

Case studies and policy lessons from EU Member States for a product policy framework that contributes to a circular economy

Biannual Report 2018



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Eco-Innovation Observatory

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ECO-INNOVATION OF PRODUCTS:

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Eco-Innovation Observatory

The Eco-Innovation Observatory functions as a platform for the structured collection and analysis of an extensive range of eco-innovation information, gathered from across the European Union and key economic regions around the globe, providing a much-needed integrated information source on eco-innovation for companies and innovation service providers, as well as providing a solid decision-making basis for policy development.

The Observatory approaches eco-innovation as a pervasive phenomenon present in all economic sectors and therefore relevant for all types of innovation, defining eco-innovation as:

“Eco-innovation is any innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle”.

To find out more, visit www.eco-innovation.eu and ec.europa.eu/environment/ecoap

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A note to Readers

Any views or opinions expressed in this report are solely those of the authors and do not necessarily reflect the position of the European Union. A number of companies are presented as illustrative examples of eco-innovation in this report. The EIO does not endorse these companies and is not an exhaustive source of information on innovation at the company level.

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Summary

With the development of the circular economy agenda, the European Commission has spelled out specific aims for achieving resource efficiency in the EU's economic model. In particular, more value must be gained from resources already in use within society to meet economic, social and environmental goals. **Eco-Innovation is the change implemented to achieve these aims.** It is about adapting and changing business practices, consumer behaviour and lifestyles toward higher levels of sustainability, and requires new and adapted policy instruments and strong policy frameworks to support these changes. **This report focuses on the contribution of product eco-innovation towards a circular economy transition in the EU.** It provides an overview of trends and illustrative good practices and highlights the key lessons learned from product policy experiences across Member States toward implementing the circular economy.

Multiple pathways exist for the uptake of circular economy principles, e.g. through repair, re-use, remanufacturing and recycling. Products are at the heart of the challenge. In particular, the way that products are designed and manufactured (considering aspects such as modularity, multi-functionality, reparability, longevity and durability) have a large impact on the options available to both consumers and companies after their initial use phase. **Therefore, from a business perspective, product eco-innovation for the circular economy encompasses a wide range of activities.** For example, it includes internal company activities aimed at increasing the efficiency of secondary resource use in production processes and daily operations, efforts to design new products with closed loop supply chains, and changes in existing business models such as leasing, sharing and new services (repair, refurbishment, etc.) in order to enter new and emerging markets. **The involvement of consumers is also key.** Citizens play a role as participants (e.g. in take-back schemes), as key drivers for more sustainable products (e.g. by purchasing products with eco-labels) and as active eco-innovators through user-led changes (e.g. by founding repair cafes and collaborative consumption schemes). However, a one-size fits-all solution over the wide scope of products and services does not exist. All innovations may be associated with both positive and negative impacts (including unintended impacts of burden shifting) for the circular economy transition. Policy makers thus face the challenges of (1) developing a monitoring framework capable of evaluating progress from a systemic perspective and (2) of finding a consistent policy mix that includes (a) prescriptive product regulations, standards and incentives to encourage a smart circular economy transition and (b) space for strategic product eco-innovation developments that may be more disruptive, but which may be hampered by strict criteria.

Monitoring and evaluating product eco-innovation trends

This report has developed a framework to monitor and evaluate product eco-innovation trends for the circular economy. It encompasses three main areas: (a) the business model, (b) product design and production and (c) use and post-consumption. As regards **the business model** (a), much of the data identified stems from EU-level surveys, such as Eurobarometer and the Community Innovation Surveys. For example, a recent Eurobarometer survey indicates that resource efficiency actions have decreased production costs for 41% of the SMEs interviewed across the EU. The European Commission website of the Eco-Innovation Action Plan also provides key insights on how circular economy principles are being implemented into business models. For example, they present data showing that Portugal (30% - manufacturing sector; 50% - services sector) and Finland (28% - manufacturing sector; 46% - services sector) are the leading

Member States in terms of facilitating the recycling of products after use in both the manufacturing and service sectors within the EU.

Product design and production (b) covers aspects such as eco-design, product durability and recycling to measure the circularity of products. Regarding product design aspects, the Cordis database on EU research and development projects indicates that only roughly 5 % of all EU projects related to product design specifically addressed eco-design, with designing for remanufacture or repair considered in only 1 % and 2 % of product design-related projects respectively. Product durability was addressed in the 2014 Community Innovation Survey. It found that around 16 % of companies in the manufacturing sector and 12 % of companies in the services sector introduced actions related to product durability. Along similar lines, however, a 2014 Dutch study assessed product lifespan, finding that the only product category characterised by an increasing lifespan between 2000 and 2006 were lamps and compact fluorescents (+3%), with stable or decreasing lifespans for all other product groups evaluated. In contrast, positive developments have been observed across the EU in terms of recycling. Since the early 2000's, EU markets for recyclables such as metal, glass, paper and cardboard have grown considerably, driven largely by policy. However, these trends are not necessarily indicative of progress toward a circular economy in which large amounts of secondary resources ("waste") are reused as raw materials in production processes. Recycling statistics often include energy recovery (e.g. incineration), which may actually compete with recycling for the recovery of secondary resources for re-use in circular supply chains. The recently established EU monitoring framework (January 2018) on the circular economy aims to take such aspects into consideration.

As regards **use and post-consumption** trends (c), according to survey responses of EU citizens, about a third of them have heard about the **sharing economy**. While participation in the collaborative economy, as both users and providers, is relatively small across the EU, it is growing rapidly. The United Kingdom and France were identified as having the highest number of collaborative economy organisations out of nine Member States assessed in 2016. Key sectors and leading trends for such new forms of consumption include: the peer-to-peer transportation and accommodation sector, on-demand household and professional services, and collaborative finance. Altogether, the assessment of trends has shown that some positive trends in the direction of a circular economy are visible across different stakeholder groups and sectors. However, data remains an important challenge, in particular due to the relatively new emergence of key concepts. Policy must continue to address challenges related to data collection, reporting and monitoring (including harmonisation and filling gaps related to e.g. product stocks and flows throughout the economy) and future research must work to better understand the systemic links between a product, the business model of which it is a part, and the societal context that determines its life-cycle.

Eco-Innovation performance across the EU

A special feature presents the most recent (2017) Eco-Innovation Index developed by the Eco-Innovation Observatory. The Eco-Innovation Index is a tool that assesses and illustrates eco-innovation performance across countries. It consists of 16 indicators grouped into five thematic areas (eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency outcomes, and socio-economic outcomes). In 2017, Sweden led the ranking of all EU countries, followed by Finland, Germany, and Luxembourg. However, strengths and weaknesses between single components vary widely among countries and performance categories. The 'eco-innovation leaders' group, for instance, had high performances across almost all components, but reached relatively lower positions in the sub-index regarding socio-economic outcomes. This

implies that policy measures to improve employment rates and turnover in eco-industries and circular economy sectors should be considered for those countries with a low performance in that eco-innovation area. Regarding the low performances of the country group 'catching up in eco-innovation', further efforts are needed regarding R&D spending in order to trigger eco-innovations on the ground. The Eco-Innovation Observatory has also developed a Global Eco-Innovation Index, which is built upon the same methodological principles as the European index. In this ranking covering 130 countries, every EU Member state achieved a score above the global average, while 17 EU countries even led the index ranking. This may be due to the efforts of the European Commission to promote eco-innovation and points to an opportunity for Member States to take advantage of their frontrunner position in the pursuit of new lead markets.

Illustrative best practices in eco-innovation and the circular economy

Ten case studies across the EU on eco-innovations promoting the circular economy are showcased. These look at different sectors, actors, aims and achievements and demonstrate the wide range of existing good practices. Each case study describes the eco-innovation element deployed, highlights barriers and challenges faced and pinpoints some key lessons for business and policy makers. In sum, the case studies reveal that eco-innovations in the circular economy often seem to require the collaboration of multiple partners (often from different groups of stakeholders), emphasising the need to provide innovation space for such strategic partnerships to develop and thrive. Municipalities often also played a key role—as pilots, as partners and as customers.

Policy instruments to promote the circular economy transition

A number of policy instruments are already in use at the EU-level and are being adapted to the needs of the circular economy while others are being developed to steer the transition. This report assessed how a number of EU instruments already contribute or could contribute in the future to the circular economy, including examples from Member States and consideration of bottom-up initiatives. Altogether, **synergies and overlaps between instruments must be strengthened to help streamline administrative procedures** (e.g. by using the same basic metrics and criteria for product evaluation) and facilitate greater uptake of good practices across product groups, sectors and Member States.

Labelling schemes are the most widely implemented voluntary measure and are just starting to be used to distinguish products which contribute to a circular economy transition. The European Ecolabel is one of the oldest and most recognised ecolabels in the EU (celebrating 25 years in 2017). The European Commission has started to integrate circular economy criteria for product groups (e.g. computers and tablets will need to pass robustness and battery longevity tests) and aims to continue to do so in the future. However, a lack of promotional activities for the EU Ecolabel, a wide gap in uptake across different Member States (Spain has over 30,000 ecolabelled products and services, while 13 Member States have less than 200) and significant differences in the uptake of different types of products hamper effectiveness of the label for promoting widespread change. Tax reductions or other incentives to engage producers would help to this end. The Nordic Swan Ecolabel is an example of an ecolabel aiming to branch out towards promoting secondary raw materials, services and sharing-based models of consumption to better reflect circular economy criteria. Such experiences could also help feed into the EU Ecolabel to strengthen it in the future.

In practice, established green public procurement practices do not yet deliver widespread circular economy benefits. Green public procurement criteria in the EU are linked to the Circular

Economy Action Plan, which addresses strategies such as product end-of-life management by contractor, recycled content, design for recycling, design for longevity and packaging. However, there are also gaps. For example, criteria requiring refurbished or remanufactured products are barely represented among the criteria for the 21 product groups distinguished by EU procurement criteria. **Some examples from Member States set an example for other countries, regions and organisations.** For example, Aalborg Municipality (Denmark) included innovative circular economy principles in tendering for school furniture and circular procurement from Wales resulted in 45 per cent of all furniture in the new offices of Public Health Wales being re-used, with 49 per cent of items remanufactured and only 6 per cent sourced from new stock. Dialogue and communication with suppliers and throughout the process appear to be critical to gaining a shared understanding on the values and commitments that benefit final results and help public organisations to rethink their procurement strategies.

The Environmental Management and Audit Scheme (EMAS) is a well-established tool in the EU that can help companies and organisations to identify circular economy opportunities. It has been in operation since the mid-1990s, leading to a high level of experience regarding both operational efficiency and know-how towards helping companies and organisations evaluate, report and improve their environmental performance, in particular as regards resource efficiency. EMAS Annexes were revised in 2017, requiring organisations to assess the significance of their environmental impacts from a life cycle perspective. This is the first step towards increasing knowledge and identifying potential business opportunities related to the circular economy transition. To continue to make use of such tools, an expansion and scaling-up of organisations using EMAS tools seems to be key to increasing outreach and potential for change, in particular in those countries with a low level of participation (there is a high concentration of EMAS certified organisations in a handful of Member States, with its prevalence relatively low in the majority of Member States). Organisations using EMAS express interest in seeing both higher levels of EMAS awareness among the general public as well as recognition from policy, in particular in the form of fee reductions and/or tax relief. Indeed, in many Member States, there is a weak system of incentives from the government for companies to implement and maintain EMAS registrations. An overall review of EMAS found that informational and marketing instruments were widely favoured (with over 80 per cent of Member States implementing such instruments) over legal (with 55 per cent of Member States employing some form of legal instrument such as streamlined permit procedures) and financial ones (present in 35 per cent of Member States). Increasing incentives to encourage participation is therefore a key step, along with strengthening the support EMAS can offer to different types of organisations (77 per cent of EMAS registered organisations were SMEs in 2017) toward implementing the circular economy in their daily operations, practices and business models.

Extended Producer Responsibility (EPR) can directly contribute to the circular economy by linking product design with end-of-life management, but so far the focus on recycling in many EPR schemes has prevented further investment in innovations for reuse, repair or remanufacture. The application of EPR schemes range from take-back requirements (around 75 per cent of all schemes) to disposal fees and deposit refund systems. Schemes with varying levels of maturity and performance exist across EU Member States, with specific EU legislation in place for end-of-life vehicles and waste electrical and electronic equipment. Considering the recently released plastics strategy for a circular economy in 2018, this report focuses on EPR schemes related to plastic waste, bearing in mind that less than 30 per cent of plastic waste is collected for recycling in the EU and that only 6 per cent of plastics demand in the EU is for recycled plastics. In the EU, 26 out of 28 Member States have EPR schemes for packaging waste, characterised by large

differences in terms of scope and effectiveness. For example, between 2012 and 2015, Germany's packaging waste production continued to rise, whereas packaging waste generation in France stabilised (mainly due to related national legislation implemented in 2012). Germany has the lowest performance regarding the prevention of packaging waste in the EU, which is explained by the absence of effective incentives for producers to prevent or reduce the amount of packaging waste (e.g. incentives for ecodesign are missing, producer fees were reduced over time, etc.). Another challenge observed in Germany (and beyond) is the downcycling of plastic packaging waste – despite high levels of collection, low quality hampers reuse). Many of these issues will be tackled under a new scheme set for 2019, however waste prevention will still not be explicitly reflected in the German fee system. In contrast to Germany, France has been able to reduce the amount of packaging waste produced and increase the recycling of packaging waste. A collective EPR scheme is in place, which requires producers to ensure the end-of-life management of the products they put on the market, in particular through the implementation of fees. In 2012, these fees were adapted in line with environmental criteria. Good sorting practices and eco-design are now rewarded and packaging which hampers recycling is penalised. Examples of best practices and key lessons learned can therefore be considered when implementing similar EPR schemes in other Member States and at an EU level. Altogether, strengthening financial incentives for eco-design seems crucial to the successful application of EPR schemes.

The Ecodesign Directive, which historically addressed mainly the energy efficiency aspects of energy-using products, is being expanded toward material efficiency. The Commission is systematically considering the possibility of establishing more product-specific and/or horizontal requirements in terms of material efficiency in revisions of existing ecodesign measures as well as new measures in order to cover areas such as durability (e.g. minimum life-time of products), reparability (e.g. availability of spare parts and repair manuals, design for repair), upgradeability, design for disassembly (through for example easy removal of certain components), information provision (e.g. marking of plastic parts) and ease of reuse and recycling (e.g. avoiding incompatible plastics). However, challenges related in particular to possible rebound effects and trade-offs (e.g. repair is not per se more material efficient if it is particularly material or energy intensive; consumers shifting behaviour to purchase higher levels of reused products could lead to increased amounts of consumption instead of less) must be addressed.

The Product Environmental Footprint is an instrument that is currently in a transitional phase and aims at measuring the environmental performance of goods and services throughout their life cycle. The pilot phase period was conducted between 2013 and 2018 and was designed as a multi-stakeholder process, involving more than 280 volunteering companies and organisations. Within the pilot phase, 'Product Environmental Footprint Category Rules' were developed, each containing a set of rules on how to calculate the life-cycle wide environmental performance of the product in scope. Consumers who participated in the pilot tests confirmed a general interest in information generated through the Product Environmental Footprint. Most small and medium sized enterprises queried declared product environment footprints to be a useful tool in terms of increasing performance and reducing negative impacts. Overall, high potential is seen for using the PEF method in existing schemes such as the EU Ecolabel, sector standards, and green public procurement, or for exploring its use in support of green claims. Further ways to integrate the product environmental footprint into existing or new policies are currently being explored.

A number of bottom-up instruments are being implemented in EU Member States, which could serve as inspiration or models for replication across the EU. For example, economic and tax incentives for repair services have started drawing the attention of national and local policy

makers in a number of Member States. Sweden has introduced two main forms of tax-based incentives to increase the use and uptake of repair services. Several other Member States such as Ireland, Luxembourg, Malta, the Netherlands, Poland, Slovenia and Finland have also introduced VAT reductions on minor repair services (including mending and alteration) of items such as bicycles, shoes and leather goods. Social enterprises, for example in France and Belgium, involved in collection and sales of used goods are also exempt from and/or have reduced VAT rates. Because many consumers are still wary of buying second-hand products due to the belief that second-hand implies lower quality, many social enterprises are taking action to create quality labels. For example, in the Netherlands, re-use centres can be certified for three years following a formal audit and undergoing interim checks. A pilot project in Ireland, consisting of 10 re-use organisations, launched “Re-Mark”, Ireland’s Re-Use Quality Standard of Excellence in 2017. Finally, 12 Member States have developed deposit refund systems for beverage containers, helping to combat plastic waste.

Altogether, products play a key role to ensuring a close looped system within the circular economy. **The level of systemic change possible within the context of product eco-innovation for the circular economy is not an isolated effort of just business, but requires widespread societal transition, including the broad spectrum of actors across economies and societies.** Greater synergy between existing and new instruments would greatly increase their effectiveness and contribute to higher levels of uptake across the EU. Greater levels of coherence from a systemic perspective may also help to ensure that individual instruments are not used to incentivise specific pathways of the circular economy (e.g. recycling) at the costs of others (e.g. reuse and repair). Waste prevention must remain a key priority as well as the inclusion of citizens in the circular economy transition through actions to raise awareness, shift behaviours and promote more sustainable practices and lifestyles.

Introduction

Eco-innovation is about adapting and changing our business practices, consumption behaviours and lifestyles toward higher levels of sustainability. It has been a key tool for implementing the goals of the European Union for increasing resource efficiency across production and consumption systems, e.g. in the Europe 2020 Strategy. The aim of eco-innovation support is to join economic competitiveness with achieving environmental and social targets by e.g. improving production practices to save resources and money; developing new business models based on leasing, sharing and service provision; and engaging in forms of user-led, social and system innovations that offer alternative choices for citizens and engaged consumers.

With the development of the circular economy, the European Commission spelled out specific aims for achieving resource efficiency in Europe's economic model. The key principle of the circular economy is getting more value out of resources being used within the economy and society. This strategy is particularly important for the EU, as one of the largest world consumers of resources on a per capita basis and with a high dependence of imports (EEA 2015). For eco-innovation, it sets a direction for policy support, namely to foster re-use and repair activities, to promote closed loop value chains (e.g. through remanufacturing), and to co-develop recycling infrastructures from the municipal to EU level that support the uptake of secondary resources in production processes.

The Eco-Innovation Observatory (EIO) has been monitoring developments across the EU since 2009. It has developed an online database¹ and contributes to the European Commission Eco-Innovation online presence², a series of regularly updated country briefs, and annual/biannual reports highlighting key trends and focusing on specific thematic issues. In this sense, the EIO has helped to build a conceptual basis and shared understanding of what eco-innovation is and why and how it should be supported by policy interventions, businesses and consumers.

This report focuses on the contribution of **product eco-innovation towards a circular economy transition in the EU**. It aims to provide an overview of illustrative good practices and trends of product eco-innovations that contribute to the circular economy as well as sustainable product policy experiences in Member States, in order to draw lessons for EU level policies. A special feature highlights new findings and trends regarding eco-innovation performance in Member States (the 2018 Eco-Innovation Scoreboard). This report is intended for EU and national policy makers, researchers, NGOs, and other stakeholders such as the private sector and consumers. Key questions for each chapter include:

- Chapter 2: How does product eco-innovation relate to the circular economy, what is the policy context and who are the key actors?
- Chapter 3: What is the state of product related eco-innovation and circular economy developments across the EU, and what are the trends? How can product eco-innovation toward a circular economy be measured and monitored?
- Chapter 4: What is happening "on the ground" / what are the good business practices?
- Chapter 5: How do EU product policy instruments link to promoting a circular economy in the EU, what is needed to further scale-up eco-innovation efforts and what are the good policy practices from Member States?
- Chapter 6: What are the key findings and policy messages?

¹ <http://www.eco-innovation.eu/>

² www.ec.europa.eu/environment/ecoap/_en

1 | Product eco-innovation for the circular economy

“Products play a key role in the economy, serving society's needs and contributing to people's identity. Designing products better, extending their useful lifetime and changing their role within the system will be crucial for the development of a circular economy.” EEA 2017

The importance of improving product policy for promoting a circular economy transition has been highlighted across EU governing bodies. It is integral to achieving the *EU Action Plan for the Circular Economy* (EC 2015) with specific measures for 2018 laid out (e.g. as relates to monitoring, plastics, critical raw materials and more³). The European Parliament and Council have especially stressed following a lifecycle approach and extending Ecodesign regulations in the *Resolution on Resource Efficiency: Moving towards a circular economy* (EP 2015) and *Council Conclusions on the EU Action Plan for the Circular Economy* (EU Council 2016), as well as specifically in the European Parliament's reports on a longer lifetime for products: benefits for consumers and companies (Durand 2018) and the implementation of the eco-design directive (Ries 2017). While these publications have helped to accelerate activities across the EU, fundamental gaps and challenges remain. In particular, circular economy criteria must be integrated in a smart way into the current patchwork of existing product policy initiatives and instruments. To do this, a common understanding of what product eco-innovation for the circular economy actually means, and how it can contribute to achieving sustainability aims, is needed. This chapter aims to help build that conceptual understanding.

The Eco-Innovation Observatory has defined eco-Innovation as:

“Eco-innovation is the introduction of any new or significantly improved product (good or service), process, organisational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole life-cycle.” EIO 2010

In this sense, it is the critical change to transforming how resources flow through production and consumption systems. That means that eco-innovation goes beyond end-of-pipe solutions to clean-up polluted water and soils and reduce emissions (e.g. eco-industries) and explicitly includes innovations that reduce the consumption of natural resources. In this way, eco-innovation addresses the overconsumption of natural resources, depicted by indicators like the ecological footprint, showing that current levels of consumption require 1.7 earths to provide the resources we use and absorb our waste⁴. It is particularly relevant for the EU, which consumes 13 per cent of the world's resources extracted annually while comprising only 6.8 per cent of the world population⁵, and which relies on imports to cover 65 per cent of all resources used (Schandl et al. 2017, UNEP 2016). It is thus key to achieving the resource efficiency aims set out in the Europe 2020 Flagship initiative and the Sustainable Development Goals (e.g. Goal 12 addressing sustainable production and consumption systems). Key to the definition of eco-innovation is that it encompasses goods or processes that are produced and developed without an explicit aim to improve the state of environment. Indeed, the eco-innovations may lead to transformational change in the way resources are used across value chains, but the motivation could be saving

³ See the website of the European Commission as well as Chapter 3 and Section 5.4 for more information: www.ec.europa.eu/environment/circular-economy

⁴ See the actual world footprint online: www.footprintnetwork.org

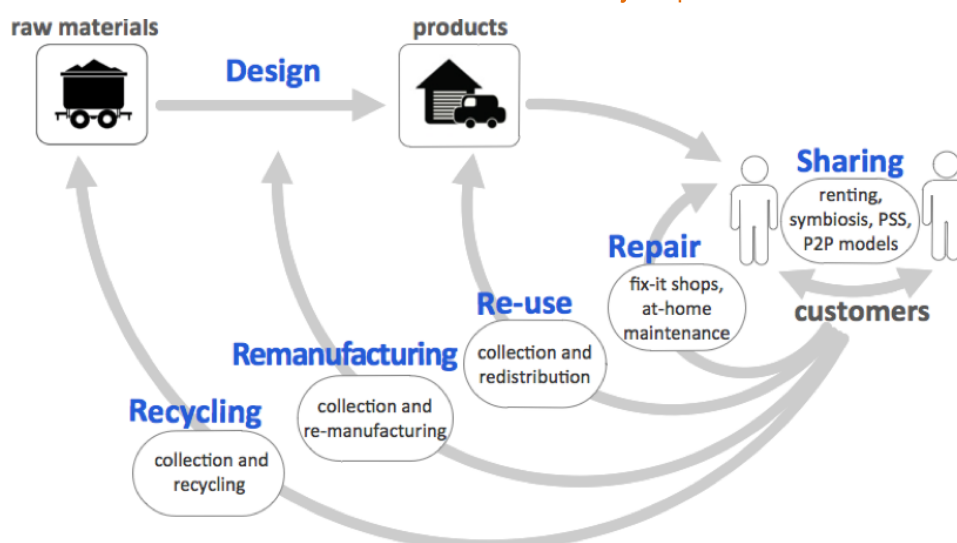
⁵ <https://data.worldbank.org/indicator/SP.POP.TOTL>

costs and materials (e.g. using secondary resources instead of raw virgin material as it is cheaper) with a co-benefit for the environment.

The circular economy is seen as one way to achieve resource efficiency. It has been defined as an economy that is restorative, aiming to maintain the utility of products and components in order to retain their value (EMF 2012). The European Environment Agency emphasises that a circular economy “minimises the need for new inputs of materials and energy, while reducing environmental pressures linked to resource extraction, emissions and waste” (EEA 2016). Key to a successful transition is going beyond the waste management perspective to integrate circular economy principles across the lifecycle. Until now, many efforts have focused on the end of the life cycle to improve collection and recycling from a waste-oriented framework. This has led to high levels of perceived resource recovery in many EU Member States, but it should be noted that some of these statistics can be deceiving. For example, recovery statistics include energetic recovery, or in other words, incineration. In some cases, this may lead to lost opportunities to reuse secondary resources for production purposes. For instance Germany has some of the highest recycling rates in the EU, but estimates from the German Association for Waste Management reveal that only around 38 per cent of waste was returned to production as secondary raw materials in 2013 (DGAW 2016). This is consistent with the finding that only 14 per cent of the raw materials used in Germany were gained from waste (IdW 2010). Innovation to consider how secondary resources may be gained across the life-cycle and particularly in the design phase, underpinned by appropriate policies e.g. with regard to an improved quality matching for supply and demand of secondary resources, is crucial. Products are at the heart of this challenge.

EIO (2014) looked at different cycles of the circular economy and the role of eco-innovation. Figure 2.1 shows importance of products, and thus product policy, to closing these loops. It distinguishes different pathways for the circular economy to manifest, e.g. through repair, re-use, remanufacturing and recycling. How the product is designed and built has a huge impact on options available to both customers and companies after the initial use phase. For example, durable and robust products that allow customers to replace broken elements and repair products could help to extend the life of products as well as to enable re-use on second-hand markets. To ease remanufacturing and recycling products must be design in a way that allows e.g. components and critical raw materials to be recovered in a smart and practical way.

Figure 1.1 Products and customers at the heart of circular economy loops

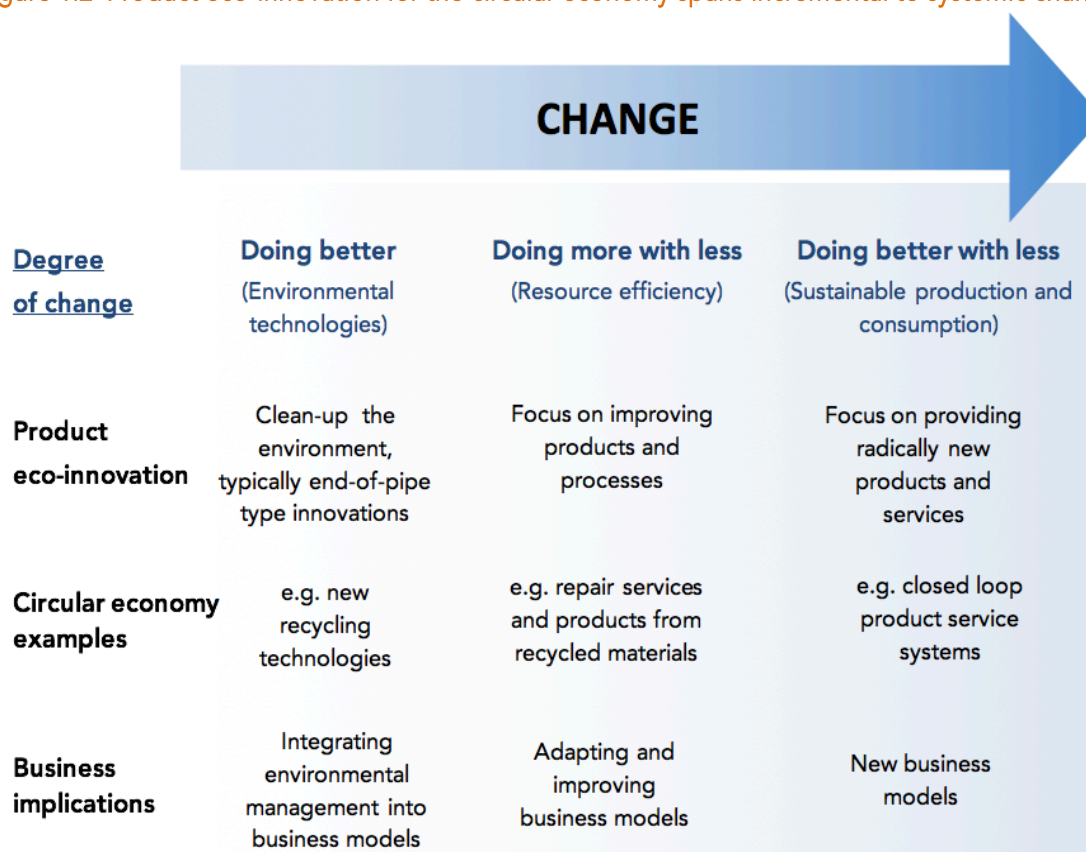


Source: EIO 2016

This implies that product eco-innovation for the circular economy encompasses a wide range of company activities. For practical purposes, it goes beyond the distinction of product, process, organisational and marketing innovation categorized in the Oslo Manual and described for eco-innovation in EIO 2010. This is because product policy for the circular economy must address many different facets of eco-innovation related to products. This spans internal company activities to better optimize secondary resource use in production processes and daily operations, efforts to design new products with closed loop supply chains, to market new business models based on e.g. leasing, and to offer new services related to e.g. repair, among others. Altogether it implies that product eco-innovation for the circular economy encompasses the “innovation cycle” in the way products are designed, produced, used, re-used and recycled.

There is also a spectrum in the degree of change induced from different types and forms of product eco-innovation for the circular economy. Figure 2.2 depicts how product eco-innovation for the circular economy spans incremental to systemic change in society and the economy. Key is the involvement of users/consumers in the more radical degrees of change. This is also evident in Figure 2.1, in which the customer interacts with all pathways of the circular economy. They are the engine behind loops for repair and re-use, and thus can use their purchasing power to create and/or increase demand for products consistent with the circular economy. Customers are critical partners for remanufacturing and recycling as they must engage in separate collection for specific waste streams and take-back schemes. They are also key to new business models offering closed loop supply chains as they must participate in the material recovery. Examples of such systems are in Chapter 4 (e.g. Recup in Germany and used jeans repurposing in Hungary). This demonstrates the importance of product policy that not only addresses companies and encourages eco-innovation at the beginning of the life-cycle, but also raises awareness for citizens and helps to provide them with the information needed to make sustainable choices.

Figure 1.2 Product eco-innovation for the circular economy spans incremental to systemic change



Source: Adapted from EIO 2012

There are also a number of business implications, as well as opportunities, associated with the product eco-innovations needed to implement the circular economy. These are associated with the introduction of new processes and products as well as changing business models that increase competitiveness in new and growing markets (see examples especially in Chapter 4). The Eco-Innovation Observatory has provided mounting evidence over the years that eco-innovation in companies leads to reduced costs, improves capacity to capture new growth opportunities as well as strengthens company image in the eyes of customers. We point to an opportunity for strategic investment, in particular for start ups meeting the demand for alternative types of consumption of an increasingly well informed and environmentally conscious populace (see Section 3.2.2 on consumption trends in the circular economy).

Key product eco-innovations for businesses to engage in as regards the circular economy include aspects such as modularity, multi-functionality, reparability, longevity and durability. EEA (2017) assessed some of the key trends with regard to products in the circular economy, distinguishing opportunities and risks towards circular economy based on an efficient and sustainable use of resources. Figure 2.3 summarises main conclusions for different product trends from that report.

Figure 1.3 Indicative impacts of product trends on material circularity

Trend	Positive aspects	Negative aspects	On balance
Increasingly complex product design and functionality	May lead to lower total demand for materials due to multi-functionality	Reduces potential for reuse and recycling (heterogeneous materials, complex disassembly)	Probably negative
Increasing use of modular design	Can extend product lifetime through easier remanufacture and repair		Probably positive
Local production on demand by additive manufacturing	Enables increased material efficiency compared to subtractive production	Customisation of products may hamper shared use May hamper recyclability (multi-material products)	Unclear
Building services around products	May increase efficiency of product and material use (frequency of use, longevity, repair)		Probably positive
Home delivery systems	Reverse logistics enable reuse, repair and remanufacture of products	May lead to an increase in household waste (packaging materials)	Unclear
Changing product lifespan	Increasing technical product lifespan of some products	Decreasing useful product lifespan of others	Unclear
Collaborative consumption	Enables more frequent/efficient use of individual products use		Probably positive
Markets for recycling	Provide support to recycling business models	Reduce incentives for reuse	Unclear
Internet of things	Allows for better information on product composition improves material recycling	Leads possibly to more complex products	Unclear

Source: EEA 2017

It is immediately clear that no one-size fits-all solution is available, but rather that all options are associated with positive and negative aspects (although not listed, major drawbacks of trends such as collaborative consumption could be rebounds associated with unneeded/excessive consumption practices, services could increase the need for transport over potentially long distances and modular design may not be the most resource-efficient solution for all types of products). It shows that different types of products require different types of eco-innovation, especially in the design phase, to weigh strengths and weaknesses from a systemic perspective. For policy makers it implies that a balance must be found between being to product prescriptive

toward incentivising a specific form of product eco-innovation for the circular economy and being too vague with incentives toward ensuring overarching aims of achieving resource efficiency through the circular economy. It certainly seems justifiable to encourage increased trends towards product reparability, modularity, longevity, etc.. It is, however, not a given that one “green solution” is the only option, or that more disruptive forms of eco-innovation could offer completely different “solutions”, e.g. by focusing on functionality and not product ownership. Regulations, for example against aspects such as planned product obsolescence, shall also play an important role as regards products in the circular economy.

Eco-innovative business models contribute to products for the circular economy. WRAP (the Waste and Resources Action Programme in the United Kingdom) has developed an innovative business model map to showcase alternative business models, and examples in practice, that extend product life, conserve resources and help to prevent waste generation. These include, for example⁶:

- **Product service systems:** delivering performance or functionality over ownership with increased potential for remanufacture and/or material recovery
- **Dematerialised services:** outsourced services replacing physical products (like on-demand music and movies)
- **Hire and leasing:** replacing ownership with increased incentives for manufacturers regarding durability and maintenance
- **Collaborative consumption:** shared use of products and skills, reducing the need for individual ownership
- **Incentivised return and re-use:** encourages customers to bring items back, enabling remanufacturing and/or re-use
- **Asset management:** internal collection, re-use, refurbishing and re-sale of used products especially as regards business-to-business eco-innovations
- **Collection of used products:** service providers collect specific products to ensure appropriate re-use (see for example the good practice on re-used paint in the United Kingdom, Section 4.10)
- **Long life:** products designed to be more durable with business models meeting customer demand for such products
- **Made to order:** with optimised production avoiding over-stocking of products
- **Bring your own device:** where users bring their own device to access services, for example, employees purchase their own computer for use at home and at work (with employer support).

While the business models described are also associated with strengths and weaknesses for a circular economy transition, they do depict the range of activities, markets and opportunities for business emerging in the context of the circular economy. Entrepreneurs interested in pursuing eco-innovation can now make use of a number of tools and recent reports promoting circular economy business approaches, showcasing successful examples in practice and highlighting eco-innovative revolutions transforming future markets⁷.

⁶ Based on the WRAP website covering „Innovative business models“: www.wrap.org.uk/content/innovative-business-models-old (accessed 17 July 2018)

⁷ In addition to EEA (2017) and WRAP, see also e.g. “How to become a green SME in a circular economy” (www.youtube.com/watch?v=V1Tszs48xCI), “The circular design guide” by the Ellen MacArthur Foundation and IDEO (www.circulardesignguide.com), “A CEO guide to the circular economy” by the World Business Council for Sustainable Development (www.wbcsd.org) and “The Next Production Revolution” by the OECD (doi.org/10.1787/f69a68e9-en). (All links accessed 17 July 2018).

All in all a joint effort is needed to revamp how products are used and reused in the circular economy. The actors discussed in this chapter include in particular business, consumers and policy makers. Also researchers, NGOs and innovation facilitators, among others, are needed to continue monitoring progress and set-backs, make recommendations and provide a space for strategic product eco-innovation developments. This highlights that the level of systemic change possible within the context of product eco-innovation for the circular economy is not an isolated effort of just business, but requires an entire societal transition, including the broad spectrum of actors across economies and societies. It needs change at the level of municipalities, e.g. in how products at the “end-of-life” are collected to development of an EU-wide infrastructure for circular economy that operates at economies of scale for best recovering secondary resources and redistributing them into production processes. Citizens must actively participate and can also drive the transition. Policy must play a central role in steering the transition through appropriate instruments targeting business, citizens and framework conditions. In particular, this chapter has highlighted the need for policy to take on multiple roles. These requirements and corresponding instruments will be further explored in Chapter 5, including the need to (a) ensure a consistent framework for evaluation (e.g. for ecolabels to keep customers informed), (b) make sure the business opportunities of new business models can be realised (e.g. provide a level playing field that does not favour existing business models and structures and offer support, share know-how and incentivise new business models, e.g. by encouraging uptake of Environmental Management and Audit Schemes across the EU), (c) to lead by example (e.g. by green public procurement), and (d) to steer markets and economies in the direction of targets (e.g. by encouraging Ecodesign, Extended Producer Responsibility), among other innovative approaches (e.g. Product Environment Footprints, etc.).

2 | State and trends of product eco-innovation and the circular economy

This chapter provides the state and trends of product eco-innovation across the EU that contribute to the circular economy, based on existing data. Chapter 3.1 summarises the different factors to take into account in terms of establishing a framework to map out *how* product eco-innovation can be measured, particularly within the context of a circular economy. Chapter 3.2 provides details on available data for *indicators* that can be used to gather insights on the state of trends of product eco-innovation.

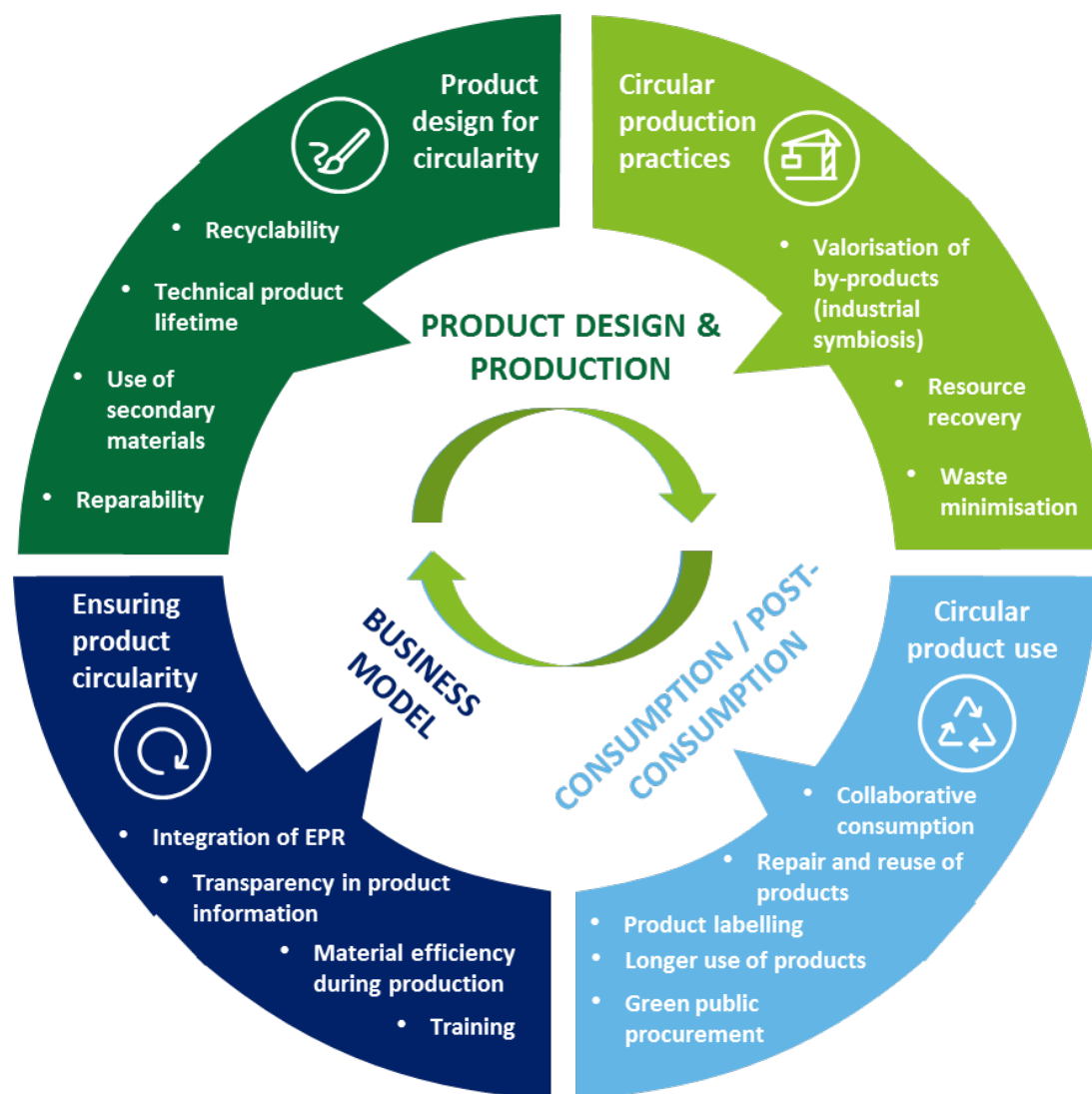
2.1 Framework for evaluating product eco-innovation for the circular economy

The previous chapter describes how product eco-innovation fits within the objectives and transition to a circular economy. The principal challenge from a products or materials perspective is thus to move from innovation at the individual firm level to reconfiguration of entire supply chains with the aim to incorporate the post-consumption phase (collection, re-use, refurbishment or recycling) (Leiden et al. 2016).

In order to establish an overview of product eco-innovation trends, a framework for monitoring and evaluation is essential. The EEA (European Environmental Agency) recently published a report evaluating the role of products in the circular economy, or “product circularity” (EEA 2017). The report raises many important issues to consider regarding the evaluation and monitoring of product circularity, notably, knowledge of the way the system in which the product plays a role behaves (e.g. a car in the transport system). In other words, the importance of identifying and understanding the systemic links between a product, the business model of which it is a part, and the societal context that determines its life-cycle. With this in mind, a framework has been developed as illustrated in Figure 3.1, which demonstrates the different areas and factors that would need to be covered in order to monitor and evaluate product eco-innovation for the circular economy. The framework encompasses three main areas (business model, product design/production and use/post-consumption) and associated indicators that effect the circularity of a product:

- **Business model:** factors applied in business models to ensure the full circularity potential of a product e.g. establishment of take back schemes, application of extended producer responsibility (EPR), integration of circular product design and production into business models, etc.
- **Product design and production:** product design and manufacturing elements that influence the circularity potential of the product from a technical perspective e.g. durability, reparability, recyclability, type of materials used, efficient production processes in terms of less resources used and waste produced, etc.
- **Use and post-consumption:** consumer behaviour elements that contribute towards close-looped product cycles e.g. innovative consumption models, longer use of products, recycling, etc.

Figure 2.1 Framework for monitoring and evaluation of product eco-innovation for the circular economy



Source: authors

2.2 Status of available indicators to measure product eco-innovation within the circular economy

Table 3.1 provides a list of relevant indicators that could be used as guidance for the type of information or data needed in order to evaluate the extent that product eco-innovation is contributing towards the circular economy.

Table 2.1 Indicators related to the circular economy from a materials perspective

Phase	Product circularity aspects	Possible indicators
Business model	Shift of business strategies towards circular concepts	<ul style="list-style-type: none"> • Number of product-service systems e.g. remanufacture and service-based offers such as offering consumers take-back schemes for products • Number of EMAS certified companies • Uptake of EPR schemes • Training programmes for employees and suppliers • Transparency in product information • Other trends on the adaptation of business models to integrate product eco-innovation and circular economy principles
Product design and production	Products designed to last longer; products designed for disassembly	<ul style="list-style-type: none"> • Product environmental footprint (PEF) • EU Eco-design related data • Evidence that businesses are implementing practices to improve product durability
	Recycled materials included in product design; products designed to be recycled	<ul style="list-style-type: none"> • Percentage of recycled content in products • Product environmental footprint (PEF) • EU Eco-design related data
	Lower volume and number of environmentally hazardous substances used in production	<ul style="list-style-type: none"> • Amount of hazardous waste generated and treated
	Less waste in production being generated	<ul style="list-style-type: none"> • Waste generation • Recycling statistics, decoupling and waste minimization statistics
	Fewer materials used in production; valorisation and use of secondary materials	<ul style="list-style-type: none"> • Materials / resource efficiency indicators • Industrial symbiosis indicators
Use and post-consumption	Alternatives to the purchase of new products	<ul style="list-style-type: none"> • Replacement rates of products • Average lifetime of products (based on real use) • Re-use, leasing and repair data
	Evidence that product labels and other information tools influence consumer purchasing decisions	<ul style="list-style-type: none"> • Trends on EU Ecolabelled products and services
	Evidence that consumers are recycling more and increasingly repairing products	<ul style="list-style-type: none"> • Product take-back and repair statistics • EU, MS level product recycling trends • Recycling market statistics • Statistics on household waste separation and collection
	Other societal or consumption trends promote circular economy principles	<ul style="list-style-type: none"> • Number of sharing schemes • Collaborative consumption statistics

The following sections provide an overview of the trends reflected in the preceding table as far as possible in terms of data availability (see section 2.3 for a summary of some of the challenges related to data).

2.2.1 Business model indicators

The actual design of a product is a key determining factor in terms of its circularity potential, however it is the business and/or consumption model that determines if this potential can be fully realised over the product's complete life-cycle. Business models are therefore essential in terms of establishing an efficient closed-looped system that incorporates product design, production, as well as the use and post-consumption (or end-of-life) phase of products.

The indicators that can be used to assess the uptake of circular principles within business models are those that can demonstrate how businesses are enabling the circularity potential of products or how they are encouraging a more circular use of products; for example by adapting and innovating their internal operations, interactions with consumers e.g. product labelling and transparency, the use of raw and secondary material resources in their products and services and establishing services and relevant infrastructure so that consumers, producers, distributors, etc. can also play their part in contributing to maximising the full potential of product eco-innovation.

2.2.1.1 *Integration of circular economy principles in business operations*

Much of the data identified on relevant EU-level indicators on business operations stem from sources such as Eurobarometer and the Community Innovation Surveys (CIS) as well as through the EcoAP (Eco-innovation Action Plan⁸) website, which provide key insights on the product design phase and how circular economy principles are being implemented into business models.

The Flash Eurobarometer report on SMEs, resource efficiency and green markets (2016) interviewed approximately 10,000 SMEs, which account for more than 20 million companies and represent 99 per cent of businesses in Europe⁹. Relevant findings from the Eurobarometer report indicate that in 2016, the most common types of resource efficiency actions that were undertaken by the SMEs relate to waste minimisation (65 per cent), saving energy (63 per cent), saving materials, saving water (47 per cent), and recycling by reusing materials (40 per cent) (EC 2016). These areas were also identified as the main resource efficiency actions that are being planned by SMEs for the next two years.

Furthermore, the report also states that resource efficiency actions have decreased production costs for 41 per cent of the SMEs interviewed and that a majority of them rely on internal support for their efforts to achieve these cost savings. In addition, approximately 30 per cent of SMEs surveyed offer green products or services and a growing number of them state that will continue to do so. Reduction in production costs through resource efficiency and the share of green products on the market can serve as important indicators in terms of assessing the efficiency of circular economic principles and the extent that product eco-innovation is being integrated into business and consumption models.

The survey also highlighted the following key barriers faced by SMEs when implementing resource efficiency practices:

- Complex administrative or legal procedures when setting up their resource efficiency action or actions
- Cost of environmental actions
- Difficulty in adapting environmental legislation to the company

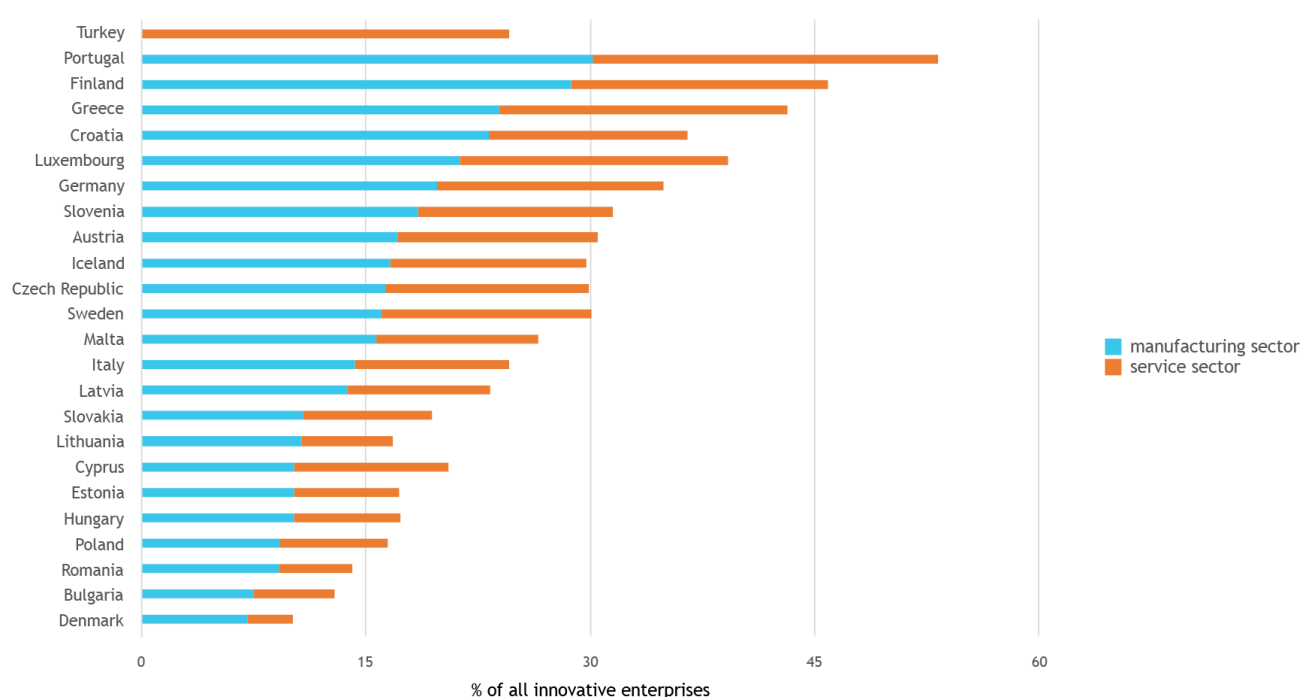
⁸ EcoAP website, available at: ec.europa.eu/environment/ecoap/indicators/business-operations_en

⁹ The survey was carried out by the TNS political & Social network within the 28 Member States in addition to Albania, the former Yugoslav Republic of Macedonia, Montenegro, Serbia, Turkey, Iceland, Moldova, Norway and the USA between the 11th and 26 September 2017.

- Lack of specific environmental expertise and the technical requirements of the legislation

The business operations data published by the Eco-Innovation Action Plan (EcoAP) provides data on the share of enterprises in the EU that facilitated the recycling of products after use as well as those that recycled waste, water or metals for their own use or for sale. Between 2012 and 2014, 15 per cent of companies in the manufacturing sector and 12 per cent of companies in the service sector introduced measures to facilitate the recycling of products after use (Figure 2.2)¹⁰. Portugal (30 per cent - manufacturing sector; 50 per cent - services sector) and Finland (28 per cent - manufacturing sector; 46 per cent - services sector) are the leading Member States in terms of facilitating recycling of products after use in both the manufacturing and service sectors within the EU. Portugal, Germany and Croatia account for the largest share of enterprises that recycled waste, water or metals for their own use or for sale (Figure 2.3).

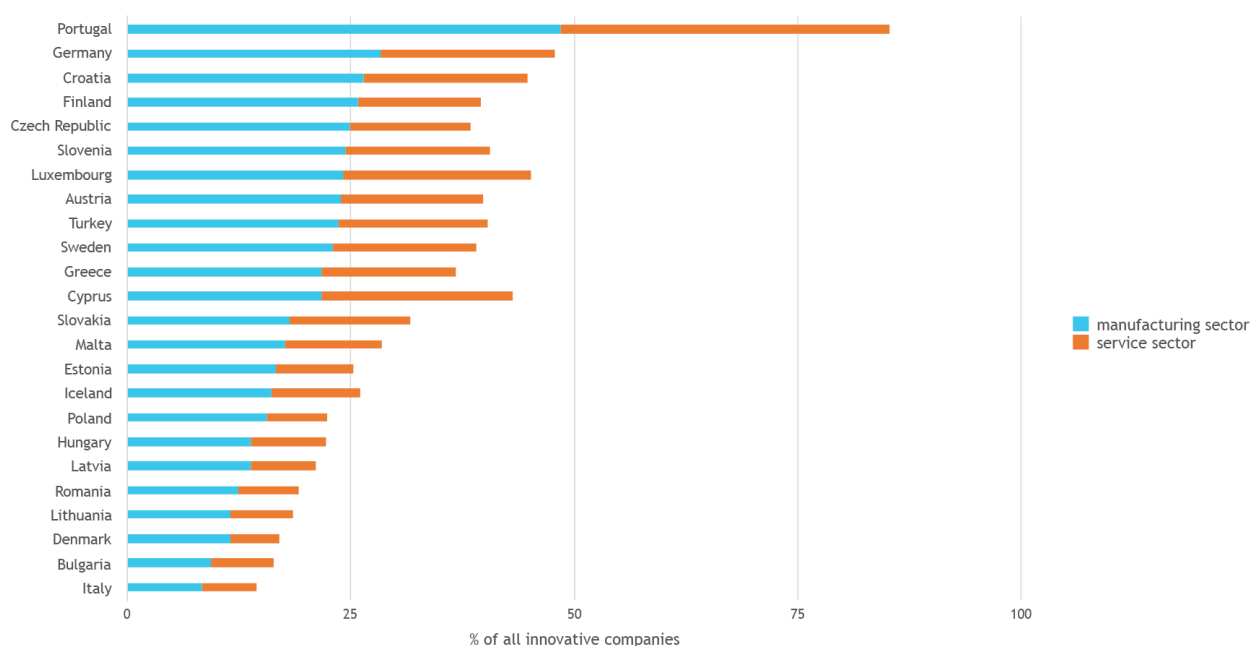
Figure 2.2 Share of enterprises that facilitated recycling of products after use (CIS-2014)



Source: ECOAP website on business operations indications. Available at: ec.europa.eu/environment/ecoap/indicators/business-operations_en. Based on data from the 2014 Community Innovation survey.

¹⁰ European Commission ; EcoAP website on business operations, Accessible here: ec.europa.eu/environment/ecoap/indicators/business-operations_en

Figure 2.3 Enterprises that recycled waste, water or metals for own use or sale within the enterprises by innovating (CIS-2014)



Source: ECOAP website on business operations indications. Available at: ec.europa.eu/environment/ecoap/indicators/business-operations_en. Based on data from the 2014 Community Innovation survey.

2.2.1.2 Product-service systems (PSS)

Product-service systems (PSS) are part of business models, which aim to provide for cohesive delivery of products and services and are emerging as a means to enable **collaborative consumption** (see section 2.2.3.1), with the aim of pro-environmental outcomes (Piscicelli et al. 2015). PSS refers to services that are offered in connection with a product — for example services that offer repair, take-back, remanufacturing, shared, use, etc. The trend to offer product-service mixes has been most notable so far in business-to-business (B2B). Some examples of existing PSS include:

- Alstom: a French train manufacturer began offering HealthHub, a predictive maintenance tool that monitors the health of trains, train infrastructure and signalling systems to extend and maintain the useful life of trains
- Amazon: selling kindle content rather than only books
- Interface and DuPont Flooring Systems: traditional carpet manufacturers offer floor covering services that include repair and maintenance
- Michelin: a tyre manufacturer, introduced 'Fleet Solutions', which leases 'tyre services' for European trucking fleets, with a flat charged based on vehicle type and distance driven.

Phillips: a manufacturer of lighting products offers a 'Pay per lux' service in which customers pay for the lighting services in the building while the firm maintains ownership of the materials and can offer maintenance and upgrades.

In terms of data to measure trends of PSS in business models at an EU level, although the model is in theory not new, no specific database or related information exists on the number and the different types that are currently in development or already implemented. Examples of other notable case studies of businesses that are applying similar initiatives are showcased in Chapter 5.

2.2.1.3 Environmental Management Auditing Scheme (EMAS)

The European Eco-Management and Audit Scheme (EMAS) is an environmental management tool that was developed and launched by the European Commission to help both businesses and public organisations measure and improve their environmental performance. EMAS-certified organizations are required to evaluate the environmental impacts of their activities based on the following six main indicators: material efficiency, energy efficiency, water, waste, bio-diversity and emissions. As such, EMAS data can provide some insights on how companies are implementing appropriate measures to improve their performance in certain areas such as resource-intensive sectors. Official EMAS statistics indicate that resource-intensive industrial sectors are represented within the top five most registered sectors. These resource-intensive sectors include for example electricity and gas, manufacture of fabricated metal products and manufacture of motor vehicles and these 3 industries make up about 12 per cent of the total amount of EMAS registered organisations¹¹. Further information on how EMAS can be used as a policy instrument to support the transition to a circular economy is included in Section 6.3.

2.2.1.4 Extended producer responsibility (EPR)

The Organisation for Economic Co-operation and Development (OECD) defines EPR as 'an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life-cycle'. EPR therefore reflects the polluter-pays-principal. In the EU, most EPR schemes are organised as collectives with a primary focus on recycling (due to high end-of-life costs for collection and processing of wastes), and has been proven to be effective in improving waste collection and treatment practices. The concrete improvements that have been observed in waste recycling and recovery over the past 10 years has given more economic value to the recycling sector, which is a key driver for circular economy efficiency in Europe. However, the focus on recycling in many EPR schemes has prevented further investment in innovations for reuse, repair or remanufacture (EEA 2017). Further, there is no clear evidence of a strong positive impact of EPR on the eco-design of products (Deloitte 2014). There are varying levels of implementation and performance of EPR across EU Member States, in terms of for example the maturity of EPR schemes in place, product categories covered, policy and financial mechanisms employed, etc. Further, data on EPR is difficult to compare between Member States due to the absence of a framework for the collection and reporting of EPR elements. Despite certain areas where EPR could be further enhanced to encourage increased harmonisation, uptake and performance across the EU, it is important to note that as part of the revised legislative proposals on waste, general requirements for extended producer responsibility schemes are defined. It notably requires that financial contributions paid by producers to EPR schemes be modulated based on the costs necessary to treat their products at the end of their life (EPRS, 2018). As such, EPR plays a key role in terms of promoting the use of effective economic instruments and providing an economic incentive for producers to put greener products on the market, in support of the waste hierarchy.

More information on the potential of EPR as a policy instrument, in particular as regards to plastics, is included in Section 6.4.

¹¹ European Commission website on EMAS, Statistics and graphs:
http://ec.europa.eu/environment/emas/emas_registrations/statistics_graphs_en.htm

2.2.2 Product design and production-related indicators

Existing EU-level information related to eco-design, product durability and recycling can help measure the circularity of products in use. This is because the design and manufacturing of a product plays a key role in its circularity potential by allowing for its re-use, repair and recyclability, as well as the types of materials that are used for its fabrication.

2.2.2.1 Eco-design

Eco-design provides significant opportunities for enabling product circularity through the reduction of resource consumption, improving the reparability and durability of products; increasing the recyclability of materials, minimizing the use of hazardous substances and increasing the energy efficiency of production processes or the use phases. Eco-design is an approach to designing products with special consideration for the environmental impacts throughout the product's lifecycle. Eco-design requirements for individual product groups are established under the EU's Ecodesign Directive. Historically, the Ecodesign Directive have addressed mainly the energy efficiency aspects of energy-using products, require certain manufacturers to design products that meet minimum energy efficiency standards. However, some Ecodesign measures have included requirements aimed at improving recyclability and durability. The Commission has stated it will systematically consider the possibility of including material efficiency requirements in future (revisions of) Ecodesign measures in order to cover areas such as durability (e.g. minimum life-time of products), reparability (e.g. availability of spare parts and repair manuals, design for repair), upgradeability, design for disassembly through for example easy removal of certain components, information provision (e.g. marking of plastic parts) and ease of reuse and recycling (e.g. avoiding incompatible plastics) (see also Section 6.5).

Despite the increasing attention on repair, re-use and durability aspects of product policy, the maturity level in terms of EU policy and availability of data at an EU-level in these areas is low. Some information is available on the use of EU research and development (R&D) funds in eco-design. For example, according to Cordis (EU R&D database), roughly 5 per cent of all EU projects related to product design specifically addressed eco-design. Designing for remanufacture or repair were considered in only 1 per cent and 2 per cent, respectively, of product design-related projects, while 8 per cent of those projects focused on recycling (EEA 2017).

2.2.2.2 Trends on lifetime of products / product durability

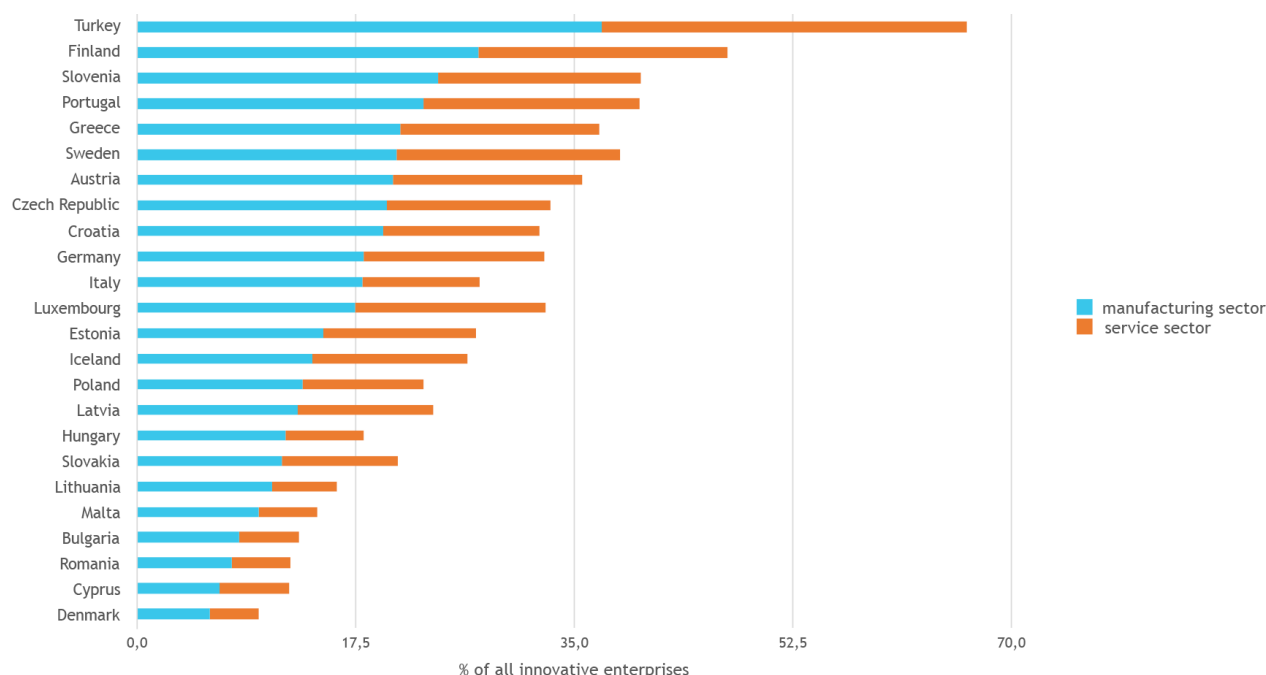
The average lifespan of products is another indicator that can demonstrate whether certain product categories are becoming more durable over time; reflecting either changes in consumer behaviours and/or product design. Figure 2.4 reflects the responses from the 2014 Community Innovation survey on business innovations that were focused on extending the durability of products. On average, out of the total respondents, 16 per cent of companies in the manufacturing sector and 11.9 per cent of companies in the service sector introduced actions related to product durability¹².

Another study carried out by Wang et al. (2014) evaluated the trends in the average lifespan of several household products. The results of this study are summarised in Table 3.2 and indicates that the only product category characterised by an increasing lifespan between 2000 and 2006 were lamps and compact fluorescents (+3 per cent) (EEA 2017). This finding could be explained

¹² ECOAP website on business operations indications. Available at: ec.europa.eu/environment/ecoap/indicators/business-operations_en. Based on data from the 2014 Community Innovation survey.

by the adoption of EU and national level policies such as the Energy Efficiency Directive and regulations on eco-design requirements for directional lamps, LED lamps and luminaires, which require manufacturers to adhere to a certain minimum level of the energy efficiency for these types of products. The findings of the study further demonstrate that for all other product categories assessed, stable or decreasing lifespans were observed, confirming that important efforts may still be needed by policy, businesses and consumers to increase product durability. It should be noted, however, that the data from the study are not recent and based only on Dutch data. Therefore, potential evolutions in terms of technological innovations, particularly for consumer electronics, and changes in consumer behaviour may not be reflected.

Figure 2.4 Enterprises that extend product life through more durable products, by innovation (CIS-2014)



Source: ECOAP website on business operations indications. Available at: ec.europa.eu/environment/ecoap/indicators/business-operations_en. Based on data from the 2014 Community Innovation survey.

Table 2.2 Average evolution in lifespan of selected household products and change from 2000 to 2006

Product Category (Median Lifespan in years)	2000	2006	Delta in 6 years
Lamps, compact fluorescent (CFL)	7.4	7.77	+3%
Vacuum cleaners	8.1	8.0	-1%
Wash dryers and centrifuges	14.5	14.3	-1%
Refrigerators	14.2	14	-1%
Dishwashers	10.7	10.5	-2%
Small IT and accessories	4.6	4.4	-2%
Tools	9.8	9.6	-2%
Small toys	3.8	3.7	-3%
Mobile phones	4.8	4.6	-3%
Washing machines	12.1	11.7	-3%
Laptop PCs	4.3	4.1	-5%
Hot water and coffee	7	6.4	-9%
Printing and imaging equipment	9	8.2	-11%
Microwaves	10.9	9.4	-15%
Small consumer electronics and accessories	9.4	7.8	-20%

Source: EEA 2017

2.2.2.3 Trends on recycling and use of secondary materials

Since the early 2000's, EU markets for recyclables such as metal, glass, and paper and cardboard have grown considerably, with a 50 per cent increase between 2004 and 2008 (EEA 2017). This trend is largely driven by policy obligations on increased recycling and decreased landfilling, as well as export recycling markets. While this indicates high levels of progress toward recycling, the trends are not necessarily indicative of progress toward a circular economy. As reflected in a report published by the European Parliamentary Research Service (EPRS), data quality and comparability is a fundamental challenge to monitoring waste and circular economy performance. The key challenges identified by the report relates both to inconsistency in definitions and measurement methods, including how target attainment is measured (EPRS 2017). In the specific example of municipal waste recycling targets, Member States can select one of four different calculation methods, and three different measuring points to report compliance with the Waste Framework Directive's municipal waste target of 50 per cent re-use and recycling by 2020.

Due to the fact that MS use different calculation methods, have different interpretations of definitions, etc. accurate measurement and comparability of waste management and progress in moving towards a more circular economy is difficult.

The revision of the EU waste legislation, finalized in 2018, *inter alia* aimed to alleviate the issues with reporting. As compared to the situation before the revision, Member States should now follow a single calculation method and a single measuring point: input to final recycling. There is a possibility to derogate from this, but a condition for derogation is that any additional losses caused by this are taken into account. The intention is to arrive at more reliable and comparable data on how much material is actually being recycled. The new methods will apply for the calculation of the new targets for 2025 and 2030, introduced by the amendments to the legislation¹³.

Another approach to address the data reporting challenges discussed above, is the European Commission's monitoring framework on the circular economy, which is based on 10 indicators that aim to collectively measure different facets of progress towards a circular economy (EC 2018b). In relation to relevant indicators on product eco-innovation within the circular economy, the EC circular economy monitoring framework provides the following relevant EU-level data (drawn largely from the Resource Efficiency Scoreboard and the Raw Materials Scoreboard) on the use of secondary materials:

- **End-of-life recycling input rate (EOL-RIR) indicator**¹⁴: measures the share (per cent) in the production system (per cent) of a raw material's input from the recycling of "old scrap" i.e. scrap from end-of-life products. According to the most recent reported data on this indicator, in 2016, 12.4 per cent of recycled materials contributed to the raw materials demand in the EU¹⁵.
- **Circular material use rate (CMU rate)**¹⁶: measures the share (per cent) of materials recovered and fed back into the economy i.e. decrease in the extraction of primary raw materials in overall material use. According to the most recent reported data on this

¹³ See http://ec.europa.eu/environment/circular-economy/index_en.htm and

[http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/625108/EPRS_BRI\(2018\)625108_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/625108/EPRS_BRI(2018)625108_EN.pdf)

¹⁴ The EOL-RIR does not take into account scrap that originates from manufacturing processes e.g new scrap.

¹⁵ EC, Eurostat indicators for the monitoring framework on the circular economy overview, Available at: ec.europa.eu/eurostat/web/circular-economy

¹⁶ The circular material use rate (CMU rate) is defined as the ratio of the circular use of materials (U) to the overall material use (M).

indicator, in 2014, approximately 11 per cent of materials are recovered and fed back into the economy¹⁵.

Finally, it should be noted that the EU monitoring framework on the circular economy was established very recently (January 2018), therefore existing information only reflect the most recent and available data rather than evolutions or trends over time. These indicators can nevertheless be used in the future to assess relevant trends related to product eco-innovation and the circular economy.

2.2.3 Consumption and post-consumption indicators

In addition to policy and business, the role of the consumer is key in terms of enabling the closed-loop life cycle of products and the transition to the circular economy. Societal or consumer behaviour trends in relation to the uptake of behaviours that favour product eco-innovation can be observed through information on consumer purchasing and product use trends, environmental product labels and evolutions in consumption practices.

2.2.3.1 Collaborative consumption

Collaborative consumption, also known as the sharing economy, collaborative economy, or peer-to-peer economy, refers to an economic model based on sharing, swapping, trading, or renting products and services, enabling access over ownership. Collaborative consumption platforms are principally operated via internet-based technology. It influences and alters consumer behaviours as it allows direct transactions between people, creating potential for new jobs and benefits for consumers. Some of the principle motivations for consumers to participate in collaborative consumption platforms include:

- Social reasons: meeting new people, sharing experiences, helps build communities
- Economic reasons: the ability to exchange products or services in order to make and save money
- Practical reasons: sharing saves valuable time, more convenient access to services
- Sustainable reasons: saving resources and protecting the environment

A study on the collaborative economy launched by DG GROW (2016), found that in 2015, over 275 collaborative economy organisations existed across the nine European Member States evaluated (PWC 2016)¹⁷. The United Kingdom and France were identified as having the highest number of collaborative economy organisations (at least 50). Germany, Spain and the Netherlands each contributed over 25 collaborative economy organisations, while less than 25 collaborative economy organisations were established in Sweden, Italy, Poland and Belgium (ibid). Other literature reflects similar findings. For example, the United Kingdom was identified as the leader of the sharing economy, accounting for 1 in 10 of the world's companies in this sector, with an estimated 23 million collaborative consumers in the United Kingdom (EEA 2017).

In terms of revenues, in 2015, the following five key sectors of the collaborative economy (listed below in order from largest to smallest collaborative economy sector by revenue) accounted for an estimated €4bn in generated revenue (PWC 2016):

- **Peer-to-peer transportation sector:** includes ride-sharing, car sharing networks and driveway / parking space sharing models. Examples include: Uber, Blablacar

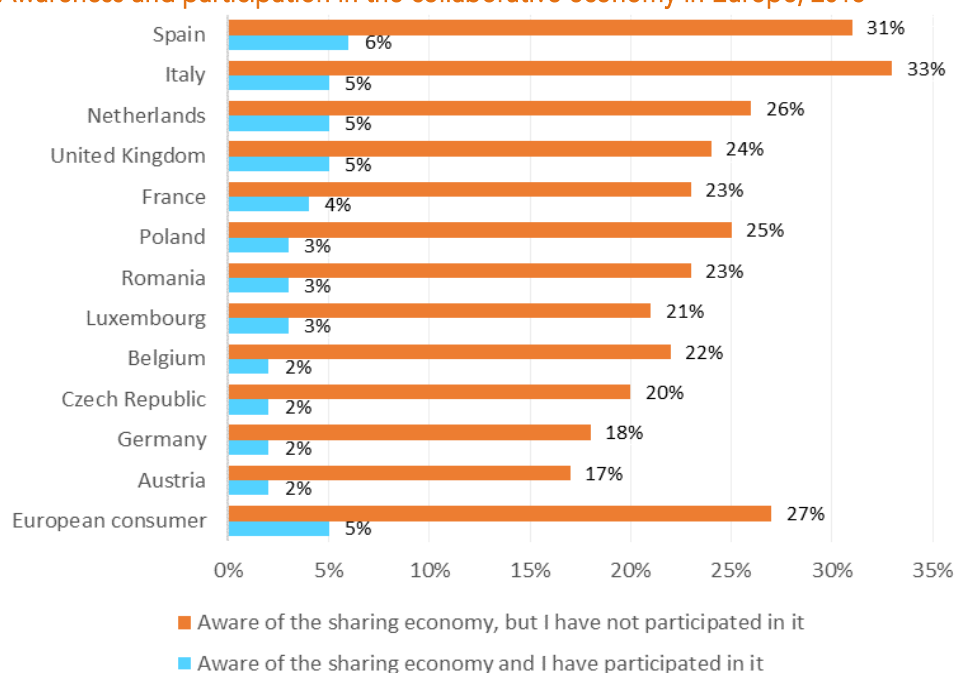
¹⁷ European start-ups covered nine Member States: France, Belgium, Germany, UK, Poland, Spain, Italy, Sweden, and the Netherlands.

- **Peer-to-peer accommodation sector:** includes peer-to-peer rental and vacation platforms as well as home swapping platforms. Examples include: Airbnb, HomeAway
- **On-demand household services:** This sector was identified as the fastest growing sector, driven by the growing popularity of freelancer platforms and crowdsourced networks e.g. ready-made food delivery or "do-it-yourself" tasks. Examples include: ShareYourMeal, Deliveroo
- **On demand professional services:** freelancer marketplaces enabling businesses to access on-demand support with skills such as administration, consultancy and accountancy. Examples include: Hopwork, Upwork
- **Collaborative finance:** individuals and businesses who invest, lend and borrow directly between each other, such as crowd-funding and peer-to-peer lending. Examples include: Funding Circle, KickStarter

The DG GROW study also confirmed that a relatively small – but quickly growing – participation in the collaborative economy is occurring amongst European consumers, as both users and providers.

Another study on the sharing economy (ING International 2015) indicates that about a third of people in Europe have heard of the sharing economy – rising to a high of 38 per cent in Italy and 37 per cent in Spain and survey lows of 19 per cent in Austria and 20 per cent in Germany¹⁸. Figure 2.5 shows additional findings of the survey on the rates of awareness and participation in the collaborative economy across selected EU Member States. The study indicates that the strongest awareness and adoption of collaborative consumption were observed in Spain and Italy, accounting for roughly three times the participation (5 to 6 per cent participation rate) compared to other Member States such as Germany and Austria (2 per cent participation rate). Actual participation in the sharing economy on the other hand, is much lower across all Member States surveyed, with only minor differences amongst them. This suggests that there are opportunities for further efforts to promote participation in the sharing economy as the concept becomes more widespread and more people turn their knowledge into action. (ibid)

Figure 2.5: Awareness and participation in the collaborative economy in Europe, 2015



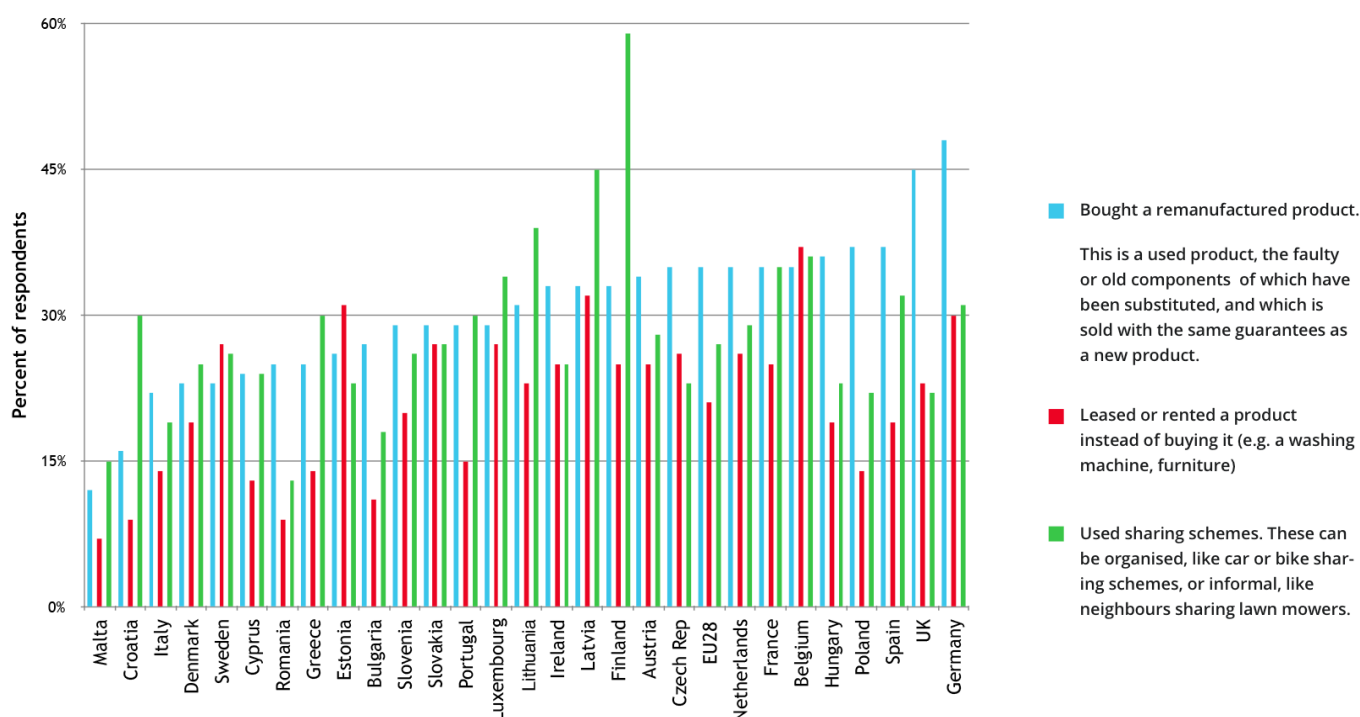
Source: ING International (2015)

¹⁸ They survey was based on a sample size of 14,829 respondents.

2.2.3.2 Indicators on re-use and end-of-life treatment

Indicators related to re-use or alternatives to the purchasing of new products provides details on the extent that consumers are changing their mind-sets on the repair and refurbishment of products. Figure 2.6 shows the share of respondents to a 2013 survey that chose alternatives to purchasing new products. In the UK and Germany, the purchase of remanufactured products is more common as an alternative to the purchase of new products, whereas in Malta and Croatia, leasing or renting out a product is the more widely used alternative. In Belgium, Estonia and Latvia, citizens seem to prefer leasing options, while sharing schemes are more popular in Finland, Ireland and Latvia¹⁹. It should be noted that other forms of re-use include customers who engage in purchasing used products, e.g. from online marketplaces (such as Ebay), at flea markets or in second-hand shops. However, indicators on the amount of such purchases are difficult to capture.

Figure 2.6 Percentage of citizens who have chosen alternatives to buying a new product, 2013



Source: European Commission, ECAP website on the Eco-Innovation Scoreboard and societal behaviours: www.ec.europa.eu/environment/ecoap/indicators/societal-behaviours_en Data extracted from: Flash Eurobarometer 388, 2013

2.2.3.3 Product labelling

Energy, environmental and organic labels are at the intersection of retail and consumer behaviour. Trends on the evolution of the number of product labels can provide some indication on whether consumers are becoming more aware and influenced by them and thereby driving businesses to offer more environmentally-friendly products and services. Trends regarding the EU Ecolabel are depicted together with policy implications for the circular economy in Section 6.1.1.

¹⁹ European Commission, Eco-innovation Action Plan website on the Eco-Innovation Scoreboard and Index and societal behaviours: https://ec.europa.eu/environment/ecoap/indicators/societal-behaviours_en

2.3 Conclusions

The assessment of the available data related to product eco-innovation and its contribution to the circular economy indicates that positive trends are occurring – notably in regards to changes in consumer behaviours (e.g. increase in collaborative consumption) and business models (e.g. integration of product circularity principles such as eco-design and PSS). Product eco-innovation areas such as eco-design, product durability and collaborative consumption provide important opportunities for both businesses and citizens to participate in the circular economy, however further support, particularly from policy could promote the uptake of these concepts. For example, trends on collaborative consumption may indicate increasing growth and participation, however in order to further encourage increased investments, uptake and participation, actions would be needed to address the challenges related to the legal status of collaborative economy platforms (EP 2016).

The practical application of a framework for the monitoring and evaluation of the extent that product eco-innovation contributes to the transition towards a circular economy is not straightforward due to the complex relationships within the supply chain between producers, consumers and policymakers and more importantly, the lack of available robust data for certain indicators. Despite the increasing trends observed on the uptake of product eco-innovation practices, they are still relatively recent concepts. As such, reporting on certain indicators or information needs is far from optimal. A multitude of research projects are ongoing to fill this gap, but strengthened statistical presence at regional, national and European levels from official agencies and sources would also help to raise awareness regarding the importance of circular economy principles and provide policy makers with a much-needed evidence base for establishing and promoting policy instruments. With this in mind, the following challenges exist in regard to the availability of data, knowledge and trends on:

- Product design and product handling for circular use e.g. life-cycle data, data on reuse, repair, redistribution, refurbishment, remanufacture and, more broadly, eco-design
- Product stocks and flows throughout the economy
- Behaviour of participants within the system e.g. collaborative consumption

Finally, it should be noted that statistics can be misleading as data is not always reported homogeneously across the EU. This underlines the need for policy to address aspects related to data collection, reporting and monitoring.

3 |Special feature: Eco-Innovation Index

The Eco-Innovation Index, developed by the Eco-Innovation Observatory, is a tool to assess and illustrate eco-innovation performance across countries. The index illustrates the performance of all 28 EU Member States. By promoting a holistic view on economic, environmental and social performance, the Eco-Innovation Index complements other measurement approaches of innovativeness of countries, such as the Global Innovation Index. The different aspects of eco-innovation are captured by the index through 16 indicators grouped into five thematic areas:

- (1) **Eco-innovation inputs:** comprising investments (financial or human resources) that aim to trigger eco-innovative activities.
- (2) **Eco-innovation activities:** monitoring the scope and scale of eco-innovative activities undertaken by companies. This component focuses on efforts and actions rather than on actual results of eco-innovation activity.
- (3) **Eco-innovation outputs:** quantifying the output of eco-innovation activities in terms of patents, academic publications and media contributions.
- (4) **Resource efficiency outcomes:** relating to wider, macro-scale impacts of eco-innovation regarding resource (material, energy, water) efficiency and GHG emission intensity.
- (5) **Socio-economic outcomes:** depicting the positive impacts of eco-innovation activities for society and the economy, including employment, turnover, or exports that can be related to broadly understood eco-innovation activities.

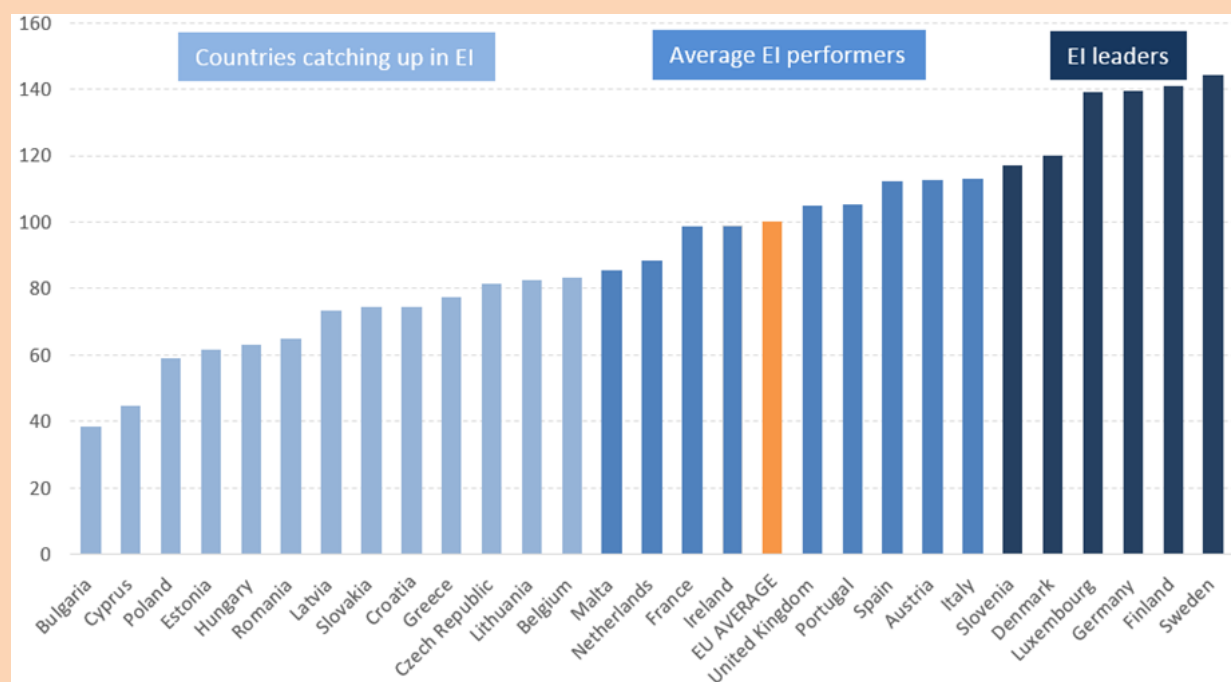
The index illustrates the performance of individual Member States compared to the EU average. By doing so, strengths and weaknesses of single countries in terms of their eco-innovation performance can be distinguished. The composite index is scaled to a reference value by setting the EU average at a value of 100. Thus, countries with higher values than the EU average obtain a score higher than 100 and countries with lower values achieve less, depending on the deviation from the EU average. Countries achieving a score beyond 115 are grouped as 'eco-innovation (EI) leaders', while a score between 85 and 115 represents 'average eco-innovation (EI) performers'. Countries scoring lower than 85 are addressed as 'countries catching up in eco-innovation (EI)'. For more information about the calculation methodology see the technical report (Giljum et al. 2018).

Taking into consideration the availability of more recent data and new data sources, the Eco-Innovation Index is continuously adapted and improved. Replacements of underlying data sources and changes in the country scores for the respective indicators may limit the direct comparability of the index results over time.

3.1 Key trends of the EU Eco-Innovation Index 2017

The EU Eco-Innovation Index 2017 shows a high score variance among the EU-28 countries (see Figure 4.1). Sweden leads the ranking of all EU countries, with an aggregated score of 144, followed by Finland (141), Germany (139), and Luxembourg (139). Also Denmark and Slovenia have been grouped as 'eco-innovation leaders'. Nine Member States, such as France, Ireland or Portugal, scoring around the EU average of 100, were 'average eco-innovation (EI) performers'. Except for Belgium, all countries found in the group of 'countries catching up in eco-innovation (EI)' were Member States that joined the European Union in or after 2005.

Figure 3.1 Eco-Innovation Index 2017



In comparison to the Eco-Innovation Index 2016, most countries remained in their respective country group. However, some changes in positions took place as Sweden, for instance, moved from ranking 5th in 2016 to the leading position in 2017, while Luxembourg dropped from ranking 1st in 2016 to 4th in 2017. Notable changes took place regarding Malta, moving upwards from the group of countries 'catching up in EI' (rank 23 in 2016) into 'average EI performers' (rank 15 in 2017). This trend can be explained by the strong increase of ISO 14001 registered organisations in Malta and its increase of turnover in eco-industries and circular economy. Latvia, however, ranking 15th in 2016, dropped to 22nd in 2017 due to a decrease of various eco-innovation activities referring to R&D personnel and researchers, ISO 14001 registered organisations or eco-innovation related patents.

While this aggregated index provides a general overview of the overall eco-innovation performance and its geographical breakdown across the EU, strengths and weaknesses between single components vary widely among countries and performance categories. For this reason, each component is more closely observed in the following.

3.2 Key trends of the EU Eco-Innovation Index components

Figure 4.2 provides an overview of the performance of all EU Member States, disaggregated by the five components of the index. Green shading indicates high performance, whereas red shading illustrates values below the EU average. The closer values are located around the EU average, the lighter the colour.

Within the component of **eco-innovation inputs**²⁰, the score ranged from only 4 (Cyprus) to 200 (Finland). All top performing countries reached a score above the EU average, whereas all countries grouped in the category "catching up in eco-innovation" had scores below the EU

²⁰ Indicators in the sub-index of eco-innovation inputs: 1.1. Governments environmental and energy R&D appropriations and outlays; 1.2. Total R&D personnel and researchers; 1.3. Total value of green early stage investments.

average. As in previous versions of the index, the indicator 'green early stage investments', calculated as the total of the time period 2014 to 2017, diverged widely between the EU Member States. For five EU Member countries (Bulgaria, Cyprus, Malta, Slovakia, and Slovenia), no investment at all was reported by the primary data source (Cleantech). With 350 US\$, Denmark was by far the leading country in this observed period. Also regarding the indicator 'R&D personnel and researchers', Denmark ranked 1st. Best performances regarding 'governmental R&D appropriations and outlays' were reached by Finland, Germany and Portugal.

Figure 3.2 Scores in the five components of the Eco-Innovation Index 2017, by country

		Eco- innovation inputs	Eco- innovation activities	Eco- innovation outputs	Resource efficiency outcomes	Socio- economic outcomes	Eco- Innovation Index
EI leaders	Sweden	166	148	182	154	77	144
	Finland	200	155	202	49	102	141
	Germany	178	151	130	121	113	139
	Luxembourg	104	124	220	183	72	139
	Denmark	178	58	154	139	70	120
	Slovenia	141	124	153	66	130	117
Average EI performers	Italy	66	111	112	180	101	113
	Austria	91	142	115	128	89	113
	Spain	75	106	139	162	72	112
	Portugal	104	134	100	107	81	105
	United Kingdom	102	87	65	160	82	105
	Ireland	113	58	69	174	55	99
	France	118	10	107	110	89	99
	Netherlands	88	38	91	111	77	88
	Malta	23	116	77	163	7	86
Countries catching up in EI	Belgium	94	11	93	95	75	83
	Lithuania	29	94	93	91	106	82
	Czech Republic	81	126	49	44	111	82
	Greece	57	96	142	50	63	77
	Croatia	25	93	61	85	105	75
	Slovakia	27	90	33	87	124	74
	Latvia	41	41	105	75	110	73
	Romania	53	37	55	60	113	65
	Hungary	39	47	13	76	125	63
	Estonia	50	76	90	2	109	62
	Poland	43	17	53	38	145	59
	Cyprus	4	39	113	62	6	45
	Bulgaria	30	37	33	4	92	38
Minimum		4	10	13	2	6	38
Maximum		200	155	220	183	145	144
Range		197	145	207	181	139	106

Also in the component **eco-innovation activities**²¹, top leading countries reached scores above the EU average, whereas all countries 'catching up in EI' (except for the Czech Republic) had a performance below the EU average. An exception among leading countries was Denmark, scoring relatively low in all indicators of this component, and thus, showing clear weaknesses regarding eco-innovation activities. Just as in the previous index 2016, Finland ranked 1st in this index component (with a sub-index score of 155). The relatively low scores of France (10), the Netherlands (38) and Belgium (11) can be explained by missing values – the 'Community Innovation Survey (CIS)', which is the basis for two of the three indicators of eco-innovation activities, were not available for these countries. Austria and Portugal had high levels of ISO registrations and thus performed notably well in this component. In Germany, for example, EMAS registrations seem to be preferred by companies, leading to a lower level of ISO certificates than one might otherwise expect (Germany ranked 5th from last in this indicator).

Within the sub-index **eco-innovation outputs**²², Luxembourg led the ranking with the highest score of 220. That is explained by its high performances regarding eco-innovation related publications (50 publications per one million inhabitants in 2016) and eco-innovation related media coverage (on average, each electronic media source published three stories on eco-innovation-related topics in 2017). The ranking was followed by Finland (score of 202) and Sweden (score of 182). Hungary achieved by far the lowest performance regarding eco-innovations outputs, mainly determined by the low number of eco-innovation patents (0.5 patents per million inhabitants in 2014). Here again, the rankings of the top as well as the lowest performing countries remained roughly similar to their overall performance in the composite index.

A more homogenous result among all EU Member States is observed in the component of **resource efficiency outcomes**²³. This relates to the fact that some high-performing eco-innovation countries are characterised by comparatively high values of per capita resource use and GHG emissions, which also has been witnessed in evaluations of earlier versions of the index. Finland, for instance, ranking 2nd in the overall eco-innovation index achieved a relatively low score of 49 in this component. This results from its high levels of material and energy use, caused by the comparatively high importance of resource-intensive industries (such as wood and paper industries). With a score of 183, Luxembourg led the component of resource efficiency outcomes, followed by Italy (score of 180) and Ireland (score of 174). Notably low scores were achieved by countries 'catching up in EI' such as Bulgaria (4) and Estonia (2). The United Kingdom, which led in the 2016 index, dropped to the 6th rank.

The last component, **socio-economic outcomes**²⁴, is led by Poland with a score of 145 followed by Hungary (125) and Slovakia (124). These countries are all in the group 'catching up in EI'. In this component, countries among all performance groups showed widely different performances. In terms of employment in eco-industries and circular economy sectors, Poland performed best, while Slovakia was the top-scorer for the indicator of turnover (revenue) in eco-

²¹ Indicators in the sub-index of eco-innovation activities: 2.1. Enterprises that introduced an innovation with environmental benefits obtained within the enterprise; 2.2. Enterprises that introduced an innovation with environmental benefits obtained by the end user; 2.3. ISO 14001 registered organisations.

²² Indicators in the sub-index of eco-innovation outputs: 3.1. Eco-innovation related patents; 3.2. Eco-innovation related academic publications; 3.3. Eco-innovation related media coverage.

²³ Indicators in the sub-index of resource efficiency outcomes: 4.1. Material productivity; 4.2. Water productivity; 4.3. Energy productivity; 4.4. GHG emissions intensity.

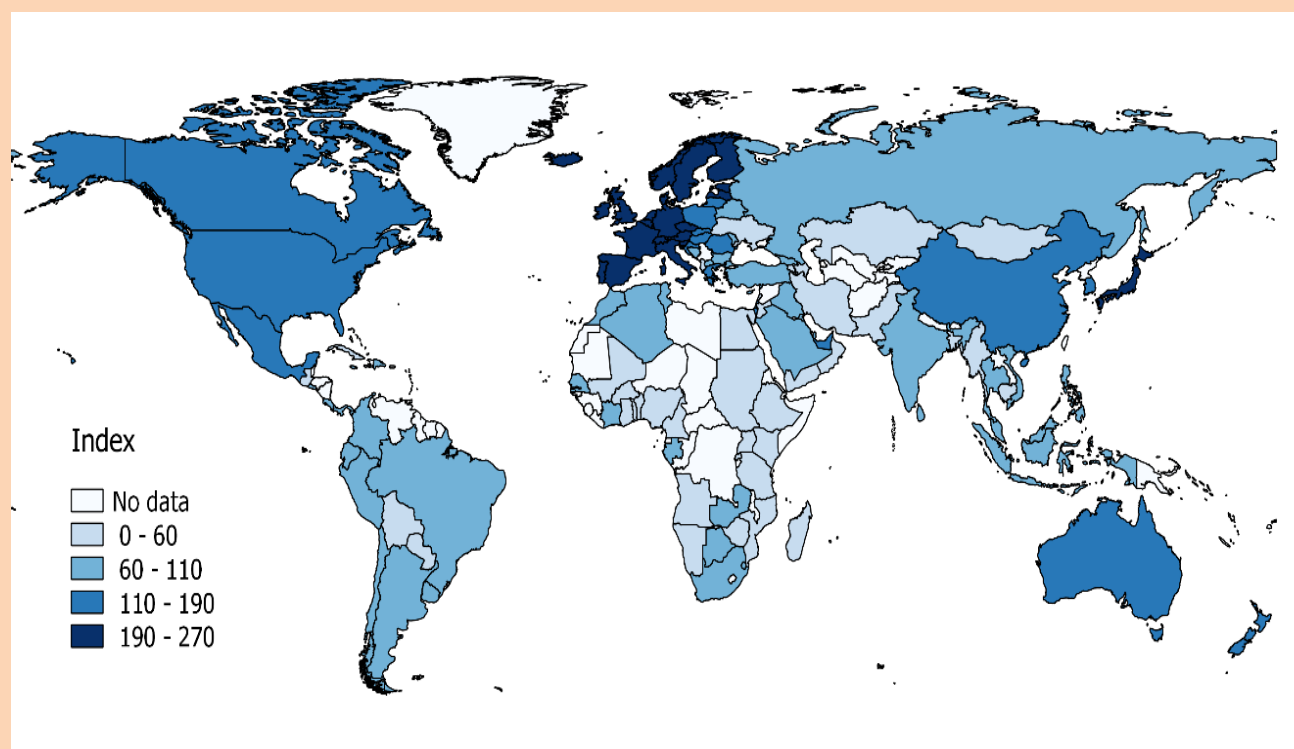
²⁴ Indicators in the sub-index of socio-economic outcomes: 5.1. Exports of products from eco industries; 5.2. Employment in eco-industries and circular economy; 5.3. Revenue in eco-industries and circular economy.

industries and circular economy sectors (as percentage of total revenue across all companies). The performance of 'eco-innovation leaders', such as Denmark, Luxembourg and Sweden, remained significantly below the EU average. Finland, however, reached a score of 102 and was located slightly higher than the EU average. With regard to exports of products from eco-industries, the performance of all countries was around the EU average.

3.3 European eco-innovation performance in a global perspective

The Global Eco-Innovation Index, which is built upon the same methodological principle as the European index, illustrates the eco-innovation performance across a large number of countries worldwide. The index 2017 comprises 130 countries covering industrialized countries, emerging economies and developing countries. Figure 4.3 illustrates the results of the 2017 Global Index in the form of a world map.

Figure 3.3 Global Eco-Innovation Index 2017



As the country average has also been set to 100, the spectrum of the Global Eco-Innovation Index ranged from 3 (scored by Mali) to 262 (scored by Sweden). Every EU Member state achieved a score above the global average, while 17 EU countries even led the index ranking. Japan (18th), Singapore (25th) and United Arab Emirates (26th), were the non-EU leading countries in terms of overall eco-innovation performance. The major emerging economies were ranked closely to the world average. Countries such as China (score of 115) and Brazil (score of 109) achieved scores above the average, while the other BRICS countries Russia (score of 93), South Africa (75), and India (69) were below that average. The countries Mali, Mozambique, Mongolia and Ethiopia achieved scores lower than 13, and thus, represented countries with the lowest eco-innovation performance.

3.4 Policy implications

Analysis of the EU eco-innovation index showed a high variance among European countries regarding their eco-innovation performances. The country group of 'eco-innovation leaders', for instance, had high performances across almost all components, but reached relatively lower positions in the sub-index regarding socio-economic outcomes. It should be noted that this may be a result of the sector definitions used in the query underlying this indicator. Nevertheless, policy measures to improve employment rates and turnover in eco-industries and circular economy sectors should be considered in low performing countries.

Furthermore, it can be seen that 'eco-innovation leaders' have high performances among all components of the sub-index 'eco-innovation inputs'. This suggests a high relevance of public as well as business investments for eco-innovation activities. Regarding the low performances of the country group 'catching up in eco-innovation' the deficit areas of R&D spending should be focused on in order to trigger eco-innovations on the ground.

By extending the view of eco-innovation activities from EU Member states to a larger number of countries around the world, it can be seen that in general EU Member States hold leading positions regarding their eco-innovation performance. This may be due to the efforts of the European Commission to promote eco-innovation and points to an opportunity for Member States to take advantage of their frontrunner position in the pursuit of new lead markets, in particular as concerns maintaining a competitive edge in the transition to a circular economy.

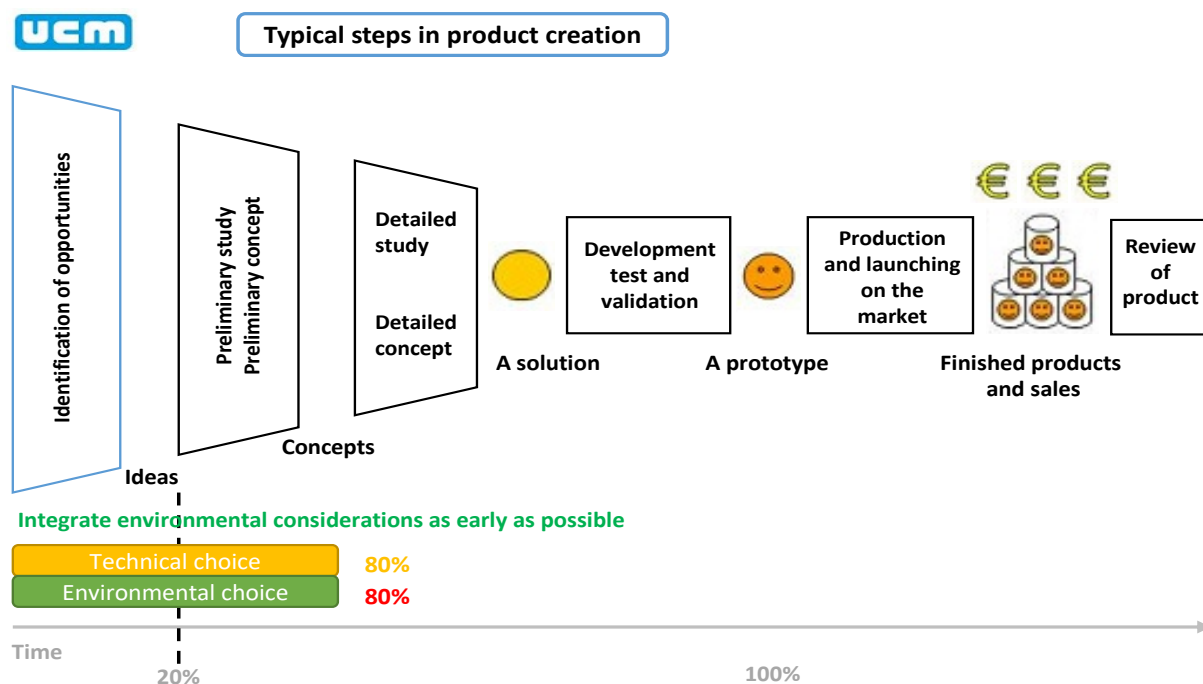
4 | Case studies: Eco-innovative products, business models and supply chains

This chapter presents ten illustrative case studies of good business practices for implementing eco-innovation in the circular economy. It spans multiple sectors in different Member States (presented in alphabetical order) focused on different phases of the product life cycle. In this sense the examples are in no way exhaustive, but rather aim to provide an overview of the wide range of eco-innovation activities happening across the EU to promote a circular economy transition. More examples can be found online²⁵ and in each of the 28 country profiles, also published online²⁶.

4.1 Belgium: Ecodesign consulting in Brussels by UCM

Key words: eco-design, eco-conception

Description: UCM (Union of the Middle Classes) is the main French-speaking employers' organisation involved in the defence of the self-employed and business leaders. As an association, it represents SMEs and Self-Employed individuals. UCM offers a diversified range of services to the self-employed and SME managers for a more efficient management of their companies. Since 2012, UCM's Eco-design Unit (**Cellule éco-conception**) has been helping companies in Brussels in all sectors to make an efficient and positive transition from their economic activities to sustainability. Sponsored by the Brussels Region to raise awareness and coach Brussels small businesses who want to innovate with their business models using eco-design or product-service system (functional economy) approaches, the Cellule éco-conception organises private sessions with individuals in addition to collective ones. To date, more than 100 companies have benefited from this free service, supported by the Brussels Capital Region.



²⁵ www.ec.europa.eu/environment/ecoap/about-eco-innovation_en

²⁶ www.ec.europa.eu/environment/ecoap/country_profiles_en

In companies, the consultants carry out free pre-diagnostics in eco-design and lead thematic workshops in circular economy applied to the company. There are three main services directly for companies:

- The Prediagnostic©: The pre-diagnosis is a tool for qualitative analysis of environmental issues related to the product or service of the company. It makes it possible to identify an eco-design strategy as well as environmental improvement paths directly applicable to the product or service concerned. The pre-diagnosis shows opportunities for environmental improvements but also an overview of eco-design achievements in the company's sector of activity, possible financial gains, contacts with new partners and is a source of creativity and innovation. Using the Prediagnostic© method, UCM consultants offer companies an environmental analysis tailored to their activity. Recommendations help companies implement concrete actions within their means. Support also includes a screening of resource and financial assistance adapted to their needs.
- The BtoGreen® game: The Bto Green game raises awareness among operational managers, business and technical managers, students, technicians, marketing managers and creates team synergies, essential in eco-design.
- The Ecolizer tool: The UCM Eco-design Unit has identified several functions as capable of significantly influencing the environmental profile of products. The Ecolizer 2.0 tool offers information which provides companies with the means to act practically to integrate environmental reflection into their daily activities.

The eco-design support offered by UCM is also aimed at professional federations. The dynamics are the same as for companies, but the results of the pre-diagnostics are extrapolated to the whole sector. On top of these services, UCM also offer training in a range of topics, and finally, as a reference player in the field of circularity, they also offer support in servitisation. Several financial aids are available from the Region, which go along with the services offered above. For example, "aid for environmental investments" is geared toward the manufacture of eco-products. The intervention of the Region amounts to up to 35 per cent of the amount of the investment made in order to reduce the environmental impact of the product or service. This aid is capped at €80,000 per company per calendar year.

Barriers overcome: The initiative raises awareness, disseminates knowledge and provides tailored/hands-on support to companies and sectoral associations about the benefits of and steps in integrating eco-design practices. A such, it intends to overcome potential barriers related to knowledge (i.e. knowledge gap related to the use of eco-design methods and environmental issues) and capacity (i.e. lack of time and scarcity of finances and personnel). By facilitating the selection of the eco-design tool and providing consulting time, personnel training, as well as financial aid, the UCM programme provides the information and part of the means and support to overcome these barriers.

Lessons for eco-innovators and policy makers: Policy makers can learn from the way UCM addressed companies' internal barriers to the uptake of eco-design. Savings and environmental benefit potentials are not well understood by companies. This initiative raises awareness and brings necessary support to strengthen capacities in companies by linking available financial aid to tailored support services and one-to-one consultancy aimed at closing the knowledge and capacity gaps. Additionally, the nature of the service provider, UCM, a professional federation of small and medium-sized enterprises, has an important added value, given its proximity to the ongoing concerns of companies, and its ability to develop methods which meet their needs and expectations. The professional federation, being a reference point for a number of sectors, is also well placed to address external barriers related to the regulatory environment or understanding market demand. Finally, the nature of the organisation provides undeniable

advantages in engaging stakeholders, who already placed their trust in the association by the very fact of their membership.

Image source: Pôle Eco-conception d'après Institut de Développement de Produit du Québec, <http://eco-conception.be/fr/page/pourquoi.html>

Website and Sources: <http://eco-conception.be/fr>

4.2 Croatia: Recycling Soap in Park Split Hotel

Key words: recycling, social entrepreneurship

Description: “Responsible Business for a Clean World” is a project initiated by the Park Split Hotel in Split Croatia, in cooperation with the Network of Associations of Persons with Disabilities (NAPD) Dalmatia and co-financed by the European Union, from European Social Funds. It is an innovative model of circular economy, social entrepreneurship and public-private partnerships. The basics of the project involve collecting the remains of unused soap in the hotel and sending it to the „soap factory” where it is cleaned, sterilized and recycled into new soap products, which are then offered back to customers at the hotel.



It thus required opening a small factory to recycle soap („sapo”), which employs 46 individuals with disabilities. The total project value is 188,865 EUR (about 70 per cent financed by the EU). One of the key aims of the project was to establish a self-sustaining working centre and raise the employability of people with disabilities, while at the same time removing the waste generated by the hotel sector as part of the response to global challenge of preserving the environment. In Croatia, tourism is one of the key industries, but it also carries significant negative impacts on the environment. Regarding soap, analysis of five collaborative hotels showed that 5.4 tonnes of half-used soap is generated and wasted annually. Next to reducing environmental impacts, another result of this project is to improve the competitiveness of the hotel sector with a reduction in operating costs of up to 15 percent. Overall, the project aims to send a strong social message and improve sustainable social development at all levels.

Barriers overcome: To realize this project required the co-operation of multiple partners, in this case including, the Croatian employment Service, Faculty of Chemistry and Technology, Art Academy, Cultural Centre Zlatna vrata, Rehabilitation centre Josipovac and the hotel Park. Getting these partners together would have required time, funding and space, making EU funding a key prerequisite for enabling such projects to be conceptualised, initiated and run with success. It also required establishing a small recycling plant for recycling soap, as well as a kind of a working center to educate persons with disabilities for recycling soap and launching new products to the market, again highlighting the importance of EU project funding.

Lessons for eco-innovators and policy makers: The idea for the project came from the hotel manager, who noticed the amount of waste generated by unused soap. It shows how taking initiative and getting into talks can lead to change. The hotel has written “It is never too late to be change agents and make something useful for someone who needs help”. This is in keeping with the social values the Hotel cherishes, including dedication to environmental and ethical practices. For example, the hotel also makes use of other environmental regulations, such as using recycled paper, offering an electric car station, applying motion sensor lights, among others. For policy makers, it means that a general dedication to greening business practices is key to both incremental changes, but also new business ideas. The need to follow green practices to be competitive worldwide also played a role in the hotel’s motivation, showing the importance of supporting a shift in consumer values to create the market for greener practices, e.g. through information campaigns. Finally, the example made by Hotel Park Split was followed by other hoteliers in Split and also leading distributors for hotel amenities. Support for one project was able to be scaled up, again emphasizing the importance of space for testing eco-innovation.

Image source: <http://hospitalityawards.com/en/the-categories/hospitality-awards/2016/>

Website and Sources: <http://sapo-reciklirani-sapun.com/pages/sapo>,

<http://www.hotelpark-split.hr/events/event-286>,

<http://www.slobodnadalmacija.hr/dalmacija/split-zupanija/clanak/id/429122/prica-s-jadra-koja-je-osvojila-svijet-koristeni-hotelski-sapuni-vise-se-ne-bacaju-u-solinu-ih-jedva-cekaju>

4.3 Czech Republic: Regeneration of acetone as new input material by LINDE Vítkovice

Key words: new technology, material efficiency, waste management

Description: LINDE Vítkovice is a joint venture manufacturing plant in the town of Ústí nad Labem that supplies complete acetylene bottles and bottle bundles to the gas companies in the Czech Republic and across Europe. In accordance with the strict quality and safety requirements and environmental protection limits set in the policy of the company, LINDE Vítkovice together with the University of Chemistry and Technology worked out an innovative approach, thanks to which the acetone is efficiently and ecologically returned to the production stage, i.e. reused as a raw material. 106 tonnes of polluted acetone is restored annually, instead of its removal by an expert company as a hazardous waste. From the point of view of waste management and environmental protection, hazardous waste material is not transported, mixed with other waste, or landfilled, instead, it is regenerated to a new raw material and has a clear traceability. The residual acetone is collected from the bottles to be reused. It does not become the cause of more pollution but is instead treated. Together with a supplier of services in waste management and subsequently in cooperation with the Institute of Technology in Vítkovice, LINDE came to a technological

solution to ensure the treatment of residual acetone, which consists of distillation. Whereas, before the project was implemented, the residues processed during the bottle refurbishment process consisted of hazardous waste in the form of contaminated acetone, thanks to this solution, 99.7 per cent of the acetone was recovered, even exceeding the production requirements. This recycled raw material is then reused. The company has made CZK 318,000 (EUR 12,400) in savings on the purchase of waste disposal services, and additional savings on the purchase of 90 tonnes of primary raw material.

Barriers overcome: Many companies and SMEs still do not realise that environmental management measures are associated with economic benefits. Waste and pollution reduction measures are commonly seen as a cost and if not a part of the environmental compliance activities they are often ignored. Over the last years many Member States have set up special advisory support services, such as material or environmental audits, which can help companies and SME in minimising their waste streams, reducing consumption and discovering new methods for gaining savings.

Lessons for eco-innovators and policy makers: Often, a collaboration of companies with local research organisations allow them to develop new solutions, like has happened in LINDE Vítkovice. It is therefore important to facilitate business-science collaboration for environmental benefits.



Image source: LINDE Vítkovice website ; www.linde-vitkovice.cz

Website and Sources:

[https://www.mzp.cz/web/edice.nsf/DF318BF6895A668FC1257F94002B3A22/\\$file/SOTPRObehove-hospodarstvi20160413.pdf](https://www.mzp.cz/web/edice.nsf/DF318BF6895A668FC1257F94002B3A22/$file/SOTPRObehove-hospodarstvi20160413.pdf)

Contacts for further information: <http://www.linde-vitkovice.cz/en/kontakt-ni-formular.php>

4.4 Germany: Replacing throw-away coffee cups with “Recup”

Key words: reuse, recycle, behaviour change

Description: RECUP is a deposit system for reusable coffee cups that has reached at least 23 cities and over 850 sites across Germany. Coffee drinkers pay a 1€ deposit for their coffee cup, receive a reduced price for their coffee and can return the cup to be washed and resold at any

partnering café. The robust cups are made in Germany, are free from BPA and other harmful substances, use one universal lid size, and can be reused up to 500 times. That means that a single reusable cup can replace up to 500 single use cups. This has multiple benefits for the environment. It is estimated that 2.8 billion coffee-to-go single use cups are used annually in Germany, causing a paper consumption equal to 43,000 trees, 110,000 tonnes of CO₂ emissions, 40,000 tonnes of waste and 1.5 billion litres of water. Moreover, as coffee cups are layered with polyethylene, they are difficult to recycle and are often incinerated in Germany. Goal of the RECUP team is to increase the sustainability of coffee-to-go. It was started by two young men with a pilot project in Rosenheim in November 2016. The team has grown to 17 employees working on implementing a nationwide deposit system for reusable coffee cups.

Barriers overcome: One of the largest challenges for the small business has been scaling up the RECUP-network across Germany without a large budget for marketing. The cooperating with large coffee shop chains and cities has been and is thus crucial. In more country regions networking has not been as fast or easy, although it is important for users to have as many partnering cafes as possible. Participating cafes have reported that most customers are enthusiastic about RECUP, with only a few feeling sceptical. However, there were some hurdles with implementing the RECUP deposit system, including integrating it into the cash register system and with understanding which tax rate applied.



Lessons for eco-innovators and policy makers: RECUP was inspired by the German deposit system for reusable bottles. This system was nothing new for consumers and thus the idea to apply it to coffee cups was not a large jump for users. This points to the fact that different types of eco-innovations may be appropriate for different socio-cultural settings. For entrepreneurs it means that new applications of “old” ideas may be easier to bring onto the market. Furthermore, the topic of resource use for coffee-to-go cups was heavily represented in the German media in the fall of 2016. This led many cities to look toward establishing a deposit system, corresponding with the development and outreach of RECUP. This shows (a) how instrumental information campaigns may be in promoting change and (b) the importance of timing for successfully launching new products/services on markets.

Image source: Recup, Leonie Aust

Website and Sources: <https://recup.de>

4.5 Hungary: Recycling of used jeans with Old Blue

Key words: upcycling, denim recycling, second hand objects, smart design, waste as a resource

Description: Old Blue is a small business with 6 employees, and a HUF 32 million (EUR 98,734.12) turnover in 2017. Old Blue’s business model is based on both circular supply and extension of

product lifecycle. The environmental problem they are tackling is created by denim production. Huge quantities of denim are produced globally: around one billion jeans per year. Water consumption, pollution and pesticides related to denim production are an ecological problem: a pair of jeans has a water footprint of 10 m³ and growing cotton necessitates a huge volume of pesticides. Old Blue designs new products, including a large variety of furniture, bags, and clothes using old jeans. They run a studio and an on-site second-hand shop, where customers can buy selected items. The company also strongly promotes awareness-raising activities related to responsible consumption. Old Blue tries to create a strong emotional relation between the customers and their products, and therefore offers a lifelong guarantee (send back and repair service) for their bags.



Barriers overcome: The company collects used jeans from collection boxes distributed around several stores. The collection boxes help advertise the business and its environmental benefits. Private individuals are also called upon to provide help in collecting and recycling used denim, and can send their unwanted jeans directly to the shop. They are incentivised to provide what constitutes the important secondary raw material to the company via discount coupons on the shop's products. The company also intends to address a cultural barrier in consumption by showcasing the range of objects that can be made from used jeans and encouraging more people to produce products from used jeans. For that purpose, they also sell the raw materials obtained from repurposing the jeans.

Lessons for eco-innovators and policy makers: By focusing on the reuse of second-hand jeans, the business model avoids the production of waste and lowers the needs for primary raw materials, reducing with it the pressure on resources and the potential for environmental degradation. By raising awareness on textile waste and the possibility of reuse, the business described above contributes to filling in the information gap between consumers and the environmental impact of the consumption of clothing items. The business model shows the feasibility and the environmental benefits of the upcycling of textile waste. This example can set an example for other types of products. Furthermore, a few Member States have shown their support to such circular activities by introducing tax and economic incentives to second-hand shops and reuse and repair services. Such support, while costing nearly nothing to the state, offers significant environmental benefit by closing the loops and extending the live-spans for many products. They also offer social benefits as often such reuse and repair activities are done by charity organisations.

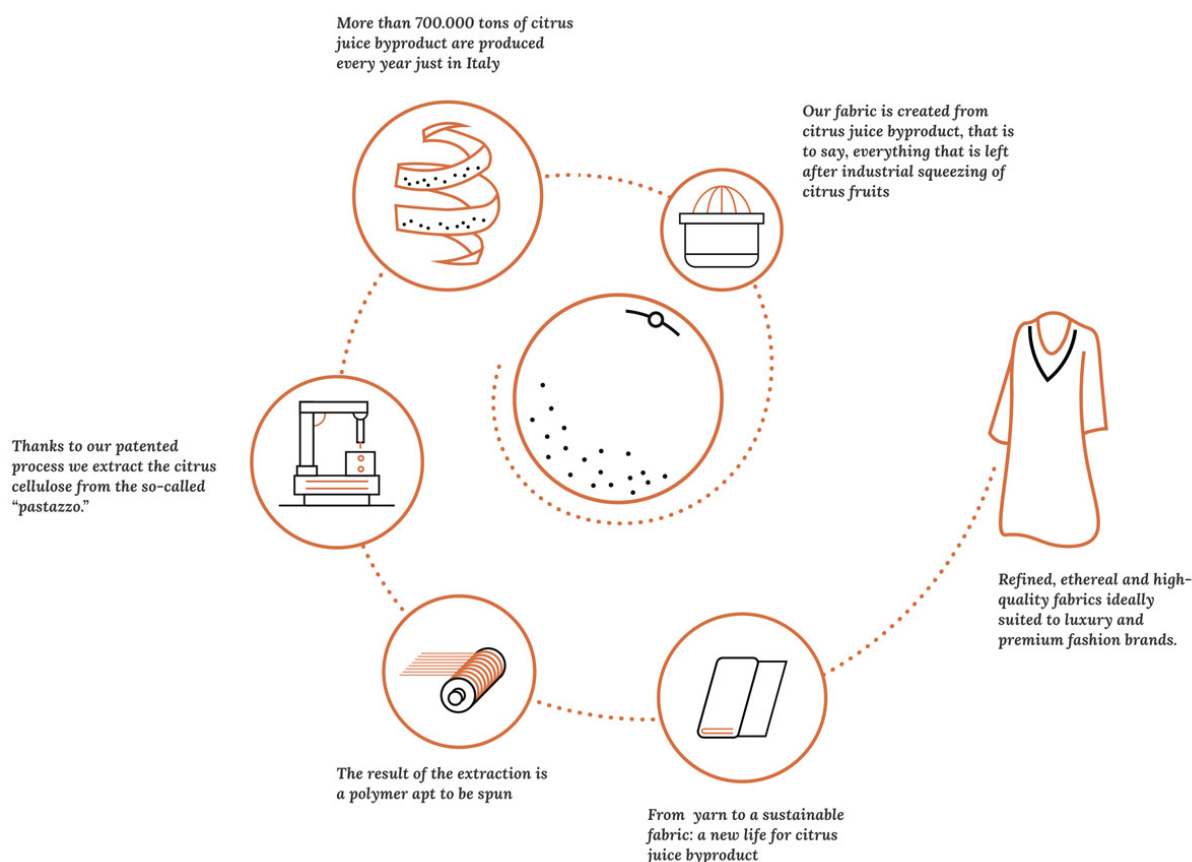
Image source: <http://oldblue.hu/index.php/szonyegek>

Website and Sources: <http://oldblue.hu/>

4.6 Italy: New fibres from citrus industry waste by Orange Fibre

Key words: recycling, textiles, waste recovery, production by-products

Description: Orange Fiber is a small Italian start-up producing textiles from citrus waste. The company, founded in February 2014, is composed of five members. It sprung out of a thesis proposing producing sustainable fabric from citrus by-products. Each year more than 700,000 tonnes of citrus waste are produced in Italy alone. It has caused problems due to illegal disposal as well as challenges for companies due to expensive disposal practices. Orange fibre developed and patented a process to extract cellulose from the “pastazzo” (what remains from citrus fruits after squeezing) to form yarn. The final product is a biodegradable material like silk. It can be woven with any type of existing yarn or in its purest form (a 100 per cent citrus textile) boosts a soft, silky hand-feel that is lightweight and can be opaque or shiny.



Barriers overcome: The innovation was patented in 2013, two investors financed the project and the first prototypes of fabric were presented at the Expo Gate of Milan at the Vogue Fashion's Night Out in September 2014. This required finding the right sources of funding for work on patenting (including a feasibility study) and investing as well contacts for emerging on the fashion scene. In December 2015, the first pilot plant for the extraction of citrus pulp opened, thanks to the funds of Smart&Start by Invitalia, and the operational phase of the project began. Fabric production followed and in 2017, the first fashion collection was created with the exclusive Orange Fiber fabric and presented by a top fashion brand.

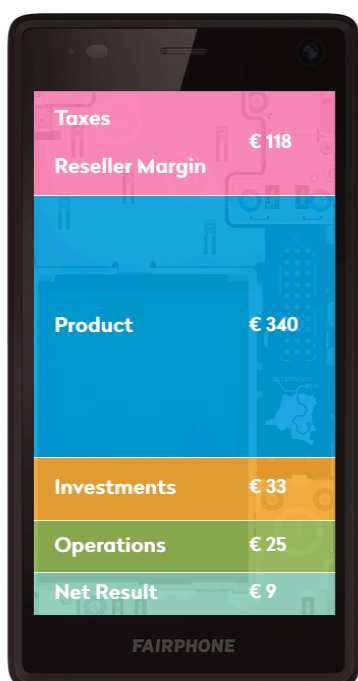
Lessons for eco-innovators and policy makers: According to the website of Orange fibre, it was started with “creativity and (the) will to dare”. This points to the willingness to take risks and try new things in order to develop eco-innovations. Furthermore, Orange Fiber is a portfolio company of Fashion Tech Lab. Fashion Tech Lab is a global structure that combines an investment company, a multinational accelerator, and an experimental laboratory, all aimed at

helping new technologies and sustainable innovations connect, collaborate, and create products and brands that evolve the industry and improve its social and environmental footprints. Fashion Tech Lab was founded by prominent fashion and digital entrepreneur and investor Miroslava Duma, who is a permanent member of the Orange Fiber advisory board. This points to the importance of providing innovation space for eco-innovations to come into existence and to mature to a level that make them attractive to investors.

Image source and further information: <http://orangefiber.it/en/>

4.7 The Netherlands: Developing ethical, modular smartphones by Fairphone

Key words: electronics, modular, fair



Description: Fairphone is a Dutch social enterprise based in Amsterdam that makes ethical, modular smartphones. They put much effort in tracing back the origin of all materials used and try to produce a phone as fair as possible. In order to extend the life of the phone, the phone is also modular and easy to repair by phone users themselves. The phone is for sale in almost all European countries. Fairphone sources materials that support local economies; conflict-free tin and tantalum in the Democratic Republic of the Congo, Fairtrade gold from Peru, and it is working to integrate responsibly mined tungsten. Transparency is also at the heart of their business model. They help consumers track each and every component used to make their phones. Their business model is also transparent, from developing the products and social projects to manufacturing, marketing and operations, detailing on their website the cost breakdown of the Fairphone, including taxes and reseller margin, production associated costs, investments, operations, and net results. Suppliers are also mapped on their online platform to help render the consumer electronics supply

chain less opaque.

Barriers overcome: Developing a smartphone with 'conflict-free' and low environmental impact minerals is a challenge that Fairphone addresses at the core of its business model. This involves facing different technical and legal barriers. Traceability of minerals across their whole supply chain is for instance difficult, and the legal framework in some countries of origin of smartphone components can add a layer of complexity to identifying the origin of minerals²⁷. The Fairphone has faced and is also facing financial barriers: e.g. gathering sufficient financial capital for the first edition of the smartphone, developing long-life products has implications on guaranteeing regular income, etc. For instance, when the first edition of the Fairphone was finalised and a first batch produced and sold out, the company did not produce a second batch despite demand, deciding that as the first edition lacked the latest software and 4G technology, continuing selling it would not be faithful to the company's objective of guaranteeing a long life for its products. This resulted in an important gap in revenues. The Fairphone does not claim to have solved the issue of sustainability for all minerals involved in the production of the smartphone, and so

²⁷ For example, according to the company, in China, which is a major producer of components that contain gold, all gold needs to go through the Shanghai Gold Exchange. After this stage it is very difficult to trace the origins of gold (CEPS, 2015, Fairphone, 2015)

barriers, such as related to capacity, remain: as transparently claimed “because it’s impossible to focus on so many resources all at once, we decided we needed to prioritise”.

Lessons for eco-innovators and policy makers: Fairphone widely raises awareness about the environmental and circularity performance that can be achieved in the sector of electronics, both directly to consumers/citizens, and in business-to-business via its practices in its own supply chain. This approach allows the company to gain advantages among customers that deliberately focus in sustainability. For example, customers that pursue green or circular procurement principles will be more likely to purchase products like Fairphone. The initiative stems from the company, demonstrating that policy should catch up to leading edge companies, in particular as regards transparency and monitoring (also as these are key barriers faced by the company).

Image source: <https://www.fairphone.com/en/how-we-work/cost-breakdown/>

Website and Sources: <https://www.fairphone.com/en/>; <http://greeneconet.eu/fairphone-designing-fairer-smartphone>; <https://www.fairphone.com/en/2017/02/01/fairer-materials-a-list-of-the-next-10-were-taking-on/>

4.8 Romania: Lets share and care urban mining for reused products

Key words: Reuse, Repair, Urban Mining, Upcycling, Campaign



Description: Let’s Share and Care! is a national campaign developed by Let’s Do It Romania!, an environmental NGO, in cooperation with Teach for Romania, an educational NGO. The campaign aims to support children from poor communities with a high school dropout rate, and at the same time to fight against waste through resource reuse. "Let's Share & Care!" involves collecting clothes, toys, stationery, furniture and other objects that can be reused from companies, employees, public institutions, etc. "Let’s Do It, Romania!" collects boxes from all companies and upgrades them in an urban mining centre before sending them for re-use. In 2017, there were 42 companies and 11 individuals that donated 3.6 tonnes of materials (clothes, shoes, furniture etc.)

for reuse in 6 schools. In 2018, the campaign continued with the “empty shop” concept. In partnership with the Promenade shopping mall, a clothes collection campaign was deployed in 12 shopping centres. The campaign attracted over 10,000 donors and a record amount of clothes in just two weeks, of about 30 tonnes, which is 10 tonnes of clothes above the proposed target. This was the largest harvest of used textiles and clothes made in Romania. The clothes will be upgraded and repaired and sent to disadvantaged families throughout Romania.

Barriers overcome: The campaign facilitates the connection between used materials that would otherwise have been wasted, repair shops and communities in need of materials. Through the cooperation with Teach for Romania, the campaign overcame the barriers of reaching out to potential beneficiaries of the used materials. The cooperation with the CSR departments of the businesses allowed the Let’s Share Romania! team to overcome the barrier of finding a channel for sourcing materials that would have been otherwise wasted. The lack of storage space and

repair specialists have been the highest barriers. They have been overcome through the development of a repair social enterprise, whose task is to repair parts of the materials which are not viable for immediate reuse.

Lessons for eco-innovators and policy makers: Let's do it Romania played the role of a broker, which is instrumental in raising awareness on the opportunities of reuse and repair and in deterring the materials from becoming waste by connecting them to beneficiaries. While the organisation finances this activity through the support of fundraising from large corporations and businesses, in order for such activities to take scale, there is a need for more public support to this type of facilitator organisations. As discussed in Section 6.6 such reuse and repair activities can be also supported indirectly, by offering tax incentives, which helps to maintain their economic viability on the one hand and contribute to avoiding waste on the other.

Image source: <http://letsdoitromania.ro/>

Website and Sources: <http://letsdoitromania.ro/>

4.9 Spain: Reusing plastic in urban furniture (e.g. bus platforms) by Zicla

Key words: sustainable construction, reuse of plastic,

Description: ZICLA is a company born in Barcelona in 2005 with the aim of converting waste into new materials for industry and new products for cities. For cycle lanes they produce urban planters, zebra and zipper separators to promote safe urban cycling. These are recyclable, reusable, and competitive products manufactured with post-consumption and post-industrial plastic waste. They also design and produce bus platforms to improve urban accessibility. Indeed, ZICLA identified a business opportunity to improve the existing bus platforms, made in



concrete, by replacing them with new platforms made by recycled plastic. The system, called Vectorial Systems, is modular and it is made from post-consumer PVC plastic waste (plastic coatings for electrical cables) and post-industrial PVC (remains from

the manufacture of hoses, tarpaulins, etc.). It is highly flexible and can be installed and uninstalled quickly and easily and its modularity enables it to be adapted to the available space. The company has a self-proclaimed commitment to circular economy and a team of experts with experience in waste recovery, green design and sustainable development. They state "the way we work fits perfectly into the circular economy, as we focus on the resource cycle and follow a model based on reusing, repairing, remanufacturing and recycling existing materials and products rather than using raw or virgin materials". They have branched out to two areas: projects to create sustainable opportunities (advising businesses on waste recovery) and recycled products for friendly cities (designing, developing and manufacturing recycled products, in particular as regards urban furniture). It is estimated that ZICLA used more than 1,600 tonnes of post-consumption PVC waste between 2009 and 2015, preventing both the landfilling of PVC and the emissions of 3,040 tonnes of CO₂ (emitted by a car travelling 415 times around the Earth).

Barriers overcome: In the process of developing the eco-innovation, ZICLA has faced several challenges. As regards the Vectorial system, challenges related first to the design of the product.

It needed to be individual, easy to assemble, modular, light and multifunctional. Second, the company faced the challenge of designing the new material, which requires high durability and strength from a mixture of flexible PVC waste from different sources (which also means that a stable supply must be ensured). Finally, there were challenges in the manufacturing process since it was necessary to test and adapt the new material to conventional injection and extrusion processes.

Lessons for eco-innovators and policy makers: Challenges faced by the company related in particular to design and production to turn their eco-innovative idea into a reality and develop a competitive product for the market. This is often the case with eco-innovations branching out into new areas. For companies, it requires the tenacity, funding and skills to carry through. For policy makers, it shows the importance of providing support to companies trying to branch out and apply circular economy principles in their eco-innovations. Information and training services are critical to companies being able to make this step. This example also demonstrates the importance of municipalities as partners and/or customers in eco-innovations. Cities applying the Vectorial system, as well as the eco-innovations for bike lanes, had to be willing to try something new (instead of keeping to the old system of concrete) to continue to create a market for the eco-innovation to reach market maturity.

Image, source and website: <https://www.zicla.com/>

4.10 United Kingdom: Remanufacturing used paint by Community RePaint

Key words: Reuse, remanufacturing, social initiative, grassroots movements

Description: Community RePaint is a UK wide paint reuse network. They estimate that 17 tins of rest paint spoil in households across the UK on average—amounting to 50 million litres of paint per year! The network aims to collect this leftover paint and redistribute it at an affordable cost to community groups (sports clubs, amateur theatre groups, arts groups, etc.), housing associations (for their tenants) and low income families and individuals. Most schemes include a small charge of up to £2 per litre, helping the scheme to be sustainable. The network is run on a day to day basis by the environmental consultancy Resource Futures (an employee-owned, non-profit-distributing company) and it is sponsored by Dulux (a leading paint brand in the UK). Schemes are operated by a range of host organisations, including furniture reuse organisations, scrapstores, community recyclers and local authorities. Each scheme in the Repaint Network is autonomous, following a basic operational model but with individual variations according to the type and ethos of the host organisation. Currently the network is made up of over 74 schemes and redistributes over 300,000 litres of paint each year. Since December 2015, two Community RePaint schemes have been updated to include remanufacturing centres, enabling more leftover paint to be reprocessed with higher levels of quality and longevity in consistent colours. Looking to the future, the network has ambitious targets to increase redistribution to over 1.5 million litres of paint in 2020, with the moto of colouring over 1 million lives across the UK.

In 2017 **74** Community RePaint schemes

Collected over **432,000** litres and redistributed over **300,000** litres of paint, which included over **50,000** litres of remanufactured paint

Adding colour to the lives of over **316,000** people through individual sales and improving the appearance of places across the UK

All thanks to **154** employees **14** trainees and **146** volunteers



Barriers overcome: The network has developed over a relatively long timeframe (starting in 1993, see below), requiring high levels of coordination with different types of stakeholders. For instance, Resource Futures works in partnerships with clients ranging from local authorities and government bodies to small businesses and multi-national companies, as well as third sector organisations and community groups. As most schemes are operated by not-for-profit organisations and community groups, the presence of a Community RePaint scheme in different areas of the UK is dependent on there being a local organisation or a willing local authority to run a scheme. Also, schemes are dependent on (a) citizens supplying leftover paint in an appropriate way and (b) local authorities and household waste recycling centres collecting used paint, which is then collected by a scheme to be checked, in some cases remanufactured, and resold. This requires knowledge sharing and information targeted to both citizens and municipal actors. Finally, there are also complex rules and regulations for storing and handling hazardous waste. This means that specialist, industrial or hazardous paints cannot be collected and must be separated out.

Lessons for eco-innovators and policy makers: The project emerged from a city level initiative (in Leeds) to investigate options for household waste and a consequent research project and pilot scheme to collect hazardous household waste using a "waste wagon". During this pilot collected paint was given to local charities for free, leading to the idea for Community Repaint. 25 schemes received a Biffa grant to support start-up costs and the network grew from there with the AkzoNobel Dulux brand becoming the sole sponsors of the network in 2008, 15 years after Community RePaint was first set up. In 2014 the network won the Gold Award in the UK Community and Charity Category at the Green Apple Awards for environmental best practice and in 2015 the first remanufacturing centre opened in Cambridgeshire. This progression from a city-level pilot to a nation-wide self-sustaining network model demonstrates (a) the importance of pilots, also as innovation spaces for generating new ideas (even unintended ones) and bringing potential partners together to generate those ideas (b) the long time-span sometimes needed to scale-up activities and the need for political horizons that take into account longer time spans and (c) the importance of awards providing recognition of eco-innovative efforts and promotion for getting the word out.

Image source and further information: <https://communityrepaint.org.uk/>

5 | Policy instruments

According to the European Commission, the EU Ecolabel, green public procurement, and the Environmental Management and Audit Scheme (EMAS) are unique among EU policy instruments in that “they aim to address the environmental impact along the whole life cycle, including the increasing number of impacts of European consumption that happens in countries outside the EU where products and materials are often produced and from which they are imported to the EU” (EC 2017a). These three instruments are focused on products and business models, and are currently being adapted to better drive the circular economy transition across Europe. This section looks more closely at how they have and could better incorporate circular economy principles. It also addresses three instruments focused more explicitly on the circular economy: namely Extended Producer Responsibility (EPR), Ecodesign for material efficiency and the pilot Product Environmental Footprint. Finally, some bottom-up product policy trends and tools from across Member States are presented with the potential for encouraging eco-innovation towards reaching aims of the circular economy.

5.1 Ecolabels

Labelling schemes are among the most widely used measures to encourage product choices that meet environmental and/or social criteria that go beyond regulatory compliance. They provide consumers with the information that the labelled product is one of the best performing products in that category on the market. In turn, market pressure created by consumer demand for labelled products are expected to encourage producers and service providers to offer products which meet stricter criteria. As such they are among the most widely implemented voluntary measures and are actively promoted across the EU by European institutions and Member States, also in form of mandatory information to be provided to the customers e.g. in the case of the energy label .

Eco-labels are increasingly being used to distinguish products, which contribute to a circular economy transition in the EU. Generally, three waves of eco-labels have emerged. The first wave informed consumers about products that are ecologically sound. The second wave built on the first to provide additional information that products are durable, safe and based on sustainable materials. The third wave is just starting to emerge. Building on the first two, it integrates criteria toward emerging issues, such as the circular economy (Kauppi 2017). In general, criteria for eco-labels can act as benchmarks across the lifecycle of a product life—for designers, manufacturers and consumers. This section looks at how circular economy is being integrated into two eco-labels—the EU Ecolabel and the Nordic Swan Ecolabel. Two good practices examples also reveal the state of the art toward helping achieve a circular economy through ecolabels and the section concludes with some policy messages for scaling up ecolabels across the EU.

5.1.1 The EU Ecolabel

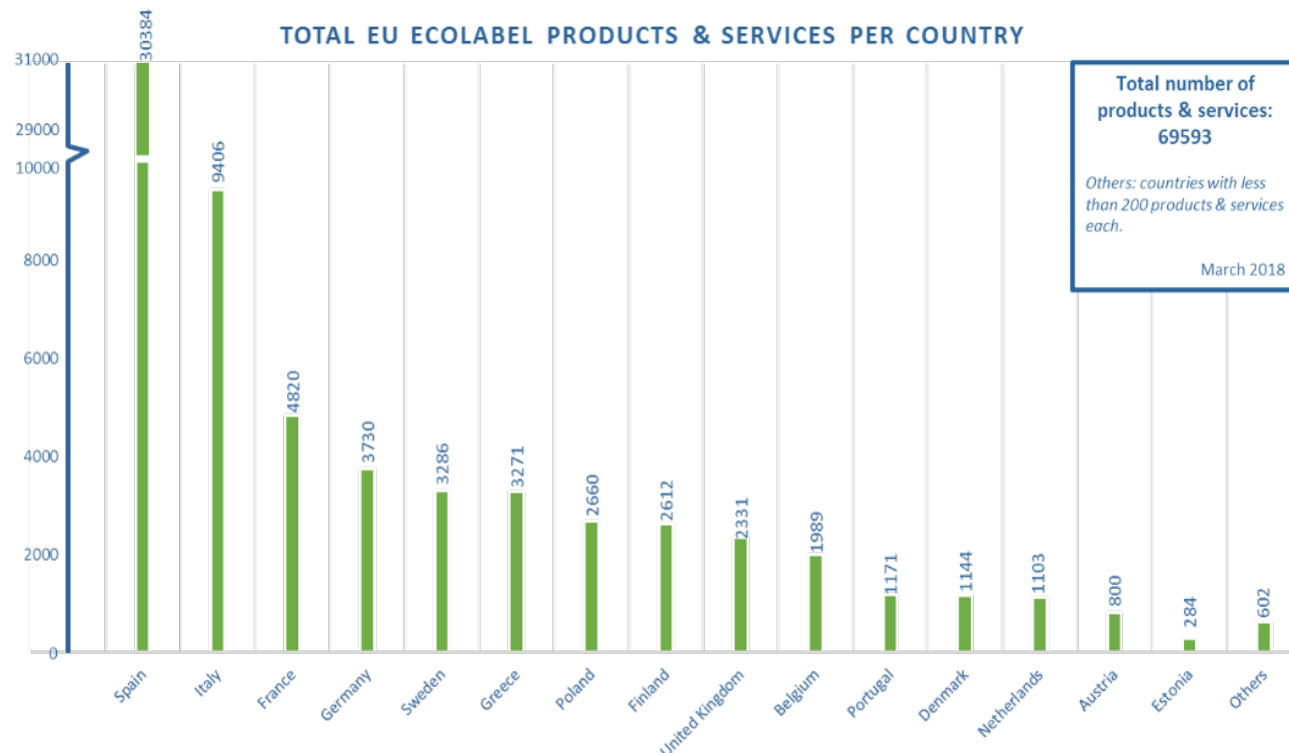
The “European Ecolabel” is one of the oldest ecolabels in the EU. It celebrated 25 years in 2017 (established in 1992) and is characterised as a voluntary scheme to encourage businesses to market products and services that are kinder to the environment. Products and services awarded by the Ecolabel carry the flower logo (see Figure 6.1) and must meet high environmental standards throughout their life-cycle: from raw material extraction, to production, distribution and disposal. The EU Ecolabel covers a

Figure 5.1 The EU Ecolabel



wide range of products and services and is continuously being extended. Currently twenty-seven different product groups span a wide range of categories, from cleaning products to cleaning services, from home and garden to clothing and paper products, and from rinse-off cosmetics to tourist accommodation services. As of March 2018, 1,976 ecolabel licences have been awarded for 69,593 products and services (up 69 per cent since 2010). With 30,384 ecolabeled products and services, Spain has by far the highest number of products and services per country, followed by Italy (9,406), France (4,820), Germany (3,730), Sweden (3,286) and Greece (3,271) (see Figure 6.2). Thirteen Member States have less than 200 products and services carrying the EU Ecolabel, indicating a wide dispersion of uptake and implementation across the EU.

Figure 5.2 EU Ecolabel statistics per country March 2018



Source: EU Ecolabel website: <http://ec.europa.eu/environment/ecolabel/facts-and-figures.html>

As regards the transition to a circular economy, the EU Ecolabel supports products and services that contribute to sustainable development at each step of the product life cycle, are energy efficient, durable and repairable. In August 2016, the Commission introduced a new set of EU Ecolabel criteria for computers, furniture, footwear, wood-, cork- and bamboo-based floor coverings and tourist accommodation product and service groups. For example for computers, manufacturers will now need to consider energy efficiency and device upgradability during design and manufacturing stages, as well as take into account how easy it is to dismantle, recover and recycle resources from the device. Computers and tablets will need to pass robustness and battery longevity tests. For furniture the new criteria requires that manufacturers conduct a more comprehensive life cycle assessment, while paying special attention to the hazardous compounds and residues, which could contribute to indoor air pollution (EC 2016b). The criteria for furniture also extends to include other materials aside from wood products (e.g. leather, textiles, metals and plastics), which may provide a wider group of potential furniture manufacturers to make use of the EU Ecolabel. As regards the new criteria for footwear, manufacturers must assume a larger responsibility for Corporate Social Responsibility

concerning labour conditions of the final footwear assembly site, e.g. toward improved “responsible supply chain management” (Sustain Europe 2018). The EU Ecolabel intends to keep expanding criteria for promoting a circular economy in the future.

5.1.2 The Nordic Swan Ecolabel

Figure 5.3 The Nordic Swan Ecolabel



Source: The Nordic Swan Ecolabel.

The Nordic Swan ecolabel is a well-recognised label for guiding customer choice in Nordic countries. According to market research by the Ecolabel, 91 per cent of Nordic consumers recognize the label and 51 per cent look for it when shopping. In general, the Swan aims to: (a) set strict energy requirements to reduce climate effects, (b) minimize chemical substances that are harmful to health and the environment, (c) promote quality products that are resource efficient; and (d) ensure biodiversity protection.

In recent years, circular economy has also become a key consideration. The study “Circular Economy and the Nordic Swan Ecolabel” (Suikkanen and Nissinen 2017) assesses how circular economy is and could be better

incorporated into the label. They found that the Swan aims to provide good quality products for the circular economy through durability, quality and warranty requirements. Recycling is required for all product groups both in production and at end-of-life in accordance with national product legislation. Secondary raw materials in products and packaging are promoted by means of percentage requirements on recycled input or residues for some product groups. In the future, “new criteria” intentions indicate that secondary raw materials will gain more importance, noting that limitations for certain product groups exist due to health or hygiene reasons. The option to separate materials already exists in some criteria sets and is expected to gain strengthened attention in the future. A product’s service time can also be extended through repair and upgrade, and requirements are visible in current criteria to a limited extent. For example, imaging equipment and remanufactured toner cartridges include obligations that enhance reparability. Finally, the market for service and sharing-based models of consumption is growing and the Swan is considering how to integrate these into ecolabelling criteria. An example is clothing subscription services and redesigned clothes. Figure 6.4 depicts a framework for future criteria development across the life-cycle of product use, highlighting some of the key considerations for ecolabel criteria toward the circular economy.

Figure 5.4 Framework for future criteria development of the ecolabel towards circular economy

EXTENDING PRODUCT

SERVICE TIME

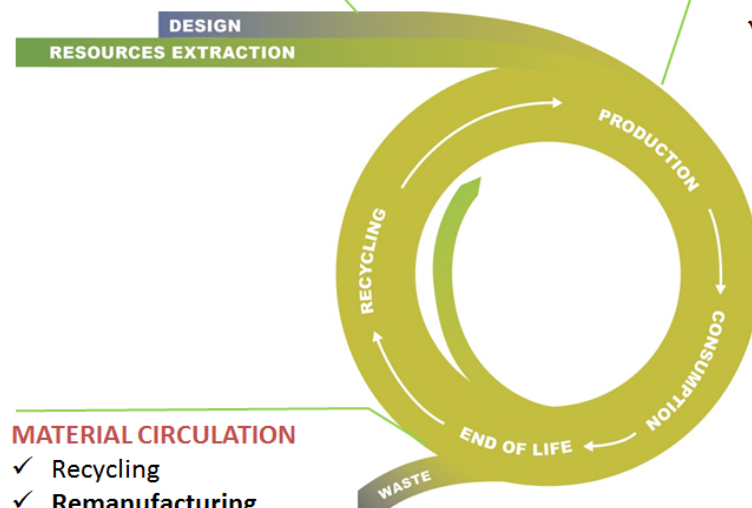
- ✓ Durable
- ✓ Upgradable
- ✓ Repairable
- ✓ Multi-functional

MATERIAL CIRCULATION

- ✓ Modular
- ✓ Separable

MATERIAL CIRCULATION

- ✓ Secondary raw materials
- ✓ Recycling in production
- ✓ Secondary components
- ✓ By-product use



MATERIAL CIRCULATION

- ✓ Recycling
- ✓ Remanufacturing
- ✓ Chemical content

EXTENDING PRODUCT SERVICE TIME

- ✓ Sharing economy services

Source: Suikkanen and Nissinen 2017

Altogether, Suikkanen and Nissinen (2017) concluded that the Nordic Swan ecolabel could be a key mechanism for promoting circular economy. On the one hand, because it has been designed as a value-added mark for the best one-third of products in a product group, it is not necessarily intended to be used as a tool for promoting disruptive, new innovations with a typically smaller, “niche market” presence. On the other hand, “the Swan has a history of trying out a process for innovative products and it could be in a position to differentiate the environmentally best sharing economy services and could extend the remanufacturing principle to other product groups” (Suikkanen and Nissinen 2017). More research could help to understand the impacts of labelling on product lifetime, in other words, whether the actual life time of a Nordic Swan ecolabelled product is longer than that of a comparable non-labelled product, as well as on the role of chemical criteria for non-toxic circular loops. Finally, Suikkanen and Nissinen (2017) find that requirements aligned with circular economy principles (on the use of by-products, secondary components, multi-functionality, modularity, separability, repair and upgrade) should be strengthened to continue promoting state-of-the art in circular economy.

5.1.3 Key policy messages

Customer recognition of ecolabels, especially the EU Ecolabel, make it a viable tool for helping to implement the circular economy transition across the EU. The long-term existence of the EU Ecolabel also mean it is a well-established mechanism rich in experience that it can draw on to promote change in customer choice. However, there are a number of weaknesses and there is room from improvement to scale up activities. In 2017 the European Commission did a “fitness check” on both the EU Ecolabel and EMAS (see below). They found that there is a lack of promotional activities for the EU Ecolabel at all levels (Commission, Member State and by

companies). With a high number and stringency of criteria requirements, significant differences are also seen in the uptake of different types of products. They found that several product groups have no - or only marginal - uptake, pointing to barriers for some specific product groups on the one hand, and on the other hand, a lack of a strategic approach for selecting for which groups to develop/revise criteria.

All in all, ecolabels and the EU Ecolabel in particular could be strengthened by

- Taking advantage of synergies and reinforcement with corresponding instruments such as Ecodesign, Extended Producer Responsibility and green public procurement. For example, ecolabel criteria can be aligned with Ecodesign minimum requirements and therefore provide synergy effects of those two instruments (BEUC 2015). Green public procurement of products with the ecolabel can help to incentivise the uptake and use of the EU Ecolabel.
- Considering experiences with different ecolabels across the EU for integration in EU Ecolabel (e.g. whether and how services that lead to more sustainable consumption are integrated into the Nordic Swan Ecolabel).
- Encouraging uptake across the EU, especially in Member States with so far a small EU Ecolabel presence. One method could be tax reductions or other incentives to engage producers (EEB 2018a).

Good practice example: Sweden's Miljönär label promotes reuse and repair

Sweden's waste management and recycling organisation (Avfall Sverige) launched the Miljönär label in 2015. This ecolabel aims to promote reuse and repair and to extend product life in order to reduce waste. The label will be awarded to businesses, such as shoe repair or second-hand shops, which re-use products by giving them a second life instead of selling new products.

More information is available online at: <https://miljönär.se/>.

Good practice example: The Cradle to Cradle (C2C) Certified™ Product Standard



The Cradle to Cradle products programme guides designers and manufactures toward product improvements that are (1) made with materials that are safe for humans and the environment (2) designed so all ingredients can be reused safely by nature or industry (3) assembled and manufactured with renewable, non-polluting energy (4) made in ways that protect and enrich water supplies, and (5) made in ways that advance social and environmental justice. It is administered by the Cradle to Cradle Products Innovation Institute, which ensure that product certification is an independent and transparent process.

Source: <http://www.c2ccertified.org/>

5.2 Green public procurement

Public authorities in the EU spend around 14 per cent of GDP on the purchase of services, works and supplies. Applying green principles in public procurement can play a substantial role in increasing sustainable production and consumption practices. By setting specific requirements, public procurement can drive companies to develop eco-innovative products, facilitate wider diffusion and encourage application of existing eco-innovative products. Traditionally, public procurements have been largely focused on procuring goods (i.e. products), and requirements have been focused on defining product qualities. This offers an opportunity to design the requirements in a way that ensures that only products that have been produced with low environmental impacts and/or the ones that will cause least impact during its use, will be purchased for use by public organisations.

In the context of the circular economy, a big impact can be made by public organisations by procuring more durable, repairable, recyclable and recycled products, as well as by improving functional use and product-service options, encouraging waste prevention and prioritising high value recycling. The Circular Economy Action Plan, among other measures, includes commitments on public procurement.

“Circular procurement is defined as the process by which public authorities purchase works, goods or services that seek to contribute to closed energy and material loops within supply chains, whilst minimising, and in the best case avoiding, negative environmental impacts and waste creation across their whole life-cycle” – EC 2017b

In practice, established green public procurement practices so far do not necessarily deliver circular economy benefits. Defining product specifications focused on circularity, as well as shifting from only the product focused procurement to product service systems including reuse, repair, recycling, sharing, etc. offers better contribution to circular economy (Table 6.1).

Table 5.1 Product procurement models and their contribution to the circular economy

Procurement models		Contribution to circular economy
Product with better environmental qualities	<i>e.g. Paper and furniture from sustainable forestry production, green energy, organic products</i>	Low or no contribution
Products with circularity consideration	<i>e.g. Recyclable, repairable, durable products</i>	Medium – high contribution
Product + Service based models	<i>e.g. Supplier take-back system including repair, reuse, recycling, refurbishment, remanufacturing, Product service systems, functional models, Product rent/lease</i>	High contribution

Source: authors

In recent years new ideas of innovative public procurement are emerging that go in line with circular economy thinking because they focus more on functions rather than on prescription of requirements to products. Instead of defining a product or service in the invitation to tender, one can also get the market to contribute ideas for solutions to the problem²⁸. This approach

²⁸ PIANOo – Dutch Public Procurement Expertise Centre, <https://www.pianoo.nl/en/sustainable-public-procurement/spp-procurement-process/prescribing-inviting>

5.2.1 State of play in promotion of circular products via green public procurement

The European Commission has been promoting green public procurement (GPP) in the EU for over two decades with the first guidelines for addressing environmental concerns appearing in the 1998 Communication (EC 1998). Some years later the process for setting common GPP criteria was rolled out following the Communication “Public procurement for a better environment” (EC 2008).

At the moment GPP criteria have been developed for 21 categories of products and services by the European Commission (see below)

Table 5.2 Product groups for which EU green public procurement criteria have been developed

<ol style="list-style-type: none"> 1. Cleaning products and services 2. Combined heat and power 3. Computer and monitors 4. Copying and graphic paper 5. Electrical and Electronic Equipment used in the Health Care Sector 6. Electricity 7. Food and Catering services 8. Furniture 9. Gardening products and services 10. Imaging Equipment 11. Paints, varnishes and road markings 	<ol style="list-style-type: none"> 12. Office Building Design, Construction and Management 13. Road Design, Construction and Maintenance 14. Sanitary Tapware 15. Street lighting and traffic signals 16. Textiles 17. Toilets and Urinals 18. Transport 19. Wall panels 20. Waste Water Infrastructure 21. Water-based Heaters
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Source: EC, GPP portal : http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

The EU GPP criteria are developed to facilitate the inclusion of green requirements in public tender documents. While the adopted EU GPP criteria aim to reach a good balance between environmental performance, cost considerations, market availability and ease of verification, procuring authorities may choose, according to their needs and ambition level, to include all or only certain requirements in their tender documents.

A recent study by the European Parliament (EP 2017) analysed how GPP initiatives in the EU are contributing to the European Circular Economy Action Plan (CEAP). The study established that a considerable number of EU GPP criteria are linked to the CEAP and address such strategies as product end-of-life management by contractor, recycled content, designed for recycling, designed for longevity, packaging, etc. But there are also gaps: e.g. GPP criteria requiring refurbished or remanufactured products are hardly to be found among the criteria for the 21 product groups. Furthermore, in each product group case, the criteria cover only a limited scope of circular economy possibilities for circularity: there are criteria for some circular economy strategies and no criteria for others (as demonstrated in Table 6.3). The criteria on packaging lost its prominence in the product criteria developed in later years. At the same time the study notes that there is a growing focus on the life-cycle approach.

Table 5.3 Overview of the (number of) GPP criteria with a link to circular economy covered under various product groups

Product group	Contractor	Products, Services, Works						Use Stage	End-of-life Stage
		Chemical content	Recycled content	Designed for recycling	Designed for Longevity	Other criteria	Packaging		
Copying paper (2)		2	1						
Food (2)			1			1	2		1
Furniture		4	2	1	1		3		
CHP									
Wall panels (2)		7	4			5			2
Cleaning (7)		28				1	11		
Electricity									
Gardening (6)	1	6	5	1		3	2		3
Indoor lighting		1			2	1	1		1
Street lighting (2)		1			2	1	2		1
Textiles (2)	2	3	2		3			1	2
Transport (5)			10					2	3
Sanitary Tapware					3			2	
Toilets (2)						1		2	
Waste water	3	2	1			2			
Health care	1				1	2		1	
Imaging equipment						4		2	
Heaters	1			1		1		2	
Buildings	1	1	2			1			7
Roads	2		3		1				4
Computers	2	3		4	7			3	4
SUM	13	58	31	7	20	23	21	15	28

Source: EP 2017

Most of the Member States have developed the national system of GPP criteria for products, some or all of which are based on EU GPP groups. Some Member States, e.g. the Netherlands and the UK have more elaborated lists of products and services with GPP criteria. At the same time the circular economy thinking has not widely penetrated across Member States criteria. A survey done in EP (2017) study revealed that only a small number of EU Member States (and regions) are actively trying to link procurement to the delivery of the circular economy. At the same time there are challenges faced by the leaders in circular economy procurement and by the laggards as presented in Table 6.4.

Table 5.4 Survey respondents on Member States and circular procurement

Definition	<i>Actively embedding (circular) procurement practice in policies for delivering the Circular Economy</i>	<i>Aware of possible alternatives, some evidence of individual examples but no systematic approach to linking procurement and the Circular Economy</i>	<i>Not aware beyond the barriers to the Circular Economy</i>
Countries	Finland, Netherlands, Belgium (Flanders specifically), France, UK (Scotland specifically)	Sweden, Denmark, Italy, Spain, Germany, Austria; UK (England); Belgium; Latvia; Malta	Romania, Lithuania, Slovak Republic, Poland, Bulgaria, Czech Republic, Portugal, Hungary
Major challenges	Legal; financial; inertia	Linking procurement to CE; lack of training in alternative approaches; verification (e.g. of LCC)	Lack of awareness/evidence; low recognition of BPQR; active legal challenges to BPQR

Notes on abbreviations: BPQR - Best Price-Quality Ratio; LCC - Life Cycle Costing

Source: EP 2017

5.2.2 Good practice examples from Member States

There are a number of successful practices from the pioneering Member States, which can set an example for other countries, regions and organisations.

Aalborg Municipality (Denmark) included innovative circular economy principles in **tendering for school furniture**²⁹. Setting of the tender requirements was done with the inspirational knowledge from national agencies and a team from the local University that have been involved in relevant initiatives on refurbished furniture. The final award criteria included:

- "Circularity" covering requirements on longer life-time, spare part guarantee, possibility to reuse, refurbish, and recycle
- "Quality of the offered interior design" - Ability to use a varied selection of furniture adapted to the specific cases and needs of students.
- "Quality of advice" of supplier, especially focused on circularity principles
- "Economy" – including cost

In recognition for the successful completion of this innovative approach to classroom design, the Municipality of Aalborg won the first prize in 'Circular economy in tendering' ('Cirkulær økonomi i udbud').

An example of **Circular procurement from Wales**³⁰ showed how **Public Health Wales (PHW)** when moving to a new office decided to adopt a new mindset when procuring for the design and supply of office furniture, equipment and floorings. PHW recognised that they already owned a large amount of quality furniture and fittings, and that with some cleaning, refurbishment and redesign, these items could be repurposed and combined with other new or re-used furniture in a cohesive and functional style. The suppliers were invited to provide tenders which would meet

²⁹ GPP in practices, Issues 79: http://ec.europa.eu/environment/gpp/pdf/news_alert/Issue79_Case_Study_155_Aalborg.pdf

³⁰ GPP in practice, Issues 77: http://ec.europa.eu/environment/gpp/pdf/news_alert/Issue77_Case_Study_152_Wales.pdf

the client's functional design and supply needs, without specifying how these should be met, thus leaving room for creativity and innovation. Social enterprises were encouraged to participate. The winning bid was from a consortium which included a sustainable office design service, a furniture manufacturer and a community interest company, with specific objectives to support low-income and long-term unemployed people in areas of high social deprivation. As a result out of all furniture used in a new office 45 per cent of items were re-used, 49 per cent of items were remanufactured, and only 6 per cent of items were sourced from new stock.

The Dutch government has taken the Circular Procurement initiative to the next level by adopting a **Circular Procurement Green Deal** in 2013, which was signed by 18 public and private parties, and in the end the number of participants increased to 45 public and private parties. Green Deals are non-financial support actions to create conditions for innovation and new sustainable entrepreneurial activities. The goal was to investigate how to achieve circular procurement, by building this knowledge together. Participating organisations gained experience by doing pilot projects, consisting of almost 80 projects in total. In 2017 they won a prize for the best Green Deal 2017 (EIO 2018c).

5.2.3 Key policy messages

Lessons gained from the circular procurement experiences show that it is possible to break a cycle of using new products only. Repaired, refurbished products can offer a good quality. Procuring functionality rather than a product will create possibilities for overall reduction of material use through shared consumption and more efficient management of a product by a supplier. By working differently with suppliers – including social enterprises – outstanding results can be achieved. Dialogue and communication with suppliers, throughout the process can help to set a good understanding, shared values and commitments that benefit final results. Interaction with knowledge circles that carry new wisdom and wider perspectives on sustainability can advise on alternative approaches that are beneficial for public organisations when rethinking their procurement strategies.

While the circular economy thinking is not common in procurement practices of member states, there are pioneers in circular procurement whose examples can be replicated or serve as an inspiration. Many of these procurers have already been sharing their experience and lessons with other Member States. The European Commission GPP platform³¹ also offers many insightful resources, good practices and guidance on how to innovate toward the circular procurements. It has to be recognised that GPP criteria suggested by the EC, as well as ones applied by the Member States over time have increased their focus on life cycle perspective of products. However, the circular economy oriented ambitions of these criteria are still weak and there are many gaps not allowing a comprehensive coverage of all circularity opportunities. The EC needs to continue more ambitious work in the development of the GPP criteria and national and local public organisations should encourage introducing circularity focused criteria along with reinventing the whole procurement system with circular economy needs in mind.

³¹ EC Green Public Procurement platform: <http://ec.europa.eu/environment/gpp/>

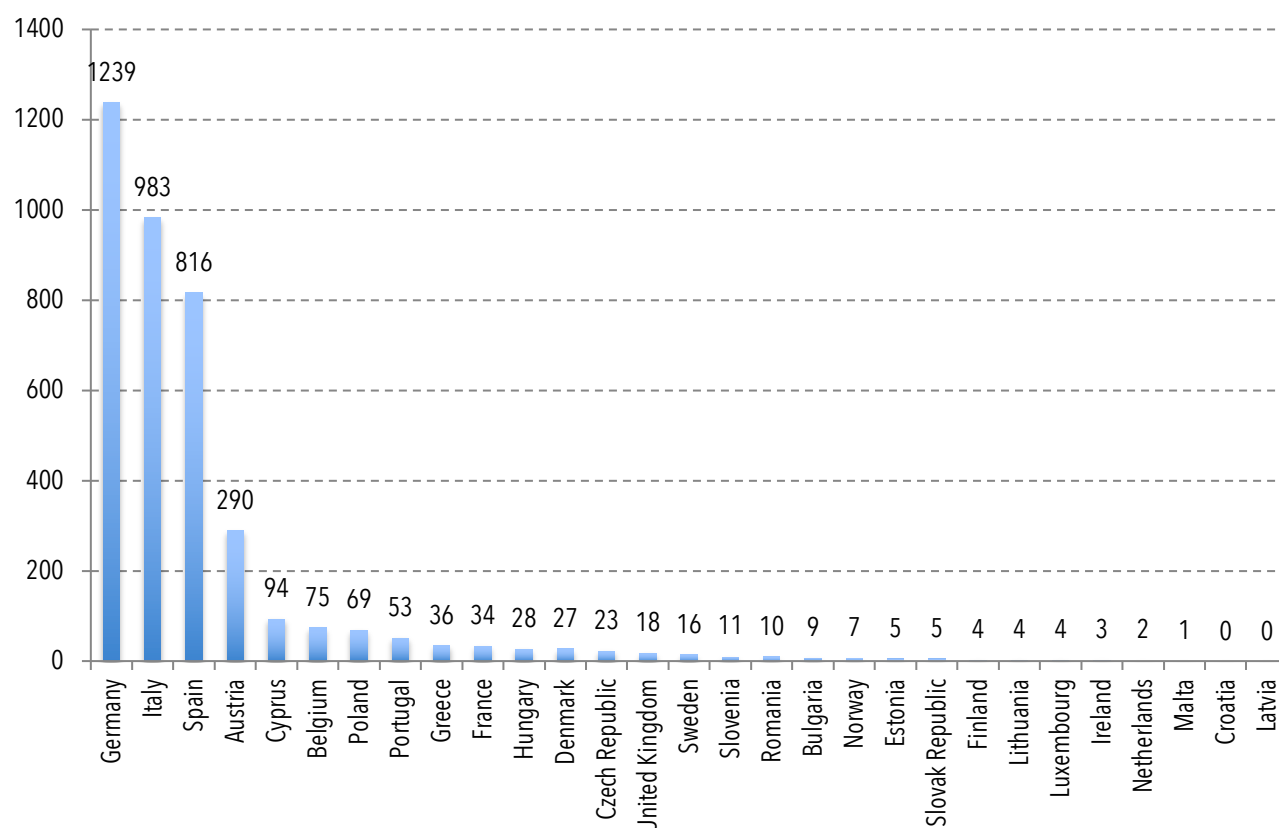
5.3 Environmental Management and Audit Scheme (EMAS)

“EMAS has an important role to play in helping Europe’s public and private organisations unlock the potential of the circular economy and in helping Europe use its re- sources more efficiently.” -EU 2017

EMAS is a well-established tool in the EU. It has been in operation since the mid-1990s, leading to a high level of experience regarding both operational efficiency and know-how toward helping companies and other organisations evaluate, report and improve their environmental performance. It includes ISO 14001 requirements (see e.g. the Eco-Innovation Index), but goes beyond them with stricter requirements for environmental performance. EMAS also has a clear focus on resource efficiency, with potential for helping countries branch out toward increasing awareness and implementation of circular economy principles. For example, EU (2017) describes the benefits of EMAS for a Circular Economy. A good practice example from the company Seacourt states that “EMAS helped [the company] Seacourt to systematically measure, assess and improve its resource consumption and waste production and set objectives for future improvement.”

As of April 2018, 3,866 organisations participated in EMAS at 9,004 sites across the EU. Nevertheless, there is a high concentration of EMAS certified organisations in a handful of Member States, with its prevalence relatively low in the majority of Member States (see Figure 6.6).

Figure 5.6 EMAS Organisations per Member State (April 2018)



Source: EMAS Statistic and Graphs. Accessed online July 2018;
http://ec.europa.eu/environment/emas/emas_registrations/statistics_graphs_en.htm

Germany has by far the highest level of participation. A 2012 survey of EMAS in Germany provided insights into who choses EMAS, why they do so and the costs and benefits of

participating in EMAS (UBA and BMU 2013). It found that a significant shift has occurred toward participation of organisations from the non-productive sector. While non-productive organisations comprised only 9 per cent of newcomers in 1995-2000 (noting also that only the productive sector was permitted to receive validation until 1998), that figure rose to 44 per cent between 2007 and 2012. This indicates that EMAS can also work in non-productive sectors and thus in countries that have large services sectors rather than production. Further, there was a shift from large organisations to SMEs comprising the majority of newcomers since 2007. The most important reasons for choosing EMAS were given as transparency of environmental relevant consumption rates, improvement of operational environmental protection and improving energy and resource efficiency. On average 15 months were needed to implement EMAS, with around 4.9 person-months required by small organisations (and an operating budget of less than 2,500 Euro per year) and 14.1 person-months by large organisations (with an operating budget of more than 10,000 Euro per year). The financial benefits were considered low on the list of priorities (although 75 per cent of respondents found the cost-benefit ratio to be positive or in balance), whereas the most significant benefit was considered to be improving operational environmental protection (81 per cent), followed by legal compliance (64 per cent) and employee participation (59 per cent). The most important improvements were seen to be generating a higher level of public awareness and improving incentives to participate related to fee reductions and tax reliefs (see also below).

Trends in Germany are indicative of EU wide trends. In 2017, 77 per cent of EMAS registered organisations were SMEs. Small versus large companies face different challenges when it comes to implementation of circular economy principles. SMEs face challenges related to a lack of finance to invest in innovations, lack of control over production processes, lack of skills, etc.). At the same time, they may be able to act more flexibly to transform their business models to match their values. In comparison, large organisations may have the financial and technical capacity to invest in new solutions, but be less flexible in their operations. Moreover, large companies are often required to comply with more environmental regulations (e.g. laws on Corporate Social Responsibility (CSR) reporting, CO₂ emissions trading schemes, etc.). EMAS may, therefore, provide different kinds of organisations with different types of support for the transition to the circular economy.

For example, the EMAS Annexes were revised in 2017, requiring organisations to assess the significance of their environmental impacts from a life cycle perspective. This is the first step towards increasing knowledge and identifying opportunities associated with the circular economy transition, in particular for SMEs. The Annexes also require risks and opportunities associated with organisations' environmental management system to be identified. This is a chance for companies to consider risks and opportunities associated with a shift to a circular economy in their business practices. EU (2017) lists potential considerations as vulnerability to some resources, potential synergies with local stakeholders, expected added value for customers, potential collaborations with interested parties/partners, among others. For larger companies especially, EMAS could help them to stay one step ahead of legal obligations related to the circular economy. Table 6.5 summarises five ways in which EMAS may support the transition to a circular economy.

Table 5.5 Five reasons to use EMAS in the transition to a circular economy

1. It is a tool to measure resource efficiency	Empirical data shows that EMAS registrations often result in significant reductions in material and energy consumption.
2. It ensures continuous improvement, which fosters innovation	EMAS also requires organisations to evaluate and continuously reduce the environmental impact of their services and products. Organisations that have been registered with EMAS for some years can therefore find themselves supporting radical and groundbreaking innovation in their search for improvements. Innovation in the design of products and services delivered is at the very heart of a circular economy.
3. It requires the involvement of employees	In EMAS, top-level management and employees have to all be involved from the very first step of the process in order to ensure that the best ideas can emerge and be implemented.
4. It keeps companies a step ahead on legislation and stakeholders' needs	In particular it helps to anticipate upcoming legislation, including measures on the circular economy
5. It provides all stakeholders, including authorities, with transparent information	The environmental statement that EMAS organisations must produce annually can also lead to new business opportunities. For example, other businesses in the area could use the waste produced by the organisation as a resource. Furthermore, public authorities and other stakeholders can rely on the information from the environmental statements in their decision-making, knowing that the facts and figures have been verified and validated by an independent, accredited third party.

Source: Text from EU 2017

The study of the potential of EMAS for the circular economy (EU 2017) presents some positive cases of how companies have implemented change using EMAS related tools. They state:

“some companies have been working at designing waste out of their processes (procurement of recycled, reusable or recyclable materials; eco-design; investment in long-lasting products or leasing; donation of used equipment; withdrawal of single-use products; digitalisation, etc.) while others have invested in new business models (renting, reverse logistics, refurbishing, etc.)” EU 2017.

To continue to make use of such tools, an expansion and scaling-up of organisations using EMAS tools seems to be key to increasing outreach and potential for change, in particular in those countries with small levels of participation (see Figure 6.6 above). The 2012 survey of German organisations indicated that a high level of organisations would be interested in seeing both higher levels of EMAS awareness among the general public as well as recognition from policy, in particular in the form of fee reductions and/or tax relief. Along a similar line, an evaluation of EMAS in Poland (Syska and Matuszak-Flejszman 2015) found that there is a weak system of incentives from the government for companies to implement and maintain EMAS registrations.

These could include for example tax relief, reduced environmental charges, reduced insurance rates, reduced tariffs, increased financial support for EMAS participation (e.g. grants and subsidies) as well as streamlined and easier environmental process regulations (e.g. for permits). There are some examples from across the EU, including in Poland, but these could be strengthened and intensified (Syska and Matuszak-Flejszman 2015):

- Germany offers a range of refunds (e.g. energy tax, electricity tax, exemption of the compulsory Renewable Energy Allocation, reduction of fees for groundwater extraction, reduction of fees for some permit procedures).
- Poland offers the possibility of an exemption for excise duty on coal and gas to energy intensive companies and exemptions from the registration fee to the registry of waste management as well as an extension of compulsory checks by environmental authorities from 1 to 3 years for enterprises with Integrated Pollution Prevention and Control permits.
- Italy offers a reduction in the scheduled time for obtaining environmental permits and some provinces allow companies a reduction in a regional fee on production activities.
- Spain offered tax relief between 2000 and 2013, but abolished it due to the financial crisis. It does still offer incentives in the form of grants and subsidies to assist in EMAS registration and the permitting process is easier for EMAS-registered companies.
- France offers a reduced fee for a general tax on polluting activities and exemptions from publishing additional non-financial reports.

A 2015 study of the European Commission came to similar conclusions (EU 2015). The compendium of EMAS promotion and policy support across Member States classified four typologies of policy and promotional support measures that Member States apply to encourage EMAS registrations. These include legal instruments (e.g. regulatory relief and green public procurement), economic and financial instruments (e.g. tax abatements, fee reductions, subsidies and awards), informational instruments (e.g. printed and digital publications, training courses, conferences and workshops) and marketing and promotional instruments (e.g. events, ceremonies, printed and digital publications and conferences/fairs) (EU 2015). Overall, the study found that informational and marketing promotional instruments were widely favoured (with over 80 per cent of Member States implementing such instruments) over legal (with 55 per cent of Member States employing some form of legal instrument) and financial ones (present in 35 per cent of Member States). However, despite their prevalence, experts indicated that they were not always aware of EMAS support measures related to information and marketing. The study indicated that sectoral promotion campaigns, which combined all typologies and instruments, were quite successful in increasing registrations in France (health care), Italy (public administration), Poland (waste), and Spain (tourism). Such models provided clear incentives to join (legal and financial instruments) and ensured that organisations were aware of benefits and tools associated with registering.

All in all, the European Commission could strengthen the shift toward a circular economy in a two-pronged strategy: (1) increasing the presence of circular economy principles in EMAS (as has begun with the new requirements) and (2) increasing the participation of all types of organisations in EMAS across the EU. For the latter, developing appropriate incentives and legal amendments to encourage company registrations as well as raising awareness on what EMAS offers are two key steps.

5.4 Extended Producer Responsibility (EPR)

“If used well, EPR can be one of the cornerstones of the transition towards a circular economy.” -Zero Waste Europe 2017

Extended producer responsibility (EPR) corresponds with the principle of polluter pays. It shifts the responsibility and costs of environmental impacts to producers from tax payers with the aim to reduce waste generation. It has two primary goals: (1) “to provide incentives for manufacturers to **design** resource efficient and low impact products... [and (2)] to ensure effective end-of-life collection, environmentally-sound treatment of collected products and improved reuse and recycling” (Watkins et al. 2017). It directly contributes to the circular economy by aiming to link design with end-of-life management.

The EPR approach was introduced in Europe in the early 1990s, and in particular over the past 15 years it has grown in reach and scope. Throughout the world around 400 EPR schemes were in use in 2016, with most stemming from OECD countries (OECD 2016). A multitude of instruments exist to implement EPR schemes, ranging from take-back requirements (around 75 per cent of all schemes) to advance disposal fees and deposit refund systems (Kaffine and O'Reilly 2015). Most EPR schemes are collective, meaning that producers for the same product group join together to pay a fee and take responsibility for practical recovery. However, individual EPR schemes, where producers takes responsibility for their own products, appears to provide more incentive for change due to a tighter feedback loop between products and impacts (EEA 2017). EU legislation regarding EPR schemes exists for end-of-life vehicles (ELV) and waste electrical and electronic equipment (WEEE) and a variety of schemes are in practice in different Member States, including compound packaging (Austria), pesticide, fertilizer, seed and plant packaging (France), and medical and pharmaceutical packaging (Portugal); agricultural films (Belgium, Finland, France, Germany, Ireland, Italy, Sweden, Spain); plastic foils (Austria); bulky plastics (Austria); disposable plastic kitchenware (Belgium, Latvia); furniture (France); and printer cartridges (France) (EC 2014, Watkins et al. 2017).

This section looks at the issue plastic packaging, providing a negative and positive example of legislation to reduce plastic waste.

5.4.1 Comparing negative and positive examples for preventing packaging waste

The European Commission recently released “A European Plastics Strategy for Plastics in a Circular Economy” (EC 2018). It emphasizes that key challenges related to plastics, in particular considering that less than 30 per cent of plastic waste is collected for recycling in the EU and that only 6 per cent of plastics demand in the EU is for recycled plastics. At the same time, plastic waste plagues in particular oceans and water ways leading to serious environmental damage across the globe. The European Commission developed a vision for a new plastics economy:

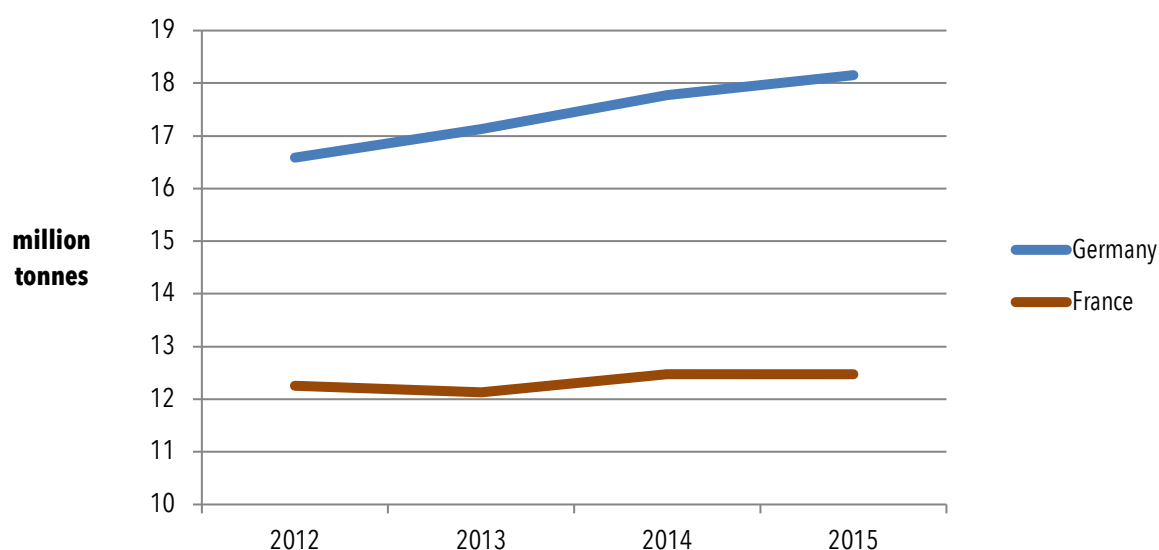
“Vision for a new plastics economy. A smart, innovative and sustainable plastics industry, where design and production fully respects the needs of reuse, repair, and recycling, brings growth and jobs to Europe and helps cut EU's greenhouse gas emissions and dependence on imported fossil fuels.” –EC 2018

One of the key pillars toward achieving this vision will be driving innovation and investment towards circular solutions. EPR has a key role to play to this end. In the EU, 26 of 28 member States have EPR schemes for packaging waste. These range in terms of simplicity, responsibilities and waste streams covered. However, all schemes make use of some type of fee, charged to producers of different types of packaging waste. Fees for plastic and composite packaging are generally much higher than for other packaging materials (Pro-Europe 2017 from Watkins et al.

2017) (for example EUR 211 per tonne for PET/HDPE and EUR 246 for drink cartons compared with EUR 124 for steel, EUR 33 for aluminium, EUR 21 for glass and EUR 17 for paper/card in the Belgian Fost Plus scheme (Fost Plus 2015, 2017 from Watkins et al. 2017)).

Figure 6.7 depicts trends in packaging waste for Germany and France. Clearly, Germany's waste production continued to rise, whereas France stabilised out (with adapted legislation implemented in 2012), despite relatively comparable trends regarding growing GDP and socio-cultural conditions. In Germany this is depictive of wider trends: packaging waste nearly doubled over the last 20 years, and the per cent of plastic packaging increased from around 11 per cent to nearly 17 per cent over the same time period (Wilts 2018). Germany is the country in last place when it comes to prevention of packaging waste in the EU. Reasons for this increase include in particular the growth of online marketplaces and delivery (with growing distribution structures), smaller households with increasing demand for smaller portions, and a large increase in meals taken outside of the home (UBA 2017). This points to the need for even stronger legislation to counteract these trends and/or encourage a greater prevalence of recovery loops in the circular economy.

Figure 5.7 Packaging waste in Germany and France in million tonnes, 2012-2015



Source: Wilts 2018 based on Eurostat

As regards legislation, Germany has an EPR scheme in place. However, it does not appear to have provided the right incentives to prevent or reduce the growth of packaging waste. One of the largest weaknesses seems to have been missing incentives for ecodesign in packaging (Watkins 2017). Moreover, fees were cut by more than half under competition in the dual system operating in Germany, removing the incentive for companies to reduce their packaging waste. A new packaging law will come into effect on the 1st of January 2019 in Germany, which makes explicit reference to eco-design and incorporating ecological principles in packaging materials at the production stage, in particular including recycled materials. However, the prevention and/or reduction of packaging waste is not addressed. Under the current system, this aspect is considered through the weight of packaging materials, but only the costs for collection and recovery are considered and not the external costs of increased resource use and the costs to e.g. clean-up plastic packaging waste from oceans. It should also be noted that packaging waste in Germany is already collected at a high level and "recovered". However, the quality of packaging waste is typically so poor that it cannot be re-used for industrial purposes, leading to

“downcycling” and an inefficient loss of material resources from a circular economy perspective (RWI 2017). Altogether, explicit consideration of waste prevention reflected in the fee system could help to increase resource efficiency and circular economy efforts in Germany (Wilts 2018).

In contrast to Germany, France has been able to reduce the amount of packaging waste produced and increase recycling of packaging waste. For example, packaging weight was reduced by 4,500 tonnes in 2015 and the amount of packaging entering the market was reduced by 106,000 tonnes between 2007 and 2012 (Eco-Emballages 2015a from Watkins et al. 2017). Around 68 per cent of packaging waste was recycled in 2016, up from 67 per cent in 2015 and 18 per cent in 1993 (Eco-Emballages and Adelphe 2016, Eco-Emballages 2015a from Watkins et al. 2017). At the same time, it should still be noted that around 1 million tonnes of packaging were landfilled in 2016 (Lange 2017), indicating that the challenge is far from over.

A collective EPR scheme (Eco-Emballages now CITEO) for household packaging waste is in place in France with the aim to encourage selective waste collection and reduce packaging waste (Didier and Sittler 2014). In it, producers are required to ensure the end-of-life of the products they put on the market (e.g. by financing a large share collection and sorting costs). Local authorities must manage waste, including developing a separate collection system for household packaging waste. Producers are also charged fees, based on the number of packaging units (before 2016) and their weight per material. In 2012, fees were modulated in line with environmental criteria. Good sorting practices and eco-design are rewarded and packaging which hampers recycling is penalised (Eco-Emballages 2015b from Watkins et al. 2017). This is done for example through a “green dot” feed modulation scheme. It means that a 50 per cent penalty is applied to packaging that hampers recycling or cannot be recycled and a 100 per cent penalty applies to packaging which cannot be recovered. At the same time, there is a bonus of maximum 24 per cent for packaging with eco-design features and which is associated with awareness initiatives (Bio Intelligence Service, 2015). Training and guidelines for producers and companies are also provided by producer organisations, including e.g. an online software tool (Bio Intelligence Service 2015, Eco-Emballages 2015a from Watkins et al. 2017). Sorting instructions shall also be placed on all packaging to enable better separation by citizens, with 40 billion packages distinguished with sorting guidelines in 2015 (ibid). While such measures and instruments seem to have led to success in turning around trends toward the circular economy, weaknesses of the system are still being worked out and improved. For example, there are a large number of sorting centres in France, and efforts are being made to reduce and modernize these in keeping with the need to stay up-to-date to continue to promote a circular economy transition. Nevertheless, strong aspects may be considered for use in other Member States.

5.4.2 Key policy messages

Watkins et al. (2017) assessed EPR for plastic packaging waste in the EU. The study uncovered a number of useful insights for policy makers. One of the main strengths of EPR is the potential for fee modulation linked to eco-design principles to encourage greater levels of implementation of circular economy principles. However, application of such fee modulation is widely different across Member States. While France provides a positive example, the lack of a common EU approach in addition to the absences of harmonized monitoring make it difficult to assess the impacts of different EPR schemes. In many countries fees seem to have failed to incentivise packaging producers toward eco-design. In others, fees may have led to a focus on light-weighting, with the risk of rewarding lighter materials (with less resource inputs) but at the same time decreasing the potential for recovery and recycling (or leaving downcycling as the only option).

The Watkins et al. (2017) study makes several recommendations towards improving EPR schemes across the EU. Key is the greater integration of EPR into environmental and circular economy objectives following a more harmonised approach and support at the EU level (through legislation or guidance). Common definitions and standards to support more robust monitoring would help to increase evidence on what works and what fails to encourage a circular economy. This could also pave the way to extend EPR to additional types of products (in particular plastics) in a smart way. Altogether, strengthening financial incentives for eco-design seems crucial to successful EPR schemes, as well as consideration of synergies and overlaps with corresponding instruments. In its time line for the implementation of the Circular Economy Action Plan, the European Commission has announced a guideline for eco-modulated packaging fees. This might be an opportunity to significantly strengthen the effectiveness of EPR schemes.

Good practice: Extended Producer Responsibility for Furniture in France

In France, end-of-life furniture is managed in line with EPR regulation. Separate schemes are in place for domestic and commercial furniture, managed and operated by Eco-Mobilier and Valdelia, respectively. The main objectives of the French EPR include:

- Decreasing waste furniture sent to landfill;
- Achieving a 45 per cent recycling/reuse target; and
- Driving eco-design principles within the furniture manufacturing sector.

€80M was collected via levies in 2013 to finance the domestic scheme, paid by furniture producers, retailers and importers, to cover the cost of collection, logistics, infrastructure and R&D into new markets for recovered materials. In 2015, the domestic EPR scheme collected 0.85M tonnes of domestic furniture, achieving a 55 per cent recycling and 86 per cent recovery rate.

Under the French EPR scheme, 2016 saw creation of Eco Modulation Criteria for new furniture placed on the market. A lower levy is charged to manufacturers, where they met environmental product criteria. This is essentially a simple criteria, in order for the process to be 'controllable'/not over burdensome to administer. This covers products which are:

- Manufactured 95 per cent of metal, no padding, (easy to recycle)
- Manufactured from 95 per cent made of wood, sourced from sustainable forests (easy to recycle)
- Products designed for babies / children which can be adapted to the growth of their user – e.g. furniture for children (cots which convert to beds/chairs, designed for growth)

Source: EEB and Eunomia (2017)

5.5 Ecodesign: going beyond energy efficient products to include material efficiency considerations

"In future, Ecodesign should make a much more significant contribution to the circular economy, for example by more systematically tackling material efficiency issues such as durability and recyclability." (EC 2016c)

The Ecodesign Directive (2009/125/EC) set out EU-wide rules for improving the environmental performance of products, focusing in particular on energy efficiency for products such as household appliances, information and communication technologies and engineering. In combination with the energy labelling framework, the EC (2016) estimate that it has been one of the most effective policy instruments at the EU level to promote energy efficiency, contributing

to an estimated half of the energy savings target for 2020. Exploring ways that the Ecodesign Directive can be used to encourage greater uptake of circular economy principles is now a key objective of the European Commission.

The 2016-2019 Working Plan describes how ecodesign shall contribute to attaining circular economy objectives. It includes considering the establishment of:

“...more product-specific and/or horizontal requirements in areas such as durability (e.g. minimum life-time of products or critical components), reparability (e.g. availability of spare parts and repair manuals, design for repair), upgradeability, design for disassembly (e.g. easy removal of certain components), information (e.g. marking of plastic parts) and ease of reuse and recycling (e.g. avoiding incompatible plastics), greenhouse gas and other emissions, and to further establish the scientific basis for developing corresponding criteria that meet the requirements of the Ecodesign Directive” (EC 2016).

The Commission has proposed developing a “toolbox” for ecodesign to help develop and incorporate material efficiency improvements in a more systematic way, both to revise guidance for existing product groups and expand coverage to new product groups. It should provide examples of how material efficiency aspects could be included in product-specific or horizontal requirements. However, these design principles have not yet been published. Corresponding activities shall also work to improve the methodological basis for raising the adoption of material efficiency requirements in product Regulations (e.g. by working with European Standardisation Organisations on material efficiency aspects). It is also expected that the Product Environmental Footprint will contribute to strengthening circular economy objectives in parallel (see Section 6.6).

A number of challenges for the circular economy transition as regards products exist:

- Durable products with a long lifespan, for example through repair, and not necessarily material efficient, especially if repair is particularly material and/or energy intensive
- Environmental impacts of repair may be dependent on how long the product can be (re)-used
- Re-used products or products based on recovered material may be less expensive than alternative “new” products. This could lead to rebounds, in particular regarding citizen behaviour and excessive consumption practices (e.g. a used refrigerator is bought as a second household refrigerator)
- Strict product standards for material efficiency and material recovery could potentially suppress or hinder product eco-innovation that doesn’t meet these standards, but is nevertheless disruptive with multiple benefits for the environment and circular economy. For example, system eco-innovations focusing on functional integration of services could be particularly affected (OECD 2017).

Good practice: Ecodesign in Spain

Spain continues to be very active at EU level on **Eco-design**. The most active region in this area is the Basque Country. The international standard ISO 14006 assesses the incorporation of ecodesign in companies, and half of the Spanish enterprises that have it are from the Basque country. This might be linked to the fact that this topic has been on the political agenda of the region for the last 15 years. Nowadays, there are 150 companies involved in the Basque regional strategy on Circular Economy. In addition, the Basque Country organises every two years an international conference on the topic, the most relevant one in southern Europe – the Basque Eco-design Meeting.

Good practice: : CIRCO – teaching manufacturers to go circular in the Netherlands

CIRCO “Creating business through circular design” is a project, that inspires and facilitates the manufacturing industry to ‘Go Circular’, using a circular design approach. CIRCO is funded by the Dutch Ministry of Infrastructure and Water Management. The project provides:

- Circular Business Design Tracks - three one-day workshops that take place within a period of two months
- Circular Design Class - one-day training course
- Information and discussion sessions “Next Steps live” focuses on latest policy and business news related to circular design in specific sectors.

The target group for these activities are businesses, entrepreneurs and researchers. 75% of the participation cost in the training activities are subsidised by the state

Source: CIRCO project, <https://circonl.nl>

5.6 Product Environmental Footprint (PEF)

Companies and consumers, striving for environmental friendly products often face knowledge gaps with regard to the environmental impacts along the entire product life cycle. To address the needs of companies that wish to provide environmental friendly products as well as the diverse and often incomparable environmental information for consumers, businesses and other stakeholders, the European Commission launched the **Single Market for Green Products**³² initiative and a Recommendation on the use of common methods for measuring and communicating the life cycle environmental performance of products and organisations³³ in 2013.

The Recommendation has as its annexes the **Product Environmental Footprint (PEF)** and the **Organisation Environmental Footprint (OEF)**, two Life Cycle Assessment-based methods to calculate environmental performance. The focus of this chapter is the PEF.

PEF results reflect resource productivity, the lifetime of the product and the way products are treated at their end of life. As such, PEF is a tool that could promote the decoupling of economic growth from both resource use and environmental impacts. This shall be accomplished by measuring the environmental performance of goods and services throughout their life cycle.

5.6.1 Methodology

The Product Environmental Footprint (PEF) is conducted as a multi-criteria measure of the environmental performance of a good or service. By applying a **life-cycle approach**, the PEF takes into consideration the spectrum of resource flows and environmental interventions associated with a product or organisation including all stages from raw material acquisition through processing, distribution, use, and end-of-life processes. Furthermore, a wide range of environmental impacts is considered including health effects, resource-related indicators and impacts on water, air and land. Thus, any potential trade-off between different types of environmental impacts associated with specific policy and management decisions can be exposed that helps avoiding unintended shifting of burdens.

³² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52013DC0196>

³³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013H0179>

Existing methods and initiatives were taken into account, such as the International Reference Life Cycle Data System (ILCD) Handbook as well as other existing methodological standards and guidance documents (including ISO 14040-44, PAS 2050, BP X30, WRI/WBCSD GHG protocol, Sustainability Consortium, ISO 14025 or Ecological Footprint).

5.6.2 Setting of the pilot phase

In order to develop product- and sector specific rules, the Single Market for Green Products initiative proposed a three-year testing period of the PEF method. The pilot phase was conducted in the period of 2013 to 2018 and designed as a multi-stakeholder process. Pilots were led by more than 260 volunteering organisations, and more than 2,000 stakeholders followed the process. The Technical Secretariats (group leading a pilot) volunteered to develop rules for their product or sector (e.g. batteries, IT equipment or pet food).

The pilot phase had three main objectives: (a) testing the process for developing product- and sector-specific assessment rules (Product Environmental Footprint Category Rules – PEFCRs and Organisation Environmental Footprint Sector Rules – OEFSRs, respectively), (b) testing different approaches to verification, and (c) testing communication vehicles for communicating life cycle environmental performance to business partners, consumers and other company stakeholders.

The pilot phase began by undertaking training activities for the representatives of the pilot companies, particularly to enable them to develop PEFCRs and OEFSRs, a technically complex process. A Steering Committee (SC) and a Technical Advisory Board (TAB) formed the two plenary bodies.

5.6.3 Developing Product Environmental Footprint Category Rules (PEFCRs)

Within the pilot phase, Product Environmental Footprint Category Rules (PEFCRs) have been developed, each containing a set of rules on how to calculate the life cycle-wide environmental performance of the product in scope. Milestone documents were subject to an open and transparent consultation process where any interested stakeholder could get involved. The steps of the process included the identification of the most relevant environmental impact categories and activities along the life cycle for a respective product category, testing draft rules on specific products and finalising the rules.

5.6.4 Results from the pilot phase and lessons learned

A wide range of essential technical developments were realised during the pilot phase:

- Application of the materiality principle, i.e. development of an approach for identifying most relevant environmental impacts, life cycle stages and processes; for focussing primary data gathering on a limited number of specific processes; and for adapting data quality requirements based on environmental relevance and access to data;
- Definition of a benchmark regarding the Environmental Footprint profile of the average product (or organisation) on the market, termed representative product (or organisation);
- Agreements on how to model climate change, electricity, transport, infrastructure & equipment, packaging, end of life and agriculture;
- Progress on normalisation and weighting;
- Guidelines on how to include biodiversity as additional environmental information (non-LCA information).

Issues where work will be finalised in 2018/19 include improvements on the toxicity-related methods (human toxicity – cancer effects; human toxicity – non-cancer effects; eco-toxicity, available in 2018) and resource use (available in 2019).

The results were elaborated in several reports. First, an **independent review** of the Environmental Footprint pilot phase by experts from UNEP, the private sector and NGOs³⁴ concluded, among others, that

- PEF and OEF are a good basis for harmonisation at the EU and the international level; that PEF and OEF are good tools for simplifying the assessment and information gathering for industry and for companies in supply chains;
- a multi-stakeholder approach that considers existing initiatives should be continued;
- the Commission should discuss as quickly as possible with stakeholders what the Environmental Footprint methods should be used for; and
- rules on verification are needed.

Second, a **verification** of embedded impacts and traceability as part of the Environmental Footprint methods implementation, including recommendations on the verification of Environmental Footprint information, was performed by EY³⁵. The report stated that a good balance between cost and reliability of verification might be to verify models and data owned by the company through on-site audits. Further, the report identified different scenarios of verification activities needed and related costs based on different types of policies. Finally, it identified issues where clarity is needed and that will be addressed in the modified Method and Guidance on developing product-specific and sector rules.

Third, a report on the **technical evaluation** of the pilot phase was carried out by the Technical Helpdesk for the Testing of Environmental Footprint Rules³⁶. The report identified points of improvement needed for fair product comparisons, including issues such as clearer rules on scope, i.e. identifying rules for identifying the right coverage and granularity for PEFCRs and OEFSRs, or improving the impact assessment of toxicity. These issues will be addressed during the revision of the PEF and OEF methods. Further improvements of the approach are also required with regard to the development an approach for defining different classes of performance; improvements regarding modelling on agriculture and animals regarding the allocation of impacts; and improvements of the International Life Cycle Data Network format for datasets. The report concluded that a significant reduction of cost of calculations will result from the PEFCRs/OEFSRs compared to conventional Life Cycle Assessments. Main drivers of this are the rules, the materiality principle (see above), freely available background data and models and having a single method as a basis.

An assessment of different **communication vehicles** for providing Environmental Footprint information, including recommendations based on tests of pilots and complementary tests decided by DG Environment, with the involvement of other interested services. Some key conclusions from the report³⁷:

- A total of 51 communication tests were carried out – 27 focussing on business-to-business communication, and 24 focussing on business-to-consumer communication. Approaches

³⁴ http://ec.europa.eu/environment/eussd/smgp/pdf/2017_peer_rev_finrep.pdf

³⁵ http://ec.europa.eu/environment/eussd/smgp/pdf/2017_EY_finalrep_verification_public.pdf

³⁶ http://ec.europa.eu/environment/eussd/smgp/pdf/HD_pilot_eval_final.pdf

³⁷ http://ec.europa.eu/environment/eussd/smgp/pdf/2018_pilotphase_commreport.pdf

included labels, environmental product declarations, reports, websites, videos, banners, infographics, ads and newsletters. To understand the impact of these approaches, surveys, interviews, workshops and focus groups were carried out.

- Both citizens and businesses find Environmental Footprint information of interest. Citizens are concerned about environmental sustainability even if environmental performance is not the main driver of their purchasing decisions; for many businesses, Life Cycle Assessment is already embedded in their thinking and they anticipate benefits for both business-to-business and business-to-consumer activities through the use of the Environmental Footprint.
- Both for citizens and businesses the clarity and simplicity of the information is key. Citizens find numerical information and scientific terms too complex and prefer graphics, bars and colour scales. QR codes, barcodes and links can lead to more detailed information for the interested citizen. Translating the complexity of EF information into simple, easily understandable messages is a challenge.
- Consumers want certification of information from named and independent sources.

With regard to **policy application**, the PEF has the potential of harmonising the scientific assessments used for product policies in the EU when dealing with the same or comparable product categories. It shows potential synergies with the EU Ecolabel and Green Public Procurement. The next steps of this initiative is to prepare proposals for the potential future applications of the method in existing or new policies. It also needs to be remarked that attainments made in the context of PEF imply a supportive role to circular economy policies. PEF results reflect resource productivity, the lifetime of the product and the way products are treated at their end of life. As such, the tool could potentially strengthen the EU legislation on Ecodesign and energy labelling. As the working plan 2016-2019 of the Ecodesign Directive (incorporating circularity) examines efficiency performances of product groups, the energy and resource efficiency strands can interact complementarily, and thus, significantly contribute to EU's 2020 resource efficiency objective (see also section 6.5).

5.7 Bottom-up instruments across Member States

In addition to the above policy instruments initiated at an EU level, Member States are increasingly demonstrating their commitments to circular economy by initiating local and national initiatives and piloting new instruments that can set an example for replication in many other countries. Prominent examples of product focused instruments, namely the ones aiming to create favourable conditions for recycling, upcycling, repair, and remanufacturing, are presented below.

5.7.1 Economic and tax incentives for repair and reuse

Economic incentives and reduced taxation are tools that could encourage thinking about repair before replacement. These incentives intend to help steer from a linear economy to a circular economy and redirect parts of the workforce from the production of new products to repair and maintenance. Economic and tax incentives for repair have started drawing the attention of national and local policy makers in a number of Member States.

Sweden has introduced two main forms of tax-based incentives to increase the use of repairs and in extension increase the life span of products and mitigate consumption of new products. The Swedish RUT, an acronym for the Swedish words for Cleaning, Maintenance and Laundry, enables tax deductions for the cost of labour when employing businesses for domestic work.

There are in particular two aspects of RUT of significance for the enablement of a more circular economy. The first is the deduction one can make when conducting repairs of major appliances (such as refrigerators or dishwashers) and the second is the deductions possible when conducting repairs, maintenance or installation of computer- or IT-equipment in or in close connection to your residence. With the RUT-system one has the possibility to make tax deductions of up to 50 per cent of the labour cost.

Another form of tax-based incentive in Sweden is the VAT reduction for services which carries out repairs of bicycles, shoes, leather goods and household linen. The VAT was reduced from 25 per cent to 12 per cent January 1st of 2017.³⁸

Several other Member States also have introduced VAT reduction on minor repair services (including mending and alteration) of e.g. bicycles, shoes and leather goods; these include Ireland, Luxembourg, Malta, Netherlands, Poland, Slovenia and Finland³⁹.

Social enterprises involved in collection and sales of used goods are exempt from and have reduced VAT. For example in France, such social enterprises are exempt from VAT because their activities are linked to the employment of disadvantaged and disabled persons. In Belgium social enterprises active in the area of reuse and preparing for reuse have a reduced VAT rate of 6 per cent (down from 21 per cent) under certain conditions, because they combine their reuse and preparing for reuse activities with training, rehabilitation and integration of disadvantaged groups.

5.7.2 Circular economy quality labels and standards

New initiatives are picking up on certification of the quality and formalising the standards for circular economy products and practices. Many consumers are still not open to buy second-hand products due to the belief that second-hand implies lower quality. In order to address the issue many social enterprises active in the second-hand industry are taking action and creating quality labels, showcasing a highly professional approach to re-use and the commitment to creating employment for those struggling to find a job⁴⁰.

One such example is the 'Keurloopbedrijven®' quality mark⁴¹, devised and implemented by the Dutch association of re-use social enterprises BKN (De Branchevereniging Kringloopbedrijven Nederland). BKN's re-use centres can be certified for three years following a formal audit and undergoing interim checks. The quality mark also recognises dedication to re-use as a priority treatment of collected goods and materials and responsible handling of the non-reusable fraction. At the moment almost 80 per cent of BKN members carry the Keurloopbedrijven® certification, making the quality standard well spread over the Netherlands. In addition bKN has recently developed a customer-oriented label '100 per cent Kringloop!' (100 per cent Circular), which can be used by members certified with the Keurloopbedrijven® quality mark. National Recycling Day, to be held on 6th October 2018, has now been renamed as '100 per cent Kringloop! Day', where the label will be officially launched at the national level. By then bKN hopes that all members will be able to reveal the 100 per cent Kringloop! sign on their buildings⁴².

³⁸ <https://www.skatteverket.se/>

³⁹ RReuse, 2017, Reduced taxation to support re-use and repair, position paper, available at: http://www.rreuse.org/wp-content/uploads/RREUSE-position-on-VAT-2017-Final-website_1.pdf

⁴⁰ <http://www.rreuse.org/tag/quality-label/>

⁴¹ <https://www.kringloopwinkels.nl/projecten/keurmerk-kringloopbedrijven/>

⁴² <http://www.rreuse.org/tag/quality-label/>

A similar initiative has been carried out in Ireland by the Community Reuse Network Ireland⁴³. This national network supporting 8 500 job, training and volunteering positions, launched the Re.Mark project with help of funding from the Irish Environmental Protection Agency (EPA). The pilot project is running in cooperation with ten re-use organisations and has launched in 2017 “Re-Mark”, Ireland’s Re-Use Quality Standard of Excellence⁴⁴. This standard is awarded to re-use shops upon a formal organisational level accreditation process that ensures that the second-hand goods offered by the shop are “safe and fit for purpose”. In accredited shops, goods are repaired, restored, or ‘reimagined’ by trained staff to extend their usable life and ensure safety.

Another notable initiative is relevant to a wider group of businesses and covers more diverse business activities. In 2017, the British Standards Institute launched *BS8001:2017: Framework for implementing the principles of the circular economy in organisations – guide*.⁴⁵ It is the first standard for implementing circular economy principles. It provides guidance around the specific issues surrounding the transition to a circular model – namely measurements, liability and insurance, logistical concerns, and materials. Guidance is also provided on specific associated business models, including leasing, the sharing economy, and remanufacturing. The standard is not intended to be prescriptive or certifiable; it is intended to be used flexibly by those which adopt it – irrespective of the size, sector, type or location of the organisation. It is suitable for organisations at a nascent or more advanced stage of transition on implementing the principles of the circular economy. Extensive input from businesses into the development of the standard has ensured the standard is useable in real-world scenarios, and that the language used in the document is not overly technical and accessible to those without prior knowledge of the circular economy.

5.7.3 Deposit-refund systems for beverage containers

Deposit-refund systems for bottles and cans have already proven their effectiveness in encouraging recycling and complementing existing curbside recycling programs, to reduce energy and material usage for containers, as well as in reducing littering by beverage containers. Such systems assume collection of a monetary deposit on beverage containers (refillable or non-refillable) at the point of sale; when the container is returned to an authorised redemption centre, or to a retailer, the deposit is partly or fully refunded to the redeemer (presumed to be the original purchaser).

With the rise of the plastic waste challenge and need for diverting it from landfilling and littering, container deposit refund systems are increasingly seen as one of the key solutions. A notable example of such a system is the Pfandsystem in Germany. The compulsory deposit is valid in Germany since 1 January 2003 for disposable packaging of beverages. All shops with more than 200 m² of retail space must take back all beverage packaging of the types of material they sell. This allows all empty disposable bottles and cans to be returned wherever disposables of the same material are sold. Here, a distinction is made according to plastic, glass or metal.

Besides Germany, 11 Member States have deposit refund systems for beverage containers. Design of the system, coverage of types of containers and deposit fees vary from country to country. For example in the Czech Republic, the system covers only beer glass bottles and crates,

⁴³ <http://crni.ie/>

⁴⁴ <http://www.crni.ie/re-mark/>

⁴⁵ The British Standards Institution, 2017, Ground-breaking British Standard for the ‘circular economy’ launched, link: <https://www.bsigroup.com/en-GB/about-bsi/media-centre/press-releases/2017/june/Ground-breaking-British-Standard-for-the-circular-economy-launched/>

while in other countries they cover PET bottles of various types and aluminium cans. In many places the system is assisted by reverse vending machines accessible in big grocery centres, while in some cases manual handling is also in practice.

The most recent developments in this area have taken place in the UK. In March 2018, the government of the United Kingdom announced plans to introduce a deposit return scheme in England for drink containers. This has been followed up by consultations that look at the details of how such a scheme would work, alongside other measures to increase recycling rates.

5.8 Conclusions

Watkins et al. (2017) note that EPR does not function in a vacuum. Indeed, greater levels of coherence should be ensured between the objectives and implementation of EPR and other instruments, such as regulatory targets, bans, pay-as-you-throw schemes, waste taxes, product and material taxes, product standards, labelling, voluntary agreements, procurement policies, and information and awareness campaigns (Watkins et al. 2017). This is true of all the instruments assessed in this chapter. While all have shown efforts to increase their contributions to the circular economy transition, strengthening criteria and scaling up activities, in particular by taking advantage of synergies between instruments, seems key.

The European Environmental Bureau (EEB) drew similar conclusions, finding that many legal frameworks were developed assuming a linear progression of products and materials through the economy. In the transition to a circular economy, overlaps are inevitable as different actors across the value chain must be addressed at different stages across the life-cycles of product use, and this must happen in a systemic way that encourages reuse. The EEB stress the need to now integrate building blocks from a circular economy perspective into both existing and new instruments, including in particular concepts such as better material utilisation, extended product lifetime, shared use/rental or leasing, value recovery and a sustainability check. All concepts will not fit to each instrument, but should be integrated in a more explicit and comprehensive way focused on the circular system of design to recovery and reuse. Key to efforts is that the same metrics can be used for different policy instruments. EEB (2018) argues that:

“Instead of discussing circular economy-related criteria for the same product categories in an isolated manner in different processes set up e.g. for Ecodesign, EPR, GPP or Ecolabel policies, there is a huge potential to create more synergies through re-organising this work” (EEB 2018).

They propose that aligning the analytical framework for verification could help to streamline processes and resources. In this case, different levels of criteria could be used for different policy objectives (e.g. the EU Ecolabel could have the strictest criteria with standard product regulation criteria covering the most basic level). It could also contribute to increasing coherency and taking advantage of synergies between instruments, which would not only increase the effectiveness of individual instruments themselves, but also of the framework of policy instruments (the instrument mix) altogether. To this end, it could also help with the challenge of finding the right balance between being too product prescriptive toward incentivising a specific form of product eco-innovation for the circular economy and being too vague with incentives toward ensuring overarching aims of achieving resource efficiency through the circular economy.

6 | Conclusions

This chapter highlights key findings and conclusions from the report and the implications for policy makers.

6.1 Key findings

- **Product eco-innovation is at the heart of the circular economy transition.** It encompasses the “innovation cycle” in the way products are designed, produced, used, re-used and recycled.
- Key product eco-innovations from a business and design perspective include aspects such as modularity, multi-functionality, reparability, longevity and durability. Business models integrating service offers such as product-service systems, dematerialised services, collaborative consumption, asset management and bring your own device, among others, are also playing an increased role along with providing new market opportunities for businesses. However, a one-size fits-all solution for all products, services and sectors does not exist. In fact, some trends may even result in rebound effects, burden shifting or negative impacts that **must be considered from a systemic perspective** to ensure that circular economy innovations contribute, as a whole, to achieving sustainability objectives.
- **Joint efforts requiring multi-stakeholder collaborations** are often needed to drive the way that products are used and reused in the circular economy. Case studies continuously highlighted the interface of multiple partners and different types of actors in successful eco-innovations. These include collaborations of e.g. business, customers, charitable organisations, research/science, and policy. Citizens are key to especially more radical degrees of change and must actively participate in (e.g. take-back schemes) and can also drive (e.g. through their demand power and also with user-led eco-innovations) the transition.
- Evidence suggests that **positive trends are occurring** – notably in regards to changes in consumer behaviours (e.g. increase in collaborative consumption) and business models (e.g. integration of product circularity principles such as eco-design and product service systems). Nevertheless, these seem to be more niche movements and have not penetrated the mainstream at a notable scale. Challenges related to data gaps and uncertainty hamper the ability to compare and learn from successful pilots and instruments across the EU. Strengthened monitoring in particular as regards to product design and product handling for circular use, product stocks and flows throughout the economy, and the behaviour of participants within the system are needed.
- **The group of eco-innovation leaders in the Eco-Innovation Index has remained relatively stable** since the inception of the Index in 2010. Nevertheless, strengths and weaknesses between single components vary widely among countries and performance categories. The country group ‘eco-innovation leaders’, for instance, had high performances across almost all components, but reached relatively lower positions in the sub-index regarding socio-economic outcomes. As regards the low performances of the country group ‘catching up in eco-innovation’ the area of R&D spending is a clear weakness that should be given more priority by policy makers.
- A multitude of lessons may be drawn from the case studies of good practices regarding eco-innovation products and business models. Top highlights include:

- Many case studies involved multiple partners. **Municipalities were often a key partner** to providing infrastructure (e.g. for urban mining and urban furniture) or for pilot projects (e.g. in Leeds, United Kingdom and Rosenheim, Germany). In some cases, a collaboration of companies with local research organisations allowed them to develop new solutions (e.g. Linde Vítkovice). It is therefore important to provide innovation spaces, networks and clusters for bringing potential partners together, and to e.g. facilitate business-science collaborations.
- The **willingness to take risks and try new things** in order to develop eco-innovations should not be underestimated: “creativity and (the) will to dare” (Orange Fibre) and “It is never too late to be change agents” (Split Hotel) were sentiments expressed. Providing a level playing field for these new ideas to emerge and become competitive should be a top priority for policy-makers.
- The need to foster green practices to be competitive worldwide also played a role in some cases, showing the importance of supporting **a shift in consumer values** to create the market for greener products, e.g. through information campaigns. Moreover, a general dedication to greening business practices may be key to both incremental changes, but also new business ideas. Support for e.g. EMAS may thus have a snowball effect.
- In some cases, organisations were able to finance activities through the support of fundraising from large corporations and businesses (e.g. in the case of urban mining in Romania), but in order for such activities to take scale, there is a need for **more public support** to the facilitator organisations.
- **Pilots can play a key role** and do have the potential to be scaled-up, albeit in some cases over long periods of time (e.g. as in Community Repaint) or also very quickly (e.g. in the case of Recup) implying the need for different types of policy support to up-scaling activities.
- **Awards provide well-deserved recognition** of eco-innovative efforts and promotion for getting the word out. Many of the examples showcased have won awards sponsored by various organisations across the EU.

6.2 Key policy messages

- **Policy instruments are starting to integrate circular economy criteria.** All six of the instruments assessed for their potential to contribute to the circular economy transition showed different strengths as potential policy tools, for example:
 - Customer recognition of the **EU Ecolabel** is high;
 - Examples of successful **public procurement** revealed the potential to break the cycle of only procuring new products (in place of reused, remanufactured, or repurposed ones) and to reinvent the procurement system toward innovative, market-based solutions to functional requests;
 - **The Environmental Management and Audit Scheme (EMAS)** may help to encourage the integration of circular economy principles in company operations;
 - **Extended Producer Responsibility (EPR)** can have a positive effect when implemented in a smart way (one of the main strengths of EPR is the potential for fee modulation linked to ecodesign principles);
 - **Ecodesign** is beginning to play a much larger role by linking material efficiency and circular economy. This approach should be further supported and strengthened as experience is gained with it in implementing regulations. ;

- Integration of the **Product Environmental Footprint** could strengthen existing initiatives and instruments.
- However, the **uptake of instruments is not high enough to achieve widespread change across all product groups, sectors and Member States**, signalling the need to further streamline these initiatives. In particular, the EU Ecolabel and EMAS only have a strong presence in a limited number of Member States.
- There is a need to develop appropriate incentives and legal amendments to encourage greater levels of implementation. Clearly, **financial incentives such as tax breaks and fee reductions have the greatest potential for encouraging companies to make use of such instruments** (EMAS, Ecolabels, etc). However, this is heavily tied to the level of resources and investment available at a Member State level. Circular public procurement can create a strong incentive for companies to redesign their products and services while getting remunerated for needed investment.
- A more harmonised approach and support at the EU level (through legislation or guidance) for EPR would greatly help to better integrate it into environmental and circular economy objectives as well as cover a larger scope of products and associated waste streams. To this end, **common definitions and standards to support more robust monitoring would help to increase evidence on what works and what fails to encourage a circular economy**.
- Aligning the analytical framework for verification of e.g. Ecodesign, EPR, GPP and the Ecolabel could help to streamline processes and resources toward a **coherent instrument mix**.
- New tools, such as the Product Environmental Footprint and bottom-up initiatives from across the EU (e.g. reduced VAT for reuse, repair and social enterprises; quality labels; and deposit refund systems for beverages) should be further explored, in particular **considering potential synergies and reinforcement with corresponding instruments**. Also instruments and tools not in focus here have the potential for scaling up: e.g. as regards product passports, Environmental Product Declarations, cradle-to-cradle® certification, among others.
- Altogether the potential to increase implementation of the circular economy is vast. Efforts require not only increased synergies between instruments, but must also take care to consider all avenues of the circular economy. In other words, promoting recycling should not hamper efforts toward **waste prevention** and waste reuse. Product eco-innovation is central to the challenge, but also how customers use those products and their level of engagement by adapting behaviours, lifestyles and value systems play a critical role.

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The Eco-Innovation Observatory (EIO) is the initiative financed by the European Commission's Directorate-General for the Environment. The Observatory is developing an integrated information source and a series of analyses on eco-innovation trends and markets, targeting business, innovation service providers, policy makers as well as researchers and analysts.

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