax and copier equipment, business outsourcing and document management. Through the *Pitney Bowes Credit Corporation* (*PBCC*) it leases its copier machines generally for a three-year-term, mainly via an operating lease in which the copy machine stays in the ownership of PBCC. Pitney Bowes designs its products regarding remanufacturing and recovery issues (Fishbein, McGarry, and Dillon 2000).
- *Ricoh* provides document management services. In 1994, it developed the *Comet Circle* product design tool in order to reduce the environmental impacts of its products along their entire lifecycle. The *Comet Circle* represents *Ricoh*'s efforts that all of its products should be designed in a way that they can be remanufactured. Ricoh aims at a reduction of its material inputs—by 25 % by 2020 and 87.5 % by 2050 from the level of 2007 (Ellen MacArthur Foundation 2012).

Drivers: The increased service variety, the strengthened customer retention and retrieving (or better not loosing) the residual material value are incentives, that motivates the top management to drive the transition from a machine producing to a function-supplying business model. In comparison with the conventional business model of buying office machines, customers of those document-management services are able to concentrate on their core business (as they do not have to care about maintenance), they are up to date on the latest technology and they can take advantage of leasing tax benefits.

Barriers: Several procurement guidelines (e.g. of public authorities) could hinder the purchase of remanufactured products as they require new products (which are supposed to meet certain quality criteria). Remanufacturing is, however, a central issue within the document management business model. Cost advantages of remanufacturing might be outperformed by technological advances that stimulates the processing of raw material (Fishbein, McGarry, and Dillon 2000).

2.1.4. From selling cars to mobility

Whereas the above examples focused primarily on changed business-to-business relationships, innovative examples of mobility concepts from the automotive industry reveal both changes in business-to-business services and business-to-customer services. In these cases, the automotive industry is also able to perform the transition from the sale of cars to the sale of mobility.

Case Study 4: Daimler's Car2Go—from selling cars to mobility

In 2009, *Daimler* started its *Car2Go* programme, making an innovative car-sharing system into a new business model. It works by offering customers flexible mobility options. Once registered, the use of the car is flexible regarding spatial, temporal and financial dimensions. It is based on GPS real-time information on the car availability that enables the customer to start and end the vehicle use at any point within a certain area. A radio frequency identification (RFID) chip serves as the car key. From the moment of unlocking the car, the user pays €0.29 per driven minute and €0.09 per minute when the car stands but without any other fixed costs (like e.g. a monthly contribution). *Car2Go* presents itself as the first public transportation offer as a free-floating fleet and has success with this concept: 9.8 % of the potential user population became registered within the first programme year—which corresponds to a market penetration that is 25 times higher than the weighted average market penetration of traditional German car-sharing companies.

Sources: Car2Go 2012; Firnkorn and Müller 2011

- *Mobility* is a Swiss car-sharing company that was established in 1997. In 480 cities (with 1,340 fixed stations) *Mobility* offers its registered 102,100 private and business customers mobility in terms of 2,600 cars that can be used. The vehicles are booked by phone or internet and have to be picked up at a fixed car station, where they have to be handed back again. Customers pay for the hours of use and the mileage driven, including costs for fuel, insurance and maintenance. Mobility cooperates with local public transport operators (e.g. Swiss Federal Railways) and gives customers with an annual subscription a discount on car sharing (COWI 2008; Mobility 2012). This is a similar business model to car sharing schemes.
- *Tamyca* (acronym for "Take my car") is an innovative private car-sharing business model that brings together car owners (with more than 2,500 cars in Germany) and occasional drivers in an internet portal. Car owners, who do not use their car often can store their car in a database where it can be booked by other drivers, who want to use a car but do not own one on their on. *Tamyca* offers a car insurance protection for users between 23 and 69 years, owners of a driving license for at least 3 years with a permanent residence in Germany (Tamyca 2012).
- "*We make electric cars make sense*" is the motto of *Better Place*, an innovative company founded in 2007. Its business model is about giving a mobility guaranty for electric cars and it is essentially based on the separation of electric car ownership from the battery. This allows the user to switch depleted batteries after driving long distances (in a battery switch station) and to drive on.

Further, *Better Place* grants unlimited access to public charge spots, the use of a driver support system that helps to find the closest battery switch station and a round-the-clock customer service. The success proves the *Better Place* business model right: *Better Place* has launched networks in Denmark, Japan, Australia, Israel and USA (Better Place 2011; Better Place 2012).

Drivers: Offering new mobility patterns through a car-sharing business model is driven by certain expectations on the supplier side regarding new customers, profit, and market shares, customer retention and an improved competitive position. Regulations (e.g. reduced or eliminated taxes on electric cars) that provide an advantage for new mobility means, are further drivers. For customers, waiving the ownership of a car and using new mobility services like car-sharing instead could eliminates costs and time for purchasing a car, repairs, insurances or just search for a parking space. Car-sharing is associated with reduced environmental pollution and decreased traffic loads (BCS 2010).

Barriers: According to a survey, car-sharing is supported by the majority of car drivers, but only few can imagine to use car-sharing on their own (Loose, Mohr, and Nobis 2004). Insufficient knowledge and understanding of the concept and of concrete local offers form an obstacle to the distribution of new mobility offers. A more significant barrier is the value people place on car ownership, especially for convenience, safety or even as a status symbol. In many rural areas, cars are necessary to get around. A further barrier is the building of strategic value chain partnerships. Specific regulations (e.g. car-sharing taxes) and lack of public support (e.g. missing provision of public parking space) also hinder the launch of new business models.

2.1.5. Further case studies

This section presents a compilation of case studies from a variety of different sectors: white ware, carpets, industrial engines, forklifts and IT equipment.

Case Study 5: Electrolux—from selling cleaning white ware to cleaning function

In 1995, the Swedish company *Electrolux Euroclean* launched a test initiative in which it sold the cleaning function of its cleaning machines (scrubber dryers). Due to the test's success, it was expanded to serve the individual cleaning needs of each customer (by offering rental equipment, staff training, machine performance guaranties, machine recycling etc.). *Electrolux Euroclean* achieved economic savings (e.g. decreased costs for used supplies due to improved machine quality) and resource savings (e.g. decreased number of newly manufactured machines, increased material value salvage through re-use, remanufacturing and recycling) by extending the life of its products. In 1998, *Euroclean* and *Electrolux* separated from each other, but the experience with the new business model remained a part of *Electrolux*. One year later, *Electrolux* started a similar test programme in the B2C context—it decided to sell the function of cleaning clothes instead of the washing machine itself. 50 households received an energy-efficient washing machine (for an installation fee of around $55), that included a smart metering (measuring the number of washing cycles and the tracking the used washing programme. The contract between *Electrolux* and the customers included a machine replacement after 1,000 washes and a per-wash fee of around $1.12. However, due to missing marketing of the business model, the customer acceptance was low. Additionally, the provider of the smart metering discontinued the smart metering—*Electrolux* wasn't able anymore to track the consumption pattern and discontinued the business model. Nevertheless, Electrolux continued to focus on function sales and on product design that is product take-back friendly and enables material recovery.

Sources: Ellen MacArthur Foundation 2012; Fishbein, McGarry and Dillon 2000

Case Study 6: Interface—from selling carpets to flooring services

In 1994, the director of the carpet manufacturer *Interface* realised, that too many carpets were ending up in a landfill yearly and that just around 20 % of the surface of those disposed carpets were worn out. One year later, *Interface* switched from its traditional carpet production to the manufacturing of interchangeable carpet tiles. This modular system allows changing just the worn carpet tiles instead of disposing the whole carpet. Further, *Interface* realised, that the customers do not need to own carpets—they simply want to use them. So it launched a business model of leasing carpets for a monthly fee ("Evergreen Lease") and whenever necessary, *Interface* replaced those parts of the carpet (usually 10 to 20 %), that show 80 to 90 % of the wear. *Interface* started its carpet lease concept with an operating lease under which *Interface* retained ownership of the carpet with guaranteeing the function and appearance of the floor covering. But due to the American Financial Accounting Standards Board, an operating lease requires a lease term of less than 75 % of the estimated economic product life and a value of payment of less than 90 % of the product's fair market value. Under these circumstances, financial institutions doubted the success of the business model and were unwilling to finance the lease. *Interface* changed its approach and offered instead standard capital lease (with transfer of ownership after five years) amended by a take-back (and recycling) offer. However, due to the internalisation of take-back (and recycling) costs, the offer was economically unattractive for the costumers. However, *Interface* maintained its idea of leasing floor-covering services and "*four years after Interface began this quest in 1994, its revenues had doubled, its employment had nearly doubled, and its profits had tripled*" (Hawken, Lovins, and Lovins 2010, 169).

Sources: Fishbein, McGarry, and Dillon 2000; Hawken, Lovins and Lovins 2010

Case Study 7: Volvo Aero—from selling engines to power

The Swedish producer of aircraft engines *Volvo Aero* decided, to sell working flight hours ("power by the hour") additionally to its conventional sale of engines, because those flight-hour agreements have become a trend in the aircraft industry. The engine lease typically lasts between three and five years. *Volvo Aero* remains owner of the engine and the customer (typically a smaller aircraft carrier) receives a flight performance guaranty with fixed prices for each hour the engines are used. Maintenance service are offered on site—additional transports aren't necessary. As engine owner, *Volvo Aero* is interested in minimising their wear—thus it has an incentive to design, maintain and service the engine in a way it performs optimally. Besides that incentive, *Volvo Aero* as the producer of the engines, is also able and has the necessary know-how to run the engines in the most ideal way. By outsourcing the run of the engines, the customer is able to concentrate on its core business again. Further, due to the improved run of the engines (better performance achievements of 1.5 to 2 %), the engine lasts longer (better performance leads to lower temperature in the engine) and fuel consumption and flight emissions are reduced. The turnover share derived from the new service offer increased from 30 to 50 % between 2007 and 2010. In addition to the flight-hour-programme, *Volvo Aero* offers a phase-in-phase-out programme, that includes a contractual agreed performance optimisation of the customer's older engines. The contract's incentives are in such a way that *Volvo Aero* is rewarded if the engine's performance is better than agreed—this also contains the risk of economic penalty, if the engines are underperforming. *Volvo Aero* reports that the statistic foundation of risk exposure and economic benefits have driven the decision to change the business model.

Sources: FORA 2010a; FORA 2010b

Case Study 8: BT Industries—from selling forklifts to elevating

BT Industries is a Swedish manufacturer of forklifts, which not only sells but also rents its forklifts in a long-term relationship to its customers, who benefit from this business model as follows: "*Think of the advantages. You avoid all the risks of ownership. You don't consume capital—not even a deposit required. We take care of the equipment and make sure it's always reliable, and we work with you to manage your fluctuating need—we call it capacity management. Rental from BT means flexibility for the future and all of your costs are predictable"* (Sundin et al. 2008, 539). The functional sales offer includes selling the function of the forklift—contract details are set up regarding the number of pallets, height of storage and storage capacity that have to be managed by the forklift. *BT Industries* is responsible for the maintenance and repair of the forklifts. After the use contract expires, the forklifts are returned to *BT industries* for remanufacturing (at any stage of their functional life). In 2001, around 1,000 forklifts from *BT Industries* were remanufactured (in a facility in Sweden). From these, 600 went into the own market again (short-term lease), while the remaining 400 were retailed by other dealers or were recycled (those forklifts that are older than 8 years are not remanufactured anymore). In case that the battery is replaced, remanufactured 5 year-old forklifts perform almost as well as newly manufactured forklifts. The close relationship between the service and maintenance personnel and the customers is advantageous regarding two aspects. First, the customer loyalty increases and second, being close to the forklift users, allows *BT Industries* to estimate the return flow of products easier, which is important for the planning of the remanufacturing processes.

Sources: Sundin et al. 2008; Sundin and Bras 2005

2.2. Key trends

2.2.1 General conclusions

In addition to the shown case studies, **there are more examples that demonstrate present *leasing society* activities**: the lease of furniture, tyres, communication equipment, solar equipment, LED lights etc. are product-service offers that are already part of current business models.

Three key trends can be observed in the above cases, and also supported by literature:

1. First, since the intense discussion about product-service systems began in the late 90s, they have been increasingly discussed by research and introduced by companies at least partly. However, "*the uptake of such ideas by industry appears limited*" (Baines et al. 2007).
2. Successful product-service systems stories occur repeatedly only in specific market segments. Especially the services regarding chemical management, integrated pest management, car-sharing, carpet use, document management and energy or resource contracting are business models that have been adopted by a number of companies and that are continually reported by recent studies (like COWI 2008; EPA 2009; FORA 2010a; Wimmer et al. 2007).
3. Second, so far, the effective use of product-service systems, and especially of the result-oriented product-services, seems to have found a stronger foothold in commercial business-to-business activities rather than business-to-customer activities. In business-to-customer activities, however the successful use of product-services is less well-documented and the number of well-known successful attempts is substantially lower (Wimmer et al. 2007). Further, Tukker and Berg (2006, 67) report that *"[i]mplementing product renting and sharing systems […] seems to be more difficult in a B2C than a B2B context*".

The selected case studies present anecdotal evidence that certain *leasing society* business models have the potential to increase resource efficiency and improve the firm's competitive position. However, the **studies do not claim that every business model based on product-service systems is successful** in terms of reduced environmental impacts and increased economic performance. Depending on the type of product-service system, *leasing society* business cases may even lead to contradictory effects (see Chapter 3).

2.2.2. Product-service systems in the German manufacturing industry

Besides the general case study reports, there are studies that analyse product-service systems empirically, such as a study from Fraunhofer ISI[12] (Schröter, Buschak, and Jäger 2010), which investigated the diffusion of product-service systems within the German manufacturing sector. It found that 25 % of the manufacturing companies in Germany use at least one product-service systems offer. According to the survey, **most common product-service systems in German manufacturing industry are**:

- a guaranteed availability of the machine through monitoring and maintenance contracts,
- a contractual arranged permanent machine or asset optimisation, that guarantees the optimum use of the machine,

[12] Fraunhofer Institute for Systems and Innovation Research

- a pay on production arrangement, in which the user pays per unit of output manufactured by a machine, which is operated by the machine's producer,
- a guaranty for the total cost of ownership, limiting the operating costs of a machine,
- leasing of chemicals, in which the result of a special chemical's use (e.g. dissolving, reacting, cleaning) is guaranteed.

Table 4: Use of product-service systems within the German manufacturing industry

PSS	Usage (% of all companies)	Main customers
Guaranty for availability	12 %	• Transport equipment • Electrical equipment • Chemicals
Contractual arranged permanent optimisation of machine or asset	7 %	• Printing • Electrical equipment • Chemicals
Pay on production	3 %	• Electrical equipment • Machinery and equipment
Guaranty for total cost of ownership	3 %	• Electrical equipment • Rubber and plastic products
Leasing of chemicals	2 %	• Transport equipment • Food products

N=1,484 companies
Source: Schröter, Buschak, and Jäger 2010, 3ff.

The study also indicated that product-service systems are used by companies from different manufacturing sectors (see Table 4). Bigger companies (with more than 250 employees) use product-service systems more frequent than small and medium-sized enterprises. Furthermore, the larger the product line and the higher the complexity of the manufactured products, the more often product-service systems are applied. Also, whether a company decides in favour of or against a product-service system investment depends on its cost analysis concept: companies, which take into account the whole life cycle costs opt three times more often for the implementation of a product-service system than companies that just focus on the purchase costs (Schröter, Buschak, and Jäger 2010).

2.3. Key drivers and barriers identified in the business cases

The presented case studies have shown a variety of product-service systems approaches revealing how business models in a *leasing society* could operate. Depending on the type of chosen product-service combination, the market and the producer-customer relationship, there is not only one *leasing society* business model, but diverse business strategies possible. Details regarding specific arrangements regarding e.g. maintenance, product take-back, gain sharing mechanisms etc. again multiply the number of possible business model options. **Facing the variety of possible business strategies, also diverse barriers and drivers towards the successful implementation of product-service systems exist**. The following Table 5 sums up the identified barriers and drivers that producers (respectively suppliers) and customers of product-service systems can face.

Drivers and barriers on the customer side take on a new dimension when it comes to the relationship between business and private customers or the relation only between customers. **In comparison with the decision-making of commercial customers that is rather rational and mainly based on economic arguments, private customers tend to make their decisions more emotionally**. This might promote but also hinder the distribution of product-service systems. For reasons of flexibility, safety, time, convenience, status symbols and living standards, people want to own the products that they use. This affects cars as well as white ware, computers, toys, tools and other private equipment. However, as sharing products could become a lifestyle change of a new generation (see chapter 1.3.), product-service systems also have high future potential in the private sphere.

Table 5: Barriers and drivers of leasing society business models

	Producer / supplier	Customer
Barriers	• investments into new infrastructure • increased fixed and operating costs • long-term relationship as a risk (coupled with success of customer) • lack of capital • diversity of regulations • variable client requirements afford expert experience, knowledge and skills • lack of personnel • lack of flexibility • public procurement guidelines • technological progress that benefits resource-inefficient production patterns • dependency from other business model partners • risk of underperformance	• "we can do it better" • long-term relationship as a risk (changing supplier is more difficult) • fear of loss of control • need to include supplier in confidential processes • lack of awareness and priority towards resource-efficiency • unknown total costs of ownership • uncertainty about saving potentials • certain level of company size needed in order to be profitable
	• uncertainties and internal resistance to change • traditional mind-set of (conventional) business models • lack of awareness and understanding of new business models • lack of public demand	
Drivers	• increased competition and declining margins in traditional markets • maintain and gain new market shares, customers and profits • diversification / increased range of services • benefit from gain sharing mechanisms • material is not lost and residual material value can be retrieved • technological process that enables new solutions • customer makes buying decisions rather rationally than emotionally	• more services • discontinuation of ownership responsibility / risk • reduced contract complexity • flexible contract conditions (ability to purchase, renew, cancel focus on core competencies) • possibility to upgrade and access to latest technology • improved production process efficiency and reduced complexity • reduced life cycle costs • predictable costs • advantage of tax benefits • improved liquidity • reduced environmental pressure • advantages for health and safety
	• regulations • public demand • improved competitive position • support by top management • improved supplier-customer relationship (trust and loyalty) through long-term contracts • empirical foundation of risk exposure and economic benefits	

3. ASSESSMENT OF THE POSSIBLE STRENGTHS AND WEAKNESSES OF A LEASING SOCIETY

KEY FINDINGS

- The win-win nature of a *leasing society* depends on *which* product-service system and *how* they are implemented. Different types of product-service systems have different economic and ecological impacts.
- Case studies suggest a strong potential for inducing positive economic and environmental benefits on a micro scale, but evidence of impacts on the macro-economic level is missing. This is an area in need of further study.
- Possible trade-offs of product-service systems could exist between economic success and environmental improvements or increasing competitiveness and adverse market powers of product-service system providers.
- Policy instruments to support a *leasing society* have to address these trade-offs if the potentials of win-win situations should really come to bear.

The **literature** on product-service systems is strongly **focused on** the analyses of various product-service systems concepts and its **microeconomic results**. Additionally, there are a number of studies (Intlekofer et al. 2010, Intlekofer 2010, Agrawal et al. 2012) that attempt to quantify the environmental benefits of different product-service systems. These studies are usually, but not always, product-related and analyse only the possible individual environmental and economic impacts of individual product-service systems.

As shown in Chapter 1, the literature on product-service systems has been heavily influenced from an ecologically motivated scientific community. Therefore, many studies distinguish product service systems by their potential for environmental improvements (see also Figure 5). This **often includes the normative assessment that product-service systems should make a contribution to environmental improvement** and serves as a criterion for determining what a product-service systems is. From an organisational perspective, all efforts of companies to focus on their core competencies represent also some form of demand for product-service systems. However, driven by factors such as streamlining and cost savings.

For the assessment of an overall economic and ecological impact of a *leasing society* it is important to decide whether under a *leasing society* only those product-service systems are analysed that are environmentally motivated and meaningful. Or is mainly the organisational core, after which a customer asks for a service instead of the product itself, the sole criterion. This **chapter presents the strengths and weaknesses concerning both types of development of a *leasing society***. In doing so, it begins to pinpoint positive features that could be strengthened as goals of a *leasing society* and negative side-effects which should be mitigated.

We are not aware of any study with a quantitative character on a macro-economic level or any economic modelling of scenarios or projections that would determine which sectors could be winners or losers in a paradigm shift in favour of a leasing society. Likewise, in the scientific literature, **no studies were found which define major potential macro-economic effects of a leasing society**, such as on net employment. There are also no quantifications of expected positive effects on the environment beyond the analysis of individual product-service systems. Under certain conditions, potential savings are possibly compensated by rebound effects and new usage models would cause an even higher resource use.

In the absence of quantitative analysis or modelling, **Chapter 3 describes possible macroeconomic consequences and trade-offs that a *leasing society* could have**. However, such qualitative sketches are strongly associated with uncertainties. A *leasing society* in our understanding would require a paradigm shift with extensive changes both within the sphere of production as well as consumption. Rifkin (2000) warned that a society in which access, and not property, would be the constituting element would lead to a new kind of irresponsible capitalism. It would exhaust all cultural resources and thereby virtually endanger the foundations of society. Even if you account Rifkin's thesis for an exaggeration, the precise implications of a society based on utilisation and access instead of ownership are potentially very far-reaching.

An additional complication is that a *leasing society* would establish a combination of various types of new producer-customer relationships, which are characterised not only by the sale of a product. Each of these product-service systems has different macro-economic and ecological impacts. Therefore, an assessment of a *leasing society* depends to a large degree on what kind of product-service systems is examined.

3.1. Environmental strength-weakness analysis of leasing models in terms of resource-efficiency

Some product-service systems are already relatively common today. These include especially product-oriented and use-oriented systems, such as pure leasing or conventional product sales with additional services such as risk guarantees. Such concepts which are still characterised by the product itself rather than the function of the product can be easily integrated into existing economic structures. Therefore, these **types of leasing are not typically associated with either ecological benefits or pronounced macroeconomic changes**.

There seems to be a prevalent assumption in literature and society that product-service systems have positive ecological effects and economic benefits, so-called win-win situations. The rationale and the theoretical explanation of these effects are shown in Chapter 1 and 2 of this study. However, **empirical studies** (Intlekofer et al. 2010; Intlekofer 2010; Agrawal et al. 2012) **demonstrate that significant environmental improvements can only be reached under certain conditions**. Some of these conditions lead to rather sobering results, will be presented here in more detail.

Figure 5: Environmental impacts of different product-service systems

PSS type	Impacts compared to reference situation (product)				
	Worse	Equal	Incremental reduction (<20%)	Considerable reduction (<50%)	Radical reduction (<90%)
1. Product-related service		←----------→			
2. Advice and consultancy		←----------→			
3. Product lease	←----------→				
4. Product renting and sharing		←----------→			
5. Product pooling		←----------→			
6. Activity management		←----------→			
7. Pay per unit use		←----------→			
8. Functional result		←----------→			

Notes:
- Renting, sharing: radically better if impact related to product production.
- Pooling: additional reductions compared with sharing/renting if impacts related to the use phase.
- Renting, sharing, pooling: even higher if the system leads to no-use behaviour.

Source : Tukker et al. 2004

Tukker has studied various product-service systems to analyse to what extent these different product-service systems have the potential to reduce ecological impacts (see Figure 5).

Accordingly to Tukker et al., only a few product-service systems have the potential for a considerable improvement of the ecological situation.

The bandwidth of the arrows also shows that the specific design of a product-service system such as *pay per service unit use* is very crucial to whether the product-service system can make a positive contribution to reducing environmental impacts. **The more the focus switches from the products to the service functions, the higher the theoretical potential for environmental savings** compared to the reference situation. The following examples show that besides *product leasing* other forms of product-service systems can also lead to negative environmental impacts.

No general extension of use-phase

Some **product-service systems may shorten rather than increase the use-phase of products** and goods. For example, in cases where goods are rented or pooled, the goods may be used more intensively. Leasing contracts are often designed in a way that the lease term does not exceed 75 % of the lifetime. Depending on whether it is financial or organisational leasing, the leasing periods of only one to three years are quite common, as the used goods and products must have a corresponding residual value at the end of their leasing period. Additionally, users of leased products often expect new equipment or machinery, whether in mobile phones, car sharing or photocopying machines. They may also show less care when they use a rented or leased products, instead of a product that they own.

At the end of the leasing period used products could either be leased to another customer, re-manufactured, but often sold as a used product. In the latter case it is not self-evident that well established product-service systems where a product is first leased or rented and afterwards sold as a used product has in total a longer life cycle than the same product sold as a new product. In this sense the **ecological benefits** of some product-service systems which, in principle, could be part of a *leasing society*, **are at least questionable**. Especially when the environmental impacts are incurred mostly in the production phase and less in the use phase of the product. For consumer goods such as washing machines or refrigerators, where the environmental impacts are connected mainly to their use phase, it might even be useful to replace these products well before reaching the end of their lifecycle. Intlekofer et al. (2010) show, for example, from an energy saving point of view it make sense to replace consumer goods rather quickly, because of the improvements in energy and water efficiency. If the efficiency gains of the new products is combined with remanufacturing of the used goods, it may result in a net decrease of material and energy use.

A direct producer-customer relationship has some advantage instead of interposed specialist in the design of product-service systems

Product-service systems are often offered by specialized companies that are interposed between the consumer and the producer (e.g. specialised leasing companies, independent remanufactures). In this case, the producers may lose interest in producing goods which require less material and energy or in designing products with provisions for easy repair or recycling.

Box 3: Ecological impact depends on the design of the product-service-system

The example clean laundry service of Chapter 1 is taken up here again in order to clarify where differences with respect to the environmental impacts are possible, depending on how the basically identical product-service systems "laundry service" is ultimately designed.

To bring the incentives of product-service systems to reality, it would be necessary that the product-service systems is provided directly by the producer of the equipment. Only in this case all life-cycle costs are fully attributed to the producer. For example, the producers of washing machines would offer the service "clean laundry" itself and not, as now, leave this service to independent external laundry in the living area. The provision of this service could be done in various ways, which each would have different ways of saving resources: (1) the service "clean laundry" could be provided directly in the cleaning center, operated by the washing machine manufacturer. This would be probably done in huge centralized laundries, which includes additional logistics for the delivery service. On the other hand the centralized laundries would assure an optimized utilisation of the washing machines. Investment in additional resource-saving solutions for the use phase of the equipment that goes beyond the pure efficiency of appliances (e.g. reuse of wash water for the first washing cycle, gas-powered dryer) are more likely and easier to fund for large treatment plants than for a small laundry with 10 washing machines. (2) It would also mean different models of cooperation are possible, where washing machine manufacturers and operators of launderettes work together, ensuring that at least the more efficient appliances are used, which are regularly maintained by the producer. In this case, you would often have no additional investments and therefore energy and water savings (see (1)), but would be able to do without a complex logistics concept. (3) An environmental disadvantage of external provision of services "clean laundry" is associated with the use of dryers, if the households have no dryer. In such cases, the ecological benefit of intensified use of washing machines might be overcompensating by the ecological impact of using a dryer. In this context a reactivating of shared laundry rooms in the basement of apartment buildings are proposed (Jasch and Hrauda 2000). Washing machine producers could negotiate contracts with landlord or property management to install and maintain these machines. However, the relevance of shared laundry rooms in apartment buildings have been falling in the last decades because of the missing acceptance of the shared laundry rooms among tenants (Jasch and Haudra 2000).

Remanufactured goods should replace new goods and not create an additional market

A *leasing society* can be an organisation, where a number of win-win situations exist and as a result economic opportunities can be combined with environmental improvements. But there is also the risk that a *leasing society* mainly consists of such product-service systems, where conflicts prevail between environmental needs and economic opportunities. For overall assessment of both the environmental benefits as well as economic performance of product-service systems like renting or leasing, it is important to know **whether re-leasing or selling of used machines opens up more market opportunities which wouldn't be available for new machines**. This is especially the case if a second or third use phase of goods and service takes place in developing countries without appropriated recycling facilities. Additionally, for many products exists no market for new products in developing countries, as new equipment would be too expensive. In this case used goods would not replace a new good rather than be a additional good. While such product-service systems make sense from a business perspective, as new markets can be opened to sell their products in different price segments, the economy-wide environmental consequences are far less clear.

Under certain circumstances, the global energy and material consumption of such product-service systems solutions would be higher than in the traditional purchasing model.

3.2. Economic strength-weakness analysis

While at least some empirical studies exist which analyse the environmental benefits of individual product-service systems, there are to our knowledge no economic studies which go beyond the micro-economic analysis of success stories like *Xerox*. But such **corporate examples cannot be easily extrapolated to an overall economic success**. Product-service systems are forms of services which can produce winners and losers (Tukker et al. 2006). These may be companies that cannot readily offer additional services because of the financial burdens or car rental companies that lose market share due to booming car-sharing. One should be careful to interpret all the positive examples at the level of pioneering companies as a general improvement of macroeconomic performance. Whether and how a European *leasing society* would be competing globally, whether the overall competitiveness is increased by a *leasing society* or whether this combination of product-service systems leads to more or less jobs remain still unanswered and need further research. Here, however, some possible trade-offs can be outlined. Depending on the investigated product-service systems, the possible economic opportunities and impacts, as well as trade-offs are very different.

Used-oriented and functional product-service systems are faced with high transaction costs

Product-service systems which are highly product-oriented, such as expanded service offerings connected with the sale of these products (e.g. extended warranty services, maintenance contracts or minimum unplanned availability time), offer various economic benefits for suppliers and customers, but the environmental benefits often remain unclear For the services providers, such contracts create a stronger customer loyalty and allow occupying additional positions in the value chain. The buyer of the product benefits from reduced risks associated with downtime and repairs. However, studies show (Schröter, Buschak, and Jäger 2010) that these services are used only by a few companies. **Use-oriented and functional product-service systems** are additionally **associated with high transaction costs**, which ensure that the share of companies using these product-service systems are much smaller than in product-oriented product-service systems. Higher transaction costs arise from the fact that additional organisational problems have to be solved by use-oriented product-service systems (e.g. definition of quality indicators for the service fulfilment are necessary, unfavourable distribution of risk to the provider of product-service systems etc.). It is conceivable that even with a cost management under life-cycle aspects, use-oriented product-service systems remains a niche market in the future because the transaction costs and organisational difficulties exceed the economic benefits.

Customer-Solutions offer the possibility for higher innovation capacity

Apart from the requested customer loyalty through customized offers that cannot be copied easily, the offered services such as maintenance contracts etc. leads to a greater specialisation in the operation and design of the products and machines. In consequence the provider has a better knowledge of the problems in the use phase, which flows back in the design or production of this equipment. The combination of engineering expertise and specialisation in the operation of the equipment or long-term experiences by maintenance contracts allows for a faster and continuous improvement of these products and to an optimized use of the device. Such specialisation will lead in many cases to a decreasing material use and lower scrap rates.

In addition, the **innovation capacity of the product-service systems provider is probably higher as that of competitors**, who operate with pure sale of their products.

The macroeconomic consequences of this higher innovation capacity on a company level is difficult to predict.

But the combination of different positive side-effects of these customer solution **could improve the global competitive position**, especially for European companies: Firstly, product-service systems increase the innovative capacity of the producers by the described mechanisms. At the same time, the stronger loyalty through customer-oriented solutions reduces the price competition with suppliers in emerging markets and hinders a switch to cheaper providers. European companies could thereby increase their competitiveness and innovativeness and thus gain global market share.

Product-service systems can intensify market power

From an ecological perspective, a clear assignment of all costs at the side of the producer makes sense to provide appropriate incentives to reduce life cycle costs. Such comprehensive **product-service systems** offers, however, **are usually associated with high capital costs, which act as a high market barrier for new competitors**. From the perspective of the incumbent, that is precisely the advantage of product-service systems. But from a perspective of welfare economics, such PSS could serve as a tool that strengthens less efficient market structures. Especially in companies/sectors where product-service systems can boost their already dominate market position by increasing customer loyalty to the extent of customer dependency. In these cases the establishment of product-service systems would favour the few dominant suppliers and prevent competition.

At the same time suppliers of product-service systems with **their market and financial power might open up whole new business and change existing market structures completely**: a lot of individual laundromats or small cleaning companies probably would be forced out of the market if the producer of washing machines would get into the cleaning market and use economies of scales by expanding their market share. It is quite possible that the organisational and financial complexity of product-service systems structurally prefer larger companies. It is probably no coincidence that particularly larger companies tend to offer and demand product-service systems. Another example could be the market for car-sharing, which is being discovered by auto companies and car rental as a new business opportunity. On one hand, the association of car manufacturers and car rental companies could transform the car sharing market from a niche market into a mass market. At the same time, the established small and medium-size car-sharing companies will increasingly be driven out of the market. Expanding their position in the value chain—depending on the market structure—could also be accompanied by an increase in market power.

But the market structure **can also be characterised by a strong market position on the demand side**, in which the supplier is forced to offer product-service systems to remain business partners, but at the same time has to bear high risk in the form of contract penalties, etc. In the questionnaire used by the Fraunhofer ISI, especially SME answered, they would offer product-service systems only at the express wish of their business partners (Schröter, Buschak, and Jäger 2010).

Not always a win-win-situation between improving economic performance and reducing environmental impacts

Several corporate examples, such as *Xerox*, show that leasing can be economically very successful by **remanufacturing and sale of used goods** and therefore, **creating additional revenue**. Over the associated extension of the life cycle, it is assumed that this results in less resource use, thus lowering the environmental impacts. In our view, however, there is a **trade-off between the reduction of ecological impacts and the generation of additional sales opportunities through re-leasing and remanufacturing**: leasing, remanufacturing and the related offering of used goods can cause cannibalisation effects with new products (Agrawal et al. forthcoming).

From an ecological perspective this is desirable, i.e. new products are replaced by used goods; from a business perspective, remanufacturing is mainly driven by the fact that remanufactured goods open up more affordable market segments and thereby generate additional revenue. In other words, **product-service systems are not per se a win-win situation**: trade-offs will occur where product-service systems are economically advantageous, but their environmental impacts could be negative. And if the cannibalisation effect is too strong, remanufacturing would be no option for the producer. This raises the question of whether through smart regulation these trade-offs can be mitigated

Product-service systems do not necessary close the production loop of the economies

In the literature, the ability to close the production cycle is seen as one of the biggest advantages of product-service systems. Programs with **voluntary or mandatory take back obligations** at the end of the use phase of products would be a strong incentive for remanufacturing and recycling. As a side-effect, such remanufacturing and recycling activities could lead to a permanent access to valuable raw material and thus, at least partially, to become independent of commodity markets. However, here it should be noted: even in the case that product-service systems with collecting systems or without change of ownership will lead to remanufacturing and recycling, it **does not automatically close the production loop in the long term or ensure that the raw materials remain permanently in the (domestic) system**. For example, it is very likely that due to lower transport costs and high wage differentials, the labour-intensive remanufacturing takes place in countries with lower labour costs and not in the country where the product was used.

In a *leasing society* not all products will be exclusively leased and not all consumers will be switched to customers. There will be a broad range of products where leasing will be no option, because the price for these products are too low or people still prefer to have these products as their property. For such cases **a *leasing society* will have to find answers for diverse organisational problems to lead to a circular economy**: How to ensure that the remanufactured products don't leave the material loop after their second or third use phase due to a lack of recycling options? In cases of sold products: how can companies ensure that consumers bring back their products? Could the general introduction of an extended producer responsibility (EPR) with reverse logistic systems be a solution and at the same time push product-service systems, such as leasing or renting, in which a return of the products can be easily secured by contract agreements? Or could EPR fail on the different organisational hurdles, which makes it difficult for companies to meet their product responsibilities, while other alternatives such as leasing and renting will remain in niches because of missing social acceptance? It will therefore be necessary that both the take-back programs and the EPR are politically shaped in such ways that they can really meet the opportunities to close the material cycles of our economies.

3.3. Social and other strengths and weaknesses

Potential employment opportunities are associated with product-service systems (Stahel and Reday 1976, cited by Hockerts 2008). This was justified by the assumption that an increasing importance of **repair and remanufacturing services tend to be more labour-intensive than the production processes**. But this would require that the remanufacturing and repair services take place domestically and are not relocated in countries with lower labour-costs. Consumer products are largely produced in emerging Asian economies because of lower cost. It is quite plausible, that the current European labour costs for the repair/remanufacturing services are also too high and therefore provide only for expensive products a domestic market for repairing.

As already described in Section 3.2, even with the obligation to take-back or leasing and renting the goods does not guarantee that these remanufacturing/repair would not take place abroad and the customers would get replacements for this period. The **question where repair service take place** arise less for capital goods because these activities are usually done at the customer site. However, increased warranty requirement (minimum downtime, etc.) may lead to organisational changes (permanent maintenance personnel at the customer) and therefore increased the need for maintenance personnel. Overall it remains ambiguous whether repairing and maintenance of capital goods offers more then minor additional employment opportunities.

Mixed employment impacts are expected by a leasing society

The **employment effect of a *leasing society* would probably be very mixed, depending on the effect of various product-service systems used as a basis**. The different product-service systems of a *leasing society* **provide both potential for additional jobs as well as the possibility of a further increase in labour productivity** with the corresponding lower demand for employment. As mentioned before in Chapter 3.2., a *leasing society* could strengthen the innovation capacity and competitiveness of their companies, which probably would lead to rising world market shares and therefore would have the potential to create new jobs, mostly by producing additional products and goods (new and used goods). But on the other hand, suppliers of product-service systems can reach higher productivity levels due to pooling, specialisation and intensified use. As a result, the same amount of work could be done with fewer employees. Some product-service systems like most outsourcing activities are motivated in order to reduce costs. So e.g. the pooling of secretarial work in secretarial pools (especially SMEs no longer employ their own secretary but buy their service externally) had a quite similar effect as pooling services of products: a SME used the service “secretary” only if they needed this service. The billing based on minutes needed for the various activities means that in many cases the working hours of a secretary are used more efficiently than if each manager of an SME uses its own secretary. This enormous cost control leads to an intensified work load and potentially needs fewer secretaries to do the same amount of work. On the other hand, these services may become cheaper and therefore generate additional demand, especially as through external office service the customers require less office space and had no overhead costs for the secretary. And as the example of “clean laundry” service offered by centralized laundry facilities shows (see Box 3 in Chapter 3.1.), product-service systems could also provide jobs perspectives for less skilled employees.

Besides the unclear net employment effect of product-service systems, it is also recognized that **some of these product-service systems also lead to deterioration in working conditions**. For a number of outsourcing activities that can be defined as product-service systems, such as security or office cleaning services that were previously provided by its own staff, cost reductions are not necessarily achieved by increasing productivity or through specialisation. In many cases the same service at a lower cost is achieved by lower wages offered by service companies against the wages you would have to pay your own staff. Therefore, product-service systems like outsourcing of office cleaning or services are often done by the same numbers of employees but at lower wages as before.

Chapter 3 has shown that **product-service systems can provide both environmental and economic benefits as well as additional employment opportunities**. At the same time, some of the possible trade-offs were discussed, showing that the potentials do not necessarily lead to win-win situations. **Negative environmental impacts or fewer and worse paid service jobs could also be a result of an enhanced use of conventional leasing and outsourcing activities**.

Positive case studies depict the entrepreneurial success of product-service systems quite convincingly. However, potential macroeconomic consequences cannot be inferred from micro-economic examples. Product-service systems can be described as an innovation systems with creative deconstruction that will produce winners and losers (Tukker et al. 2006). **To achieve win-win solutions, political institutions need to take trade-offs into consideration when designing policies**. Since not all product-service systems will probably make a contribution to a resource-efficient Europe, further research is needed to analyse which product-service systems will under what circumstances support both ecological and economic benefits and should therefore be the focus of policy measures.

4. MOVING TOWARDS A LEASING SOCIETY: RECOMMENDATIONS AND POLICY OPTIONS

KEY FINDINGS

- The actual costs of environmental policy need to be assessed within a dynamic framework that takes into account initial costs for abatement, innovation responses and, eventually, the entrenchment of new product-service systems business models and less overall resource dependence.
- Many of the initiatives currently being brought forward at EU and national levels already have a great potential for promoting the transition towards a *leasing society*.
- Market-based instruments have a great potential for fostering a shift towards sustainable product-service systems.

The current dynamics of technology push and market pull are probably not sufficient to promote the transition toward a *leasing society* (Cook, Bhamra and Lemon, 2006; with regard to eco-innovations more generally see Hemmelskamp, 2000). **In order to realise the economic and ecological potentials of product-service systems, government intervention would be required**. A key ingredient to the successful management of the transition towards more sustainable patterns of production and consumption lies in the identification of existing barriers and of those drivers that "*offer the best leverage for guiding change in a desirable direction*" (Smith et al. 2005).

4.1. Relevant policy initiatives

Many of the initiatives currently being brought forward at EU could be relevant for promoting the transition towards a *leasing society*.

The Flagship Initiative for a resource-efficient Europe is one among seven under the Europe 2020 Strategy. It aims at supporting the shift towards a resource-efficient, low-carbon economy and provides a long-term framework for action in many policy areas. One of its main building blocks is the Roadmap to a resource-efficient Europe (COM(2011) 571). In the Roadmap the Commission has expressed the vision that by "*2050 the EU's economy has grown in a way that respects resource constraints and planetary boundaries, thus contributing to global economic transformation*" (European Commission 2011). The policy recommendations in this section are oriented towards one of the milestones of the Roadmap: "*Milestone: By 2020, citizens and public authorities have the right incentives to choose the most resource efficient products and services, through appropriate price signals and clear environmental information […]. Minimum environmental performance standards are set to remove the least resource efficient and most polluting products from the market. Consumer demand is high for more sustainable products and services*" (European Commission 2011).

Another of the seven flagship initiatives of the Europe 2020 Strategy is the Innovation Union promoting European Innovation Partnerships (EIPs). These partnerships between private and public actors aim at societal challenges and the associated modernisation of sectors and markets with the accompanying exploitation of new business opportunities.

An intended key feature of the EIPs is the design and implementation of a variety of steps concerning research and development, demonstration and pilot projects, fast-tracking of regulation and standards, and the mobilisation of demand through better coordinated public procurement[13]. As this approach bears many of the interlocking features of the following policy recommendations, a European Innovation Partnership on leasing could be a suitable way of promoting steps towards a *leasing society*.

4.2. Policy instruments

There are many possible categorisations of policy instruments (see e.g. Lascoumes and Le Gale 2007; Howlett et al. 2009). For reasons of simplicity **this section divides the range of available policy instruments into four categories**:

1 market-based instruments, which seek to influence market transactions by influencing price signals or information provision regarding product and service qualities or prices,
2 regulatory instruments, which mandate or prohibit specific practices or technologies,
3 information-based instruments, which generate knowledge and provide information to the wider public or specific target groups, and
4 participatory instruments, which mobilise stakeholders into voicing their interests, ideas and concerns.

Table 6: Overview of policy instruments

Policy instruments	Direct / Indirect	Possibilities for fostering a *leasing society*	Policy developments / documents at EU level
Mode of intervention: market-based			
Cap-and-trade permit systems or taxes or charges on pollution or resource use	Indirect	Making resource-efficient PSS more competitive	Roadmap to a Resource Efficient Europe
Reduced VAT rate for maintenance, repair and remanufacturing services and for longer-than-average warranties	Indirect	Can give the right incentives for a longer lifetime of products and can help to improve the material and skill infrastructure for PSS related economies of scope	Council Directive 2009/47/EC amending Directive 2006/112/EC as regards reduced rates of value added tax
Deceleration of depreciation in tax legislation	Indirect	Slower rates of depreciation make ownership less beneficial from a financial perspective and can thus favour leasing models	
Public procurement	Direct / Indirect	Can support ecologically superior products and services and can contribute to informing wider public of economic and ecological benefits	Innovation Union

[13] EC Website http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=eip

Charges for waste disposal and treatment	Indirect	Taxes and fees on landfilling and incineration	Thematic Strategy on the Prevention and Recycling of Waste
Deposit-refund systems	Indirect	Increases the probability that producers or retailers need to take on post-consumption responsibility for products	
Labelling schemes	Indirect	Can inform consumers of life cycle costs of products *vis-á-vis* services	Product Environmental Footprint (PEF) standard, Roadmap to a Resource Efficient Europe
Mode of intervention: regulatory			
Further development of performance and technology standards	Direct / Indirect	Can make products relatively more expensive and thus PSS relatively more competitive. Could potentially mandate use of PSS instead of products.	Eco-Design Directive
Further development of Extended Producer Responsibility	Indirect	Can help to close loops and internalise costs by assigning more post-consumption responsibility to producers	Thematic Strategy on the Prevention and Recycling of Waste, WEEE
Further extension of minimum warranties	Indirect	Incentives producers to make sure that their products are long-lasting. Higher prices for better-quality products can make leasing more attractive	Proposal for a Directive of the European Parliament and of the Council on consumer rights; Green Paper on the Review of the Consumer Acquis
Obligatory shared facilities	Direct	Can respond to collective action problems and help citizens to save money and resources (e.g. by mandating communal laundry facilities for housing complexes exceeding a certain number of housing units)	
Standardisation and harmonisation of legal framework	Direct	Enables customers to rely on low risk of transactions and thus makes PSS more attractive.	Directive 2006/123/EC on services in the internal market

Mode of intervention: informational			
Support further research into possibilities for PSS and support diffusion of knowledge on PSS	Direct	Lowers informational barriers for potential PSS providers and thus facilitates take-up of PSS schemes	EU Framework Programmes
Mode of intervention: participatory			
Consultation	Direct	Allows stakeholders to represent their views. May help to better target policy to support sustainable PSS.	

4.2.1. Market-based instruments

The value of natural resources like water, air, soil, etc. is difficult to express in economic terms. The price to use natural resources most often does not reflect their environmental costs. Market-based instruments like taxes, charges or tradable permit schemes can contribute towards reforming market frameworks so that price signals better reflect environmental costs (OECD 2011). This can spark eco-innovation, the greening of business models and, thus, development towards *a leasing society*. **Measures to incorporate the true costs of resource use in markets will help level the playing field so that resource-efficient innovations can compete successfully with traditional solutions** (Mont and Lindhqvist 2003; Cechin and Vezzoli 2010).

Tax policy

Tax reform can provide incentives for the development and deployment of product-service systems. In general, a more environmentally-oriented tax policy could contribute to changing the current trajectory of economic development towards one less based on the consumption of products and more based on the provision of services (OECD 2010). **Taxes could be adapted in three key ways to encourage development of a *leasing society***:

- shift taxation from labour towards resource consumption,
- reduce VAT rates for extended warranty, maintenance, repair and remanufacturing,
- extend depreciation rates.

Current tax structures often favour resource use over labour. This can hinder the development of a *leasing society* in two ways. First, high labour costs pose an important barrier to the success of business models based on labour intensive repair and maintenance services (Cook et al. 2006; Mont 2002). Second, incentives to use primary resources more efficiently are missing, if the price of resource use is low. **Modifying the price relation between capital and labour would provide a number of benefits.** It could improve the cost structure of labour-intensive services, make circular product-service systems a more competitive option for business, and increase the demand for resource-efficient services (Scholl et al. 2010). The EU has recognized the need for tax reform. One milestone of the Roadmap to a Resource Efficient Europe for 2020 is, "*a major shift from taxation of labour towards environmental taxation, including through regular adjustments in real rates, [which] will lead to a substantial increase in the share of environmental taxes in public revenues, in line with the best practice of Member States*" (European Commission 2011).

One way of supporting product-service systems in the business-to-consumer sector could be to apply a reduced VAT rate for certain products and services (Copenhagen Economics 2008; OECD 2010; Bahn-Walkowiak et al. 2010; Watkins et al. 2012).

Currently, a reduced VAT rate can be applied to "*minor repairing of bicycles, shoes and leather goods, clothing and household linen (including mending and alteration)*"[14]. An extension of this permission to electronic and household equipment could further support repair and maintenance in a *leasing society*[15]. Moreover, producers who offer an extended warranty going beyond the typical time period could be rewarded with a reduced VAT rate (Watkins et al. 2012). The Commission (2007 10)[16] suggested that a reduced VAT rate may be applied to goods or services for environmental reasons. A future assessment to evaluate the impact of reduced VAT rates in terms of resource-efficiency and leasing would be valuable.

The rate of depreciation has strong implications on the decision to buy or lease products (Brigham and Daves 2012). Because the depreciation of capital assets is a tax-deductible expense, it allows owners to recover a part of their investment in capital assets. Slower rates of depreciation mean that it takes longer to recover the initial investment and thus weigh on liquidity. This makes leasing more attractive, as leasing offers the possibility to directly deduct leasing fees from annual taxable income. This is especially relevant for business-to-business leasing schemes. **It may be possible to initiate a reconsideration of current rates of depreciation in EU countries in light of ecological and resource-efficiency criteria.** However, because this measure could lead to more product-oriented leasing with a quick turnover of products (e.g. every year a new car) instead of a result-oriented provision of services (as in the vision of *a leasing society)* more detailed analysis is necessary.

Green Public Procurement

Green public procurement could increase demand for leasing solutions (Cechin and Vezzoli 2010; Mont 2002). By using product-service systems, the public sector can set an example for private and corporate consumers. Public authorities can also go one step further by creating a market for novel product-service systems solutions. Each year, they spend the equivalent of about 16 % of the EU GDP on goods and services such as furniture, IT equipment, electricity, transport, buildings, food and catering, and cleaning products and services, among others (European Commission 2008. A shift toward result-oriented leasing would not only set a profound example, but also provide a niche market (Tukker and Tischner 2006b; Nill and Kemp 2009) for companies to test radical novelties and try out new business models.

4.2.2. Regulation

Regulatory instruments can be used to set the framework conditions for encouraging development towards a *leasing society*. This section focuses on two: the Eco-Design Directive and Extended Producer Responsibility. Other regulations could also be beneficial, for example, adjusting building codes to ensure that facilities are available for sharing (e.g. communal laundry facilities) for housing complexes exceeding a certain number of housing units (Scholl et al. 2010).

[14] Directive 2009/47/EC (p. 20)

[15] It should be noted that differentiated VAT rates are often difficult to apply. Repair and maintenance may also comprise new or substituted parts of the product. Thus, the difference between the supply of services and (parts of) products may not be straightforward.

[16] COM(2007) 380 final

Examples of related measures are the Directives regulating the management of waste from electrical and electronic equipment (WEEE) and the use of certain hazardous substances used in this equipment (RoHS) as well as Directives related to the energy efficiency of appliances such as the Energy labelling Directive.

Eco-Design Directive

The Directive on the Eco-design of Energy-related Products (ERP) (2009/125/EC), so far addresses products of which the use has an impact on energy consumption:

1. *"Energy-using products (EUPs), which use, generate, transfer or measure energy (electricity, gas, fossil fuel), such as boilers, computers, televisions, transformers, industrial fans, industrial furnaces etc.*
2. *Other energy related products (ERPs) which do not use energy but have an impact on energy and can therefore contribute to saving energy, such as windows, insulation material, shower heads, taps etc."*[17]

The Directive provides coherent EU-wide rules for eco-design and ensures that disparities among national regulations do not become obstacles to intra-EU trade. The Directive does not introduce directly binding requirements for specific products, but defines conditions and criteria for setting requirements for product characteristics. The requirements are supposed to facilitate free movement of goods across the EU and to enhance product quality and energy efficiency.
It encourages manufacturers to design products with the environmental impacts in mind throughout their entire life cycle. The European Commission enacts implementing measures on specific products and environmental aspects after impact assessment and broad consultation of interested parties.

The Directive applies for those energy-related products, which have an important environmental impact and volume of trade in the internal market as well as a clear potential for improvement, for example where market forces fail to make progress in the absence of a legal requirement.

Elements of the Eco-Design Directive which are relevant for a *leasing society* are:

1. the framework and procedures for assessing products
2. the definition of requirements for product characteristics
3. the impact of these requirements on the product-design manufacturers

These elements could support a transition towards a *leasing society*, if they would be applied not only to products but also to product-service-systems. This could support energy-related product-service systems. In addition, an expansion of the Eco-Design Directive assessment frameworks and product characteristics towards the inclusion of aspects of material requirements could even develop the potential of a broader transition towards a resource-efficient Europe.

[17] http://ec.europa.eu/enterprise/policies/sustainable-business/ecodesign/index_en.htm

Extended Producer Responsibility

The OECD *defines* Extended Producer Responsibility as an environmental policy approach "*in which a producer's responsibility for a product is extended to the post-consumer stage of a product' life cycle*"[18]. Especially **EPR programmes aimed at ensuring that producers need to deal with the remains of their products at the end of the life-cycle can make leasing business models more attractive** (Mont and Lindhqvist 2003). Product-service systems may also be thought of as a response to legislation toward extended producer responsibility "*as material artifacts produced by the firms would not transfer to consumers thus avoiding the need to develop, often costly, take-back procedures and mechanisms*" (Cook, Bhamra and Lemon 2006). Waste Electrical and Electronic Equipment (WEEE) and End-of-life Vehicles are areas particularly suitable for testing the promotion of product-service systems by means of extended producer responsibility.

4.2.3. Information

In general, monetary and ecological costs over the entire life cycle of conventional products and product-service systems are widely unknown. Better knowledge of the life cycle costs of product-service systems could be a strong driver for more circular business approaches. Thus, assessment procedures and their results need to be shared among producers and consumers and integrated into research policies and programmes.

Informing Producers

Transfer of knowledge among industry has contributed to the promotion of chemical leasing (White et al. 1999). **Knowledge about the product-service systems concept is a key element for facilitating uptake** (see. e.g. Cook, Bhamra and Lemon 2006). Many companies are constantly looking into new possibilities for growth and may consider extending their range of supply into services (Mont 2002). However, a lack of knowledge about such possibilities may inhibit a stronger uptake of service-oriented activities. Documentation of case studies, contractual arrangements and their economic as well as environmental performance (White et al. 1999) could promote diffusion of good practice.
Furthermore, **research on product-service systems could be promoted in order to identify areas with the greatest ecological and market potential** and to elaborate suitable business models. Facilitating technology and knowledge transfer from research institutions to industry (Mont 2002) could be another element to promote the *leasing society*. Competitiveness concerns may often pose a barrier to such knowledge transfer. As a response, governments may fund demonstration activities. These demonstration activities could also address issues of consumer and business acceptance, on the one hand by behavioural research (White et al. 1999), and on the other hand by integrating users into service development (Liedtke et al. 2012).

[18] http://www.oecd.org/env/environmentalpolicytoolsandevaluation/extendedproducerresponsibility.htm

Informing Customers

The presentation of a clear cost structure was key to the success of Chemical Management Services (Mont 2002). There may be a lack of awareness or understanding of the product-service systems concept at the most basic level. In addition, the life-cycle costs of products and services may not be clear to potential customers (Mont and Lindhqvist 2003). In order to raise awareness and understanding of the product-service systems concept, an information campaign is one approach to overcome existing information barriers. Governments could also support the diffusion of product-service systems through public procurement procedures. Moreover, labelling schemes may be able to support the uptake of leasing solutions by highlighting the cost and effort implications over the entire product life-cycle (OECD 2011).

Nevertheless, because a *leasing society* could lead to more radical changes in the structure of economies and flow of materials, labelling schemes may have to co-develop with novel solutions. While labelling could be an important tool to inform customers, and thus a key part of bringing new product-service systems innovations on the market, it can also pose a considerable financial burden on producers or service providers. Here, tax credits and subsidies for auditing expenses could help to encourage voluntary labelling and thus facilitate comparability for consumers and public procurement.

Research and Education

Research policy could support demonstrative and niche activities in order to enable experimentation and the maturing of innovative product-service systems (Cechin and Vezzoli 2010). In conjunction with research policy, promoting education to train the next "*generation of professionals capable of designing, implementing and managing [ecologically efficient] PSS*" (Cechin and Vezzoli 2010) is needed. For instance, dedicated university courses on eco-efficient product-service systems and research grants for PhD students could be offered.

Such efforts could be integrated with the development of the "*EU Skills Panorama and a European Sector Council on skills for green and greener jobs"* (European Commission 2011)

4.3. Recommendations

General measures can set the right background conditions for a *leasing society* and at the same time they can counteract rebound effects that may arise from the utilisation of product-service systems. **Without a change in political and economic framework conditions, information campaigns and grants for product substituting business models run the risk of providing costly but short-lived support for the transition to a more resource-efficient Europe.**

Changing the framework conditions and thereby *indirectly* supporting product-service systems is more likely to meet the requirements of the resource-efficient Europe. However, *direct* measures aimed at supporting the uptake or up-scaling of product-service systems can have a secondary but nevertheless important effect: They can help to overcome resistance against changing framework conditions by raising producer interest in general framework conditions that are supportive for their own business models and thus amplify interests in favour of a resource-efficient Europe including a *leasing society*.

While active support for product-service systems R&D is important, **an exclusive focus on support for innovative business models instead of framework conditions runs the risk of providing insufficient incentives for adoption in the absence of government support as there is no cost to environmentally harmful activities** (with regard to environmental innovation more generally see OECD 2010). Nevertheless, a number of specific recommendations can be given on the basis of the information in section 1, 2 and 3.

Box 4: Recommendations

RESEARCH

The transition to a *leasing society* would require a better understanding of social, economic and environmental impacts. The different manifestations of product service systems may have completely different intended and unintended macro-economic effects. Therefore, the European Union should invest in systemic research, including dynamic modelling and governance of a *leasing society*, e.g. in the Horizon 2020 framework program.

In parallel, basic research and assessment on a *leasing society* could be complemented with demonstration and pilot projects, diffusion of best practice, and targeted experimental public procurement initiatives. Eventually, a European Innovation Partnership in support of resource-efficient product-substituting services could be initiated.

MARKET-BASED INSTRUMENTS

An ecological tax reform could shift taxation from labour towards resource consumption to give the right incentives for a transition towards less resource-intensive products, lifestyles and more labour intensive maintenance and repair of more durable products and innovative product service systems.

Reduced VAT rates for maintenance, repair and remanufacturing could give the right incentives for a longer lifetime of products and leasing business models e.g. for electronic and household equipment. In addition, a reduced VAT rate could be granted to producers who offer an extended warranty going beyond the typical time period.

Landfill and incineration charges could give incentives for re-use, remanufacturing and recycling, including supporting product service supply.

Longer depreciation periods could contribute to extend the average use phase of a product.

Public procurement could create niche markets for developing a *leasing society*.

REGULATION

The Eco-Design Directive should be extended towards resource savings and efficiency including requirements for materials.

Producer responsibility could be strengthened including deposit refund schemes in areas such as end-of-life vehicles or electric and electronic equipment.

Minimum warranties for products could be further expanded.

The introduction of communal laundry and car sharing facilities for housing complexes exceeding a certain number of housing units should be tested.

The legal framework for product-service systems for standardised and harmonised contracting could be developed in the EU Single Market.

INFORMATION

In general, monetary and ecological costs over the entire life cycle of conventional products and product service systems are widely unknown. Better assessment procedures and their results need to be shared among producers and consumers.

Voluntary labelling for leasing-solutions should be encouraged with tax credits for assessment and auditing expenses to facilitate consumer choices and public procurement.

Knowledge on life cycle costs advantages of product-service systems including public assessments of product-service systems and products should be integrated in government procurement procedures.

Research, pilot projects, education and the dissemination of information on product-service systems can be supported in the framework of various EU programs.

PARTICIPATION

Business, civil society, policy-makers and scientists should be consulted for improving a shared understand of possible opportunities and risks connected to the *leasing society*. This could become the vanguard of a future European Innovation Partnership.

REFERENCES

- Agrawal, V.V., A. Atasu, and K. Van Ittersum. (forthcoming). "Remanufacturing, Third-Party Competition, and Consumers' Perceived Value of New Products". *SSRN eLibrary*. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1983342 .
- Agrawal, V.V., M. Ferguson, L.B. Toktay, and V.M. Thomas. (2012). "Is Leasing Greener Than Selling?" *Management Science* 58 (3) (January 3): 523–533 doi: 10.1287/mnsc.1110.1428.
- Bahn-Walkowiak B., H. Wilts, R. Bleischwitz, and J. Sanden. (2010). "Differenzierte Mehrwertsteuersätze zur Förderung eines resourceneffizienteren Konsums". *MaRess Ressourceneffizienzpaper* 3.6. Wuppertal Institute for Climate, the Environment and Energy. Wuppertal.
- Baines, T. S., H. W. Lightfoot, S. Evans, A. Neely, R. Greenough, J. Peppard, R. Roy, et al. (2007). "State-of-the-art in product-service systems". *Proceedings of the Institution of Mechanical Engineers Part B-Journal of Engineering Manufacture* 221 (10) (October): 1543–1552. doi:10.1243/09544054JEM858.
- Better Place. (2011). „Better Place. An OECD Case Study". OECD/European Commission/Nordic Innovation Joint Workshop, The Future of Eco-Innovation: The Role of Business Models in Green Transformation, January 20, Copenhagen: http://www.oecd.org/sti/innovationinsciencetechnologyandindustry/49522094.pdf
- Better Place. (2012). „Better Place": http://www.betterplace.com/
- Botsman, R., and Roo Rogers. (2011). *What's Mine Is Yours: How Collaborative Consumption is Changing the Way We Live*. (revised and updated edition). HarperCollins.
- Braungart, M. (1991). "Kongressreader zum 6. Praxisnahen BAUM-Kongress, 'Mit Umweltschutz zum Gewinn' - für die Wirtschaft und die Umwelt: Am 21. Und 22. November 1991 im Sachsenwald-Forum Reinbek bei Hamburg". In *Umweltschutz als Wettbewerbsvorteil für Unternehmen - Intelligente Lösungen für Umweltprobleme durch bessere Produkte, das Leasingkonzept für Gebrauchsgüter*, 109–121. BAUM.
- Brezet, J.C., A.S. Bijma, J. Ehrenfeld, and S. Silvester. (2001). The design of eco-efficient services: Method, tools and review of the case study based „Designing Eco-efficient Services" project. Design for Sustainability Program. Delft: Delft University of Technology.
- Brigham E.F., and P.R. Daves (2012). *Intermediate Financial Management*. South Western College Publishing. Cincinnati, Ohio.
- Bund, K. (2011). "Meins ist deins". *Die Zeit* (Dezember 15).
- Car2Go. (2012). "Hallo Ulm": https://www.car2go.com/de/ulm/
- Cook, M.B., T.A. Bhamra, and M. Lemon, M. (2006). "The transfer and application of Product Service Systems: from academia to UK manufacturing firms". *Journal of Cleaner Production*, 14(17), 1455–1465.
- Cooper, T., and S. Evans. (2000). *Products to services*. (A report for Friends of the Earth). The Centre for Sustainable Consumption, Sheffield Hallam University.

- Copenhagen Economics (2008). *Study on Reduced VAT Applied to Goods and Services in the Member States of the European Union. Taxation Paper.* Directorate General Taxation and Customs Union, European Commission.
- COWI. (2008). *Promoting Innovative Business Models with Environmental Benefits, Final Report*. Kongens Lyngby: http://ec.europa.eu/environment/enveco/innovation_technology/pdf/nbm_report.pdf .
- Davies, A. (2004). „Moving base into high-value integrated solutions: a value stream approach". *Industrial and Corporate Change* 13 (5) (Oktober 1): 727–756 doi:10.1093/icc/dth029.
- Dittrich, M., S. Giljum, S. Lutter, and C. Polzin. (2012). *Green economies around the world? Implications of resource use for development and the environment.* Vienna.
- EEA. (2010). *The European Environment. State and Outlook 2010. Material Resources and Waste*. Copenhagen: European Environment Agency.
- Ellen MacArthur Foundation. (2012). *Towards the circular economy: Economic and business rationale for an accelerated transition*. Ellen MacArthur Foundation.
- EPA. (2002). *Resource Management: Strategic Partnerships for Resource Efficiency*. WasteWise Update. Washington D.C.: U.S. Environmental Protection Agency, Office of Solid Waste.
- EPA. (2009). *"Green Servicizing" for a More Sustainable US Economy: Key concepts, tools and analyses to inform policy engagement.* Washington D.C.: US Environmental Protection Agency, Office of Resource Conservation and Recovery.
- European Commission. (2005). *Taking sustainable use of resources forward: A Thematic Strategy on the prevention and recycling of waste*. COM(2005) 666 final. Brussels.
- European Commission. (2008). *Public procurement for a better environment*. COM(2008) 400. Brussels.
- European Commission. (2009). *Mainstreaming sustainable development into EU policies: 2009 Review of the European Union Strategy for Sustainable Development* (COM(2009) 400). Brussels.
- European Commission. (2011). *Roadmap to a Resource Efficient Europe*. COM(2011) 571 final Brussels.
- European Commission. (2012). *Waste Electrical and Electronic Equipment Directive (WEEE Directive)* (2012/19/EU). Brussels.
- European Union. (2006). *Directive 2006/123/EC of the European Parliament and of the Council of 12 December 2006 on Services in the Internal Market*. Brussels.
- European Union. (2009). *Council Directive 2009/47/EC of 5 May 2009 amending Directive 2006/112/EC as regards reduced rates of value added tax*. Brussels.

- European Union. (2009b). *Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products*. Brussels.
- Firnkorn, J., and M. Müller. (2011). „What will be the environmental effects of new free-floating car-sharing systems? The case of car2go in Ulm“. *Ecological Economics* 70 (8) (June): 1519–1528. doi:10.1016/j.ecolecon.2011.03.014.
- Fishbein, B. K., L. S. McGarry, and P. S. Dillon. (2000). *Leasing: A Step Toward Producer Responsibility*. New York: INFORM.
- FORA. (2010a.) *Green business models in the Nordic Region: A key to promote sustainable growth. Copenhagen*: Danish Enterprise and Construction Authority.
- FORA. (2010b.) *Provisional collection of Nordic cases and expert interviews - "Green Business Models in the Nordic Region"*. Workshop on green business models in the Nordic region, September 3rd 2010. Copenhagen: Danish Enterprise and Construction Authority.
- Goedkoop, M. J., C.J.G. van Halen, H.R.M. te Riele, and P.J.M. Rommens. (1999). *Product Service Systems, Ecological and Economic Basics*.
- Greene, A., and N.L. Breisch. (2002). „Measuring Integrated Pest Management Programs for Public Buildings“. *Journal of Economic Entomology* 95 (1): 1–13.
- Hawken, P. (1993). *The Ecology of Commerce*. New York: HarperCollins.
- Hawken, P., A.B. Lovins, and L.H. Lovins. (2010). *Natural Capitalism: The Next Industrial Revolution*. Earthscan.
- Hemmelskamp, J. (2000). "Environmental Taxes and Standards: An Empirical Analysis of the Impact on Innovation", in Hemmelskamp, J., K. Rennings and F. Leone, eds., *Innovation Oriented Environmental Regulation*. Physica-Verlag. Heidelberg/New York.
- Hockerts, K. (2008). *"Property Rights as a Predictor for the Eco-Efficiency of Product-Service Systems"*. CBS Center for Corporate Social Responsibility.
- Hockerts, K., A. Petmecky, S. Hauch, and S. Seuring. (1994). "Servicekonzepte als Element einer öko-effizienten Kreislaufwirtschaft". In *Kreislaufwirtschaft statt Abfallwirtschaft: Optimierte Nutzung und Einsparung von Ressourcen durch Öko-Leasing und Servicekonzepte*, ed. by. K. Hockerts, A. Petmecky, S. Hauch, S. Seuring, and R. Schweitzer, Schriftenreihe der Bayreuther Initiative für Wirtschaftsökologie:3–14. Bayreuth: Universitätsverlag Ulm.
- Holliday, C.O., S. Schmidheiny, P. Watts, and World Business Council for Sustainable Development. (2002). *Walking the talk: the business case for sustainable development*. Sheffield [a.o.]: Greenleaf [a.o.].
- Howlett M., M. Ramesh, A. Perl. (2009). *Studying Public Policy: Policy Cycles and Policy Subsystems*. Oxford University Press. Oxford.
- Innotec. (2012). "Innotec Abfallmanagement GmbH". http://www.innotec-abfallmanagement.de/de/index.htm
- Intlekofer, K. (2010). Environmental implications of leasing.

- Intlekofer, K., B. Bras, and M. Ferguson. (2010). "Energy Implications of Product Leasing". *Environmental Science & Technology* 44 (12) (June 15): 4409–4415. doi:10.1021/es9036836.
- Jasch, C., and G. Hrauda. (2000). "Ökologische Dienstleistungen: Markt der Zukunft". Institut für ökologische Wirtschaftsforschung.
- Kim, S.-H., M. A. Cohen, and S. Netessine. (2007). "Performance Contracting in After-Sales Service Supply Chains". *Management Science* 53 (12) (December 1): 1843–1858. doi:10.1287/mnsc.1070.0741.
- Koortman, J., D. Theodori, H.v. Ewijk, F. Verspeek, J. Uitzinger, F.L. Roca, G. Ferrer, E. Esteve, C. Gensch, D. Quack. (2006). *Chemical product services in the European Union*. European Commission. Directorate-General Joint Research Centre. Institute for Prospective Technological Studies.
- Lascoumes P., and P. Le Gales (2007). "Introduction: Understanding Public Policy through Its Instruments—From the Nature of Instruments to the Sociology of Public Policy Instrumentation", *Governance: An International Journal of Policy, Administration, and Institutions*, 20(1), 1–21.
- Lay, G., M. Schroeter, and S. Biege. (2009). "Service-based business concepts: A typology for business-to-business markets". *European Management Journal* 27 (6): 442–455.
- Leaseurope, and KPMG. (2012). *European Leasing*. A Joint Leaseurope and KPMG's Asset Finance Tax Network Publication. Leaseurope, KPMG.
- Leismann, K., M. Schmitt, H. Rohn, and C. Baedeker. (2012). *Nutzen statt Besitzen, Auf dem Weg zu einer ressourcenschonenden Konsumkultur*. Short study. Heinrich Böll Stiftung Ökologie. Berlin: Requested and published by the Heinrich-Böll-Stiftung together with the Naturschutzbund Deutschland.
- Levine, M. (2009). „Share my Ride". *The New York Times Magazine* (March 8): 36.
- Liedtke C., M.J. Welfens, H. Rohn, J. Nordmann. (2012). LIVING LAB: user-driven innovation for sustainability. *International Journal of Sustainability in Higher Education*, 13(2), 106–118.
- Loose, W., M. Mohr, and C. Nobis. 2004. *Bestandsaufnahme und Möglichkeiten der Weiterentwicklung von Car-Sharing*. Schlussbericht. Freiburg: Öko-Institut.
- Manzini, E., and C. Vezzoli. (2000). *Product-Service System and Sustainability: Opportunities for sustainable solutions.*
- Markeset, T., and U. Kumar. (2005). „Product support strategy: conventional versus functional products". *Journal of Quality in Maintenance Engineering* 11 (1): 53–67. doi:10.1108/13552510510589370.
- Marsden, R. (2012). "Full circle". *Parliament Magazine* (356) (Oktober 15): 13–16.
- Meijkamp, R. (2000). *Changing consumer behaviour through eco-efficient services : an empirical study on car sharing in the Netherlands*. Delft, Netherlands: Delft University of Technology.
- Merkies, J. (2012a). "Beyond Ownership". *The Parliament Magazine* (346): 7.

- Merkies. (2012b). "The end of ownership". *European Voice :* http://www.europeanvoice.com/article/imported/the-end-of-ownership/74591.aspx
- Merkies, J., and E. Lowitt. (2012). "Leasing could provide the route to a circular and self-supporting economy". *the Guardian:* http://www.guardian.co.uk/sustainable-business/leasing-route-circular-economy
- Mobility. (2012). *Geschäfts- und Nachhaltigkeitsbericht 2011*. Luzern.
- Mont, O.K. (2000). *Product-Service Systems*. Final Report. Stockholm: The International Institute of Industrial Environmental Eocnomics.
- Mont, O.K. (2002). "Clarifying the concept of product–service system". *Journal of cleaner production*, 10(3), S.237–245.
- Mont, O.K., and T. Lindhqvist (2003). "The role of public policy in advancement of product service systems". *Journal of Cleaner Production*, 11(8). 905–914.
- Ng, I.C.L., and S.S. Nudurupati. (2010). "Outcome-based service contracts in the defence industry – mitigating the challenges". *Journal of Service Management* 21 (5): 656–674. doi:10.1108/09564231011079084.
- Nill, J., and R. Kemp. (2009). "Evolutionary approaches for sustainable innovation policies: From niche to paradigm?" *Research Policy,* 38(4). 668–680.
- OECD. (2010). *Taxation, Innovation and the Environment. OECD Publishing*. Paris.
- OECD. (2011). *Towards Green Growth*. OECD Publishing. Paris.
- Ölundh, G. (2003). "Environmental and Developmental Perspectives of Functional Sales". Stockholm: Department of Machine Design Royal Institute of Technology.
- Oxford Economics. (2011). *The Use of Leasing Amongst European SMEs*. A report prepared for Leaseurope.
- Reiskin, E.D., A.L. White, J. Kauffman Johnson, and T.J. Votta. (2000). „Servicizing the Chemical Supply Chain". *Journal of Industrial Ecology* 3 (2-3): 19–31. doi:10.1162/108819899569520.
- Rifkin, J. (2000). *The age of access. The new culture of hypercapitalism, where all of life is a paid-for experience.* Penguin Putnam Inc., New York.
- Saecker, S. (2011). "The SAFECHEM Business Model - sustainable solutions for industrial cleaning". OECD/European Commission/Nordic Innovation Joint Workshop on The Future of Eco-Innovation: The Role of Business Models in Green Transformation, Januar 20, Copenhagen: http://www.oecd.org/sti/innovationinsciencetechnologyandindustry/49522094.pdf
- SAFECHEM. (2012). „About us". *About us*. http://www.dow.com/safechem/eu/en/.
- Scholl G., L. Schulz, L. Süßbauer, and S. Otto (2010). *Nutzen statt Besitzen – Perspektiven für ressourceneffizienten Konsum durch innovative Dienstleistungen. MaRess Ressourceneffizienzpaper 12.4.* Wuppertal Institute for Climate, the Environment and Energy. Wuppertal.
- Schröter, M., D. Buschak, and A. Jäger. (2010). *Nutzen statt Produkte kaufen. Mitteilungen aus der ISI-Erhebung. Modernisierung der Produktion*. Fraunhofer Institut für System- und Innovationsforschung (ISI).

- Sechser, B. (1989). "New developments in pesticides for IPM in Africa with special reference to cotton pests". *International Journal of Tropical Insect Science* 10 (06): 815–820. doi:10.1017/S1742758400012583.
- SERI. (2011). "Global Material Flow Database".
- Shostack, G.L. (1982). "How to Design a Service". *European Journal of Marketing* 16 (1) (Dezember 31): 49–63. doi:10.1108/EUM0000000004799.
- Silver, M. (1989). *Foundations of economic justice*. Oxford [a.o.]: Blackwell.
- Smith A., A. Stirling, and F. Berkhout. (2005). "The governance of sustainable socio- technical transitions". *Research Policy*. 34(10). 1491–1510.
- Sommer, A. (2012). *Managing Green Business Model Transformations*. Dissertation, Leuphana Universität Lüneburg. Berlin, Heidelberg: Springer-Verlag.
- Sorrell, S. (2007). "The economics of energy service contracts". *Energy Policy* 35 (1) (Januar): 507–521. doi:10.1016/j.enpol.2005.12.009.
- Stahel. W.R. (1998). "From products to services: selling performance instead of goods". *IPTS report*.
- Stahel, W.R. (1997). "The Service Economy: 'Wealth Without Resource Consumption'?" *Philosophical Transactions of the Royal Society of London. Series A: Mathematical, Physical and Engineering Sciences* 355 (1728) (Juli 15): 1309–1319. doi:10.1098/rsta.1997.0058.
- Stahel, W.R., K. Hockerts, A. Petmecky, S. Hauch, S. Seuring, and R. Schweitzer. (1994). "Langlebigkeit von Gütern - Materialrecycling - Ressourcen-Effizienz". In *Kreislaufwirtschaft statt Abfallwirtschaft: Optimierte Nutzung und Einsparung von Ressourcen durch Öko-Leasing und Servicekonzepte*, Schriften der Bayreuther Initiative für Wirtschaftsökologie: 57–72. Ulm: Univ.-Verl. Ulm.
- Stremersch, S., S. Wuyts, and R.T. Frambach. (2001). "The Purchasing of Full-Service Contracts:" *Industrial Marketing Management* 30 (1) (January): 1–12. doi:10.1016/S0019-8501(99)00090-5.
- Sundin, E., J. Östlin, A.Ö. Rönnbäck, M. Lindahl, and G. Ö. Sandström. (2008). "Remanufacturing of products used in product service system offerings". *Manufacturing Systems and Technologies for the New Frontier*: 537–542.
- Sundin, E., and B. Bras. (2005). "Making functional sales environmentally and economically beneficial through product remanufacturing". *Journal of Cleaner Production* 13 (9) (Juli): 913–925. doi:10.1016/j.jclepro.2004.04.006.
- Tamyca. (2012). "Privates Carsharing - jetzt günstig Auto mieten bei tamyca.de". *tamyca.de*. http://www.tamyca.de/.
- Tellus Institute. (2002). *Advancing Resource Management Contracting in Massachusetts: Reinventing Waste Contracts and Services*. Prepared for Bureau of Waste Prevention, Massachusetts Department of Environmental Protection. Boston: Tellus Institute.
- Toffel, M.W. (2002). *Contracting for servicizing*. Unit Research Paper. Harvard Business School Technology & Operations Management Unit Research Paper.
- Tukker, A. (2004). "Eight types of product–service system: eight ways to sustainability? Experiences from SusProNet". *Business Strategy and the Environment* 13 (4) (July): 246–260. doi:10.1002/bse.414.

- Tukker, A., and C. van den Berg. (2006). "Product-services and competitiveness". New business for old Europe□: product-service development, competitiveness and sustainability. - Sheffield□: Greenleaf, ISBN 9781874719922. - 2006, p. 35-71.
- Tukker, A., C. van den Berg, and U. Tischner. (2006). "Product-services: a specific value proposition". New business for old Europe□: product-service development, competitiveness and sustainability. - Sheffield□: Greenleaf, ISBN 9781874719922. - 2006, p. 22-34.
- Tukker, A., and U. Tischner. (2006a). New business for old Europe: product service development, competitiveness and sustainability. Sheffield: Greenleaf Publishing.
- Tukker, A., and U. Tischner. (2006b). Product-services as a research field: past, present and future. Reflections from a decade of research. *Journal of Cleaner Production*. 14(17). 1552–1556.
- Tukker, A., U. Tischner, and M. Verkuijl. (2006). "Product-services and sustainability". New business for old Europe□: product-service development, competitiveness and sustainability. - Sheffield□: Greenleaf, ISBN 9781874719922. - 2006, p. 72-98.
- Vandermerwe, S., and J. Rada. (1988). "Servitization of business: Adding value by adding services". *European Management Journal* 6 (4) (December): 314–324. doi:10.1016/0263-2373(88)90033-3.
- Watkins E., D. Hogg, A. Mitsios, S. Mudgal, A. Neubauer, H. Reisinger, J. Troeltzsch, and M. van Acoleyen. (2012). *Use of Economic Instruments and Waste Management Performances*. Bio Intelligence Service. Paris.
- White, A. L., M. Stoughton, and L. Feng. (1999). *Servicizing: The Quiet Transition to Extended Product Responsibility*. U.S. Environmental Protection Agency, Office of Solid Waste.
- Wilts, H. (forthcoming). *"Nachhaltige Innovationsprozesse in der kommunalen Abfallwirtschaftspolitik - eine vergleichende Analyse zum Transition Management städtischer Infrastrukturen in deutschen Metropolregionen"*. Dissertation, TU Darmstadt, FG Raum- und Infrastrukturplanen.
- Wimmer, R., M. J. Kang, U. Tischner, M. Verkuijl, J. Fresner, and M. Möller. (2007). *Erfolgsstrategien für Produkt-Dienstleistungssysteme*. A project report from the programme "Fabrik der Zukunft, Impulsprogramm Nachhaltig Wirtschaften". Energy and environmental research reports.
- WWF (World Wildlife Fund), ZSL (Zoological Society of London), und Global Footprint Network. (2012). *Living Planet Report*.
- Xerox. (2010). Environmental sustainability at Xerox.
- Xerox. (2012). 2012 Environment, Health and Safety Report. Norwalk: Xerox.
- Zaring, O., M. Bartolomeao, P. Eder, P. Hopkinson, P. Groenewegen, P. James, P. de Jong, et al. (2001). *Creating eco-efficient producer services*. Gothenburg: Gothenburg Research Institute.

EUROPEAN PARLIAMENT

DIRECTORATE-GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT A
ECONOMIC AND SCIENTIFIC POLICY

Role

Policy departments are research units that provide specialised advice to committees, inter-parliamentary delegations and other parliamentary bodies.

Policy Areas

- Economic and Monetary Affairs
- Employment and Social Affairs
- Environment, Public Health and Food Safety
- Industry, Research and Energy
- Internal Market and Consumer Protection

Documents

Visit the European Parliament website: **http://www.europarl.europa.eu/studies**

PHOTO CREDIT: iStock International Inc.

Leasing Society