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EXECUTIVE SUMMARY

Product Service Systems (PSS) are seen as pivotal in driving the circular transition across the Nordics and the European Union. This project, "PSS in the Nordics," investigates the nuanced dynamics of PSS, exploring their potential for economic and environmental success in alignment with the overarching Nordic Vision to become the most sustainable and integrated region globally.

PSS models integrate products and services, offering a unique form of provider ownership. It holds significant potential for circular and digital economies, reshaping consumption and ownership norms. However, the successful deployment of PSS relies on intricate considerations such as business model design, active steps to reduce material consumption and consumer acceptance. This project aims to clarify the potential environmental and socioeconomic benefits of PSS and the critical factors involved in their implementation.

This report marks the culmination of the project's third phase, focusing on understanding the challenges and enablers surrounding PSS models in the Nordics. Building on the initial phases of gaining an overview of existing PSS models (Step 1) and identifying suitable product groups (Step 2), this report offers empirical insights into existing barriers, the regulatory landscape affecting Nordic PSS models, and practical tools, templates and guidance relevant to PSS providers.

Incorporating inputs from over 40 stakeholders within the Nordic PSS landscape, in-depth policy assessments, and evaluations of relevant business development resources, this report delves into the examination of twelve prominent barriers, encompassing cultural, technical, economic, market, and regulatory domains.

- **Cultural barriers** encompass deeply ingrained consumer practices related to ownership, preconceived notions of PSS and a perceived cost disparity between PSS solutions and traditional product sales.
- **Technical barriers** involve the absence of standardised solutions, administrative complexities, and the challenge of documenting circular and sustainable models and products. Proposed solutions include tailored technology solutions to streamline processes and enhance user experience.
- **Economic and market barriers** include challenges accessing investment due to financial institutions' lack of understanding of PSS configurations, competition with traditional product sales, and difficulties in requiring exceptionally durable and repairable products essential for the extended product utilisation embedded in PSS.
- **Regulatory barriers** encompass a lack of supporting regulations and a regulatory landscape geared towards linear business models, an absence of legislative and financial guidance to assist PSS providers in navigating the complex legal landscape, and rigid existing requirements and restrictions.

The regulatory framework analysis concludes that the regulatory instruments aimed at PSS adoption in the Nordics remain limited, even though PSS is seen as a vital circular economy tool. A way to even out the economic playing field for PSS providers is the implementation of EPR schemes. EPR schemes apply strategic modulated fees aligned with the waste hierarchy and its practices, laying a foundation of favourable economic conditions for PSS. The Nordic countries are behind in establishing ambitious EPR schemes. Researchers are advocating for additional supportive regulations for a more substantial integration of PSS models in the Nordics. An absence of adequate supporting regulation leaves a regulatory gap that hinders the realisation of the benefits associated with PSS solutions.

The regulatory framework for PSS adoption in the Nordics is currently limited, hindering their role in the circular economy. One way to level the playing field for PSS providers is the implementation of Extended Producer Responsibility (EPR) schemes with strategic fees aligned to the waste hierarchy. However, the Nordic countries lag in establishing robust and ambitious EPR schemes, impeding the potential of PSS to contribute significantly to circular economy goals.

Researchers advocate for developing additional supportive regulations to ensure a more substantial integration of PSS models in the Nordic context. The absence of comprehensive regulatory support leaves a void that hinders the realisation of the full spectrum of benefits associated with PSS solutions.

PSS models have received limited attention in the Nordic regulatory and political framework, primarily relying on softer regulatory approaches. Public procurement, a potential lever for PSS solutions, is underutilised despite the Nordic emphasis on sustainability and circularity.

Within the regulatory framework, a need exists for standards mandating the creation of durable and repairable products, particularly during the product design phase. Such standards are crucial for the success of use and result-oriented PSS solutions.

Furthermore, Nordic PSS providers lack a cohesive platform for knowledge exchange, hindering collaborative insights sharing across countries, product groups, and business sizes—a key factor for success.

The report aims to provide a comprehensive understanding of the factors influencing the success of Nordic PSS models by synthesising insights from the regulatory framework analysis, stakeholder inputs on barriers and enablers, and the available tools to address these barriers. This understanding serves as a foundation to determine why Nordic PSS models may or may not be thriving and how to effectively harness their potential to contribute to the circular growth objectives of the Nordic region.

In the conclusive chapters of this report, a comprehensive exploration of the obstacles PSS providers face is presented alongside identified enablers for navigating these challenges.

- **Cultural enablers** emphasise collaborative efforts and knowledge sharing across Nordic PSS providers, promoting circular business practices. Sustainable consumer focus underscores the importance of transparently showcasing commitment to sustainable practices to build consumer confidence. The ongoing societal shift towards a Circular Economy is viewed optimistically, yet the full realisation depends on the strategies adopted by Nordic policymakers.
- **Technical enablers** highlight data and documentation management proficiency, especially in the IT sector. Social Media emerges as a critical tool for connecting with customers, though its costliness is acknowledged. The robust Nordic infrastructure is pivotal in supporting PSS implementation and advancement.
- **Economic and market enablers** discuss the need for economic support, with discussions centring on funding and loans. Collaborative partnerships with public entities, such as municipalities, prove beneficial for accessing discarded products and recycled materials. Public procurement is recognised as a dual-faceted factor, both a hindrance and accelerator, with the potential to influence market dynamics substantially.
- **Regulatory enablers** focus on incentive structures driven by regulations, including reduced taxation and EPR initiatives, with room for improvement in current frameworks. Consultancy and guidance, primarily through national business programs, are vital for navigating legislation, funding opportunities, and business model development. Reporting standards are identified as a recurring concern, emphasising the need for clear guidelines to prevent 'greenwashing' and ensure compliance with marketing regulations among PSS providers.

The report's final chapter presents strategic recommendations to enhance PSS implementation in the Nordic region. Four key outputs are outlined:

- **Elevated Consumer Recognition:** Initiatives include integrating circular concepts into education, demystifying product sharing through informative campaigns, and guiding consumers with government-endorsed initiatives. The goal is to enhance the cultural acceptance of PSS and circular business models.
- **PSS Providers Technically Competent:** Empowering SMEs with the technical capabilities required for PSS development. This involves supporting digital integration through national programs, es-

establishing standardised tool repositories for PSS providers, and disseminating guidelines for effective environmental reporting. The objective is to enable SMEs to navigate the technical aspects of PSS implementation.

- **Parity with Traditional Businesses:** This strategy addresses the funding and market challenges PSS models face. It includes investigating and elevating green investment requirements, developing Nordic standards for Eco-design and market surveillance, and facilitating business ecosystem clustering for collaborative growth. The aim is to ensure that PSS models compete effectively with traditional business models.
- **A Supportive Regulatory Landscape:** Focused on creating a supportive regulatory environment, this strategy involves developing action plans for universal access to regulatory guidance, investigating the effects of regulatory initiatives, and analysing PSS representation in public procurement. The goal is to foster a legal framework and economic incentives that encourage the adoption of PSS models and circular business practices.

The Nordic region holds a unique opportunity to lead in sustainability and innovation. By integrating circular principles into education, enhancing technical capabilities, fostering collaboration and innovation, and establishing proactive measures, the Nordics can create a supportive economic landscape that promotes PSS and other circular business models.

CONTENT

1	INTRODUCTION.....	7
1.1	The project.....	7
1.2	Methodology.....	9
2	BARRIERS FOR PSS IN THE NORDICS.....	13
2.1	Cultural barriers.....	14
2.2	Technical barriers.....	17
2.3	Economic & market barriers.....	19
2.4	Regulatory barriers.....	20
2.5	The interconnectedness of the barriers.....	22
2.6	Sub-conclusion.....	26
3	REGULATORY FRAMEWORK FOR PSS IN THE NORDICS.....	29
3.1	EU Directives & regulation.....	29
3.2	Action plans, strategies & initiatives.....	38
3.3	Public Procurement.....	43
3.4	Policies and regulations for consumers and businesses.....	46
3.5	Voluntary agreements & information campaigns.....	53
3.6	Informational campaigns & challenges.....	54
3.7	Sub-conclusions.....	56
4	GUIDES AND TOOLS FOR PSS.....	57
4.1	International guides and tools relevant to PSS.....	57
4.2	Nordic guides and tools relevant to PSS.....	64
4.3	Relevance of available tools.....	72
5	CONCLUSIONS.....	73
5.1	Cultural Enablers.....	73
5.2	Technical Enablers.....	73
5.3	Economic & Market Enablers.....	74
5.4	Regulatory Enablers.....	74
6	RECOMMENDATIONS FOR NORDIC POLICYMAKERS.....	76
6.1	Elevated Consumer Recognition.....	77
6.2	PSS providers are technically competent.....	78
6.3	Parity with Traditional Businesses.....	80
6.4	A Supportive Regulatory Landscape.....	81
6.5	Conclusion.....	82
7	BIBLIOGRAPHY.....	84

1 INTRODUCTION

The concept of Product Service Systems (PSS) builds on a degree of provider ownership by combining products and services. PSS have significant potential for supporting circular and digital economy, improving societal sustainability and value creation and have been described as one of the most effective instruments for moving society toward a circular economy (CE) and resource efficiency¹. While PSS can be considered a promising pathway to support the shift to a CE, the outcome depends on the business model design, active steps to reduce material consumption and consumer acceptance. Several definitions of PSS have been proposed with noticeable similarities describing services, supporting networks, and infrastructure designed to satisfy customer needs and generate value².

One of the most cited definitions of PSS in literature is that given by Tukker³, seeing PSSs as combinations of tangible products and intangible services designed for their joint capability of fulfilling specific needs. Tukker has defined three orientations of PSS: 1) Product-oriented models, where the business model design mainly relies on tangible products with some added services; 2) Use-oriented models, where the business model design reflects a middle ground between tangible products and intangible services; and 3) Result-oriented models, where the business model design mainly or solely relies on intangible services. Read more about models and product groups in the report ‘Business models and product groups for Product Service Systems (PSS) in the Nordics’ at the project webpage www.pssinthenordics.com.

1.1 The project

The project ‘*Product Service Systems in the Nordics – Paving the Way for Circular Business and Sustainable Consumption*’ was initiated in November 2021 and runs until December 2024. The project explores whether, when and how PSS models can be successful in a Nordic context, delivering resource efficiency and economic gains.

The Nordic Council of Ministers has set out a new Nordic Vision for 2030, addressed in the Action Plan 2021 to 2024. The Nordic Region aspires to become the world’s most sustainable and integrated region, based on three dimensions: a green Nordic Region, a competitive Nordic Region, and a socially sustainable Nordic Region⁴. Circular business models and innovation pathways are critical components in achieving this vision. PSS models support the circular and digital economy, potentially significantly improving societal sustainability and value creation.

Developing innovative business models like PSS can enable alternative value-creation opportunities and mechanisms to implement circular principles across industries. PSS is seen to have emerged due to traditional manufacturing companies wanting to cope with the changing market forces and realising that linking services with products could lead to higher profits⁵. The penetration of PSS in the Nordics is understudied⁶. There is limited knowledge sharing among the Nordic countries and industries and sparse utilisation of collaboration opportunities. This project aims to demonstrate whether, when and how PSS and producer ownership models can be successful, i.e., be significantly more resource efficient and economically viable than traditional business models.

The project is divided into two phases with a total of five steps. This report addresses the potentials and challenges of PSS solutions for PSS in the Nordics based on findings from the first three steps of the project, as illustrated in Figure 1.

¹ Reigado et al., ‘A Circular Economy Toolkit as an Alternative to Improve the Application of PSS Methodologies’.

² Kim, ‘A Representation Framework of Product–Service Systems’.

³ Tukker, ‘Eight Types of Product–Service System’, 2004.

⁴ NCM, ‘The Nordic Region – towards Being the Most Sustainable and Integrated Region in the World’.

⁵ Salwin and Kraslawski, ‘State-of-the-Art in Product-Service System Classification’.

⁶ Hernandez, ‘Systems Approach to the Development of Integrated Solutions in the Nordic Manufacturing Industry’.

Project overview

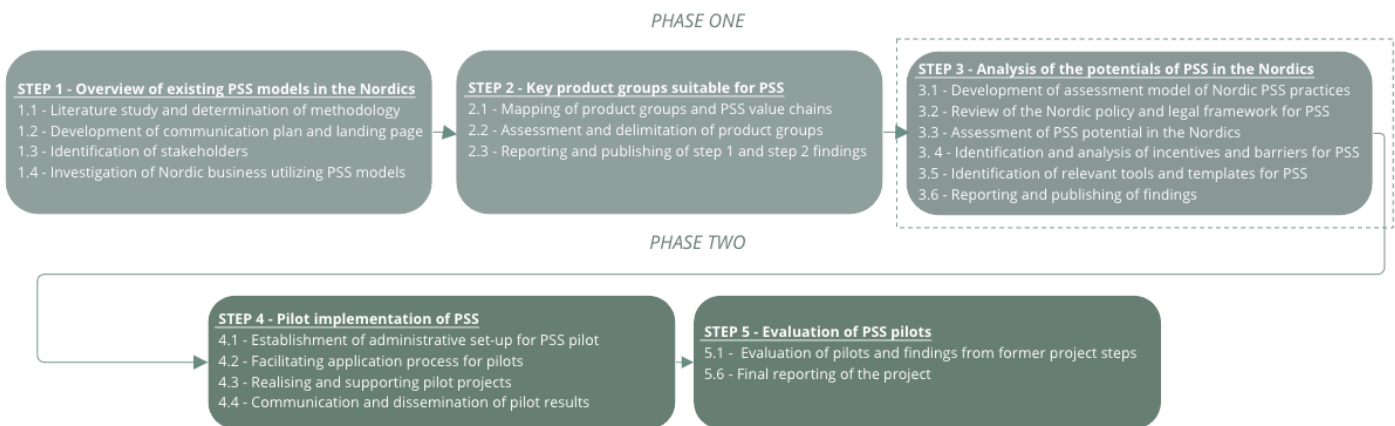


FIGURE 1 – Project overview – PSS in the Nordics

The project is carried out by a consortium consisting of the Nordic partners Norion (Denmark, project lead), Norsus (Norway), RI.SE (Sweden), VTT (Finland), and Environice (Iceland), together with supporting PSS experts from iiee (Sweden) and Vito (Belgium). The project steering group consists of members from Sitra (Finland), Naturvårdsverket (Sweden), Miljøstyrelsen (Denmark), Miljødirektoratet (Norway), Ministry of Economic Affairs and Employment (Finland), and Nordic Innovation.

1.1.1 Step 1-2 report: Business models and product groups for PSS in the Nordics

The first report for project *PSS in the Nordics: Business Models and Product Groups for Product Service Systems (PSS) in the Nordics* presented the findings from the project’s first two steps to create an overview of existing PSS models in the Nordics (step 1) and identify key product groups suitable for PSS (step 2). The first report provides insight into existing PSS solutions applied in the Nordic Region, based on Arnold Tukker's three categories for PSS - Product-oriented, Use-oriented, and Result-oriented. The analysis of the first report is based on 275 cases of PSS identified in the Nordic countries and categorised into nine product group clusters: Transportation; Packaging; Machinery and tools; Appliances, furniture, and household products; Products for children; Clothing and accessories; Seasonal and special occasions; Electronic equipment and solutions; and ‘Other’⁷; as illustrated below:

TRANSPORTATION	PACKAGING	MACHINERY & TOOLS	APPLIANCES, FURNITURE & HOUSEHOLD PRODUCTS	PRODUCTS FOR CHILDREN	CLOTHING & ACCESSORIES	SEASONAL & SPECIAL OCCASIONS	ELECTRONIC EQUIPMENT & SOLUTIONS	OTHER
Bicycles	Plastic & single use	Cranes	White goods & large appliances	Children clothes	Casual clothing	Party & event equipment	Computers & smartphones	Agriculture
Cars	E-commerce	Heavy machinery	Kitchen appliances & tableware	Toys	Clothes for special occasions	Sports, camping & hiking gear	Printers	Infrastructure
Scooters	Freight	Tools	Heating & electricity	Furniture & equipment	Workwear		Batteries	Animals
Boats		Processing equipment	Furniture		Accessories & jewellery		Cloud-based options	Plants
Mobility as a Service		Chemicals	Textiles				Streaming service & E-books	Dinner subscriptions & catering

FIGURE 2 – Product groups with relevance for PSS in the Nordics

⁷ Egebæk and et al., ‘Business Models and Product Groups for Product Service Systems (PSS) in the Nordics’.

The study shows that PSS models across the product groups focus on reducing CO₂e emissions, increasing production utilisation, supporting sustainable material sourcing, and reducing waste. Most product group clusters include product services such as repair, refurbishment, and extended warranty, facilitation of a prolonged lifespan of products, and increased product durability. Many PSS solutions have focused on increasing consumer awareness of product emissions and waste production, but consultations with the PSS providers indicate that the main attraction for consumers utilising PSS solutions is convenience, especially related to the products' maintenance.

The study further shows that PSS providers are mainly retailers or distributors - only 20 % are producers, manufacturers, or designers. Around 40 % of the PSS solutions target the B2C and B2B markets, respectively, whereas only a few – around 15 % - target the B2G market. Consultations with PSS providers indicate that this is due to a lack of accommodation for PSS and circular business models in the criteria for public procurement⁸.

1.2 Methodology

The following section will introduce the methodology and approaches utilised in the empirical collection, assessment of barriers, and the assessment of relevant tools, templates and guides. This report aims to provide recommendations for Nordic policymakers on supporting PSS providers across the Nordic region.

1.2.1 Project structure

The report is structured into four chapters:

1 Barriers to PSS solutions in the Nordics	Based on a comprehensive literature review, findings from 40 interviews with Nordic PSS providers, four national workshops across the Nordics, and one joint Nordic workshop with participants from PSS businesses, authorities, researchers, and business – and sector organisations.
2 The current regulatory framework related to PSS solutions	An assessment of EU and Nordic action plans and strategies, regulation and legislation, voluntary agreements, and instruments relevant to the Nordic PSS solutions. Including a discussion on whether the current regulatory framework resolves the identified barriers and what type of policy instruments are missing to support circular business models in the Nordics.
3 Guides, tools, and templates supporting PSS	Presentation of guides, tools, and templates for the development, iteration, and management of PSS solutions.
4 Recommendations for Nordic policymakers	Recommendations on how to improve and increase the support for PSS providers contributing to market transitions towards the circular economy (CE) in the Nordics, including specific recommendations for PSS providers on how to ensure that the PSS solution provided is significantly more sustainable than traditional business models.

⁸ Egebæk and et al. (2022): Business models and product groups for product Service Systems (PSS) in the Nordics.

1.2.2 Empirical foundation

The empirical foundation of the project includes a literature study of more than 140 academic articles and reports; mapping and analysis of 275 Nordic PSS providers; 40+ interviews with Nordic PSS providers and policy agents; four national workshops in Denmark, Finland, Sweden, and Norway; and a joint Nordic workshop with Nordic PSS providers, authorities, researchers, and sector associations.

Based on the literature study and the stakeholder consultations, relevant selection criteria of product groups suitable for the study and PSS solutions in the Nordic region were identified (Figure 3). Nine overall product group clusters were established, entailing 37 product groups in total, as illustrated in Figure 2. Interviewees were selected to obtain both a broad and deep understanding of the PSS sphere and the barriers for PSS in the Nordics.

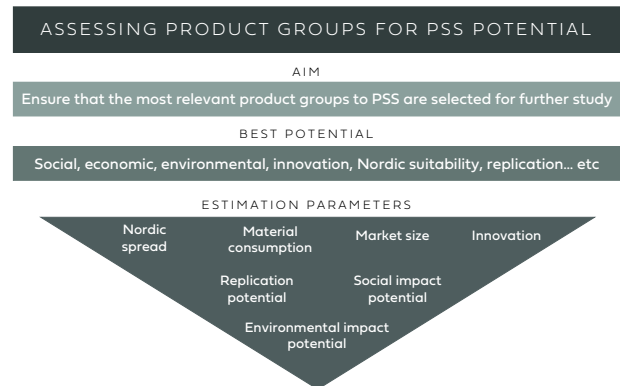


FIGURE 3 – Product group selection criteria

1.2.3 Analysis of barriers and enablers

The barriers presented and analysed in this report have been widely discussed with PSS stakeholders throughout the project. The extensive work from the findings from stakeholder engagement activities was prioritised due to the focus on the Nordics region and the vast amount of relevant stakeholders and perspectives included, including PSS providers, authorities, researchers, and sector associations. Therefore, extra validation steps were included in the execution of project activities to ensure that the barriers identified are representative of the conditions for PSS solutions in the Nordics.

Illustrated in Figure 4 below is an overview of the approach for data validation that has made the analysis of Nordic PSS barriers provided in this report possible.

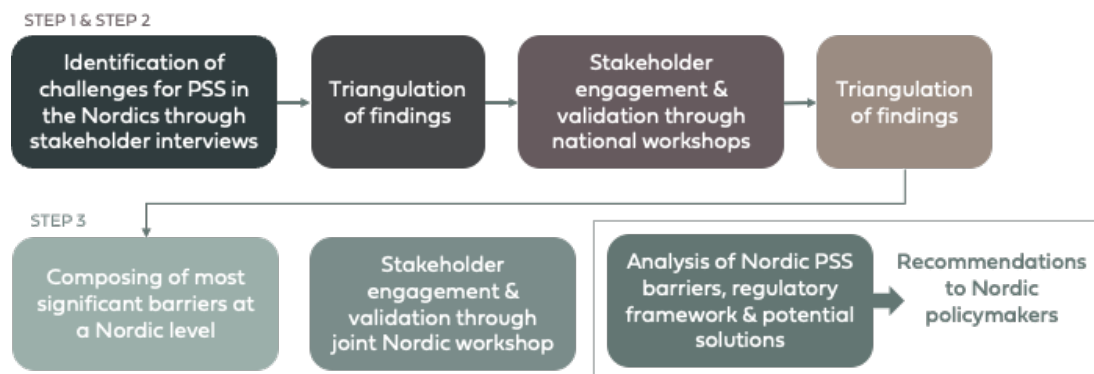


FIGURE 4 – Structure of barrier identification and data validation

barriers to PSS in the region. Employing a triangulation approach, statements from a consulted PSS provider was classified as a barrier only when substantiated by at least two additional sources. This methodology provided ten indicative themes encapsulating the primary barriers to the successful implementation of PSS in the Nordics.

Four national workshops were held to ensure further validation of the triangulated findings. PSS providers and researchers were presented with a matrix entailing the four barrier categories: Cultural, Technical, Economic, and Regulatory. The workshop participants provided further insights on barriers and incentives within the matrix framework. Besides validating the identified barriers, the workshops provided a more nuanced understanding and additional findings on the challenges and barriers for PSS in the Nordics. The

data from the stakeholder interviews and national workshops further provided the needed perspectives for the first policy mapping for the regulatory framework analysis.

By aggregating the findings from the literature study, the PSS provider interviews, and the four national workshops, more than 400 findings on barriers and potentials were triangulated to formulate the twelve most significant barriers to PSS in the Nordics within cultural, technical, economic, and regulatory barriers.

A joint Nordic workshop for Nordic providers, authorities, sector associations and researchers was facilitated to validate the identified barriers and identify further policy measures and tools relevant to PSS in the Nordics. Here, the workshop participants were presented with the identified barriers – discussing the relevance, significance, and priority of the twelve barriers in break-out groups entailing different types of stakeholders. The approach provided an understanding of the significance of the identified barriers and a more nuanced understanding of why these barriers are present in the Nordic region. The joint Nordic workshop further enhanced the understanding of which aspects of the Nordic regulatory framework support or challenge the market conditions for PSS solutions in the Nordics. This enabled the final selection of relevant policy measures for the analysis of the regulatory framework analysis, based on environmental impact potential, social impact potential, economic impact potential, potential incentive structures, and awareness creation potential.

The empirical foundation for this report, stem from interviews with PSS providers carried out in the winter of 2021 and spring of 2022. Additionally, inputs were collected from PSS providers, research institutions, and business associations during a collaborative Nordic workshop held in November 2022.

1.2.4 Impact assessment of PSS solutions

It is widely perceived that PSS solutions are inherently sustainable or circular, but evidence from the present project shows that this is not always the case as PSS embrace a wide range of business model configurations, product acquisition, use, maintenance and disposal practices, and consumer behaviour. Most of the more than 40 consulted PSS stakeholders are pursuing a more circular economy, but some businesses are simply seeking economic advantages, others are unaware of the concept of PSS and indifferent to the transition to a circular economy.

PSS's environmental, economic and social desirability have been investigated through a 'potential impact analysis' of seven Nordic PSS solutions (the investigation has been reported to the Nordic Council in a separate information brief⁹). Data from the PSS providers were collected specifically for the potential impact analysis as no LCA had been carried out previously. The assessment of the impact was based on the LCA, S-LCA and EIO-LCA methodology enabling comparison with a traditional product-sales model.

The environmental impact of the seven PSS solutions has been assessed based on three impact categories: Climate effects (global warming potential) in units of CO₂e; depletion of natural fossil resources in units of energy content, MJ; and depletion of scarce natural non-fossil resources, expressed in units of reference material, kg of antimony equivalent. Six of the seven assessed PSS solutions provided between 20-75% environmental impact reductions compared to a standard product-sales model, primarily due to the increased utility of the products. The last PSS solution had a slightly higher environmental impact. This was mainly due to the resource input, as the PSS solution uses high-impact but very durable materials. The slightly higher environmental impact in the production was therefore counted as insignificant due to the long lifespan of the products in the PSS solution.

The social impact of the seven PSS solutions was assessed based on 25 subcategories of the activity categories from the Social Hotspot Database. Five main social category areas were included: Labour rights and working conditions; health and safety; human rights; governance; and community infrastructure. The five categories and included subcategories were assumed to have equal importance. Four of the seven PSS solutions have a lower social impact compared to a standard product-sales model. Generalisations on the

⁹ The information brief will be published on the PSS in the Nordics website www.pssinthenordics.com

social impact of the PSS solutions are, in general, challenging due to the high variation in material input, value chains, manufacturing conditions, etc.

The economic impact was estimated with a varying degree of underpinning data. Basic direct costs, prices of resources, goods and services were based on global market values. Services provided by the PSS providers were generally less accurate; therefore, these were based on an estimated markup. Four of the seven PSS solutions have a lower economic impact compared to a standard product-sales model. This is mainly due to the additional economic costs related to the operations of a PSS solution, from the increased transportation, cleaning, and maintenance compared to a product-sales model.

More research will have to be done on the environmental, social and economic impact of PSS solutions to provide a representative picture of the reduction potential of PSS. However, the impact assessment underpinned the importance of product utilisation on all three parameters.

2 BARRIERS FOR PSS IN THE NORDICS

The following chapter will address the identified most significant barriers to developing, implementing, and continuing PSS solutions in the Nordic market. The barriers have been divided into four main categories:



CULTURAL barriers often encompass insufficient awareness or willingness to engage in transition processes¹. Common cultural barriers in the Nordics include rigid linear value chains, precarious business culture, and low consumer awareness¹⁰.



TECHNICAL barriers often encompass insufficient technologies to support transition processes¹¹. Common technical barriers in the Nordics include the absence of data, demonstration projects, and relevant technologies¹².








ECONOMIC & MARKET barriers often encompass insufficient economic access and viability to support economic business models¹³. Common economic barriers in the Nordics include high investment costs and low raw-material prices¹⁴.



REGULATORY barriers often encompass insufficient regulatory frameworks¹⁵ or legislation developed with a linear economy in mind. Common regulatory barriers in the Nordics include an absence of laws and regulations and conflicts of regulatory instruments between sectors and countries¹⁶.

Within each category, three types of barriers have been assessed as most significant. In the table below, the 12 barriers have been ranked from most pressing (1) to least pressing (7) based on the findings from the interviews, national workshops, and the joint Nordics workshop.

RANK	TYPE	BARRIER	DESCRIPTION
1		CULTURE OF OWNERSHIP	Nordic PSS providers are challenged by the consumers being used to owning the product they acquire. Therefore the benefits of, e.g. product rental and leasing, are not easily converged. The barrier is most prominent with products assigned an emotional value, considered private, or that may contain sensitive information about the user (mostly IT).
2		LACK OF SUPPORTING REGULATION	Regulatory incitements for PSS (e.g. fee and tax systems favouring reuse) are lacking in the Nordics. Consultations with PSS providers indicate that the financial conditions for SMEs are challenging due to the need for high start-up capital.
3		LACK OF LEGISLATIVE & FINANCIAL GUIDANCE	Many PSS providers are missing guidance on the legislation and policies relevant to PSS, especially regarding the rights and requirements of providers and consumers. This affects PSS providers' ability to comply with legislation and to prepare for forthcoming legislation, such as extended producer responsibility.
4		LACK OF STANDARD SOLUTIONS/SYSTEMS	There is a general lack of standard solutions for business logistics, stock overview, payment systems, etc. The need for investments in digital solutions specific to each business model can be economically straining.
5		EXISTING REQUIREMENTS & RESTRICTIONS	Since most regulatory frameworks are conditioned to linear business models, some requirements and restrictions constitute barriers for PSS models, e.g., requirements for revision, certification schemes, legal product ownership configurations, and labelling.

¹⁰ Hjelt et al., 'Low-Carbon Circular Transition in the Nordics'.

¹¹ Kirchherr et al., 'Breaking the Barriers to the Circular Economy'.

¹² Hjelt et al., 'Low-Carbon Circular Transition in the Nordics'; Kirchherr et al., 'Breaking the Barriers to the Circular Economy'.

¹³ Kirchherr et al., 'Breaking the Barriers to the Circular Economy'.

¹⁴ Hjelt et al., 'Low-Carbon Circular Transition in the Nordics'.

¹⁵ Kirchherr et al., 'Breaking the Barriers to the Circular Economy'.

¹⁶ Hjelt et al., 'Low-Carbon Circular Transition in the Nordics'.

5		RELUCTANCE IN INVESTMENTS	Many PSS providers experience a lack of understanding of PSS solutions from banks and investors, e.g. a distrust in the ability to generate revenue. This especially challenges the start-up phase or when exploring new business areas or concepts.
5		COMPETITION WITH PRODUCT SALES	While the concept of servitisation is not new, PSS models challenge the prevailing understanding of the interaction between provider and customer. Customers unsure what to expect from a PSS solution favour the traditional product-sales model.
6		ADMINISTRATIVE BURDENS	Most PSS models require a complete overview of, e.g., stock, solutions in use, monthly payments, etc. PSS can be administratively heavy and costly if no digital tools can facilitate the administrative tasks. Implementing and using IT solutions can be challenging for PSS providers and consumers.
6		VALUE CHAIN CONFIGURATIONS	Many PSS providers are not manufacturers or designers but part of business ecosystems and complex value chains. To provide an economically viable PSS model, it can be necessary to adjust, e.g., a product's durability, reparability, or design, as maintenance and repair costs can be a significant expense.
7		DEMAND FOR DOCUMENTATION	Circular PSS solutions require documentation if the (environmental) benefits are to be utilised in marketing. This is not expected to the same degree for linear models. PSS providers must spend more resources documenting their value chain and impact - distorting the market conditions for circular PSS solutions.
7		PRECONCEIVED NOTIONS OF PSS	Preconceived notions or expectations of PSS solutions from consumers can be challenging for PSS providers to overcome. For example, the PSS solution is costly (not considering the Total Cost of Ownership) or will be unhygienic or unsafe.
7		LOW APPEAL	The low appeal of PSS solutions is challenging PSS providers, as it hinders a viable demand. PSS providers point to a lack of awareness of PSS solutions' potential environmental and economic benefits as the root cause of this barrier. PSS providers further address that the barrier is most prominent in rural areas.

While all barriers reflected in the table above have been identified through interviews and workshops with various Nordic stakeholders, most barriers are likely not solely relevant from a Nordic perspective. Barriers identified through and among the Nordic PSS stakeholders share similarities with barriers identified in the academic literature on Product Service Systems¹⁷. The barrier analyses include reflections on barriers 'typical for the Nordics' to understand whether the data collection points to challenges particular for the Nordic countries.

To provide an in-depth understanding of the most common barriers to PSS in the Nordics, the following analysis seeks the root causes of each barrier, providing a solid foundation for further analysis of the regulatory framework and available tools, which all will play into the final recommendation for Nordic policymakers on how to support PSS solutions in the Nordics.

2.1 Cultural barriers

The Nordic stakeholders included in validating and prioritising barriers to PSS in the Nordics through interviews and workshops have determined cultural barriers to be the most pressing. This assessment is confirmed by articles assessing similar barriers¹⁸. Additionally, the cultural barriers are assessed as the most challenging to address by the Nordic stakeholders. The cultural barriers have been summarised into three most significant types: 'Culture of ownership', 'Preconceived notions of PSS', and 'Lack of demand'. The following section will explain potential causes and the connection between these barriers.

¹⁷ As identified in, e.g., Ritzén & Sandström, 2017; Gaiardelli et al., 2014; Alessandro et al., 2017; Van Ostaeyen et al., 2013.

¹⁸ Kirchherr et al., 'Barriers to the Circular Economy', 1 August 2018.

Culture of Ownership

Nordic PSS providers are challenged by the consumers being used to owning the products they acquire. Therefore, the benefits of, e.g., product rental and leasing, do not quickly converge. The barrier is most prominent with products assigned an emotional value, considered private, or that may contain sensitive information about the user (mainly IT).

Due to the prevailing *Culture of ownership* of products identified among the PSS providers in the Nordics, PSS providers experience challenges in conveying the benefits of PSS solutions, e.g., product rental and leasing, particularly with use-oriented models. The same applies to result-oriented models, as the culture of ownership challenges the concept of receiving a result or service rather than a product. However, this barrier is dependent on the type of product service provided. Based on the literature study¹⁹, the Culture of ownership is evaluated to be a more general barrier related to the global buy-use-throw tendencies. The Culture of ownership is therefore not considered specific to the Nordic, rather, it could be expected to be less significant due to long traditions of sharing-economy approaches²⁰. The acceptance of the sharing economy is reflected by some PSS models being widely accepted, e.g. the leasing of cars or rental of machinery, but many types of products are still new in the spectrum of PSS. Traditions also play a role in the barriers, exemplified in gift giving, where most receivers expect to keep ownership of the product given. The culture of ownership has the most significant effect on use-oriented models, as low conversion and return rates of products directly affect their ability to continue their services.

There could be many underlying reasons why the Nordic PSS providers experience the *Culture of ownership* as a significant barrier. From a customer perspective, there is a range of potential disadvantages and risks related to PSS solutions, reducing the interest in trying out alternative product-ownership configurations, such as convenience, guaranteed access or a sense of security or independence, and fear of losing control. As a consumer, owning a given product might give a sense of control over usage and availability, with no significant external aspects affecting product ownership.

The challenge conveying to customers the benefits of PSS solutions experienced by the Nordic PSS providers could be due to low actual customer benefits, as customers in some cases are expected to take on inconveniences of continuous payments, consequences of wear and tear of products, abstract concepts of functionality vs product, etc. Whether PSS providers offer actual customer benefits is, of course, dependent on the specific PSS solution. Consultations with the Nordic PSS providers indicate that most PSS solutions offer some customer benefits but that these benefits are best understood among customers in the case of PSS solutions for expensive products, short-term products and products with complex usage, maintenance and repair practices.

Preconceived notions of PSS

Preconceived notions or expectations of PSS solutions from consumers can be difficult for PSS providers to overcome, e.g. that the PSS solution will be costly (not considering the Total Cost of Ownership) or unhygienic or unsafe.

Preconceived notions are a tough barrier to address on a generalised plan, for one, because the specific preconceived notions experienced by the PSS providers are conditioned to the particular PSS case, and secondly, because it is very challenging to generalise whether there is some fairness to these *preconceived notions*. In some cases, the preconceived notions of, e.g. PSS solutions being the most expensive choice compared to product sales will be complexly right, even in a Total Cost of Ownership (TCO) and product lifecycle perspective – in other cases, it will not be a true assumption.

Many PSS providers experience customer curiosity about the concepts of PSS. Still, this curiosity comes with some, deserved or not, preconceived expectations of PSS solutions that can be a hindrance – with the

¹⁹ Egebæk and et al., 'Business Models and Product Groups for Product Service Systems (PSS) in the Nordics'.

²⁰ Belk, Eckhardt, and Bardhi, 'Handbook of the Sharing Economy'.

expectation of high costs of PSS solutions being the most challenging. Consumers in the Nordics are, in most cases, accustomed to one-time payments for products and easy discarding when the product is used (up), broken, or no longer wanted. In reality, the TCO are not always reflected in the PSS solutions either, and the potential economic cost reductions, from a consumer perspective, will often be very dependent on the acquisition costs and the habitats /situated practices of product use and maintenance.

Some PSS providers further experience that consumers fear wasting money through the PSS system, e.g. if the product does not need any service or repair in the use period or whether the membership model will make sense economically for the consumer. In some product groups, such as products for children, consumers become uneasy due to *preconceived notions*, e.g. hygiene aspects of reused products, and with electronic equipment (mobile phones, computers, tablets), there is the central issue of data safety. Other PSS providers experience challenges regarding the social acceptance of the product pooling models in particular due to the services disturbing shared public spaces or even constituting a danger to others, which have been the case with some product pooling models for e-scooters²¹. The latter example is related to the management style of the PSS models, as pooling models often will be reliant on the customers' consideration of others and the products or strict enforcement of requirements from the provider side.

Low appeal

The low appeal of PSS solutions is challenging PSS providers, as it hinders a viable demand. PSS providers point to a lack of awareness of the potential environmental and economic benefits of PSS solutions as the root cause of this barrier. PSS providers further address that the barrier is most prominent in rural areas.

Linear business models can be considered the standard practice in the Nordics. PSS tends to challenge the understanding of products and service transactions by combining the two and, in many cases, maintaining provider ownership of the product provided. This is noticeable in the demand for PSS solutions, particularly in product groups where a producer or provider ownership is uncommon and has a *low appeal* on the customers, such as machinery and equipment.

Consumers in all market types (B2C, B2B, and B2G) find the usual approach to procurement and product sales easy to access and understand. The understanding of what a PSS solution provides of added value falls short, due to a lack of awareness of the potential environmental, economic and social benefits of the solutions, as well as the added convenience and access to inaccessible products reflected in some PSS solutions. A disconnection between the general understanding of CE as desirable among consumers and the need for circular product consumption has been noted by consulted PSS providers.

The *low appeal* of continued payments, product sharing, and provider ownership has an indisputable effect on the demand for PSS solutions. The prevailing lack of awareness, coupled with a low appeal and, subsequently, low demand, often steers PSS providers towards prioritising urban markets.

The urban-centric approach embraced by most consulted PSS providers is justified by several factors. Firstly, the higher concentration of potential customers in urban areas, driven by population and business density, aligns with considerations of efficient transportation logistics. Focusing PSS services in urban settings ensures shorter product delivery and pick-up distances. Moreover, urban areas present consumer challenges, such as limited storage space and parking, making traditional ownership less convenient. Additionally, certain urban demographics tend to prefer circular consumption practices, enhancing the appeal of PSS solutions.

However, this urban-centric focus has implications. It inherently restricts the exposure of PSS solutions in rural areas, leading to reduced awareness and appeal in these regions. Longer delivery distances and a cultural preference for traditional ownership practices contribute to the lower acceptance of PSS solutions in rural settings.

²¹ Egebæk and et al., 'Business Models and Product Groups for Product Service Systems (PSS) in the Nordics'.

2.2 Technical barriers

Nordic stakeholders consulted generally perceive the identified technical barriers to be among the least pressing is that, based on interviews and workshops, technical barriers are generally considered less critical. This viewpoint aligns with the broader perspective found in the literature that examines similar challenges²². Although many technical issues can be resolved through outsourcing, it's crucial to address them since this may not always be a viable option for all PSS providers, particularly SMEs.

The identified primary technical barriers include the absence of standard solutions/systems, administrative burden, and the demand for documentation.

Lack of standard solutions/systems

General lack of standard solutions for business logistics, stock overview, payment systems, etc. The need for investments in digital solutions specific to each business model can be economically straining

There is a general absence of different types of IT solutions, e.g. logistics, stock overview, and payment systems, that can accommodate the complexity of a PSS solution. While the development of new and specified IT solutions is needed in most cases for a PSS model to function, this burden can often not be borne by a single provider, especially if it concerns an SME. Therefore, some standardised technical solutions could be developed to benefit several PSS providers simultaneously.

One commonly required solution/system is a payment system capable of facilitating continuous payments from customers and payback solutions. In the case of use-oriented models, an IT system enabling a comprehensive stock overview is often essential. This ensures the availability of requested products and provides insights into return rates and the popularity of various items. The manual maintenance costs associated with overseeing these aspects challenge the economic viability of PSS solutions. Consequently, many consulted providers have invested in developing digital solutions tailored to their business models.

In particular, start-up PSS companies and those in newer PSS product groups are particularly affected by the lack of standard solutions, as they have fewer resources for establishing their business models. Conversely, for well-established businesses that offer PSS solutions as an add-on, the economic cost of developing an IT solution has a relatively smaller impact on the viability of the PSS solution. This also holds true for businesses within well-established product groups and models, such as leasing cars or offering rental services for office equipment.

Data collected and analysed from existing technical solutions could provide an overview of the benefits of PSS, including the associated environmental, social, and economic benefits, as well as suggestions on how to maximise these benefits based on user profiles. These solutions could provide more specifications and guidelines within different product groups to assist in the development and iteration of PSS solutions, e.g., how long the user period should be, how many returns are needed, what kind of logistics to use, type and options for take back or recycling by the end of life, how to test before full scale, how to optimise PSS providers offerings and maximise profits or take-backs, assist customers in the optimisation of use patterns, etc..

Administrative burden

Most PSS models require a full overview of, e.g., stock, solutions in use, monthly payments, etc. PSS can be administratively heavy and costly if no digital tools can facilitate the administrative tasks. Implementation and use of IT solutions can be challenging for both PSS providers and consumers. Lack of technical knowledge about sustainable strategies, production data, and procurement criteria hinders the development and successful implementation of a PSS solution.

²² Kirchherr et al., 'Barriers to the Circular Economy', 1 August 2018.

Most of the identified PSS solutions in the Nordics rely heavily on online platforms when providing their product services. However, several PSS providers express how implementation and use of technical solutions can be challenging, both internally and by consumers, due to a lack of knowledge of such systems. For some, the lack of knowledge hindering efficient operations of the PSS solutions is related to the educational background of the operators and the challenges of finding skilled workers. While it can be assumed that it can be a challenge to find skilled workers for businesses in general, a few PSS providers highlighted that this specific challenge does not apply to them, as job applicants target their PSS models due to the perceived sustainability of this type of business model. Among the users, the self-service set-up of many PSS solutions accommodates customers with experience in e-commerce to a greater extent. On account of the increase in e-commerce during covid, this aspect of the barrier is most likely only challenging to PSS providers targeting the elderly population.

Connected with the *Lack of standard solutions*, many PSS providers struggle with the *Administrative burden* related to the upkeep of PSS solutions. In some cases, the *Administrative burden* is not reduced enough with the development of a specialised IT solution, leading to continued challenges as the specialised IT requires continuous updating with the development of new markets and offerings. These challenges are often more hindering in the start-up phase of the PSS business model, as it generally is more challenging to interpret one's own PSS systemically at this point. In the start-up phase of a PSS business, the *Administrative burden* is further reinforced by the process of identifying relevant competencies and ensuring efficient knowledge sharing internally.

Most PSS models require a complete overview of stock, solutions in use, monthly payments, etc. Many PSS solutions identified in the Nordics benefit from being very data-driven, especially if a large product-service variation is provided. The challenge is mostly related to the processing of the data, as this often requires professional and technical knowledge. *Administrative burdens* are related to the pricing of the product services since aspects of reusability, maintenance, repair, and a higher amount of data processing are often included in the pricing, forcing PSS providers to increase pricing to cover expenses.

Demand for documentation

Circular PSS solutions require documentation if the (environmental) benefits are to be utilised in marketing. This is not expected to the same degree for linear models. PSS providers need to spend more resources documenting their value chain and impact - distorting the market conditions for circular PSS solutions

Demand for documentation is, to a greater extent affecting all types of businesses proclaiming to be circular, sustainable, or green, due to an increased focus on green claims and misleading marketing. The transition to circular economy processes is often long and complex as entire value chains must be mapped and adjusted to the new design-, production-, and distribution practices. Documentation of the circularity of a product service, as with product sales, must be in place and be verifiable by a third party to ensure that the marketing of the solutions is in compliance with the environmental marketing regulations in Nordics.

While the *Demand for documentation* of environmental benefits is not greater than for product-sale business models, in the context of green claims and marketing regulation, PSS providers have some additional challenges due to the complexity of the PSS value chain and the insufficient understanding of environmental reductions when continuously recirculating a product. Therefore large investments are often required to prove the circularity and sustainability of the PSS concept. As very few industrial environmental assessments have been done on PSS solutions, there is not much help to get for the PSS providers. Well-established PSS solutions in larger enterprises might be able to procure environmental assessments of their product(-services), which often would be too large an investment for SMEs.

The barrier *Demand for documentation* illustrates the difference in opportunities for SMEs and large enterprises, indicating the potential distortions created by marketing legislation. While the barrier is not unique for PSS solutions in the Nordics, the circular practices of SMEs providing PSS solutions might be suppressed, as the economic benefits of the circular practices, e.g., appealing to environmentally conscious consumers, will be unachievable.

2.3 Economic & market barriers

There is a general agreement among Nordic stakeholders that economic and market barriers, in most cases, will be very significant in a business context. While the economic and market barriers have not been determined as the most pressing barrier hindering PSS in the Nordics, the economic barriers have been recognised as significant. This is especially pertaining to the start-up phase of a PSS solution or business model development. *The economic and market barriers have been summarised into the three most significant: Investments, Competition with product sales, and Value chain configurations.* The following section will provide an understanding of potential causes and the connection between these barriers.

Investments

Many PSS models require a high initial investment to achieve the necessary stock amount. However, there is a lack of understanding of PSS solutions from banks and investors in, e.g. the ability to generate revenue, making it challenging for start-ups to receive a loan or funding. This especially challenges start-ups or when exploring new business areas or concepts.

Consumers in the Nordics are accustomed to the availability of a large selection of products. To be able to deliver good services and compete with traditional product-sale models, PSS models, therefore, require a high initial stock, which can be particularly difficult to achieve for PSS providers. Compared to product-sales business models, where stock changing stock will depend on consumer demand, seasons and value chain availability, an extra layer is added for PSS, as the coupling with services requires additional skills, time, resources and logistics to ensure availability of the product service.

Despite the normalisation of use-oriented PSS solutions in the Nordics²³, many PSS providers experience that financial institutions, such as banks and funding bodies, a lack of understanding of PSS models in particular, and there is a general distrust in the PSS models' ability to generate revenue. The restraint in investing in PSS solutions, from the perspective of the financial institutions, could be accounted for uncertainties about the value of the used products, as the bankers and investors will have to calculate their own risk of granting a loan or providing funding. When products are used multiple times by different customers, the value that can be extracted from the products in case the PSS business goes bankrupt is unclear. If the used products have little to no value, or there is not a mature second-hand market, the value of the PSS business lies in the intangible services provided instead of the product. This could be seen as a high-risk *investment*, as there will be virtually no remaining value in the PSS company in case of bankruptcy and, therefore, no way for the investor to regain the capital invested. Consequently, it can be challenging for PSS providers to find investors and gain access to bank loans for business development, expansion, development of IT systems, an increase in product stock etc. The low *investment* willingness establishes a basis for distortion in access to the market since the competitive position of PSS models against traditional product sales models is further weakened.

Reluctance in investment is a barrier is considered as particular in the Nordics, as multiple Nordic PSS providers has experienced a great investment willingness in other European countries. The reluctance should ease as PSS builds a 'track record' of success in terms of building markets and returning profits. The challenge with *investments* is also viewed differently between PSS providers, depending on the type of PSS model and the type of product-service offered.

Competition with product sales models

While the concept of servitisation is not new, PSS models challenge the prevailing understanding of the interaction between provider and customer. Customers unsure of what to expect from a PSS solution favour the traditional product-sales model.

²³ Egebæk and et al., 'Business Models and Product Groups for Product Service Systems (PSS) in the Nordics'.

Competition with product sales models can be considered an anticipated market condition for most PSS solutions. Product-sales models are so culturally engrained in the understanding of consumption in the Nordics that many PSS providers experience the *competition with product sales* as very challenging²⁴. When customers are unsure of what to expect from a PSS solution, the experience of some PSS providers is that the more well-known product-sale solution will often be favoured. In contrast, some PSS providers experience no significant *competition with product sales models*. The latter is often the predominant experience of providers offering PSS solutions that differ significantly from the typical product sale interaction, either through unique added-value offerings, creation of accessibility of otherwise inaccessible products, or case-by-case specialisation of the product-service offered.

The risks and disadvantages of PSS solutions might be an important factor as to why some PSS providers experience steadfast *competition with product sales models*. PSS solutions are not all benefits, and there are, generally speaking, some risks present for the consumers that are not present with product sales. Customers could fall short of payment one month or changes in fees, with the risk of losing a product-service they are reliant on. If the ownership is with the customer, they would be able to sell the product if they fall short on money – this gives some extent of security. Another major risk of PSS solutions is the bankruptcy of the PSS provider, leaving the customer with limited options for action. Many of the PSS providers consulted are aware of these risks for the customers, and they mitigate and reduce the customer risks. However, the PSS providers are also at risk of, e.g. customers withholding products and/or payment.

Value chain configurations

Many PSS providers are not manufacturers or designers but part of business ecosystems and complex value chains. To provide an economically viable PSS model, it can be necessary to adjust, e.g., a product's durability, reparability, or design, as maintenance and repair costs can be a major expense.

Many of the PSS providers consulted can be classified as SMEs, which often means that they need to provide added services themselves or are reliant on good partnerships in the value chains. The PSS providers that have not been able to establish good partnerships within their value chain are often challenged by the need for very durable and repairable products to facilitate the often increased utilisation through the product service provided. Most identified and consulted PSS providers are not manufacturers themselves, but rather they are a part of business ecosystems that, at times, entails very complex value chains. This is both identified as an advantage and disadvantage by the consulted PSS providers. On the one hand, the economic viability of PSS models is very dependent on, e.g. product durability, as maintenance and repair costs are a significant expense, especially for use-oriented models. On the other hand, PSS providers have partnered with larger enterprises on take-back systems and stock building.

While reuse, recycling and refurbishment have been recognised by the Nordic governments as desirable, PSS providers experience that the publicly facilitated structures for recycling are not up to date, limiting the accessibility to recyclable materials. PSS providers utilising recycled materials or secondary raw materials, which can assist states and industries in reducing waste generation, have experienced hindrances of uptake of these materials by regulation, a lack of willingness among industries or municipalities, or the economic viability of collection, separation, and transport.

2.4 Regulatory barriers

There is a general agreement among Nordic stakeholders that regulatory barriers have a great impact on both the opportunities for innovative action and incentive structures for both consumers and business providers. All of the identified regulatory barriers included in the analysis were ranked top five of the most significant barriers, of which the most significant was deemed to be a *Lack of supporting regulation*. The following section will further include the barriers, *Lack of legislative & financial guidance*, and *Existing*

²⁴ Egebæk and et al.

requirements to provide an understanding of the barriers, potential causes and the connection of these barriers.

Lack of supporting regulation

Regulatory incitements for PSS (e.g. fee and tax systems favouring reuse) are lacking in the Nordics. Consultations with PSS providers indicate that the financial conditions for SMEs are challenging due to the need for high start-up capital.

Several PSS providers describe how the existing regulation does not support PSS solutions integrated circular functions, constituting barriers in a wide range of areas. Most of the impacted PSS providers address how the regulatory framework is conditioned to linear business models, by which the regulatory framework becomes a disadvantage for PSS providers. The lack of regulatory incitements for PSS, like fees and tax systems favouring reuse, constitutes a structural lock-in hindering innovative business models supporting reuse, recycling, refurbishment etc., which typically entail more labour. Furthermore, the consultations with the PSS providers indicate that the financial conditions for SMEs, e.g. when setting up business bank accounts or payment systems, can be challenging due to an expectation of high start-up capital. This challenge is most likely not isolated to PSS solutions; however, the challenge is very visible due to the lack of familiarity with PSS solutions in financial institutions.

When looking at the EU assessments of the Nordic countries' facilitation and implementation of CE parameters, they are often ranked among the most developed²⁵. However, CE-oriented PSS providers consulted experience very few supporting actions from governmental institutions. Market conditions are seen as very rigid, and some of the CE-oriented PSS providers experience a general lack of incentive and transition support from governmental institutions. The lack of supporting regulation is described as a significant barrier to achieving the desired circularity of the product services of the CE-oriented PSS providers. Some of the experienced rigidity can be associated with a lack of government-facilitated market incentive structures, such as tax or VAT reductions, implementation of EPR systems, and access to publicly collected recyclable waste. However, these market incentive structures are, in themselves, not always enough, as illustrated by the tax reductions for repairs in Sweden²⁶.

Lack of legislative & financial guidance

Specific guidance on legislation and policies relevant to PSS is missing, especially regarding the rights and requirements of providers and consumers. This affects PSS providers' ability to comply with legislation and to prepare for forthcoming legislation and policies such as extended producer responsibility.

While there are many public offers for circular business models, many PSS providers have expressed a dire need for guidance on the legislation relevant to PSS, as there is great confusion on when legislation does and does not apply to PSS models. One of the major concerns addressed by the PSS providers related to the rights and requirements of the provider and the consumer, particularly when it comes to the use-oriented models. PSS providers have struggled to find guidance and even legislative guidelines on when a product can be deemed stolen when rented out to a customer that does not return the product upon the agreed time. The same challenge applies when a product is rented out to a customer that stops payments but remains in possession of the product. The lack of understanding and guidance on the regulatory framework for PSS in the Nordics affects the PSS providers' ability to comply with legislation and prepare for forthcoming legislation, such as extended producer responsibility. When PSS providers are unable to provide the customers with clear guidance on customer and provider rights, requirements etc., the PSS providers are at risk of appearing untrustworthy. The lack of legislative guidance can thereby directly affect the PSS providers' ability to attract and preserve customers and customer relations.

²⁵ Halonen et al., *Sustainable Development Action – the Nordic Way*.

²⁶ skatteverket.se, 'Rotarbete och rutarbete'.

PSS providers further experience a general lack of guidance on financial options to support the development and operations of their businesses. A wide range of consulted PSS providers have had, or continuously have, challenges finding suited payment systems that can facilitate rental or take-back solutions. They further find that there are major barriers related to gaining access to fitting bank accounts, bank loans or funding opportunities, hindering especially start-ups providing PSS solutions from accessing or establishing well onto the market. Consulted PSS providers who have tried gaining access to other European countries, such as Germany and Holland, have not experienced the same challenges and generally highlight that there is a better understanding of PSS solutions and circular business models in the banking and financial sectors in these countries.

Existing requirements & restrictions

Since most regulatory frameworks are conditioned to linear business models, some requirements and restrictions constitute barriers for PSS models, e.g., public procurement criteria, requirements for revision, certification schemes, legal product ownership configurations, and labelling.

With the regulatory framework conditioned to linear business models, some existing requirements and restrictions are perceived as rigid and inflexible in establishing PSS models. Stakeholders mention requirements for revision, certification schemes, legal product ownership configurations, and labelling among the PSS-specific barriers in the current Nordic regulatory framework. In particular, the use-oriented models are affected by these barriers that hinder, e.g., business insurance, innovation of the market, and environmental reporting.

The existing requirements and restrictions also relate to the regulatory guidelines and definitions of waste. For CE-oriented PSS providers trying to implement recycled materials and used or refurbished products, the waste classification systems can be a challenge. These are, e.g. relevant to take-back solutions for EoL products, where the line between waste and refurbishable products can become unclear.

Public procurement requirements and restrictions are one of the biggest challenges for PSS solutions operating under the Nordic regulatory framework. Due to rigid frameworks for public procurement, only a few identified PSS providers target the B2G market. Although the public procurement framework differs to some extent in the Nordics, a common denominator is the need for more inclusion of circular business models in procurement criteria. The primary challenge is the overarching focus on the economic aspects of GPP. The barrier is highly dependent on the product group, as procurement criteria differ based on the product type. Some PSS providers have successfully targeted the B2G market, e.g. within Machinery & equipment; Appliances, furniture & home products; and Electronic equipment & solutions. All of these product group clusters have relatively higher acquisition prices and a need for more specialised maintenance.

2.5 The interconnectedness of the barriers

The barriers evaluated above are not strictly bound to the four categories, cultural -, technical-, economic & market- and regulatory barriers. All categories and barriers are interconnected at some level. This means that a transition to alleviate one barrier can result in a chain reaction – good or bad – in another area. The analysis of each barrier and the interconnectedness emphasises that the challenges of the PSS providers are closely interrelated in a dynamic web. Therefore, the identified barriers reflect interdependence. When seeking to improve the framework conditions for PSS models in the Nordics, it is likely necessary to focus on several areas at the same time. To unveil an understanding of the root causes of the challenges for PSS in the Nordics, the barriers must therefore be assessed relative to one another, enabling the identification of possible intervention points to be undertaken to break the inclined chain reaction²⁷.

²⁷ Kirchherr et al., 'Breaking the Barriers to the Circular Economy'.

Figure 5 below provides an overview of the complex interconnectedness between all identified barriers to PSS in the Nordics, including those that have been validated and prioritised by Nordic PSS stakeholders. Figure 5 illustrates how all barriers are affected by other barriers within the same category as well as barriers from other categories. The complexity of the models challenges a direct translation of which barriers are impacted by which.

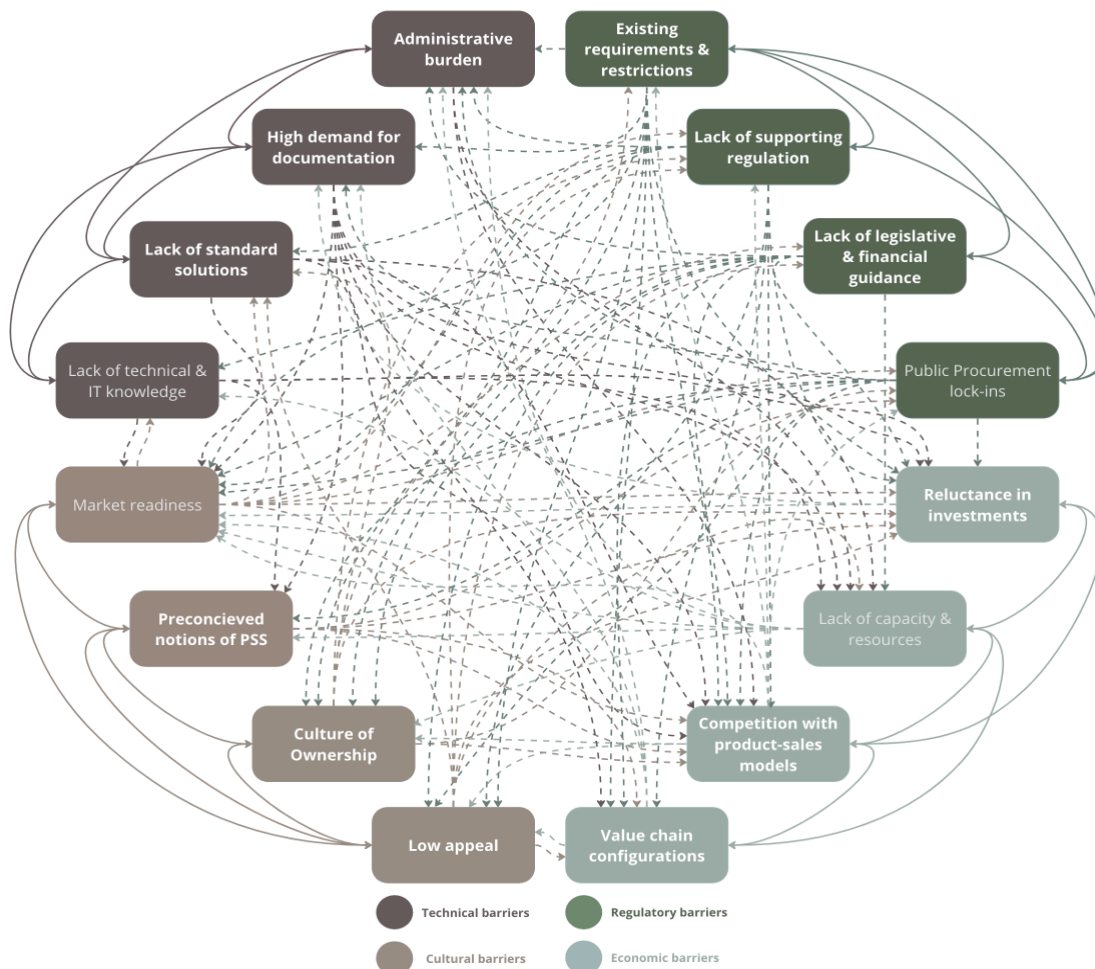


FIGURE 5 – Barrier web - Interconnectedness between barriers to PSS in the Nordics

The technical barrier *Lack of technical & IT knowledge*, regulatory barrier, *Public Procurement lock-ins*, cultural barrier, *Market readiness*, and economic & market barrier *Lack of capacity & resources* were not viewed as generally associable across all sectors. Rather these barriers were identified as sector-specific. The four barriers have been validated similarly to the cross-sectoral barriers and are therefore included in the following discussion.

Unravelling the barrier web

Based on the evaluation of the most significant barriers to PSS providers in the Nordics and the assessment of the interrelations between all validated barriers, it is clear that the cultural barriers are the category with the strongest link to all the other categories. Both organisational culture and consumer behaviour play an important part in the development, operations and success of innovative business models such as PSS solutions. Innovation and circular economy are, in theory, and empirically, often highlighted as desir-

able pathways for businesses and consumers due to idealistic, economic and environmental reasoning^{28,29,30}. The cultural barriers for PSS have similarities to the main cultural barriers to circular economy (CE) transition in the EU, as stated in the literature, e.g. hesitant company culture, limited willingness to collaborate in the value chain, lack of consumer awareness and interest, and operating in an optimised linear system as a niche business model³¹. Limited consumer acceptance is a well-studied barrier to CE, and the identified PSS barriers, *Culture of Ownership* and *Preconceived notions of PSS*, share similarities with the barriers to CE rooted in minimal consumer awareness and interest in exploring new business models³². The cultural barriers *Low appeal*, and *Market readiness* identified throughout the project hint at a dissonance between the apparent desirability of the innovation and circularity embedded in most PSS solutions and the actualised consumer behaviour. While it can be argued that PSS solutions such as product renting and leasing have been around in the Nordics for a long time, it does not seem to have the same psychological appeal as owning a product.

*"I think this is because the rental concept for clothes is still not normalised in Denmark, and it is not part of the Danes' consciousness. The Danes are only just getting used to being able to rent (...)"*³³

The concept of provider product ownership is still unusual for consumers accustomed to having any given product available at their convenience. The thought of not owning a product can alienate consumers stuck in the predominant *Culture of ownership*. The *Culture of ownership* is highly linked to the *Preconceived notions of PSS*, where consumers' expectations of PSS solutions being, e.g. costly, unhygienic, or unsafe, further affects barriers in the economic barrier category and, in particular, the regulatory barriers *Existing requirements* and *Public procurement lock-ins*. While most Nordic countries have increased the focus on including sustainability in public procurement, public procurement tenders and the habits of public procurers can still be too rigid to include PSS solutions properly³⁴. *Preconceived notions of PSS* play a role in the public procurers' selection of products and/or services, which are often based on well-known and former procurement patterns – despite a wide range of good practice examples³⁵, the total cost of ownership (TCO) calculation tools³⁶, and academic literature praising other solutions^{37,38,39}.

*"There are enough references and good examples, but often it is still not enough to convince the customers. Challenges are visible in the finance departments in the public sector. (...) There is a conservative attitude about what has always been done and a focus on the price instead of operation"*⁴⁰

The *Competition with the product-sales* barrier mostly affects the *Low appeal* in a B2C and B2B perspective as PSS providers have to take the role of the 'convincer' in relation to the consumers. With PSS solutions, consumers' doubts about the rights, e.g. if a product is damaged; the total price, e.g. with subscription services; and quality, e.g. due to multiple users of a product, will have to be addressed by the PSS provider. Due to regulatory barriers, especially the *Lack of supporting regulation* and the *Lack of legislative and financial guidance*, PSS providers experience unclarity in the responsibilities and rights of providers and consumers in between. Therefore, PSS providers are not always able to convey the rights and responsibilities of both the consumer and the provider. The lack of awareness of the potential cost-savings of PSS

²⁸ Szilagyi et al., 'Consumers in the Circular Economy'.

²⁹ Bertassini et al., 'Circular Economy and Sustainability'.

³⁰ Scipioni, Russ, and Niccolini, 'From Barriers to Enablers'.

³¹ Kirchherr et al., 'Barriers to the Circular Economy', 1 August 2018.

³² Ranta et al., 'Exploring Institutional Drivers and Barriers of the Circular Economy'.

³³ Danish PSS provider in the machinery & equipment product group cluster, interview conducted the 14 February 2022.

³⁴ CE policy expert from the organisation Danish Industries, interview conducted the 31 October 2022.

³⁵ European Commission, 'GPP Good Practice - Environment - European Commission'.

³⁶ The Danish Environmental Protection Agency, 'Hvad er totalomkostninger?'

³⁷ Bratt et al., 'Assessment of Criteria Development for Public Procurement from a Strategic Sustainability Perspective'.

³⁸ Camilleri, 'The Circular Economy's Closed Loop and Product Service Systems for Sustainable Development'.

³⁹ Lăzăroiu et al., 'Environmentally Responsible Behavior and Sustainability Policy Adoption in Green Public Procurement'.

⁴⁰ Danish PSS provider in the machinery & equipment product group cluster, interview conducted the 14 February 2022.

solutions from a TCO perspective is also reflected among the public procurers, making PSS solutions seem expensive compared to offers only reflecting the acquisition price of a product. This reflects the connection between the *Low appeal* and the *Lack of legislative and financial guidance*. Further, the *Lack of supporting regulation* for PSS in the Nordic challenges accessibility to the B2G market, as public procurers are restricted by rigid procedures⁴¹:

“They (the municipality of Copenhagen, red.) have a lot of good intentions, but they are locked in by rules and procedures, which means that they cannot take the decision (to utilise the PSS solution, red.) or there is some legislation that means they do not have the legal basis to buy our product-service”⁴²

Succeeding in changing lock-ins and rigid structures for public procurement, making PSS more of an option in procurement processes is considered a major driver for PSS. The big differences across products, utilisation scenarios and business models make the PSS field appear complex and challenge the establishment of general guidelines and cost estimates. Furthermore, knowledge of products' environmental impact is generally insufficient and difficult to demonstrate, as no standard calculation model can yet embrace the complexity and variation of all PSS solutions and *Value chain configurations*. The lack of documentation and the *high demand for documentation* reflected in technical barriers challenge the acceptance of PSS, especially in a public procurement context. A thorough understanding of the products and their value chain requires specific insight and knowledge, which very few PSS providers have. Therefore, it is unclear whether PSS models actually achieve environmental benefits. Some PSS solutions can clearly be considered more harmful if there is a poor focus on product quality, utilisation practices, etc.. The environmental benefits or cost saving will therefore have to be assessed on a case-by-case basis, challenging general recommendation on when a PSS is beneficial and when it is not. A method to easily assess the environmental impacts for the providers to improve and advertise the benefits of their PSS model is therefore considered necessary to penetrate the Nordic market fully.

Many PSS providers consulted are missing different types of *standard IT solutions*, e.g., logistics, stock overview, and payment systems, that can accommodate the complexity of a PSS solution. Some of the PSS providers consulted further have challenges with finding standard (IT) solutions that fit their *technical and IT knowledge* skills. While IT solutions might be more or less crucial for a PSS provider (depending on the PSS model, product-service provided, target market etc.), all PSS providers need a sufficient payment system that can facilitate continuous payments from the customers and possibly payback systems.

“It is one of the biggest barriers, both in regard to the start-up (phase, red.) and in regard to the competition, as there are no ‘off the shelf’ solutions for circular business models. There is no digital solution available to facilitate circular business models, and there is no help available. Therefore we have had to build up everything from scratch”⁴³

The *Lack of standard solutions* has driven many consulted providers to invest in developing digital solutions specialised for their business model. This is a very expensive process and can have a negative effect on the development of standard solutions, as the economic gain for software developers is greater when developing individual systems, as tailored solutions yield more revenue. Start-up PSS companies and SMEs are the ones most affected by the *Lack of standard solutions*, as the capital often is small in the start-up phase or for SMEs. However, payment systems, stock overview systems etc., are an essential part of the operations of most PSS solutions. Therefore, the lack of standard solutions suited to PSS models can have a delaying effect on the further development, market stability and improved *value chain configurations* of the start-up and SME PSS models.

For well-established businesses, the economic cost of developing an IT solution does not have as much of an effect on the viability of the PSS solution, as capital, in most cases, will be available or easier to access through, e.g., bank loans. For most PSS providers, the investments in technical devices used for manufacturing processes, workers with additional or specialised skills, tools, spare parts and spatial conditions to

⁴¹ Kirchherr et al., ‘Barriers to the Circular Economy’, 1 August 2018.

⁴² Danish PSS provider in the transportation product group cluster, interview conducted the 24 February 2022.

⁴³ Danish PSS provider in the Products for Children product group cluster, interview conducted the 23 February 2022.

provide added value through additional services, e.g. maintenance and repair, can be challenging due to the time consumption and expenses needed to make these changes. This, paired with a general experience of *Reluctance in investments* among financiers, makes business expansion challenging.

Financiers, accustomed to conventional investment practices and calculations of economic risks and benefits, pose challenges for innovative PSS businesses. Traditional financial norms, such as recouping investments within 1-3 years, clash with PSS models, which often entail a more gradual revenue stream. Additionally, consumer hesitance arises due to a focus on immediate economic costs, making it difficult to assess the long-term affordability of PSS. The perceived financial insecurity of PSS, compounded by a lack of demonstrations and quantification models, contributes to a general skepticism and hinders investment. Moreover, despite the prevalence of certain PSS solutions in the Nordics, a widespread lack of understanding persists, partly due to the diverse nature of PSS models and their intricate revenue structures.

This generates a range of challenges for PSS providers, most prominent in the start-up phase or when expanding business areas - concepts or in the development of new products and PSS configurations. The lack of understanding of the risks and liabilities of PSS models in financial institutions provides the grounds for potential misconceptions and distrust in the ability to generate revenue. At the same time, it can be reasonable to expect that financial institutions could improve how they estimate the risks of PSS solutions in a funding interaction; it cannot be expected to be their sole responsibility. PSS providers seeking investments should also be expected to provide some the same extent of proof of profitability as a product sales model and actions to prevent bankruptcy or actions from stopping the business. At the same time, there is still sufficient residual value left in the company (e.g. stock sales, recurring revenues, absence of heavy liabilities) to pay back their loans.

2.6 Sub-conclusion

In the previous section, an in-depth evaluation of Nordic cultural, technical, economic, and market, as well as regulatory barriers to PSS implementation and market advancement, was conducted. This assessment was built upon insights from over 40 interviews with pertinent stakeholders across the Nordic region. The findings were subsequently subjected to thorough triangulations and validation processes involving stakeholders, enhancing the robustness of the analysis.

Cultural Barriers

Among the identified barriers, the Culture of Ownership, Preconceived Notions of PSS, and Low Appeal emerged as the most notable cultural challenges in adopting PSS in the Nordics.

- The Culture of Ownership was identified as the most substantial barrier, deeply ingrained in consumers' preferences and practices. It is a challenge deeply rooted in societal norms and practices, where personal ownership of products is deeply valued and embedded. Addressing this barrier requires significant collaborative efforts to reshape and transform well-established consumption patterns and mindsets. Overcoming the Culture of Ownership barrier demands strategic campaigns, educational initiatives, and innovative marketing approaches to gradually shift consumers' mindsets toward more collaborative and sustainable consumption models like PSS.
- Preconceived Notions of PSS emanate from a consumer disconnect with a product's Total Cost of Ownership (TCO), leading to a lack of consideration for the comprehensive lifecycle costs and environmental repercussions associated with the product. This detachment from the complete lifecycle of a product hinders a clear understanding of the value proposition that circular business models, such as PSS, can bring to the table.
- The Low Appeal barrier revolves around PSS providers' ability to communicate and persuade consumers of the benefits of the PSS models, which are often associated with higher consumer costs compared to traditional product sales.

Technical Barriers

Technical challenges encompass Lack of Standard Solutions/Systems, Administrative Burdens, and Demand for Documentation.

- The Lack of Standard Solutions/Systems encompasses the absence of adequate IT solutions that can effectively handle the complexities of PSS logistics, inventory management, and payment systems. This challenge arises from the operational dynamics of PSS models, where seamless coordination and management of product movement, stock levels, and financial transactions are essential. The absence of standardised solutions tailored to the specific requirements of PSS models can lead to manual and time-consuming processes, affecting both PSS providers and consumers. This technical barrier highlights the need for tailored technology solutions to streamline the complexities of PSS operations, enhancing efficiency and user experience.
- Administrative Burdens arise from the manual handling of PSS logistics due to the Lack of Standard Solutions/Systems, posing challenges for both providers and consumers. Providers face increased complexities in managing their offerings, while consumers may experience delays or confusion in their interactions with the service. This technical barrier underscores the importance of efficient digital tools to automate and streamline PSS logistics, alleviating the administrative burdens for all stakeholders involved.
- The Demand for Documentation is, to a greater extent, affecting all types of businesses proclaiming to be circular, sustainable, or green. This reflects the growing emphasis on green claims and misleading marketing. However, due to the complexity of their solutions, PSS providers are particularly challenged in assessing the PSS value chains and related emissions and impacts.

Economic and Market Barriers

Significant economic and market barriers include Investments, Competition with Product Sales, and Value Chain Configurations.

- Gaining access to Investments presents a challenge for many PSS providers. Financial institutions, including banks and funding bodies, often exhibit a lack of comprehension regarding PSS models. This lack of understanding is compounded by prevailing scepticism about the revenue-generating potential of PSS models. As a result, PSS providers encounter barriers in securing the necessary financial support to establish and grow their ventures.
- Competition with product sales models is a recurring challenge anticipated by most PSS solutions. The deeply rooted cultural preference for product-sales models in the Nordics has led to a strong association between consumption and ownership. Consequently, many PSS providers confront fierce competition with traditional product sales models, which often come at a lower cost due to the prevailing Nordic consumption patterns. This challenge poses a significant obstacle to the PSS businesses' ability to establish their presence in the market.
- Value chain configurations present a distinct challenge for small and medium-sized enterprises (SMEs), primarily due to the requirement for exceptionally durable and repairable products. These attributes are essential to facilitate the extended product utilisation typically associated with PSS offerings. For SMEs operating within the PSS framework, ensuring the longevity and reparability of their products becomes pivotal in optimising the benefits of their service-oriented approach.

Regulatory Barriers

The most notable regulatory barriers encompass Lack of Supporting Regulation, Lack of Legislative and Financial Guidance, and Existing Requirements and Restrictions.

- The Lack of Supporting Regulation is intricately tied to the prevailing regulatory landscape predominantly geared toward linear business models. This incongruence between the existing regulatory framework and the principles of PSS places PSS providers at a disadvantage. The absence of

regulatory incentives, such as fees and tax systems that promote reuse and circular practices, further exacerbates this situation. This lack of supportive regulations creates a structural lock-in that hampers the growth of innovative business models centred around reuse, recycling, and refurbishment, all of which often require a greater emphasis on labour-intensive processes.

- The Lack of legislative and financial guidance compounds the challenges PSS providers face, introducing significant uncertainty regarding the applicability of legislation to PSS models. This ambiguity extends particularly to understanding the rights and responsibilities of both providers and consumers within the PSS framework. The absence of clear guidance leaves PSS providers navigating complex legal landscapes without a well-defined roadmap. This lack of clarity can deter potential providers from entering the PSS market, fearing legal pitfalls and non-compliance issues.
- With the regulatory framework conditioned to linear business models, some of the Existing Requirements and Restrictions are perceived as rigid and inflexible in establishing PSS models. Stakeholders mention requirements for revision, certification schemes, legal product ownership configurations, and labelling among the PSS-specific barriers in the current Nordic regulatory framework.

Given the intricate interconnections among various barrier categories, addressing any single obstacle can potentially trigger a cascade of effects, both positive and negative, across other domains. These barriers collectively signify an underlying challenge within the Nordic transition towards a circular economy. The hurdles confronted by PSS providers in the region serve as indicative of the prevailing linear societal norms that underpin the majority of existing systems. This status quo underscores the need for systemic change to align with circular economy principles.

Consequently, this report's subsequent section entails a comprehensive evaluation of the regulatory framework governing PSS and circular business models in the Nordic context. This assessment is intended to form the basis for constructing actionable recommendations to Nordic policymakers, aiming to bolster the growth and success of circular PSS solutions across the region. Through targeted policy interventions, the objective is to stimulate the evolution of a supportive ecosystem that can effectively nurture and scale PSS models, propelling the Nordics closer to their circular economy aspirations.

3 REGULATORY FRAMEWORK FOR PSS IN THE NORDICS

Barriers and incentives for the implementation of PSS are highly affected by the regulatory framework in the Nordics. Only a few identified policies directly aim at fostering PSS. Instead, policies tend to indirectly promote PSS by creating the right framework conditions or supporting the supply and demand of circular products and services. Furthermore, regulations and policies can unintentionally create barriers to the development of PSS.

The Nordic countries' regulatory frameworks differentiate as a consequence of national laws and the respective membership status in the European Union (EU). Although only Denmark, Finland, and Sweden are members of the EU, Norway and Iceland are closely linked to the EU through their membership in the Agreement on the European Economic Area (EEA). In 2019, the EU, Iceland, and Norway agreed to extend their cooperation to reduce emissions by at least 55% by 2030, compared to 1990 levels⁴⁴.

Policy instruments influencing PSS in Denmark, Finland, Sweden (and to some extent Norway and Iceland) are found on different governmental levels. Regulation impacting PSS, such as product policies, often stems from the transnational level, e.g. EU Directives or regulations. In recent years, PSS has gained more attention, and several EU strategies, such as national CE Action Plans and the textile strategy, directly mention PSS. Policy measures within the mandate of national policies in the Nordics can also influence PSS. At the local level, municipalities are closely connected to companies and can offer tailored support and facilitate the needed transition for companies and consumers towards more circular practice.

This report uses the term 'policies' as an umbrella term for strategies, regulation, legislation, and concrete policy tools, covering both direct and indirect instruments. Direct instruments are likely to focus on, e.g. obligations of PSS providers or support to PSS providers when offering their services. Indirect instruments will likely influence the demand for product services by nudging or adding pressure on consumers. Some indirect instruments can benefit both the demand and the supply side, e.g. through non-discriminatory incentives⁴⁵. Four types of policy tools have been assessed in the following analysis:

- Regulatory tools place legally binding obligations on actors, requiring them to follow the rules.
- Economic tools create incentives with, e.g. subsidies, taxes, or funding programs.
- Information tools create knowledge through campaigns, courses, or labelling schemes that enable actors to make informed decisions.
- Voluntary tools are public-driven initiatives such as partnerships, in which actors can choose to participate and thereby achieve some goodwill, influence, or other softer incentives.

The analysis relies on regulatory and legislative text, academic literature and reports, and interviews with businesses operating different PSS models, policy experts and additional relevant stakeholders. The analysis focuses on policies that broadly influence PSS across product groups, with a few highlighted examples of policies that affect PSS models in specific sectors.

3.1 EU Directives & regulation

From a multilevel perspective, the EU-Nordic relationship involves reciprocal interactions in policy-making. The Nordics influence EU Directives and regulations at two levels: The governmental (including govern-

⁴⁴ 'The European Union and Norway | EEAS Website'.

⁴⁵ Plepys, Heiskanen, and Mont, 'European Policy Approaches to Promote Servicing'.

ments, ministries, and actors, where Nordic horizontal policy-making shapes EU processes) and the organisational level comprising European groups with Nordic members, fostering Nordic priorities' integration in the EU. Here, vertical policy-making impacts EU processes.

Both levels participate in national policy-making⁴⁶. Denmark, Finland, and Sweden must implement binding EU regulations, while EU Directives set common goals for member states, adapted through individual laws and action plans⁴⁷. Norway and Iceland align their regulations and policies with EU rules based on the Directive or regulation type^{48,49}.



3.1.1 Ecodesign Directive

EU's Ecodesign Directive provides the legal framework for improving the environmental performance of products. The Ecodesign Directive establishes a framework under which manufacturers of energy-related products are obliged to reduce energy consumption and other negative environmental impacts throughout the product life cycle. A product has to comply with minimum requirements to be placed on the EU market. The Ecodesign Directive mainly affects product- and use-oriented PSS models, as these tend to be more reliant on tangible products which can be regulated according to the Ecodesign Directive. Result-oriented PSS models can consist of only intangible services⁵⁰, but the Ecodesign Directives can still be relevant for e.g. lighting-as-a-service solutions.

The Ecodesign Directive delivers energy efficiency requirements for more than 30 product groups. The European Sustainable Products Regulation (30/03/2022), replacing the Ecodesign Directive, has a broader scope and includes energy efficiency requirements as well as demands for lowered environmental impact of products in general, and material efficiency, durability, reusability, upgradability, reparability requirements for specific product groups. Specific requirements refer to exact values or limits, e.g. maximum energy consumption or minimum quantities of recycled material in the production⁵¹. While the first Ecodesign Directive solely focused on energy efficiency and only had relevance for PSS solutions utilising energy, the revision of the Directive addresses the total impact of a product⁵².

The focus is on prolonging the lifespan of products and designing products for reusability and repairability, and access to repair parts that support and improve the opportunities of PSS models - also for non-producing suppliers. As an example, Ecodesign requirements for household washing machines include aspects of resource efficiency, availability of spare parts, delivery of spare parts, and access to repair and maintenance information. Many of these aspects are an ingrained part of the PSS perspective (in particular product- and use-oriented PSS models), contributing to product durability and longer use phases. However, the high focus on products rather than services is a way to maintain the status quo where the product is the defining object, which de facto also is the focal point of most PSS solutions.

Ecodesign and energy labelling policies has resulted in annual savings in of around 175 Mtoe, equivalent to Italy's total annual primary energy consumption. This equates to a saving of around EUR 490 per household per year in energy bills⁵³. However, the EU Commission estimates that 10-25% of products covered by the Ecodesign Directive do not comply with the Ecodesign criteria and energy labelling requirements, leading to unfair competition and a loss of envisaged energy savings⁵⁴. This picture corresponds to the perception of PSS providers in the Nordics who have implemented Ecodesign and circular aspects into

⁴⁶ Sääksjärvi, 'Positioning the Nordic Countries in European Union Environmental Policy'.

⁴⁷ 'Types of Legislation'.

⁴⁸ 'The European Union and Norway | EEAS Website'.

⁴⁹ Delegation of the European Union to Iceland, 'The European Union and Iceland | EEAS'.

⁵⁰ Tukker, 'Eight Types of Product-Service System', 2004.

⁵¹ European Parliament, Council of the European Union, 'Directive 2009/125/EC - Ecodesign'.

⁵² European Parliament, Council of the European Union.

⁵³ RIES, 'REPORT on the Implementation of the Ecodesign Directive (2009/125/EC) | European Parliament'.

⁵⁴ RIES.

their business models and find themselves challenged in the competition with business models that openly ignore regulation or falsely claim to comply with the requirements.

Strengthening the Nordic market surveillance, in compliance with the Ecodesign Directive, can support PSS providers and circular business models in general. Standardisation is perceived as an essential tool to create enforceable measurement methods and parameters⁵⁵. While standardisation of measurement methods and parameters could be provided directly by the EU, Nordic standards for Ecodesign and market surveillance could also be developed through collaboration between Nordic policymakers. This could not only support PSS providers but could also influence future EU policies in the area. It is estimated that EUR 28 million can be saved in the Nordic countries if collaborative measures for market surveillance were implemented, only needing an investment of around EUR 2.1 million⁵⁶.

3.1.2 Waste Framework Directive



The Waste Framework Directive (WFD) establishes the legal framework for treating waste in the EU and the countries with membership to the EEA agreement. It sets out measures addressing the adverse impacts of the generation and management of waste on the environment and human health and for more efficient use of resources. Based on the assessment of 275 PSS solutions in the Nordics⁵⁷, all types of PSS models are affected by the WFD, as the framework should be the grounds for national targets on waste prevention, reuse, and recycling. These targets affect the incentive structure developed for waste generation reduction, reuse as part of business models, and inclusion of recycled materials in product services.

The WFD introduced new approaches to waste management in the EU member states, focusing on limiting the impacts of waste on human health and the environment. The overarching legislative framework defines the main concepts associated with waste management in accordance with CE, the waste hierarchy (figure 6), the polluter pays principle, and the end-of-waste status⁵⁸.

For the EU member states, the WFD sets out an amplitude of legally binding waste management targets to be achieved by 2025, 2030 and 2035. The WFD further sets up requirements for the member states to draw up waste management plans at a national, regional, and local level, which must be monitored. Progress must be notified to the European Commission^{59,60}.

With the revised version of the WFD in 2018, the following targets were set up for the EU member states:

- 55% preparation for reuse and recovery of municipal solid waste must be achieved by 2025;
- 60% preparation for reuse and recovery of municipal solid waste must be achieved by 2030;
- 65% preparation for reuse and recovery of municipal solid waste must be achieved by 2035.

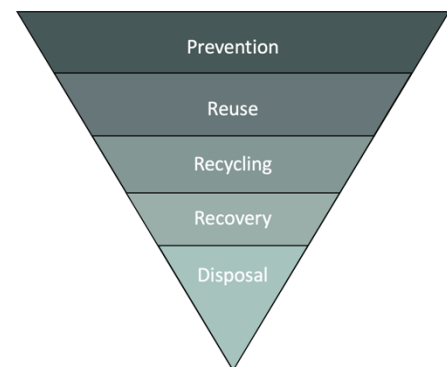


FIGURE 6 – Waste hierarchy

The WFD also fortify the need to implement measures to prevent waste generation. Further, the WFD establishes that by 2025, the European Commission will consider

⁵⁵ European Parliament, Council of the European Union, 'Directive 2009/125/EC - Ecodesign.'

⁵⁶ Larsen, 'The Nordic Ecodesign Effect Project – Estimating Benefits of Nordic Market Surveillance of Ecodesign and Energy Labelling.'

⁵⁷ Egebæk et al., 'Business Models and Product Groups for Product Service Systems (PSS) in the Nordics'.

⁵⁸ European Parliament, Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance).

⁵⁹ European Parliament.

⁶⁰ European Parliament, 'Directive (EU) 2018/851 Amending Directive 2008/98/EC on Waste.'

the framework for preparing for reuse and recycling targets for material-specific fractions such as textile waste and commercial waste, among others⁶¹.

While there are no direct effects of the WFD on PSS models, the overall focus on reducing waste generation and increasing reuse and recycling favours many of the identified PSS solutions across the Nordics. Most PSS solutions seem to be based on ideas of reuse and recycling, supporting the commercial transition to a circular economy. However, some PSS providers facilitating the uptake of waste production are challenged by classification standards availability of upcycable materials due to the waste ownership system. The access to upcycable materials is straightforward in some municipalities and in other municipalities, not a debatable option. This entails a challenge in regard to equality in regard to market conditions based on the governance of each municipality. Further, many PSS providers operate within the prevention category of the waste hierarchy with very few incentives. Through the uptake of waste and waste prevention effort, the implementation of PSS solutions in the Nordics support achieving WFD policy goals. However, the development of municipal guidelines on facilitating the uptake of waste and national incentive structures for waste prevention on a manufacturing and detail level could support increased compliance with the WFD policy goals, benefitting both PSS providers and other businesses, as well as municipalities.



3.1.3 Plastic and packaging

Packaging and Packaging Waste Directive

The Packaging and Packaging Waste (PPW) Directive sets up the legal framework for managing packaging and packaging waste, aiming to harmonise national measures. The directive is also covering countries in the EEA agreement⁶². The Directive aims at preventing and reducing the environmental impact of packaging and packaging waste⁶³. Looking at the PSS solutions identified in the Nordics⁶⁴, the PPW Directive is primarily relevant for product- and use-oriented models with value mainly in products compared to result-oriented models (with value in service). Product- and use-oriented PSS models are affected in regard to all activities related to the product, from design to disposal. In contrast, most result-oriented PSS models only will be affected in regard to use- and disposal practices. Therefore the Packaging Directive affects all types of PSS models, albeit to different degrees.

The PPW Directive provides in the preamble that those involved in the production, use, import, and distribution of packaging and packed products are aware of the waste produced based on their business practices and that they, by the polluter pays principle, accept responsibility for that waste⁶⁵. The PPW Directive covers all packaging placed on the European market and all packaging waste on an industrial, commercial, office, shop, service, or household level, regardless of the packaging material⁶⁶. After the most recent amendment in 2018, the Directive further contains measures to prevent the generation of packaging waste and promote the reuse, recycling, and other forms of packaging waste recovery, thus strengthening the Directive's contributions to the transition towards CE⁶⁷. While PSS providers could be challenged by the PPW Directive (as all other business providers in the field), many of the consulted PSS providers have already incorporated or are planning to incorporate reuse aspects of their packaging in their business model. This will provide an advantage, as the Packaging Directive entails a requirement for implementing EPR

⁶¹ European Parliament.

⁶² European Parliament, Council of the European Union, Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste (Text with EEA relevance).

⁶³ European Parliament, Council of the European Union, European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste.

⁶⁴ Egebæk et al., 'Business Models and Product Groups for Product Service Systems (PSS) in the Nordics'.

⁶⁵ Hojnik, 'Ecological Modernization through Servitization'.

⁶⁶ European Parliament, Council of the European Union, European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste.

⁶⁷ European Parliament, Council of the European Union, Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste (Text with EEA relevance).

schemes for packaging waste before 2025 for all EU member states. The actualised effect of the PPW Directive is highly dependent on the national implementation of EPR schemes in the Nordics.

The Proposal for Packaging and Packaging Waste Regulation

The EU legislation on packaging and packaging waste is evolving. The proposed revision⁶⁸, introduced in November 2022, strengthens the role of reuse in packaging waste reduction. The proposal sets the first quantitative and binding reuse targets for specific packaging formats: transport packaging, including, e.g., packaging of certain large household appliances and packaging for the transport and delivery of non-food items through e-commerce, and food and beverage packaging (hereunder sales packaging of takeaway beverages and takeaway ready-prepared food intended for immediate consumption without the need of any further preparation). Furthermore, the proposal aims to incentivise the building of required reuse systems⁶⁹.

By integrating reuse aspects in the PSS business model, the PSS providers are prepared for future EPR schemes and for reporting prevention, reuse, and recycling initiatives⁷⁰ since reuse and recycling systems often require an overview of consumption, stock, and waste. However, many of the PSS providers consulted struggle with the *administrative burden* and are missing more supportive IT solutions to facilitate the work (cf. section 2.2.2).

Directive on single-use plastics

The EU's Directive on single-use plastics (SUPD) was introduced in 2019, with the main objective of reducing the impact of plastics on the environment, the human health and promoting the CE with innovative and sustainable business models. The SUPD applies to a wide range of products, from cigarette butts to food containers, introducing proportionate and tailored measures to prevent plastic waste. One of the most affecting measures introduced through SUPD, where the prohibition of placing certain types of single-use plastic products on the EU market, including cotton bud sticks; cutlery; plates; straws; stirrers; sticks for balloons; cups, food, and beverage containers (expanded polystyrene); and all products made of oxo-degradable plastic⁷¹.

While the useful role of plastic in the EU economy is recognised, the Directive addresses the challenges with the short-lived plastic applications, which are not designed for reuse or cost-effective recycling. Therefore, a range of measures for the single-use plastic product not mentioned above was introduced to support a more circular and efficient plastic market in the EU⁷². These measures include:

- Design requirements to reduce plastic litter;
- Labelling requirements to inform consumers of plastic content, disposal options, and the harmful consequences of littering;
- Consumption reductions through awareness-raising measures;
- Waste management and clean-up obligations for producers, hereunder through the introduction of EPR schemes⁷³

The role of innovative and sustainable business models is mentioned multiple times throughout the Directive, including the direct intention of fostering these types of business models to contribute to the efficient functioning of the internal market through reuse and recycling practices⁷⁴. The increased awareness among consumers of the environmental challenges with single-use plastic products and the prohibition of certain types of single-use plastic products provides an opening in the market for PSS solutions facilitating

⁶⁸ Directorate-General for Environment, 'Proposal for a Revision of EU Legislation on Packaging and Packaging Waste.'

⁶⁹ Proposal for a revision of EU legislation on Packaging and Packaging Waste.

⁷⁰ European Parliament, Council of the European Union, Directive (EU) 2018/852 on packaging and packaging waste.

⁷¹ European Commission, 'Single-Use Plastics'.

⁷² European Parliament, Council of the European Union, Directive (EU) 2019/904 - SUP.

⁷³ European Commission, 'Single-Use Plastics'.

⁷⁴ European Parliament, Council of the European Union, Directive (EU) 2019/904 - SUP.

reuse and recycling. PSS alternatives to single-use food and beverage containers have especially flourished post the implementation of SUPD.

Plastic waste taxation

As a part of the EU recovery package, necessitated by the increased spending during COVID-19, a ‘plastic tax’ was introduced as a resource in the 2021-2027 EU budget. The plastic tax entered into force on January 1st 2021. Calling the measure a plastic tax might be misleading, as the measure is more reminiscent of a penalty than a tax in a traditional sense. The ‘plastic tax’ can entail an economic contribution by the EU member state based on the amount of non-recycled plastic packaging waste produced. The contributions of the member states are based on the weight of the non-recycled plastic packaging waste and a uniform rate of 0.80 EUR per kilogram. As the weight of the non-recycled plastic packaging is based on Eurostat data, which was reported by the member states in July of the year N+2, the contributions of the member states will be based on forecasts up until then. It is estimated that the ‘new plastic tax’ can provide the EU with between 6 to 8 million EUR of additional revenue each year⁷⁵. The ‘plastic tax’ will further provide an incentive to promote and strengthen business models facilitating a reduction in the production of plastic packaging waste. This could provide to be beneficial for Nordic PSS providers, offering reusable plastic products, dependent on the approach of the governments of the Nordic member states.



3.1.4 WEEE Directive

The Directive on Waste Electrical and Electronic Equipment (WEEE), which also apply to Norway and Iceland through the EEA agreement, aims to contribute to the sustainable production and consumption of electrical and electronic equipment. The WEEE Directive address environmental and other issues related to the growing amount of consumed and discarded electronics in the EU⁷⁶. While the WEEE Directive might not be relevant for all PSS solutions, it has relevance for all types of PSS models, as PSS solutions for electrical and electronic equipment can be found in both product-, use- and result-oriented PSS models⁷⁷.

To contribute to the sustainable production and consumption of electronics, the WEEE Directive has the following objectives:

- Preventing the creation of WEEE;
- Contributing to the efficient use of resources and the retrieval of secondary raw materials through reuse;
- Increasing recycling and improving the environmental performance of all actors involved in the life cycle of EEE.

To reach the objectives, the EU member states must facilitate separate collection and proper treatment of WEEE and set targets for collection, recovery, and recycling. The WEEE Directive promotes collaboration between product designers and recyclers to facilitate an increase in the reuse, dismantling, and recovery of components and materials. Following the stipulations of the WFD, the WEEE Directive highlights that the purpose of separate collection is that each member state must ensure implementation of the producer responsibility principle as a tool to achieve the minimum collection rate annually⁷⁸. In most member states, EPR schemes for WEEE are implemented through multiple competing Producer Responsibility Organisations (PROs)⁷⁹. Following the WEEE Directive, EEE should be reused when appropriate, as separate collection facilities shall prepare WEEE for reuse and grant personnel from reuse centres access to the WEEE⁸⁰. This makes especially use- and result-oriented PSS solutions interesting, as the PSS providers working within the field of EEE often keep costs and pricing down by acquiring and refurbishing used EEE products.

⁷⁵ KPMG, ‘Plastic Tax - KPMG Global’.

⁷⁶ European Parliament, Council of the European Union, Directive 2012/19/EU (WEEE).

⁷⁷ Egebæk et al., ‘Business Models and Product Groups for Product Service Systems (PSS) in the Nordics’.

⁷⁸ European Parliament, Council of the European Union, Directive 2012/19/EU (WEEE).

⁷⁹ Ahlers et al., ‘Analysis of Extended Producer Responsibility Schemes’, n.d.

⁸⁰ European Parliament, Council of the European Union, ‘Frequently Asked Questions on Directive 2012/19/EU (WEEE)’.



3.1.5 Batteries Directive

The EU Batteries Directive, applicable to Norway and Iceland via the EEA agreement, governs waste batteries and aligns with the Nordic focus on sustainability. The proposed Battery Regulation in 2020 aims to ensure the sustainability and safety of batteries in the EU markets⁸¹. These regulations impact various Product-Service System (PSS) solutions in the Nordics that involve battery usage across all three PSS model categories.

The directive addresses the lifecycle of batteries, emphasising design, market placement, end-of-life considerations, and recycling. Key objectives include promoting separate collection for high material recovery, reducing battery disposal in mixed waste, enhancing environmental performance, improving the practices of economic operators, and minimising hazardous substances in batteries. The directive covers portable, automotive, and industrial batteries, each serving distinct functions in various PSS product group clusters.

While some EU member states met the 45% collection target by 2016, challenges persisted in aligning waste portable batteries with the correct waste streams. Despite increased battery production, the collection rate improved, and most EU member states achieved recycling efficiency for lead-acid batteries. The ongoing efforts reflect a commitment to sustainable practices in battery usage and disposal, which is crucial for the PSS landscape in the Nordics.



3.1.6 Unfair Commercial Practices Directive

The Unfair Commercial Practices Directive (UCPD), applicable under the EEA agreement since its implementation in 2005, focuses on bolstering consumer confidence and facilitating cross-border trade, particularly benefiting SMEs⁸². Given that most of the 275 assessed PSS solutions in the Nordics fall under SMEs, they are directly impacted by the UCPD, addressing unfair commercial practices in business-to-consumer transactions.

The UCPD covers the entire spectrum of PSS models, including product-, use-, and result-oriented models, reflecting its relevance in regulating market conditions and ensuring fair practices. The 2019 amendment further modernised the UCPD to enhance enforcement and adapt to evolving consumer protection rules. The directive provides a legal framework empowering national enforcers to restrict various unfair business practices, such as false environmental claims, planned obsolescence, and obligations for online platforms and marketplaces⁸³.

Several unfair business practices, in particular, false environmental claims, have significant repercussions for PSS providers, particularly SMEs and micro-enterprises, influencing consumer trust in circular and sustainable solutions. The UCPD revision and its alignment with Nordic environmental marketing regulations are viewed as crucial support not only for PSS providers but also for consumers engaging with PSS and other circular business models.



3.1.7 Extended Producer Responsibility (EPR)

Extended Producer Responsibility (EPR) is an environmental policy framework that places responsibility on producers throughout a product's life cycle, covering material selection, manufacturing processes, and impacts from product use and disposal. Embedded in the EU's Waste Framework Directive (WFD), EPR sets

⁸¹ European Parliament, Council of the European Union, 'DIRECTIVE 2006/66/EC on Batteries and Accumulators and Waste Batteries and Accumulators and Repealing Directive 91/157/EEC'.

⁸² European Parliament, Council of the European Union, Directive 2005/29/EC - unfair business-to-consumer commercial practices in the internal market

⁸³ European Parliament, Council of the European Union, 'DIRECTIVE (EU) 2019/2161 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 November 2019'.

minimum requirements and is mandatory for various product categories, including WEEE, vehicles, batteries, packaging, and single-use plastics. Producers must design products to minimise environmental impacts and assume legal, physical, or socio-economic responsibility for unavoidable impacts.

Producer responsibility for all types of packaging must be introduced in the member states before January 2025. This also applies to Norway and Iceland based on the EEA agreement. The WFDs' new minimum administrative requirements for existing producer responsibility schemes (cars, batteries, and electronic waste) must be implemented starting 5 January 2023⁸⁴.

EPR schemes, defined by Article 8(1) of the WFD, aim to harmonise waste management systems across member states, ensuring environmental protection, market functionality, waste prevention, and promotion of reuse and recycling. The overarching goal is to create a circular economy by minimising waste production and encouraging recovery methods^{85, 86}.

The implementation of EPR requirements provides incentives for the adoption and advancement of PSS models, particularly in use- and result-oriented categories. These models align with the principles of waste prevention and product reuse inherent in EPR schemes. As producers bear financial responsibility for end-of-life treatment, PSS models, with features like maintenance and repair services, contribute to waste reduction. The introduction of modulated fees or changes in product pricing within affected categories can create a more equitable economic landscape for PSS solutions, aligning product pricing with the total cost of ownership.

EPR – Nordic comparison

The Nordic countries have established distinct Extended Producer Responsibility (EPR) schemes that play a pivotal role in shaping the landscape for PSS models. These schemes aim to hold producers accountable for the waste generated by their products, incentivising more sustainable practices.

Each Nordic country's approach to EPR reflects its commitment to reducing waste and promoting sustainability. While all countries have distinct administrative structures and scopes, the common thread is holding producers accountable for their product's end-of-life impact. The proposed tax system in Denmark and the taxation exemptions for beverage packaging in Finland directly affect PSS models by influencing packaging design choices. EPR systems in all countries indirectly encourage circular practices in PSS models by promoting waste reduction, recycling, and more responsible consumption and production.

In **Denmark**, 'Dansk Producent Ansvar'⁸⁷ (DPA) administers the rules on producer responsibility for electrical equipment, batteries, and vehicles, as well as the Danish system for car scrapping. Due to the new minimum requirements in the WFD, changes to existing EPR schemes are to be implemented in Denmark. How to implement the new requirements and a new EPR scheme on packaging is currently being negotiated. The government has proposed a tax system where companies are taxed based on the packaging they put on the market⁸⁸. It reflects the partial organisational approach, defined as an approach where regional or municipal organisations carry the responsibility for waste collection, with financial support from the producers⁸⁹.

Today, the waste management of packaging is paid for by the citizens through a waste fee. The proposed initiative and implementation of EPR on packaging have an incitement creation purpose, aiming for companies to reduce the amount of packaging waste and promote recyclable and reusable packaging⁹⁰. The

⁸⁴ 'Europa-Parlamentets og Rådets direktiv (EU) 2018/ af 30. maj 2018 om ændring af direktiv 2008/98/EF om affald'.

⁸⁵ European Parliament, Council of the European Union, 'Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives (Text with EEA Relevance)'.

⁸⁶ Ahlers et al., 'Analysis of Extended Producer Responsibility Schemes', June 2021.

⁸⁷ Dansk Producentansvar, 'Dansk Producentansvar - Datacenter for cirkulær økonomi'.

⁸⁸ Miljøministeriet, '41.000 virksomheder skal fremover betale regningen for emballagen'.

⁸⁹ Watkins and Gionfra, 'How to Implement Extended Producer Responsibility (EPR)'.

⁹⁰ Miljøministeriet, '41.000 Virksomheder Skal Fremover Betale Regningen for Emballagen'.

current Danish waste regulation, where the management of packaging waste does not affect the producers and suppliers directly, has been a barrier to developing PSS solutions for packaging in Denmark. This has been addressed by the company New Loop, which is developing a refund solution for takeaway packaging, in which the packaging is circulated and reused in a closed loop. The implementation of an EPR scheme for packaging in Denmark will enable PSS models alike to become more competitive, as all companies must pay for the waste management of the packaging they put on the market. However, the greatest effect for circular PSS models would be achieved through the inclusion of modular fees in the EPR scheme, as circular companies would be rewarded for embedding the intended reuse and recycling of packaging in their product design phase.

In **Iceland** the Icelandic Recycling Fund has the legal responsibility to create economic incentives for recycling. The fund works as an EPR scheme by charging producers and importers a recycling fee for the included product categories. Then, the fund contracts out waste processing and uses the recycling fees to pay the costs. This system is now being updated to reflect the extended scope of the 2018 EU waste directives⁹¹.

In **Sweden**, the Environmental Protection Agency (Naturvårdsverket-NVV) is responsible for ensuring that EPR is fulfilled by companies that produce the following products: packaging, fishing gear, certain tobacco products and filters, certain one-time-use products, wet wipes, electrical equipment, batteries, balloons, tires, cars, and medicines. Specific requirements for each category vary and there are many different instruments that are used. For example, tire manufacturers must contract a product responsible organization that collects used and discarded tires. Such an organization must be approved by the NVV⁹². Manufacturers of batteries and electronic equipment must pay a yearly (nominal) fee (1000 SEK) to NVV and report (yearly) how much electronics and/or batteries they have sold to the Swedish market and how much batteries have been collected and disposed of or recycled⁹³. Manufacturers of some one-time-use products are required to pay flat and variable fees based on how much they sell⁹⁴. Wet wipes is one such product, and manufacturers of wet-wipes are also required to report if their product contains plastics⁹⁵. Manufacturers of many metal cans and plastic bottles must make sure their product is compatible with deposit programs. While manufacturers of packaging retail producer responsibility, municipalities will have an official responsibility to collect household waste (which includes packaging) in 2024 and beyond⁹⁶. Each of these instruments and requirements aims to make the polluter pay and reduce the amount of waste and pollution that occurs by enforcing some type of coordination for the collection of products and by collection fees so that society has some funding to do the same.

In **Finland**, the Pirkanmaa ELY Centre⁹⁷ monitors the implementation of producer responsibility, with the exception of Åland. Several dedicated producer responsibility organisations are responsible for certain waste products. For example, the producer responsibility for batteries and accumulators, based on the Waste Act (2011) and the Government Decree on Batteries and Accumulators (2014), is managed by Akkukierätyks Pb Oy, Finnish Car Recycling Ltd, Recser Oy and ERP Finland ry. Regarding packaging waste, EPR is based on the Waste Act (2011) and the Government Decree on Packaging Materials and Waste (2014) and is organised through a service company, Rinki Oy, in collaboration with two producer organisations; Suomen Pakkaustuottajat Oy and The Finnish Plastics Recycling Ltd. Here, producers are defined as packers, importers and distance sellers of packed products, who have a minimum turnover of 1 million euros. While beverage packaging is also subject to producer responsibility, the way it is organised in Finland differs from other types of packaging. In case the producers sell products in packaging belonging to a deposit

⁹¹ Umhverfis- og auðlindaráðuneytið, 'Í Átt Að Hringrásarhagkerfi Stefna Umhverfis- Og Auðlindaráðherra í Úrgangsmálum'.

⁹² Naturvårdsverket, 'Producentansvar för däck'.

⁹³ Naturvårdsverket, 'Producentansvar för batterier'.

⁹⁴ Naturvårdsverket, 'Nedskräpnings-avgifter för vissa producenter'.

⁹⁵ Naturvårdsverket, 'Producentansvar för våtservetter'.

⁹⁶ Naturvårdsverket, 'Producentansvar för förpackningar'.

⁹⁷ ELY Center, 'Tuottajavastuu - Tuottajavastuu - ELY-Keskus'.

and return scheme (DRS), these beverage packages are not subjected to a tax. The DRS for beverage packaging is regulated by the Waste Act (2011) and the Government Decree on return schemes for certain types of beverage packaging (2013), and the taxation is regulated by the Act on Excise Tax on Certain Beverage Packages (2004). Currently, two organisations run DRS's in Finland: Ekopulloyhdistys ry for refillable glass bottles and Suomen Palautuspakkaus Oy for single-use packaging. Besides the aforementioned EPR schemes, in Finland, there are also dedicated schemes for paper, vehicles, tyres and electronic and electronic appliances. All these schemes are based on the Waste Act (2011) and product-specific government decrees.

3.2 Action plans, strategies & initiatives

The following section will provide an overview of national and supranational action plans, strategies and initiatives affecting PSS solutions in the Nordics. A special focus will be given to the CE action plans from the EU and the national CE action plans from the Nordic countries. This special focus will be given to those action plans, as PSS models retain ownership of products for multiple use cycles and provide incentives to design products with longer lifespans, reparability, and high-value recycling, thereby pushing the economy in a more circular direction. Therefore, measures that support PSS, both directly and indirectly, are found in the CE plans. Further, strategies impacting some of the specific product group clusters will be included, as this influences the product design-, use- and end-of-life phases.

3.2.1 EU's Circular Economy Action Plan

In 2015, the European Commission adopted the first CE Action Plan (CEAP), focusing on measures to stimulate the transition to CE, foster sustainable economic growth and generate new jobs in Europe. By 2019, most of the 54 actions included in CEAP had been completed⁹⁸. Therefore, the European Commission adopted a new revised CE Action Plan (CEAP2) in March 2020, functioning as one of the main building blocks for the European Green Deal⁹⁹ focusing on the decoupling economic growth from resource use¹⁰⁰. PSS solutions could play a significant role in decoupling economic growth from resource use due to the provider ownership reflected in the use- and result-oriented PSS models. CEAP2 further includes initiatives targeting multiple aspects of the CE relevant to PSS solutions, hereunder:

- Product design for durability and reparability;
- Promotion of CE processes;
- Encouragement to sustainable consumption;
- Waste prevention; and
- Internal circulation of recycled or secondary raw materials.

The CEAP2 will contribute to achieving the EU Green Deal goal of climate neutrality in 2050 and ensure the long-term competitiveness of the EU. The action plan presents 35 actions to be implemented by the Commission in 2020-2023. The actions can be sorted under five headlines:

- A Sustainable Product Policy Framework;
- Key Product Value Chains;
- Less Waste, More Value;
- Crosscutting Actions;
- Monitoring the Progress¹⁰¹.

⁹⁸ European Commission, 'First Circular Economy Action Plan'.

⁹⁹ European Parliament, Council of the European Union, 'Circular Economy Action Plan'.

¹⁰⁰ European Parliament, Council of the European Union, 'A European Green Deal'.

¹⁰¹ European Parliament, Council of the European Union, A new Circular Economy Action Plan For a cleaner and more competitive Europe.

Product-as-service models are mentioned in CEAP as part of the future CE, which is to be ensured by the plan's actions. The action *Designing Sustainable Products* states that the Commission will consider establishing sustainable principles and other appropriate ways for “*incentivising product-as-a-service or other models where producers keep the ownership of the product or the responsibility for its performance throughout its lifecycle*”¹⁰². The Sustainable Products Initiative and other measures proposed in the CEAP2 were adopted in 2022¹⁰³.

In addition to CEAP2, the Nordic countries collaborate on environmental issues through various national actors and the Nordic Council of Ministers, establishing a unified Nordic strategy for sustainable development¹⁰⁴ through, e.g., the Nordic 2030 vision. Besides Iceland¹⁰⁵, all Nordic countries have CE action plans in place. Initiatives and efforts that support CE often indirectly better the conditions for PSS. Some Nordic action plans, e.g. the Danish CE plan, also current initiatives where the aim to influence conditions for PSS is stated.

3.2.2 The Danish Circular economy action plan

The Danish CEAP - National waste prevention and management plan 2020-2032 presents Danish policies and initiatives promoting CE at different stages in the value chain. The plan highlights circular business models, such as PSS models, as important for reducing waste generation and improving resource utilisation. Circular business models are here defined as models which preserve or regenerate the value of products, components, and materials at the highest possible level in either a technical or biological circulation. To support companies with circular business models, several initiatives are presented¹⁰⁶:

- **Establishing a single-entry point into the public administration for companies with circular business models.** The aim is to provide the necessary information and help businesses with circular models to overcome regulatory barriers. The initiative has led to a platform launched by the Ministry of Industry, Business and Financial Affairs where businesses can find relevant rules, ask questions, and get an answer coordinated with authorities. Businesses are also encouraged to use the platform to inform if any rules or regulations impede establishing circular business models¹⁰⁷
- **Supporting digital circular opportunities** through commercial use of data and challenges. With this aim, the Danish Business Authority launched the website *challenges.dk*. Here companies can compete on circular ideas and business models to utilise surplus capacity both in a public and private context.
- **Support sustainable packaging in e-commerce** under the upcoming requirement of EPR for packaging. To provide knowledge on solutions which can ensure that the upcoming implementation of an EPR scheme will lower the waste amounts and create new business opportunities, mappings of global packaging solutions for e-commerce and the packing flows in Denmark were presented as an initiative.

Besides the above-mentioned initiatives, directly improving conditions for PSS models, other initiatives impact the conditions for PSS indirectly, including:

- Subsidy scheme for circular business models in small and medium-sized enterprises¹⁰⁸; and
- Nationwide efforts for CE in small and medium-sized enterprises¹⁰⁹.

¹⁰² European Parliament, Council of the European Union.

¹⁰³ European Commission, ‘Green Deal: New Proposals to Make Sustainable Products the Norm and Boost Europe’s Resource Independence’.

¹⁰⁴ Sääksjärvi, ‘Positioning the Nordic Countries in European Union Environmental Policy’.

¹⁰⁵ Umhverfis- og auðlindaráðuneytið, ‘Í Átt Að Hringrásarhagkerfi Stefna Umhverfis- Og Auðlindaráðherra í Úrgangsmálum’.

¹⁰⁶ Miljøministeriet, ‘Handlingsplan for Cirkulær Økonomi: National Plan for Forebyggelse Og Håndtering Af Affald 2020-2032’.

¹⁰⁷ Virksomhedsguiden, ‘Udfordrer Din Forretningsidé Reglerne?’

¹⁰⁸ Miljøministeriet, ‘Handlingsplan for Cirkulær Økonomi: National Plan for Forebyggelse Og Håndtering Af Affald 2020-2032’.

¹⁰⁹ Miljøministeriet.

The Danish CEAP further includes a focus on strengthening recognised methods to measure and document the service life of products and the ability to repair them. This will be facilitated by enhancing existing cooperation between Dansk Standard (the Danish standardisation organisation), authorities, and companies on the participation in the EU's standardisation, to ensure the development of methods for measuring and documenting the lifetime of products. Further, the Danish companies' capacity to compete on the service life, reparability, and operation of their products will be strengthened, affecting the competitiveness of PSS solutions¹¹⁰.

3.2.3 The Finnish Strategic Programme to promote a CE

A strategic programme to promote a circular economy was established in 2021, aiming to transform the Finnish economy into one that is based on the principles of a circular economy by 2035. The programme is strongly linked with the Finnish Government's carbon neutrality target, which should be met by 2035. The programme acknowledges servitisation as a part of the circular economy. As service business models are not yet dominant in many areas, the programme aims to foster and support servitisation by developing legislation, financial incentives and taxation. Furthermore, the programme highlights that citizens must be helped to find circular economy services and improve the attractiveness of these novel services.

The program targets transport systems, in particular, by promoting real-time and user volume-based economic transport guidance that encourages the use of shared transport services. In addition, the programme aims to investigate the prerequisites for accelerating other circular economy service models, such as repair services, leasing of chemicals and similar comprehensive industrial service models, by exploring potential financial incentives, voluntary agreements and information steering. Finally, the programme aims to foster cooperation between an extensive network of organisations, companies, central government, and municipalities to develop ways to gather information on CE services, including sharing platforms¹¹¹.

The recent evaluation of the strategic circular economy program identified that "*PSS models may also promote unsustainable consumption*"¹¹². Therefore, the measures to promote servitisation must be evaluated case-by-case when conducting detailed planning in order to avoid intended consequences. In this evaluation, electric scooter rentals were given as an example of unsustainable consumption due to the configurations of the PSS models¹¹³.

Finnish road map to a circular economy 2016-2025

Sitra initiated and led a national process to create a road map to a circular economy. The aim of this work, which was done in collaboration and participation of a versatile set of stakeholders, was to support the transition to a CE in Finland through which the challenges of climate change, the depletion of natural resources and urbanisation could be tackled. The role of PSS is emphasised, and these models are seen to be "*one of the most central circular economy business models because it encourages the production of durable, high-quality products. Product as a service will enable new business opportunities as a result of after-sale services for products and deeper customer relationships*"¹¹⁴. The participatory road map process has supported the implementation of the CE in Finland and has both Exemplified and raised awareness also regarding PSS models.

¹¹⁰ Miljøministeriet.

¹¹¹ Ministry of Employment and the Economy - Finland, 'Government Resolution on the Strategic Programme for Circular Economy'.

¹¹² Hildén et al., 'Evaluation of the Finnish Strategic Programme to Promote a Circular Economy. Suomen Ympäristökeskuksen Raportteja 7'.

¹¹³ Hildén et al.

¹¹⁴ Sitra, 'Finnish Road Map to a Circular Economy 2016-2025'.

3.2.4 Circular economy: a strategy for change in Sweden

In 2020 the Swedish Government adopted a national strategy for a circular economy (“Circular economy: a strategy for change in Sweden” - M2020/01133)¹¹⁵ with the ambition and the long-term goal to accelerate the transition to a circular economy and therefore meet environmental and societal objectives as per Agenda 2030. The strategy includes four interlinked focus areas:

- Circular economy through sustainable production and product design;
- Circular economy through sustainable ways of consuming and using materials, products and services;
- Circular economy through non-toxic and circular material cycles; and
- The circular economy is a driving force for the business sector and other actors through measures to promote innovation and circular business models.

In 2021 the “Circular Economy Action Plan” was issued, presenting current policy instruments and measures that the government has decided upon or intends to adopt to support the transition to a circular economy. To further strengthen its action on the circular economy, the government created and appointed the “Delegation for the circular economy”. This is the Government’s advisory body tasked with being a knowledge centre and a coordinating force for the business sector’s transition to a circular economy. It will also identify obstacles and act as a catalyst.

3.2.5 The Norwegian strategy for a green, circular economy

The Norwegian government published a green, circular economy strategy in June 2021. The strategy aims to “develop a green, circular economy that makes better, more efficient use of resources”¹¹⁶. The Norwegian government wants to further develop policies and policy instruments as a framework for value creation and green competitiveness in Norway. The strategy includes specific action points for the sectors that have been identified as having the most significant potential for circularity:

1. Bioeconomy (agriculture and forestry, aquaculture and forestry);
2. Industrial processes;
3. Construction and buildings;
4. Service industries, including retail and wholesale.

The Norwegian government intends to support the local authorities, both counties and municipalities, in promoting the transition to a circular economy. The strategy mentions research to build a more circular economy and digital solutions, for example, digital passports and digital marketplaces, which, among other things, can be used for secondary raw materials or sharing assets.

The strategy contains a long list of goals. These include economic instruments to promote better resource use, promoting sustainable consumption and green innovation through public procurement, strengthening consumer rights and making it easier to adopt circular consumption patterns, improving consumer information and giving more support for Ecolabelling Norway’s work on the circular economy and a series of goals related to the four specific sectors mentioned¹¹⁷.

3.2.6 EU strategies relevant to PSS

Besides action plans supporting the transition to a circular economy, there is a range of EU strategies addressing CE, overarching components, and specific materials or product groups. The following will provide a brief overview of some of the EU strategies most relevant for PSS in the Nordics and the product group clusters addressed in the *PSS in the Nordics* project.

¹¹⁵ Regeringskansliet, ‘Swedish Strategy for Circular Economy Accelerates the Transition to Sustainability’.

¹¹⁶ Klima- og miljødepartementet, ‘Nasjonal Strategi for Ein Grøn, Sirkulær Økonomi’.

¹¹⁷ Klima- og miljødepartementet.

EU Strategy for Sustainable and Circular Textiles

In the communication, *EU Strategy for Sustainable and Circular Textiles*, the European Commission addresses the significant share of EU textile consumption, whereof 81% is comprised of clothing consumption. As the textile industry plays a prominent role in the European economy, the strategy was developed to create a coherent framework and a vision for the transition of the textile sectors¹¹⁸. The vision consists of multiple targets to be reached by 2030 with relevance for PSS solutions, including:

- All textile products are long-lived and recyclable, to a great extent made of recycled fibres;
- All textile products are free of hazardous substances and produced in respect of social rights and the environment;
- Consumers benefit from high-quality, affordable textiles;
- Fast fashion is out of fashion;
- Reuse and repair services are widely available and economically profitable¹¹⁹.

While PSS models are mentioned directly in the strategy as a means to reshape the purchasing habits of consumers, the strategy recognises the difficulties of this task. The strategy further recognises PSS models as a means to extend the lifespan of textile products and as a cost-effective and affordable alternative to fast fashion. Thereby, PSS solutions are expected to fill out an important role in the achievement of significant aspects of the 2030 vision of the strategy. However, Nordic PSS solutions are still facing challenges with the *Culture of Ownership* and ensuring economically profitable business models within the clothing product group.

The Commission recommends Member States to support PSS solutions by adopting favourable taxation for the reuse and repair sector and providing guidance on circular business models through investments and funding. Such measures can enhance the prospects for PSS solutions and contribute to achieving the strategic vision, fostering circular value creation and job opportunities in the textile ecosystem.

EU Chemicals Strategy for Sustainability

The EU Chemical Strategy for Sustainability, an extension of the European Green Deal, pursues the protection of human health and the environment by addressing pollution comprehensively. Relevant to PSS models, the strategy envisions¹²⁰:

- Promotion of the development of safe and sustainable chemicals and materials, clean production processes and technologies, innovative tools for testing and risk assessment;
- Promote modern and smart production processes, safe and sustainable uses and business models, chemicals as a service, and IT solutions for tracking chemicals;
- Minimise exposure of humans and environment to substances hazardous to health and the environment through risk management measures and full information to users of chemicals;
- Promote safe and clean recycling solutions, including chemical recycling, waste management technologies, and decontamination solutions.

While few Nordic PSS solutions for chemicals exist, they align with the strategy's vision. These solutions offer tools for risk assessment, innovative technologies to reduce chemical usage and waste, and IT solutions ensuring proper chemical handling. The European Commission recommends Member States to enhance regulatory and market initiatives to support innovative business models like PSS, specifically emphasizing "chemicals as a service." This concept can be applied both to the function of the chemical itself and to sectors like logistics, specific chemical processes, and waste management. The Chemical Strategy

¹¹⁸ European Parliament, Council of the European Union, A New Circular Economy Action Plan For a Cleaner and More Competitive Europe'.

¹¹⁹ European Parliament, Council of the European Union.

¹²⁰ European Commission, 'Chemicals Strategy'.

for Sustainability lays the foundation for implementing supportive measures and incentive structures for PSS solutions within the chemical industry.

A European Strategy for Plastics in a Circular Economy

The strategy outlines a vision for a revamped plastic economy, targeting the design, production, and use phases of plastic products. The strategy sets ambitious goals for 2030 relevant to PSS solutions¹²¹:

- All plastic packaging placed on the EU market is either reusable or can be recycled in a cost-effective manner;
- Consumers are incentivised and made aware of the key benefits of better design, new business models and innovative products, offering sustainable consumption patterns;
- Increasingly, new companies emerge that provide circular solutions, such as reverse logistics and alternatives to disposable plastics, benefitting from the development of digitalisation.

This strategy emphasises the importance of a smart, innovative, and sustainable plastics industry, recognising the potential of circular business models to minimise plastic waste and yield environmental, social, and economic benefits. The European Commission recommends introducing EPR schemes for plastic products to provide economic incentives. The impact on the Nordic economic incentive for PSS solutions depends on the approach to EPR. If modular fees, considering reuse and waste prevention, are implemented, it would significantly boost incentives for PSS solutions. A standard average fee without accounting for waste prevention actions would result in fewer incentives.

Proposal for a Directive on empowering consumers for the green transition

In 2022, the European Commission published a *proposal for a directive empowering consumers for the green transition* through better protection against unfair practices and better information. The Commissions would amend the Unfair Commercial Practices Directive and the Consumers Rights Directive¹²². The proposal entails changes including:

- Product characteristics on environmental and social impacts, durability and reparability;
- Comparison tools, providing traders with a service that compares the sustainability of products;
- Repair scores provided to consumers, informing of the availability of spare parts, user and repair manuals¹²³;

While the actualised effects on PSS models in the Nordics are dependent on both the revision of aforementioned Directives and the transposing in the Nordic national legislation, one major impact can be expected if implemented: PSS providers, which themselves are not producing actors, would be better equipped to select durable products suitable for reuse and repair. However, there is a chance that the changes following the proposal would challenge the marketing of the circular concepts in a PSS solution further, especially for SMEs. This can be countered nationally by ensuring proper support for SMEs in certification processes, documentation of practices, guidance on marketing legislation, etc. Support programmes, enabling SMEs to gain a proper understanding of the collection and analysis of documentation, could further support their ability to communicate actualised CE efforts.

3.3 Public Procurement

Robust laws and policies governing Public Procurement drive market development. This section explores EU Green Public Procurement (GPP) guidelines and the Nordic regulatory framework, influencing PSS models' access to B2G, B2C, and B2B markets.

¹²¹ European Commission, 'A European Strategy for Plastics in a Circular Economy'.

¹²² Borzan, 'Empowering Consumers for the Green Transition'.

¹²³ Borzan.

3.3.1 EU GPP guidance

The European Commission's Public Procurement for a Better Environment strategy targets improved EU public procurement practices through collaboration with public authorities and stakeholders. One key focus is Green Public Procurement (GPP), defined as the procurement of goods, services, and works with reduced environmental impact throughout their life cycle compared to alternatives with the same primary function¹²⁴.

GPP is a voluntary tool for EU Member States, supported by guidance, best practices, a toolbox, and criteria. While the EU provides the legislative framework for public procurement, it enables criteria such as environmental labels, innovation partnerships (OPI), and market dialogue to promote GPP. The strategy emphasises concrete aims, including standard GPP criteria, life cycle costing information, legal and operational guidance, and political support with indicators for monitoring¹²⁵.

The strategy recommends education and information materials to assist public procurers in defining green criteria, encompassing various PSS models. GPP primarily focuses on products, but newer criteria extend to services such as repair and maintenance and end-of-life management for computers, tablets, and smartphones.

Despite the overarching aim to monitor GPP, it has not been fully implemented in any EU Member States, including the Nordic countries. Implementation varies by country, complicating the assessment of the EU's impact versus national agendas. The challenge lies in the lack of control, potentially leading to lower compliance without effective monitoring mechanisms¹²⁶.

3.3.2 Finnish Public Procurement

The **National Public Procurement Strategy** was established in 2020 to improve the effectiveness and responsibility of public procurement. Within this programme, reuse is seen as an element to improve ecological sustainability and responsibility^{127,128}. As part of the programme, competent innovative public procurement, KEINO, was launched. During 2022-2023 the priorities include procurement of new solutions, implementation of ecosystem agreements with cities and refining lessons learned into practical tools and operating models for procurement units. The aim is to improve public procurers' and service providers' competencies regarding product service systems and other new models. According to a recent evaluation (2021), the competence centre is seen as a nationally significant actor in the promotion of sustainable and innovative procurement as it has succeeded in bringing together key actors and experts and has reached the set goals. However, more attention is needed to maintain operational strategy, disseminate and scale up good practices and promote pioneering procurement activities^{129,130}.

Public Procurement Act (1397/2016) is the national law on public procurement in Finland the aim of this law is to improve the use of public funds, to promote high-quality, innovative and sustainable procurement, and to secure equal opportunities for companies and other communities to offer goods, services and construction contracts in public procurement tenders. This act also supports sustainable procurement covering PSS¹³¹.

¹²⁴ European Commission, 'Communication from the Commission to the Institutions: Making Public Procurement Work in and for Europe'.

¹²⁵ European Commission, Public procurement for a better environment {SEC(2008) 2124} {SEC(2008) 2125} {SEC(2008) 2126}.

¹²⁶ European Commission, 'Green Public Procurement'.

¹²⁷ The Finnish Government, 'Kansallinen julkisten hankintojen strategia 2020'.

¹²⁸ Hankinta-Suomi toimenpideohjelman valmisteluryhmä, 'Suomen Julkisten Hankintojen Tilannekuva'.

¹²⁹ Keino, 'Keino - Home'.

¹³⁰ Ruokonen et al., 'Kestävien ja innovatiivisten julkisten hankintojen osaamiskeskuksen (KEINO) arviointi'.

¹³¹ The Finnish Government, Laki julkisista hankinnoista ja käyttöoikeussopimuksista.

3.3.3 Norwegian Public procurement act

The Public Procurement Law (anskaffelsesforskriften)¹³² is mentioned in a report on barriers to a circular economy in Norway written by Deloitte and commissioned by the government¹³³. Specifically, the Law on public procurement says public organisations should emphasise minimising environmental impacts and emphasise climate-friendly solutions, and they can set environmental criteria in the procurement. If they have environmental criteria, it should be weighted at least 30% as a general rule. That means environmental criteria are voluntary and do not need to be weighted at 30%. The government is currently revising this, so environmental criteria become more important in public procurement¹³⁴.

3.3.4 Swedish Public Procurement Legislation

Swedish public procurement is over 800 billion Swedish krona per year. This equates to nearly 20% of Sweden's GDP. When public procurement is applied strategically, it can leverage the development of a more sustainable society by requesting environmentally and socially sustainable products while capitalising on suppliers' innovation capacity to promote new solutions. The national procurement strategy contains seven strategic objectives that procuring authorities and units can use to develop their strategic work with public procurement. Objective 6 is about implementing environmentally responsible public procurement¹³⁵.

LOU (Lagen om offentlig upphandling), the Public Procurement Act in Sweden, applies to all public procurements of goods, services and construction work not covered by some other procurement law or any specific exception that applies to the procurement in question. LOU does not contain any particular green mandatory stipulation, which is somewhat unclear regarding procurement award criteria. The result is that price is often weighted more than any other criteria, such as quality or environmental concerns¹³⁶. This is due, among others, to the lack of well-defined criteria effectively measuring the environmental quality improvements of procured goods, work and services. However, the public authorities have the opportunity to use some indirect, more coercive environmental mechanisms, such as the use of knock-out green technical requirements; to decide not to award upon an environmental breach, or to alter the order of the most advantageous tender¹³⁷.

LOU divides the procurement of services into three different categories:

1. Services that are exempt from the rules (e.g., certain legal services and certain services in the fields of civil defence, civil protection or the prevention of danger);
2. Social services and other special services listed in Annex 2 to the LOU (mainly health and social services, education and training services, hotel and restaurant services, legal services, investigation and security services, and postal services);
3. Services fully covered by the rules (mainly gardening, laundry services, and telephone services).

In 2015 the Swedish government set up an agency (Upphandlingsmyndigheten) that supports public authorities by developing and conveying knowledge, tools and methods for public procurement. The goal is to develop high-standard public business focusing on sustainable, innovative and efficient procurement.

The Legal, Financial and Administrative Services Agency, Kammarkollegiet, further provides extensive support to the Swedish government, which involves qualified legal and economic expertise. They produced a feasibility study showing that government agencies are interested in buying and selling used furniture. The

¹³² Nærings- og fiskeridepartementet, 'Forskrift Om Offentlige Anskaffelser (Anskaffelsesforskriften) - Lovdata'.

¹³³ Deloitte, 'Kunnskapsgrunnlag for Nasjonal Strategi for Sirkulær Økonomi - Delutretning 2. Barrierer for å Utløse Potensial for Sirkulær Økonomi i Norge'.

¹³⁴ fiskeridepartementet, 'Regjeringen vil skjerpe miljøkravene i offentlige anskaffelser'.

¹³⁵ Fuertes Giné, Vanacore, and Hunka, 'Public Procurement for the Circular Economy'.

¹³⁶ Konkurrentverket, 'Swedish Public Procurement Act'.

¹³⁷ Fuertes Giné, Vanacore, and Hunka, 'Public Procurement for the Circular Economy'.

study also points to several areas that public authorities need to develop to increase the degree of circularity for furniture purchases.

3.3.5 Danish Public Procurement

Environmental criteria in public procurement are recognized as a means to promote circular business models and encourage the development of durable products and sustainable production practices. While some cases in Denmark showcase successful collaboration between municipalities, such as Herning's innovative solution for reusing workwear meeting safety requirements, these instances remain exceptions. In most cases, the predominant focus is on price rather than sustainability criteria, reflecting established habits, consumption patterns, and a lack of knowledge among employees overseeing public procurement¹³⁸.

To address this, the Danish Ministry of the Environment has introduced a Total Cost of Ownership (TCO) Tool for public procurers. Mandated for use in public tenders, the TCO tool aims to guide the procurement of products with a lower environmental footprint throughout their life cycle, particularly relevant for products involving electricity or water use. TCO calculations incorporate the actual costs of a product, including usage, maintenance, service, and disposal. By considering factors like longer product lifetimes, repair, and maintenance, the TCO tool seeks to enhance procurers' understanding of PSS solutions and potentially position PSS providers more competitively in public procurement processes¹³⁹.

3.3.6 Icelandic Public Procurement

In Iceland, the EU legislation on public procurement was implemented by Act 30/2016 on Public Procurement. Environmental criteria are voluntary in the act. A new national policy on sustainable procurement was adopted in 2021, followed by an action plan for 2021-2024. According to the action plan, Ríkiskaup (The Central Public Procurement Authority) will take measures to include mandatory environmental criteria for certain products and services¹⁴⁰.

3.4 Policies and regulations for consumers and businesses

Policies and regulations for consumers and businesses affect the possible PSS model designs and configurations. The rights of consumers and businesses; economic incentive structures; uptake of reusable products; etc., are determined by the national implementation of supranational regulation and national legislation outside the domain of supranational entities. The following sections will explain some of the Nordic legislations affecting PSS model design and operations.

3.4.1 Consumer laws

Consumer laws have a significant effect on the possible offerings of a PSS model, the marketing of the PSS solutions, and the liabilities of both the consumer and the provider of a PSS solution. The following section will provide an overview of some of the Nordic consumer laws.

Danish consumer laws

The Danish Competition and Consumer Authority are responsible for a number of laws related to consumers, including the Danish Marketing Practices Act¹⁴¹. The Danish Law on Prohibition for the Protection of

¹³⁸ Based on interview with the industry organisation Dansk Industri, conducted in the fall of 2022

¹³⁹ Den Ansvarlige Indkøber, 'TCO-værktøjer | Den Ansvarlige Indkøber'.

¹⁴⁰ Fjármála- og Efnahagsráðuneytið, 'Opinber innkaup'.

¹⁴¹ Danish Competition and Consumer Authority, 'Consumer Regulation'.

consumer interest primarily states that the EU Directives addressing consumer protection are legally binding in Denmark and that businesses violating the EU Directives can be punished by law. Compensation to the consumer may be required¹⁴².

The Danish Marketing Practices Act establishes guidelines for good marketing practices, covering areas such as misleading actions, misleading omissions, aggressive commercial practices, distortion of economic behaviour, unsolicited communication, and commercial practices targeting children and young people¹⁴³. Particularly impactful for PSS models are the sections addressing misleading actions and omissions, especially in the context of environmental marketing.

The Danish Consumer Ombudsman has noticeably increased the focus on greenwashing and green claims since 2021, leading to Denmark's first greenwashing conviction¹⁴⁴. In response to this, a comprehensive guide on environmental marketing was published in 2021, distinguishing between general and concrete statements. General statements, like 'sustainable product,' necessitate documentation such as Life Cycle Assessments or certification, verifiable by a third party. On the other hand, concrete statements not emphasising environmental or ethical considerations are usually not considered misleading¹⁴⁵.

Despite these guidelines, Danish PSS providers find it challenging to align their practices with the good marketing practices outlined in the Danish Marketing Act. The documentation issue poses a significant hurdle, especially for SMEs, as Life Cycle Assessments and certification schemes can be prohibitively expensive. Consequently, SMEs may struggle to provide the required documentation for their implemented circular practices economically.

The Consumer Protection Regulation in Sweden

The Swedish Consumer Agency (SCA)¹⁴⁶ is a government agency whose task is to safeguard consumer interests. The government and the parliament establish consumer policy objectives and the direction of work for the Swedish Consumer Agency. This is led by a Director General who is also the Consumer Ombudsman (Konsumentombudsman, KO). KO can represent consumer interests in relations with businesses and pursue legal action in court. SCA follows trends in society and market developments, to identify consumer problems in different markets, including environmental issues that might affect society and the marketplace. Therefore, it could be inferred that the uptake of PSS models will gain prominence in importance and number of treated cases.

Swedish consumers can also be supported by two independent organisations which provide information service and guidance, namely, Hallå konsument¹⁴⁷, which collaborates with several government agencies, the four consumer rights bureaus, and municipal consumer guidance services; and ECC Sverige¹⁴⁸ offering consumers legal advice free of charge about consumer rights in cross-border trade within the EU, Iceland, Norway and the UK.

A key piece of legislation is the Consumer Safety Act (Produktsäkerhetslagen (2004:451))¹⁴⁹ which was created under the responsibility of the Ministry of Agriculture, Food and Consumer Affairs and establishes rules regarding the safety of products and services offered by business to consumers on the market in Sweden. The law implements Directive 2001/95/EC of the European Parliament and of the Council on general product safety¹⁵⁰. With the purpose to prevent personal injury, the law commands that all goods and services that companies offer to consumers must be safe. Since the Product Safety Act does not specify

¹⁴² Erhvervsministeriet, Lov om forbud til beskyttelse af forbrugernes interesser.

¹⁴³ Marketing Practices Act.

¹⁴⁴ Osbæck, 'Første dom og bøde for greenwashing'.

¹⁴⁵ Forbrugerombudsmanden, 'Kvikguide Til Virksomheder Om Miljømarkedsføring'.

¹⁴⁶ Konsumentverket, 'About the Swedish Consumer Agency'.

¹⁴⁷ Konsumentverket, 'Hålla konsument'.

¹⁴⁸ ECC Sweden, 'ECC Sverige'.

¹⁴⁹ Finanadepartementet, Produktsäkerhetslag.

¹⁵⁰ Ministry of Agriculture, Food and Consumer Affairs, 'Product Safety Act (2004:451).'

exact requirements for products and services, it is critical to monitor and screen among the numerous laws and regulations, e.g. standards, and identify which ones apply.

The Finnish Consumer Safety Act (920/2011) and guidance

The law aims to ensure the safety of consumer goods and consumer services, health and property hazards caused by preventive consumer goods and consumer services, ensure high-quality consumer safety monitoring and contribute to improving the operating conditions of operators. The act sets safety rules on the services offered to consumers, including PSS. Consumer safety aspects are seen as important in Finland, as suggested in a Government proposal, *'Finland is known to be one of the most advanced member states in terms of consumer safety legislation and especially its supervision'* (HE 46/2015 vp)^{151,152}.

To strengthen businesses' and entrepreneurs' knowledge and competence based on the legal requirement of their products and services, the Finnish Safety and Chemicals Agency has developed an online learning environment for manufacturers, importers and distributors of consumer goods, including toys, personal protective equipment, gas appliances, machinery, electrical appliances and general consumer goods. The learning environment features a tool that businesses can use to test how well they know their products and learn about legal requirements. The agency also issued the 'I Know' My Products certification¹⁵³. Furthermore, the Finnish Safety and Chemicals Agency gives guidance on the safety of exercise and hobby equipment rental services, including instructions for arranging safe rental services. The code of conduct applies to the rental of sports, exercise and hobby equipment, such as rental of mountain bikes, winter sports equipment, camping equipment, trampolines, bouncy castles and more¹⁵⁴.

Icelandic consumer laws

In Iceland, The Consumer Agency (Neytendastofa) is entrusted with market surveillance of business operators, good functioning and transparency of the markets in respect to safety and consumers legal rights. The agency is responsible for enforcement of legislation on consumers health, legal and economic rights. The Icelandic consumer legislation is in all main respects identical to the EU-legislation, due to Iceland's membership of the EEA.

Among the most relevant legislation when it comes to the sale of goods and services from businesses to consumers is The Consumer Purchase Act no. 48/2003 and The Service Purchase Act no. 42/2000. However, neither of these directly addresses PSS. The former explicitly focuses on the purchasing of products, while the latter may be applicable to PSS-models. However, The Service Purchase Act mainly covers repair services or similar cases where the consumer hands over a product to the service provider.

In addition to the above-mentioned acts, The Control of Business Practices and Marketing Act no. 57/2005 is an important part of the puzzle. The purpose of this act is to prohibit unfair business practices, to ensure transparency and to prevent misleading marketing, e.g., greenwashing¹⁵⁵.

3.4.2 Taxes and subsidies

Taxes and subsidies are strong regulatory tools to facilitate market development. Tax exemptions, reduced taxes, alterations of VAT, etc., can provide the economic incentive to implement circular practices – or the opposite. The following section will provide an overview of taxes and subsidies affecting PSS in the Nordics.

¹⁵¹ Työ- ja elinkeinoministeriö, Kuluttajaturvallisuuslaki.

¹⁵² The Finnish Government, Hallituksen esitys HE 46/2015 vp - Hallituksen esitys eduskunnalle laeiksi kuluttajaturvallisuuslain sekä terveydenhuoltolain 21 §:n muuttamisesta.

¹⁵³ The Finnish Government, Kuluttajaturvallisuuslaki.

¹⁵⁴ Tukes, 'Liikunta- ja harrastevälineiden vuokrauspalveluiden turvallisuus'.

¹⁵⁵ Alþingis, Lög og reglur Neytendastofu.

The Swedish tax reductions on households (RUT, ROT and REP)

In Sweden, households can take advantage of tax reductions through two key initiatives: RUT (rengöring, underhåll och tvätt) focusing on cleaning, maintenance, and washing services; and "ROT" (reparation, ombyggnad och tillbyggnad) targeting renovation and reconstruction activities. As part of future plans, these provisions are expected to encompass repair ("REP") and recycling aspects as well.

The Swedish government has introduced tax incentives for consumer goods repairs with the intention of encouraging people to mend their broken items instead of discarding them. A significant move in this direction is the reduction of VAT on repair services from 25% to 12%. This measure aims to curb excessive consumption, motivate consumers to embrace repair practices, and render such endeavours financially appealing.

However, the assessments of the impact of these tax reductions exhibit a mix of positive and negative outcomes. While the RUT tax reduction can potentially drive the adoption of service subscriptions such as cleaning and maintenance, the applicability of ROT to PSS models targeting B2C interactions might be limited¹⁵⁶. This is primarily because the framework is tailored for individual consumers who hold ownership of the products they intend to renovate. Consequently, ROT might inadvertently reinforce the conventional product sale and ownership norms prevalent today.

While ROT does offer consumers financial relief when it comes to repair costs, its influence on encouraging manufacturers to prioritise longer product lifespans through design for repairability remains less pronounced. Thus, the policy could stimulate new behaviours and skills related to repair and recycling, but its overall impact on broader systemic change may be modest. The introduction of these tax incentives signifies an important step towards fostering a culture of repair and sustainable resource management. However, further considerations and adjustments may be needed to fully unlock their potential in shaping a more circular economy through PSS models.

Norwegian tax rules

A report on barriers to the circular economy commissioned by the Norwegian government identified several barriers that hinder or slow down the development of the circular economy in Norway¹⁵⁷. Norway's accounting, tax and VAT systems are not geared for circular models. This applies to extending the lifetime of products, encouraging maintenance and repairs, or new business models based on renting or selling used goods. Some examples of rules relating to depreciation incentivise destroying unsold goods instead of reusing them. Norway has VAT on sales of used/second-hand goods just as for any other goods, which also mentioned as a significant barrier. Instead, the tax system should provide incentives for circular business models, e.g., by removing the VAT on used goods. Norway also has VAT on services for repairs and employer's tax, which makes labour-intensive activities, such as repairs, very costly for companies.

Interviews with Norwegian businesses echo the findings in the report. One interviewee said that their accounting department had to figure out how to report income from a subscription service when they added a rental component to their linear business model. The tax system is not designed for circular economy models where, e.g., revenue comes from monthly rentals instead of a single sale. The interviewee said they would prefer a VAT cut on repairs or a reduced employer's tax for the circular part of their business, which is very labour-intensive¹⁵⁸.

The Danish Green Tax Reform

The Danish Government and Parliament made the first agreement on green tax reform based on the recommendations from an expert group. The new Green Tax Reform focuses on significantly increasing the

¹⁵⁶ skatteverket.se, 'Rotarbete och rutarbete'.

¹⁵⁷ Deloitte, 'Kunnskapsgrunnlag for Nasjonal Strategi for Sirkulær Økonomi - Delutretning 2. Barrierer for å Utløse Potensial for Sirkulær Økonomi i Norge'.

¹⁵⁸ Interview with Norwegian PSS provider (May 2022)

price of emitting CO₂e and covering more industries than former legislation. The purpose is to provide a taxation system with high and more uniform taxation of CO₂e¹⁵⁹.

Under the new framework, a CO₂e tax of DKK 750 per tonne will apply to companies not covered by the EU quota trading system. For those within the system, an additional tax of DKK 375 per tonne CO₂e will be levied, resulting in a total of DKK 1125 per tonne CO₂e, including the price of quotas. This taxation approach aims to provide companies with a clear incentive to reduce emissions by adopting renewable energy sources and embracing low-emission technologies¹⁶⁰.

While this reform holds potential benefits for fostering a green transition in the market, there are concerns for small PSS companies. The administrative costs associated with many PSS models, combined with the additional taxation, could pose challenges.

Recognising the potential economic impact on companies, especially SMEs and micro-enterprises, the Danish Government has earmarked 7 billion DKK to support businesses, with targeted aid for those affected by the Green Tax Reform. A 1 billion DKK fund encourages CO₂e capture and storage, providing up to 850 DKK per tonne. Furthermore, gradually implementing the CO₂e tax from 2025 to 2030 should ensure a smooth transition¹⁶¹.

The Danish Government has not addressed how the new taxation will affect SMEs and micro-enterprises, and some economic challenges are expected for these companies. Which industries will be included under the new tax reform has not been clarified either, and it is, therefore, challenging to predict the exact effects on PSS solutions. However, the proposal does indicate that heating and fuels for transport for industrial enterprises could become more expensive.

Icelandic taxation

The Icelandic tax system favours linear models and does not provide any incentives for circular solutions, except indirect measures such as the CO₂ tax on fossil fuels, as prescribed in Chapter I of The Law on Environmental and Natural Resources Taxes (Act 129/2009)¹⁶².

3.4.3 Other relevant Nordic regulations & legislation

Similar to the effects of taxes and subsidies, some regulations and legislation provide incentives for implementing circular business practices. Sometimes, regulations and legislation hinder the implementation of the same circular practices, as they were developed with a linear system in mind. The following section will provide highlights of legislation and regulation affecting PSS in Nordic countries.

Norwegian Used Goods Law (brukthandeloven)

The Norwegian Used Goods Law (brukthandeloven)¹⁶³ aims to prevent the sale of stolen goods by requiring all sellers of used goods to obtain a permit to sell used goods and keep detailed inventory records¹⁶⁴. According to the interviews conducted, some PSS providers experience issues with this law, e.g. one PSS provider stated:

“You are supposed to keep detailed records of everything you get in and sell, and many used goods stores do this, but for us, documenting every single item through the sorting process, cleaning, to sales, repairs, or repurposing is impossible.”¹⁶⁵

¹⁵⁹ Regeringen, ‘Grøn skattereform – Et grønnere og stærkere Danmark i 2030’.

¹⁶⁰ Regeringen.

¹⁶¹ Regeringen.

¹⁶² Alþingis, Lög um umhverfis- og auðlindaskatta.

¹⁶³ Nærings- og fiskeridepartementet, Lov om handelsverksemd med brukte og kasserte ting (brukthandelova) - Lovdata.

¹⁶⁴ Nærings- og fiskeridepartementet, Forskrift om handelsverksemd med brukte eller kasserte ting mv - Lovdata.

¹⁶⁵ Norwegian PSS provider in the Clothing & Accessories product group cluster, interview conducted the 27 May 2022.

The company eventually got an exemption from keeping records after they moved their head office to a new police district. However, the frustration over police districts not having the same approach to this law stayed:

“The law is there to prevent stolen goods from being sold, things like cars and antiques, not to prevent us from selling used goods... The authorities have not facilitated this type of economic activity, the sale of used goods, repaired and repurposed goods, and rentals. None of them is profitable for us at this point, so they need to make it easier for us so we can earn some money from this, not make it more difficult.”¹⁶⁶

According to stakeholders, the law can also cause issues for companies with a linear business model, making companies hesitant to initiate or postpone projects to venture into the circular economy¹⁶⁷.

Reduce and Refuse, Recycle and Replace – The Plastics Roadmap for Finland 1.0 and 2.0.

Another recent collaborative road mapping process addressing PSS is the Plastics Roadmap for Finland. This roadmap aims to ensure the breakthrough of a circular plastics economy in Finland by 2030 by reducing environmental littering and other environmental damage caused by plastics. The linkage to PSS comes from the promotion of reusable packaging. In particular, the recent roadmap update (2022) emphasises packaging reuse and is linked with the European Plastics Strategy and national implementation of the single-use plastics Directive (2019/904)^{168,169}.

3.4.4 Funding programs

Multiple Nordic PSS providers have highlighted funding programs as a measure playing a part in the development, establishment, and iteration of PSS solutions (Cf. section 2). Funding programs can function as a driver of business model innovation, why the following section will provide an understanding of past and current funding programs in the Nordics.

Danish SME funding

Funding opportunities for companies pursuing sustainable initiatives have been highlighted among Danish PSS providers as an essential measure to incentivise the transition to CE. In particular, in the start-up phase of a PSS solution, this is a significant help to ensure a successful implementation and stabilisation of the market. In Denmark, a range of funding schemes have been supporting small and medium-sized companies over the past couple of years, hereunder:

- Grøn omstillingsfond (green transition fund), closed in 2015¹⁷⁰
- Grøn Vækst via Grønne Forretningsmodeller (green growth via green business models), closed in 2021¹⁷¹
- CLEAN Green Plan, closed in 2022¹⁷²
- Bæredygtig Bundlinje (sustainable bottom line), closed in 2022¹⁷³
- and SMV:Grøn (SME:green), closed in 2022¹⁷⁴
- Grøn Cirkulær Omstilling (GCO) (green circular transitions), still open for applications¹⁷⁵

¹⁶⁶ Norwegian PSS provider in the Clothing & Accessories product group cluster, interview conducted the 27 May 2022.

¹⁶⁷ Interviews (2022)

¹⁶⁸ Green Budget Europe et al., ‘Aligning Fiscal Policy with the Circular Economy Roadmap in Finland’.

¹⁶⁹ Linkages to EU's Plastics Strategy, SUPD, and further EU initiatives on the recyclability of products, the use of recycled plastics, biobased and biodegradable plastics, as well as restrictions on microplastics, and Government Programme of Prime Minister Sanna Marin (including the strategic programme for CE)

¹⁷⁰ Teknologiuudvikling, ‘Grøn Omstillingsfond: +0,5 Mio. Kr. i Offentligt Tilskud’.

¹⁷¹ Erhvervsfremmestyrelsen, ‘Grøn Vækst via Grønne Forretningsmodeller | Danmarks Erhvervsfremmestyrelse’.

¹⁷² Clean, ‘cleangreenplan’.

¹⁷³ Gate 21, ‘Bæredygtig Bundlinje - grønne og cirkulære forretningsmodeller | Gate 21’.

¹⁷⁴ Virksomhedsprogrammet, ‘SMV’.

¹⁷⁵ GCO, ‘GCO | Grøn Cirkulær Omstilling’.

All the funds mentioned above have provided funding for a range of sustainable transition activities, hereunder: development of innovative products; product testing; pilot projects; development of sustainable business models; test of recycled materials in product design; activities to reduce waste; compose lifecycle analysis; prolong product lifespan; and other activities in the same ballpark.

Subsidy schemes for green business models are a part of the Danish Circular Economy action plan¹⁷⁶, recognising that businesses need support with green transitions, ensure proper knowledge, facilitate innovation, and provide an advantage over linear business models. Many of the PSS providers consulted in Denmark have been supported by one of these funding schemes, most commonly to develop documentation for the effects or benefits of their business models.

Finnish Bio and Circular Finland RDI programme

The Bio and Circular Finland Research, Development and Innovation (RDI) program supports the development of competitive bio and circular economy solutions and ecosystems in Finland. Furthermore, the programme aims to increase the exports of bio- and circular economy solutions. The program directs export activities, in particular, for the plastic and packaging industries and supports new innovations in various sectors of the circular economy, e.g. for new applications in textiles and construction. Reuse- and PSS business models are seen as a part of the circular solutions and are financed through this programme¹⁷⁷.

Mistra - The Swedish Foundation for Strategic Environmental Research

Mistra is a foundation providing capital to support the development of strong environmental research environments with the aim of creating a good living environment for all and strengthening Swedish competitiveness. Each year Mistra invests approximately SEK 200 million in various research initiatives involving collaboration among academic disciplines as well as between research a various range of stakeholders. The investments are therefore intended to assist companies, public stakeholders and users in the development of new products and services with the aim to meet society's environmental challenges. Mistra's statutes were adopted pursuant to a Swedish Government decision in 1993 and amended by the Swedish Government's decisions in 1997 and 2010.

Re:Source

RE:Source is one of seventeen Strategic Innovation Programs (SIP) funded by the Swedish Energy Agency, Formas, and Vinnova. The assignment to the three authorities originates from the Swedish government's research and innovation bill. The purpose of the programmes is to contribute to resource efficiency and sustainability to increase the positive impact on society and the global competitiveness of Swedish companies. Currently led by RISE, the programme welcomes any Swedish actors who want to get involved by becoming members. Each member of RE:Source can influence the business through a vote at the general meeting. The programme membership is free. However, members must contribute with work time in line with the programme's strategic tasks.

Icelandic Innovation fund

In Iceland, an Innovation Fund is focusing on technical solutions. According to the interviewed PSS providers, this fund does not fit well with PSS initiatives since the funds cannot support the creation of inventories or be used for salaries, and 50% own funding is usually required. A smaller fund for circular economy initiatives has been operating for a couple of years by the Ministry for Environment, Energy and Climate. Some of the PSS providers have gotten support from there.

¹⁷⁶ Miljøministeriet, 'Action-Plan-for-Circular-Economy-Danish.Pdf'.

¹⁷⁷ Business Finland, 'Suomalaisille yrityksille'.

3.5 Voluntary agreements & information campaigns

Voluntary agreements and informational campaigns have long been highlighted as policy instruments to support the transition towards the circular economy. While the effectiveness of these instruments has been discussed for quite some time, they are still utilised to spread information on products, product services and rights, legislation and regulation. The following section will highlight some voluntary agreements and information campaigns relevant to PSS in the Nordics.

3.5.1 Ecolabel

With green marketing practices gaining wide acceptance to provide a competitive advantage, ecolabelling has become a tool to differentiate green products from non-green products. Ecolabelling can be used to communicate information about a given product or service and, through disseminating knowledge, build up the consumers' trust.

EU ecolabelling

The EU ecolabel covers a wide range of product groups and consists of a set of criteria focusing on minimising the main environmental impacts of products over their entire lifecycle. Experts have developed the EU ecolabel criteria in consultation with key stakeholders, e.g. industry and consumer organisations. The criteria are continuously updated to reflect changes in market and EU policies to ensure that products with the EU ecolabel are of the highest quality goods and services concerning the latest environmental standards¹⁷⁸. EU Ecolabel is managed by the European Commission, with bodies from the Member States and expert stakeholders. According to the European Commission, the EU ecolabel¹⁷⁹:

- Facilitates the consumers' choice in favour of labelled products in a B2C market and creates business opportunities in the B2B market;
- Highlights ways to optimise products and production processes through the sets of criteria;
- Enhance a company's sustainable image;
- This leads to financial savings due to reduced resource use and energy consumption and improved waste management;
- Ensures easier access to the B2G market due to the European focus on Green Public Procurement; and
- Ensure that the certified product is within the 10-20% most environmentally friendly products, providing the most reliable way to communicate environmental information to consumers¹⁸⁰.

Nordic Swan ecolabelling

The Nordic Ecolabelling is a voluntary ecolabelling scheme for the Nordic countries established in 1989 by the Nordic Council of Ministers¹⁸¹. Further, the Nordic Swan Ecolabel is an official, independent, 3rd party certification scheme¹⁸². Currently, certifications for more than 25.000 products within 60 different product groups have been granted¹⁸³. The Nordic Swan Ecolabel ensures that certified products can be considered sustainable based on life cycle assessment, with an overall goal to reduce the environmental impact of producing and consuming goods. Strict requirements in all lifecycle phases and continuous development of requirements to follow sustainable development are declared as the foundation for the Nordic Swan Ecolabel¹⁸⁴.

¹⁷⁸ European Commission, 'EU Ecolabel Product Groups and Criteria'.

¹⁷⁹ European Commission, 'EU Ecolabel - Business'.

¹⁸⁰ European Commission.

¹⁸¹ Miljøministeriet, Bekendtgørelse om det europæiske og det nordiske miljømærke.

¹⁸² Nordic Ecolabelling, 'Why Choose Ecolabelling'.

¹⁸³ Miljøministeriet, Bekendtgørelse om det europæiske og det nordiske miljømærke.

¹⁸⁴ Nordic Ecolabelling, 'Why Choose Ecolabelling'.

According to the Nordic Ecolabel board responsible for the Nordic Swan Ecolabel, certification provides:

- High consumer awareness and demand, as 9 of 10 Nordic consumers know about the certificate, and half of these look for the ecolabel when they shop;
- International recognition and reference, as the Nordic Swan Ecolabel is one of the world's strictest certifications to obtain, thereby increasing global demand;
- A solid and effective marketing tool¹⁸⁵; and
- An advantage in Public Procurement due to the 2014 EU Procurement Directive is that procurers are required to ask specifically for eco-labelled goods and services in their tenders or for equivalent documentation¹⁸⁶.

Studies have found that ecolabels positively reinforce consumers towards a product due to positive associations and a portrayed projection of the environment¹⁸⁷. Ecolabels can therefore be utilised to overcome barriers with a lack of trust in PSS solutions among consumers and barriers to penetrating the B2G market through using ecolabels in public tender material.

Indirectly, the ecolabels contribute to more durable products, ensuring more significant opportunities for PSS models focusing on increasing the utilisation and lifespan of products. Likewise, it creates more transparency about what a product contains, facilitating proper end-of-life management and increasing opportunities for PSS models focusing on refurbishment and recycling.

The topic of eco-labelling has been discussed with various PSS providers in the Nordics. It is considered valuable in some cases but also an expensive and inconvenient process (cf. section 2.2.1). The European Commission has addressed challenges with financing ecolabels, as they offer special discounts on EU Ecolabel fees for SMEs, micro-enterprises, and applicants from developing economies, thereby reducing the cost of preparing an application for the EU Ecolabel¹⁸⁸. Unlike the EU ecolabel, no discounts are offered to SMEs or micro-enterprises. When obtaining the Nordic Swan Ecolabel, an application fee amounts to € 3,000 + VAT, and an annual fee of a minimum €2,000 + VAT must be paid to secure continued certification¹⁸⁹.

3.6 Informational campaigns & challenges

Informational campaigns are often highlighted as essential measures to ensure good knowledge sharing, dissemination of legislative and regulatory requirements, and an understanding of rights for consumers and business providers. Further challenges, created as a private initiative or facilitated by a public entity, can provide a structure for innovative business development. While dissemination activities accompany most legislation in the Nordics to affected actors or guides to increase pragmatical understanding and implementation, PSS providers across the Nordics describe guidance on legislative and regulatory requirements and rights as insufficient. However, the perception of these activities' usefulness highly depends on the product group cluster in question, indicating that dissemination of certain regulatory framework conditions is sufficiently tackled, e.g. food safety regulation for the packaging product group cluster. For product group clusters, such as products for children, PSS providers experience the dissemination of the regulatory framework as neglected or not addressed to the providers for whom it is relevant.

Finnish informational campaigns and challenges

Kokeilun Paikka (Kokeilunpaikka.fi) is an openly accessible experiment platform where people can turn their ideas into experiments, apply for funding by participating in experiment challenges, comment on

¹⁸⁵ Nordic Ecolabelling.

¹⁸⁶ 'Green Public Procurement'.

¹⁸⁷ Sharma and Kushwaha, 'Eco-Labels'.

¹⁸⁸ European Commission, 'EU Ecolabel - Business'.

¹⁸⁹ 'What Does It Cost?'

other experiments, and share lessons learned. The platform aims to support and foster a culture of experimentation. It is open to individuals, companies, educational and research institutions, associations and public organisations. The hope is to increase democracy, as citizens can participate, experiment with their ideas, and learn from each other. The platform has supported small-scale, rapid experimentation related to CE business models, including different PSS models¹⁹⁰.

Another example from Finland on information measures to support PSS is the circular economy public procurement handbook. The handbook aims to increase competencies for CE public procurement, and it perceives PSS as a part of CE business models to be supported¹⁹¹.

Danish Informational Campaigns and Challenges

In Denmark, various informational campaigns and challenges are relevant to PSS providers. However, Danish PSS providers consulted describe the Danish legislation as complex and demanding to understand, especially for SMEs with fewer resources. The Danish Business Authority has developed an online platform, NyeForretningsmodeller (new business models), to assist with this. The platform aims to increase access to the public authorities for guidance and help regarding legislation. On the platform, the most important legislation related to circular business models, sharing-economy-based business models, e-commerce, and data and new technology. The platform provides the opportunity to post questions to the Danish Business Authority directly in case of doubts or hardships understanding the regulatory framework¹⁹². Although this seems like an excellent approach to overcoming the obstacles experienced by the PSS providers consulted, none has utilised the platform.

The Danish Business Authority further launched the online platform Challenges.dk in 2017, which is currently maintained by a small consortium of partners to the authority. The platform focuses on green and circular challenges/idea competitions that support the development of innovative solutions and circular business models through knowledge sharing. The platform promotes co-creations and solutions with public benefits on a local, regional, and national level¹⁹³.

While it can be demanding for PSS providers to achieve the needed understanding of legislation, consumers also need advice and guidance in understanding their rights. Danish PSS providers have highlighted how they are confronted with doubts and lack of understanding, especially use-oriented models, due to the unfamiliar product ownership configurations. The Danish Competition and Consumer Authority have developed an online platform, forbrug.dk, whereunder consumers can access guidance on their rights regarding sharing- and renting business solutions. Knowledge of insurance, payment, third-party portal, and complaints is disseminated on the platform. Thereby the platform enables consumers to have a proper understanding of these types of solutions, creating the grounds for confidence that such solutions are not a scam and that consumer rights are still covered¹⁹⁴.

Circular Sweden

Circular Sweden¹⁹⁵ is a corporate forum that drives the development of circular material flows forward with the vision to achieve 100% circular material flows. The goal includes making Sweden a leader in circular material flows and driving development internationally by 2030.

¹⁹⁰ Kokeilun Paikka, 'Kokeilun Paikka'.

¹⁹¹ Alhola et al., 'Kiertotaloushankintojen Käsikirja'.

¹⁹² Erhvervsstyrelsen, 'Om Os | Nye Forretningsmodeller'.

¹⁹³ Erhvervsstyrelsen, 'Challenges.dk lukker'.

¹⁹⁴ Forbrug.dk, 'Forbrug.dk'.

¹⁹⁵ Circular Sweden, 'Circular Sweden'.

3.7 Sub-conclusions

The frequent mention of the PSS concept within EU regulation indicates a general perception of PSS being a potentially vital circular economy tool. However, the translation of these ideals into concrete regulatory instruments aimed at promoting PSS adoption in the Nordics remains notably limited.

The implementation of EPR schemes, characterised by dynamic fee structures, can level out the economic playing field for PSS providers. Still, the Nordic countries are not in the European forefront in terms of establishing ambitious EPR schemes. A promising avenue for incentivising PSS lies in the strategic application of modulated fees aligned with the waste hierarchy. By aligning fees with practices such as product reuse and recycling, the foundation for favourable economic conditions supporting PSS can be laid.

Researchers and PSS stakeholders are advocating for additional supportive regulations to facilitate a more substantial integration of PSS models in the Nordic region. While the policy instruments discussed in the preceding sections have varying impacts on PSS models, a consistent challenge observed across the Nordic countries is the absence of adequate supporting regulation. This regulatory gap is a significant factor that hinders the realisation of the benefits associated with PSS solutions and provider ownership in the Nordic context.

Evidently, PSS models have received limited direct attention within Nordic regulatory and policy frameworks. This observation is supported by the stakeholder consultations, revealing a widespread dearth of supportive regulation for PSS. While PSS solutions exert a limited presence within regulatory documents, the Nordic nations wield an array of indirect policy tools—economic, informational, voluntary, and regulatory—that indirectly affect PSS models. Primarily, the Nordic regulatory framework concerning PSS is anchored in softer regulatory approaches. While this might not pose a direct challenge to PSS providers with a circular focus, they do face a significant challenge in competing against linear, wasteful, and unregulated business models. The promising instrument, public procurement, is far from utilised to the extent possible as a lever for PSS solutions. Nordic PSS providers struggle notably with facets of the regulatory framework related to public procurement. While Nordic public procurement outwardly emphasises sustainability and circularity, there is a persistent underlying inclination towards economic factors.

Moving beyond the need for economic incentive structures for PSS, there exists a broader necessity for regulatory standards that mandate the creation of durable and repairable products – in many instances, outlined in the EU Directives. These considerations during the product design phase play a pivotal role in supporting and amplifying the adoption of use- and result-oriented PSS solutions. The durability and repairability of products profoundly impact a PSS provider's financial outlays and the economic viability of the overall PSS solution. Furthermore, the evaluated informational campaigns predominantly focus on individual businesses instead of fostering a connected approach.

Addressing the knowledge gap, Nordic PSS providers lack a cohesive platform for cross-country, cross-product group, and cross-business size knowledge exchange. This collaborative sharing of insights could play a pivotal role in advancing PSS solutions, better equipping SMEs to navigate implementation challenges while offering established PSS providers novel perspectives on unexplored obstacles in the Nordic market. A unified Nordic PSS platform, whether steered by individual Nordic countries or orchestrated through the Nordic Council of Ministers (NCM), holds the potential to synergise the collective expertise and insights accumulated in the domain of circular economy transitions specific to the Nordic context.

4 GUIDES AND TOOLS FOR PSS

Establishing a new PSS business model or strengthening an existing one require a different product development and value chain mindset as opposed to working with a traditional linear business model. Especially the complex combination of products and services necessitate new organisational approaches.

PSS providers and value chain stakeholders point at lack of knowledge and missing access to relevant tools and templates as a very important barrier for expanding PSS in the Nordics. The design process of PSS will often be an iterative process, where lessons learned are continuously implemented in the business model while new approaches and solutions are developed and tested. This section provides insights into the available international and Nordic tools and templates for (further) development of PSS solutions, all to be found at the project's dedicated website.

4.1 International guides and tools relevant to PSS

Tools, templates, and guides supporting businesses' transition to circular business models, such as PSS, are readily available online. These tools, templates and guides are often developed by a consortium of researchers and, in most cases, free of charge. The following section will introduce five international tools, templates and guides relevant to the development, implementation and iteration of PSS solutions.

4.1.1 The Circular Design Guide



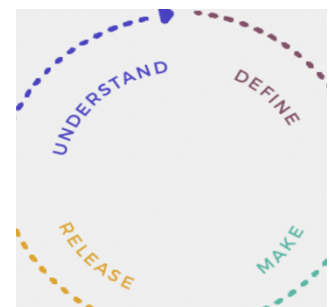
The Ellen MacArthur Foundation and IDEO have created a guide for businesses trying to transition towards CE and help innovators create more elegant, effective, and creative solutions for the CE. The guide's primary goal is to provide insight into changing the mindset of business owners, developers, and innovators to accommodate circular approaches to business practices. To enable this, the guide relies on the design thinking approach, which they argue underpins the guide and allows businesses to explore new ways to create sustainable, resilient, long-lasting value in the CE. At the Joint Nordic Workshop on PSS in the Nordics, 9 out of the 47 participants knew about The Circular Design Guide.

To ensure a good start in the transition towards CE, the Circular Design Guide has made a range of methods available to help businesses **understand, define, make, and release** circular innovations with the help of six activities within each category.

To help companies **understand** CE, the guide provides activities to Understand Circular Flows; Regenerative Thinking; Service Flip; Insides Out; Inspiration: Digital Systems; and Learning from Nature. The activity 'Service Flip' is oriented towards transitioning product-based business models to product-service models, with an accommodating Service Flip Worksheet template to assist in understanding the underlying user needs and creative out-of-the-box thinking. As multiple PSS providers experience challenges regarding cultural lock-ins and competition with linear business models, the Service Flip Worksheet template can provide the needed understanding of consumer needs to accommodate and deliver attractive product services despite the relatively absent market readiness.

To help businesses **define** their CE approach, the guide provides activities to; Define Your Challenge; Find Circular Opportunities; Building Teams; Circular Buy-In; Circular Business Model; and Create Brand Promise. The 'Circular Buy-in' are especially relevant for PSS providers by offering a template for Stakeholder Mapping, enabling a reflective process on understanding stakeholders' perspectives and creating a narrative to help them understand, e.g. a PSS solution. This allows a process where cultural and market lock-ins can be broken down to accommodate circular business practices.

To help businesses **make** circular business designs, the guide provides activities for User-Centred Research; Circular Brainstorming; Embed Feedback Mechanisms; Smart Material Choices; Concept Selection; and



Rapid Prototyping. The ‘User-Centred Research’ is highly relevant for PSS providers, especially those offering use-oriented models. An interview template is attached to this activity, as the point is direct engagement with relevant stakeholders to assist in understanding the needs of every stakeholder involved in the use cycle of a circular proposition. Thereby PSS providers can ensure that their product services are relevant, attractive, and specialised to the user group.

To help businesses *release* all the circular approaches and practices presented in the guide, the guide provides activities for Product Journey Mapping; Launch to Learn; Imagine New Partnerships; Create Your Narrative; Align Your Organisation; And Continuous Learning Loops. The ‘Product Journey Mapping’ is of particular interest for PSS providers, as the templates provided facilitate a reflective process of multiple use phases of a product, and end-of-life handling, creating an overview of process flows in complex PSS systems.

Additional advanced activities are included in the methods provided in the Circular Design Guide: Materials Journey Mapping; Product Redesign Workshop; Material Selection; and Moving Forward with materials. The methods and activities provided in this guide could all be relevant for PSS providers, including a descriptive text and a video, template, or exercise. The templates provided by the guide all provide an overview of current and potential practices for PSS providers.

The Circular Design Guide	
Developed by	The Ellen MacArthur Foundation & IDEO
Origin of funding	Eric and Wendy Schmidt Fund For Strategic Innovation¹⁹⁶
Format	Online platform – free of charge; downloadable features available
Language	English
Useful to	All types of PPS; before, during and after the development of a PSS solution
Link to tool	https://www.circulardesignguide.com

4.1.2 The Circular Toolbox^{197,198,199}



The Circular Toolbox offers a detailed step-by-step guide for apparel brands to design and launch a rental pilot in 10 months, including podcasts, tools, and templates throughout the steps. While the Toolbox focus on the apparel sector, most of the podcasts, tools, and templates are relevant for pilots in other sectors. They can facilitate the introduction of rental schemes in new and existing business practices. The Circular Toolbox was composed as a part of the Circle Textiles Programme, launched in 2014, as the first sector programme by Circle Economy²⁰⁰. At the Joint Nordic Workshop on PSS in the Nordics, only 8 out of the 47 participants had knowledge of The Circular Toolbox.

The guide consists of five steps towards piloting a business model, with the first three steps focusing on partnerships, decisions and steps needed to initiate a pilot launch:

1. Introductory knowledge of circular business models, archetypes, impact potential and best practices, including exercises and tools to ensure a common understanding of the key elements of CE in a business context, tools to identify the relevant business models and how they are

¹⁹⁶ Ellen MacArthur Foundation, ‘Design and the Circular Economy’.

¹⁹⁷ ‘The Circular Toolbox - How to Launch a Rental or Resale Pilot in 10 Months.’

¹⁹⁸ ‘Stichting Circle Economy’.

¹⁹⁹ ‘About Us - Circle Economy’.

²⁰⁰ Circle Economy is a global impact organisation founded in 2011, and funded through the Stichting Foundation. Circle Economy works to overcome barriers to CE by utilising data- and fact-based roadmaps for action, to make the CE transition understandable, and to inform policy makers.

applied in the market, tools to facilitate the definition of common team goals and working methods, and tools for successful company criteria. A podcast provides information on six company owners' journey towards decreasing consumption patterns.

2. Focus on the understanding of the customer and the market when utilising a rental business model, including tools to assist in the mapping, clustering, and summarising of relevant data for a rental business model, dos and don'ts based on knowledge shared by existing businesses, tools for the identification of the needs of customers, and tools to frame challenges as opportunities as a starting point for ideation. Collaboration templates, podcasts and useful websites are also available.
3. Guide on designing and testing a prototype. To facilitate the design and testing of a prototype, two tools are provided; a customer journey tool and a prototype canvas. A podcast with six business owners' experiences is included in this step.
4. Tools for finetuning the finding from the proceeding steps, including tools to assist in building a business case, to flag environmental, social, market and governance pitfalls, and map out the systems, processes, content, and capabilities needed to succeed with a rental business model. Also included is a partner database and guide.
5. Guide on piloting the circular business model, including tools to assist in storytelling, billboard design, and setting objectives, key results and initiatives. This step shows two podcasts focusing on crafting and implementing pilots and how brands have benefitted from circular innovation processes.

With each step and exercise, time estimation and whether the exercises are designed for a core or extended team are indicated, enabling the implementation of transitioning processes in everyday workflow. The steps and tools are designed to be used primarily by brands, next by consultants, professors, and students. The toolbox is available for everybody and can be accessed by creating a user, free of charge.

The Circular Toolbox	
Developed by	Circle Economy
Origin of funding	Laudes Foundation
Format	Online platform – free of charge; downloadable features available; options for tailored support at cost
Language	English
Useful to	Apparel branches, wanting to implement PSS solutions; gaining knowledge on implementation of pilot
Link to tool	https://www.thecirculartoolbox.com

4.1.3 ResCoM²⁰¹



In the project ResCoM (Resource Conservative Manufacturing), a collection of methodologies and tools for implementing closed-loop manufacturing systems was developed. The European Commission co-founded the project to help designers and manufacturers understand how product collection, remanufacturing, and reuse enable more profitable, resource-efficient, and resilient business practices compared to linear manufacturing systems.

The ResCoM platform has brought together 11 software applications, descriptive tools, and methods to support the decision-making and implementation of closed-loop manufacturing systems. A Circular Pathfinder is developed to assist users in identifying the most relevant ResCoM tools for the specific product

²⁰¹ 'The ResCoM Platform and Tools'.

pathway. Despite the primary focus on manufacturers, most of the tools provided by ResCoM have some relevance for distributor and retail PSS providers.

Some tools provided on the ResCoM platform are completely in line with the needs of manufacturing PSS providers, in particular:

- The Multiple Lifecycle Product Design tool: An ideation tool using the existing Modular Function Deployment (MFD) method to plan for multiple use cycles and lifecycles of a specific product. The tool enables the determination of module interfaces and standardisation to support multiple lifecycle value propositions.
- The Circular Calculator tool is an assessment tool constructed to help designers understand how strategic decisions influence the degree of circularity of resource flows and potential value capture of a Product Service System. The tool displays a product's potential mass and value flow based on whether different parts are reused, remanufactured and/or recycled, enabling the exploration of different conceptual design solutions and scenarios.
- Tools offering an overview of the economic and environmental performance of the business model, e.g. The Multimethod Simulation tool, The Multiple Product Lifecycle Management tool, and The MI: BoM Analyzer (Eco Audit Reports) tool. The latter also offers an assessment of regulatory and supply chain risks of circular scenarios.

Using these tools, some of the challenges addressed by Nordic PSS providers could be reduced since monetary risks for product and service development would be assessed and regulatory uncertainty addressed. However, at the Joint Nordic Workshop on PSS, none of the participating experts and PSS providers knew the ResCoM tool, indicating that the tool could use more exposure to the Nordic PSS providers needing exactly such guidance.

Additionally, the game ‘Lease or Buy’ is provided by the ResCoM platform. With this game, users can interactively explore the difference in revenue streams and risks associated with ownership and access two different business models. Many uncertainties for new PSS providers can be assessed through this game, creating an understanding of what to be aware of in the business model design. Several publications and case studies are available, with relevant insights on PSS models. All resources, tools and games provided on the ResCoM platform are free of charge and open to everyone.

ResCoM	
Developed by	KTH, Fraunhofer, TUDelft, Insead, Ideal & Co, Eurostep, Granta, Bugaboo, Gorenje, Loewe, Tedrive Steering, the Ellen Macarthur Foundation
Origin of funding	European Union’s Seventh Programme for research, technological development and demonstration
Format	Online platform – free trial period; downloadable features available; Account creation required
Language	English
Useful to	Support manufacturing companies and their value chains to make the transition to CE
Link to tool	https://www.rescoms.eu/platform-and-tools.html

4.1.4 Lean Service Creation (LSC) Handbook²⁰²

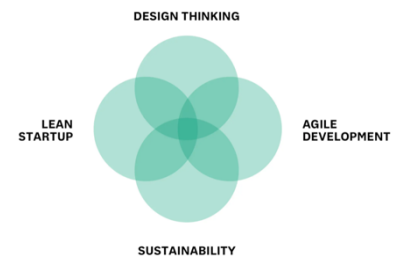


Lean Service Creation (LSC) is a well-tested and open-sourced method that presents a set of tools for different challenges and can also be seen as a culture and language for a company to work within. It combines

²⁰² Futurice, ‘Lean Service Creation Handbook’.

lean business thinking, agile development, user-centric design, and a start-up mentality. At the Joint Nordic Workshop on PSS in the Nordics, 2/47 participants knew The Lean Service Creation (LSC) Handbook.

The Lean Service Creation Handbook is developed by Futurice to help companies create innovative digital services that balance commercial imperatives and user needs and delivers positive social and environmental impact. Even though the focus is on digital solutions, the handbook can be used in any company aiming for customer-centric service. The handbook can be relevant for PSS providers who experience challenges with developing new business models due to the existing culture in the company. The handbook can be used to create a new business or make iterative enhancements to existing services.



By presenting seventeen different canvases, distributed in seven phases, the handbook provides the companies with checklists and a system for organising answers regarding business development, ensuring that the right questions are asked and the right problems are solved. The canvases help the facilitation of co-creation, quality feedback, experiments, prototyping, iterative learning, problem tackling, finding tangible ideas in abstract ones, and functioning teamwork.

1. *The business objective* – the core of the LSC process, can also be called the design phase. In this phase, a common goal is set by everyone in the team, making the team function effectively.
2. *User’s needs* – the PSS providers focus on understanding the customer’s needs, emotions, motives, and values to create services that the customers love.
3. *Ideation* – the canvases are tools for creating technically feasible ideas that fulfil business, users, and society’s needs.
4. *Concepting* – the idea is reviewed, making it more compelling and solid.
5. *Business model* - the concept is reviewed to define the business potential, considering the value exchanges.
6. *Validation* – the assumptions upon which the newly developed concept is built are validated. This ensures that the wanted objectives are reached.
7. *Wrapping it all up* – defining the minimum lovable product (MPL) the business can get away with creating and which the customers will likely fall in love with.

Lean Service Creation (LSC) Handbook	
Developed by	Futurice
Origin of funding	No funding
Format	Online platform – free of charge; downloadable features available;
Language	English
Useful to	Develop a business concept from scratch or developing an service add-on to existing business models
Link to tool	https://futurice.com/lean-service-creation

4.1.5 Circular X tools²⁰³



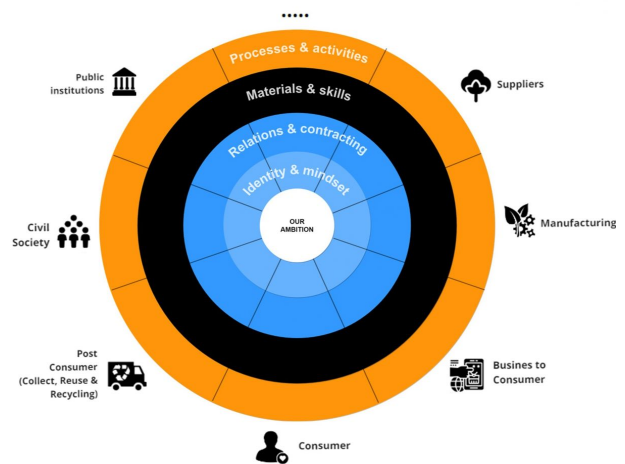
The project Circular X consists of experimentation with circular service business models, aiming to facilitate a diverse range of organisations, from start-ups to multinational organisations, with the implementation of CE practices. The project started in 2020 and will run for five years, funded by the European Research Council. A range of case descriptions, podcasts, academic publications, and annual reports are available

²⁰³ ‘The Boundary Tool | Circular X’.

on the platform, providing insights into circular business model design, servitization and circular transitions. At the Joint Nordic Workshop on PSS in the Nordics, 0/47 participants knew The Circular X tools.

A part of the Circular X project is developing tools relevant to circular businesses. While the project is still in its early stages, five templates and tools have already been published on their platform, with two being most relevant for PSS providers or business exploring options within PSS:

1. **A business for sufficiency database:** A tool showcasing publicly available data from 150 companies and their efforts to promote sustainable consumption practices. A common barrier described by PSS providers in the Nordics is the lack of market readiness and lock-ins in traditional ownership patterns. This tool provides real-world examples of how companies tackle sufficient consumption (often related to awareness raising), product life extension services, support for repair and personalised production. The database functions as an inspiration source for developing strategies for circular actions.
2. **A Boundary Tool:** A process template helping businesses engage in multi-stakeholder collaboration to strengthen circular practices and innovation processes. Most Nordic PSS providers have had the need to establish new partnerships for their PSS solutions. This template can facilitate a reflective process of partnership selection by focusing on complementarities and mismatches in stakeholder relations, competencies, and activities. The template is an activity wheel consisting of five steps.



Circular X tools	
Developed by	Nancy Bocken, Ankita Das, Marc Dijk, Deanna Han, Jan Konietzko, Laura Nießen, Roger Nyffenegger, Julia Smid, Marco van Hees & Myrthe Velter
Origin of funding	European Research Council (ERC)
Format	Online platform – free of charge; downloadable features available;
Language	English
Useful to	All types of PSS, in before, during and after the development of a PSS solution
Link to tool	https://www.circularx.eu/en

4.1.6 The Circulator²⁰⁴



The Circulator was developed through an EIT Raw Materials funded project with the aim to support aspiring entrepreneurs in the implementation of conscious strategic decisions regarding the sustainability of their business model and value proposition. The web-based tool provides an overview of the most relevant business models for the raw materials industry in a circular context.

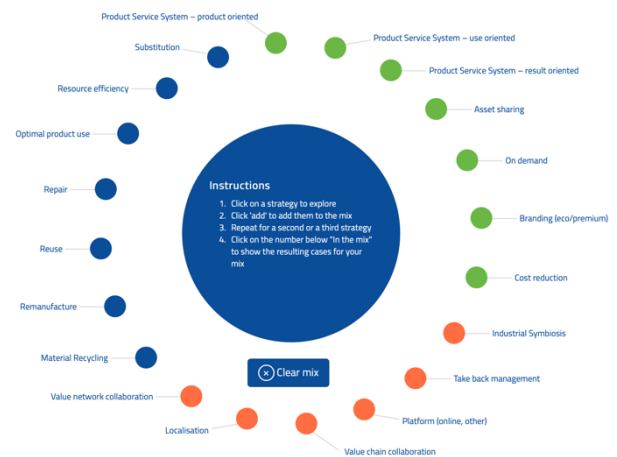
The central idea behind the Circulator is the notion that circular business models typically consist of a mixture of strategies that can be organised into three main categories described in the following:

1. **Circular Value Creation Strategies** – the category relates to the component of the business model that enables the creation of economic and environmental value based on the circular management of products and/or materials. In a Business Model Canvas Framework, Circular Value Creation Strategies are often linked to the key activities, key resources and capabilities or the key partner elements.

²⁰⁴ Circulator, 'Circulator'.

2. **Value Proposition Strategies** – the category refers to the manners of delivering value to the customers that typically enable the inclusion of circular value creation strategies in a business model. In a Business Model Canvas Framework, Value Proposition Strategies are linked to the product offer, customer segments and customer relationships elements.

3. **Value Network Strategies** – the category refers to strategies that go beyond the business itself, acknowledging that a truly circular business entails the full value network to be involved in creating shared values. In the Business Model Canvas Framework, Value Network Strategies are linked to the delivery channel, customer relationships, key partners or key resources and capability elements.



Based on the project of which the web-based tool is developed, it is highlighted that a circular business model suited to a specific company or start-up can be made by mixing the strategies from the three main categories. The web-based tool also offers an overview of existing companies using the strategy mixes.

The Circulator further offers the concept of Archetypes. Four archetypes have been identified, representing a certain blend of business focus as the main entry point for developing a circular business model.

As illustrated in the strategy mix tool, all archetypes of PSS are included in the tool. When three strategies have been selected, case examples utilising the same strategy mix are available to the user of the Circulator, enabling business owners to gain insights into lessons learned, different utilisation of strategies, etc.

The Circulator	
Developed by	VITO, Circular Flanders, TUDelft & Radboud University
Origin of funding	EIT Raw Materials
Format	Online platform – free of charge.
Language	English
Useful to	All types of PSS, before, during and after the development of a PSS solution
Link to tool	https://www.circulator.eu

4.1.7 CEvaluator²⁰⁵



The CEvaluator is a checklist that was developed for the financial sector and maps out the circularity performance of investment files in an objective yet accessible manner. The tool was developed in a partnership between VITO, Econocom and the Foundation for Future Generations, with the support of the Circular Flanders. Flanders Circular is the hub and inspiration for the circular economy in Flanders. It is a partnership of authorities, companies, the midfield and the knowledge world, who take action towards circularity together.

The tool considers circularity in the sense of product and material flow. Broader aspects of ecological sustainability are also included. The checklist exposes typical funding opportunities and risks relating to circular cases and revenue models.

The generated output does not contain percentages or scores. Rather, the tool offers a nuanced overview of opportunities and risks regarding the circular economy. The visual presentation provides the user with

²⁰⁵ CEvaluator, 'CEvaluator'.

insights into the extent to which the files address the dimensions of circularity and enables files to be compared with one another.

To ensure objective outputs, the CEvaluator is aligned with broader European frameworks, e.g. the categorisation system developed by the EU Commission’s Expert Group on Circular Economy Financing. When utilising the CEvaluator, the user will be taken through six steps, as listed below:

1. Transition to a circular economy
2. Environmental sustainability
3. Opportunities
4. Risks
5. Your details
6. Your results

Step 1-4 is set up like a survey, assisting the user in reflections on whether essential circular parameters has been touched upon in the business’ application to get an investment. Step 5 requires the input of the basic business data, and Step 6 provides the results of the valuator.

CEvaluator	
Developed by	VITO, Econocom & the Foundations for Future Generations
Origin of funding	Flanders Circular
Format	Online platform – free of charge.
Language	English
Useful to	All types of PSS financiers and PSS businesses seeking an understanding for financiers valuation process.
Link to tool	https://www.cevaluator.be/en

4.2 Nordic guides and tools relevant to PSS

Tools, templates and guides supporting businesses’ transition to circular business models have also been developed in the Nordics. The Nordic tools, templates and guides are mostly developed by researchers like their international counterparts. However, some of the Nordic tools, templates and guides have been developed in partnership with public authorities. The following section will introduce eight Nordic tools, templates and guides relevant to the development, implementation and iteration of PSS solutions.

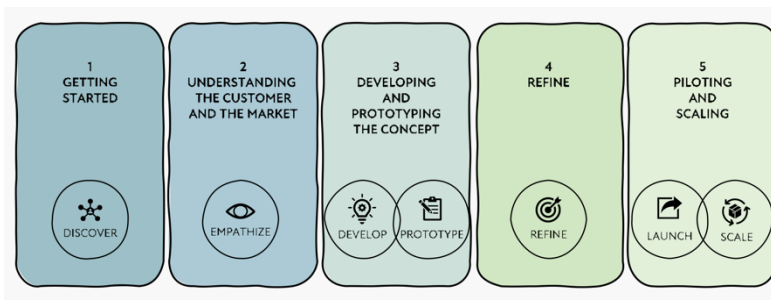
4.2.1 Guide for developing product as a service business²⁰⁶



The Guide for developing Product as a Service Business was created in the research project Paas Pilots during 2021-2022. The examples are on implementing and developing Product as a Service in the context of the textile industry. However, regardless of the operative domain of companies, the guide provides useful tools and tips applicable to both business and consumer-to-business markets, helping them to form a product as a service business model.

²⁰⁶ Heinonen et al., ‘Guide for Developing Product as a Service Business’.

The guide is useful for businesses searching for an introduction to and overview of Product as a Service Models, the possibilities they provide and what the building and implementation of such business models require. Besides an introduction to Product as a Service model with real-life examples and a discussion on the value it provides from an economic, societal, and environmental perspective, the guide provides practical guidance on the preparation and implementation of Product as a Service model. The approach is based on visioning and road mapping and results in the creation of a developer's path. The Product as a service developer path consists of the following 5 steps:



1. Getting started involves considerations of demand and need for circular business models, collaborative opportunities, mapping of success goals and focus areas, stakeholder map, and priority of key targets.
2. Understanding the customer and the market involves, e.g., considerations on how the business model is special compared to traditional and whom it creates value for.
3. Developing and prototyping the concept, involving, e.g., price setting, tests with customers, visualisation of customers' "journey map", and exploration of gaps.
4. Refine, involving, e.g., cross-checking on the business models' environmental and social impact, the definition of partners, and the definition of steps still needed before launching.
5. Piloting and scaling, involving, e.g. the creation of a marketing campaign, measurements of the concept's impact, piloting and testing of the concept in practice.

Each step outlines elements important to consider and perform in the development of Product as a service business and gives suggestions on suitable tools to use in the step.

Guide for developing product as a service business	
Developed by	Turku University of Applied Sciences, VTT Technical Research Centre of Finland and LAB University of Applied Sciences
Origin of funding	Finnish Innovation Fund Sitra
Format	Report, available online
Language	English
Useful to	All business providers wanting to develop and implement PSS solutions
Link to tool	https://www.theseus.fi/handle/10024/781641

4.2.2 Klimakompaset (the climate compass)²⁰⁷



Klimakompaset was developed for the Danish Business Agency to help businesses calculate greenhouse gas emissions caused by business activities. The tool is financed by the European Social fund and the European Regional development fund. The tool was developed for different types of businesses and can be used partially or entirely, depending on wants and needs. All data and results of Klimakompaset are based on the Green House Gas (GHG) protocol as a standard on how CO₂ emissions are calculated, covering six types of greenhouse gasses.

²⁰⁷ The Danish Business Agency, 'Forside | Klimakompaset'.

The tools provide two calculation options for businesses: 1) calculation of the environmental impact of the current practices of a company; and 2) calculation of different scenarios for reduction measures of a business. The results are reported as CO₂e emissions in three scopes: Scope 1 (direct emissions from business activities), Scope 2 (indirect emissions from energy- and heat consumption), and Scope 3 (indirect emissions from the value chain), and in total CO₂e emissions in tonnes. The emission factors used for the calculations are updated annually, based on, e.g. implementation of renewable energy sources in Denmark.

While the tools cannot be used directly for certification or as a basis for green marketing, other functions of the tool are relevant for PSS providers. The tool can be utilised to analyse emissions from five categories of business activities: energy and process consumption; primary and secondary procurement; transportation; waste and recycling; and products sold. The category ‘products sold’ are of particular interest to PSS providers since it includes the use phase of products sold or rented out. The tool provides an overview of which categories a business should implement reduction measures and the number of tonnes of CO₂e emissions per employee, per million DKK turnover, and per square meter. PSS providers can use the results provided by the tool as input for the yearly business climate account, which many Danish businesses compose to be ready for future climate regulation.

Most importantly, the tool can evaluate the effect of business reduction measures on emissions in scope 1, 2 and 3. This function can be utilised as a decision tool since multiple calculations can be made by one business, enabling strategic selection of reduction measures. A detailed step-by-step guide is provided by the Danish Business Agency.

Klimakompasset (the climate compass)	
Developed by	Danish Business Agency and the Confederation of Danish Industry
Origin of funding	The European Social Fund and the European Regional Development Fund
Format	Online platform
Language	Danish
Useful to	All businesses, wishing to increase an understanding of their Greenhouse Gas Emissions
Link to tool	https://klimakompasset.dk/klimakompasset/

4.2.3 Total Cost of Ownership tool²⁰⁸



The Danish Environmental Protection Agency has developed a total cost of ownership (TCO) calculating tool, which provide the sum of a product’s purchase price and the overall operating costs for the product's lifetime. It is a simple-to-use, free tool in an Excel format, with in-depth guidance on all variables.

The TCO tool is not available for all product types but is relevant in an assessment of the following: computers, displays, multifunctional devices, projectors, servers, storage, large network equipment, small network equipment, UPS, lighting, refrigerators and freezers, self-service machines, add-on bidets, motorised vehicles, air coolers, condenser units, dishwashers, ovens, and washing machines. The TCO tool does not apply to all product types and is designed for providers and procurers of the B2G market only. However, it does make sense to utilise the TCO tool when:

- Operating costs constitute a large part of the total costs of a product,
- There are significant differences in the annual operating costs of a product,
- There are significant differences in the lifespan of a product,
- There is a standard for measuring the lifespan of a product.

The TCO tool considers power consumption, water consumption, resource consumption, installation, services and working hours. However, the calculations are based purely on economic aspects and do not

²⁰⁸ The Danish Environmental Protection Agency, ‘Hvad er totalomkostninger?’

account for environmental factors. The Danish EPA developed the tool as a part of the Danish Government's strategy for intelligent public procurement and is used in a tender process by both the public agency or organisation and the provider of a product. However, PSS providers focusing on the B2B and B2C market can also find some relevant use for the tool, e.g. calculating the estimated climate footprints of a product based on standards for CO₂ emissions and kWh on the product types. The total costs and climate footprint estimates can be utilised by PSS providers as a guideline for pricing and improvements of the product services provided, which many Nordic PSS providers describe as a challenging process.

Total Cost of Ownership tool	
Developed by	The Danish Business Authority, the Danish Environmental Protection Agency and the Danish National Association of Municipalities
Origin of funding	The Danish Environmental Protection Agency
Format	Downloadable content
Language	Danish
Useful to	Public procures, and business wishing to gain an understanding of TCO of a product
Link to tool	https://denansvarligeindkober.dk/tco-vaerktoejr

4.2.4 ready2LOOP²⁰⁹



Ready2LOOP is a free online platform developed to support manufacturing companies and their value chains to make the transition to CE. Financed by the Danish Industry Fund and developed by the Technical University of Denmark, the ready2LOOP project aims to support the Danish industry to increase competitiveness when transitioning to CE across the entire value chain. However, the platform can be used by all.

By creating a profile on the website, any company can evaluate their specific readiness for the transition towards CE, create an overview of the strategic opportunities for transitioning, get help to prioritise and select a dimension to focus on and plan the implementation for actions towards CE. Results provided through the website are based on a three-year project, where the consortium behind ready2LOOP worked in close partnerships with multiple companies, such as Novo Nordisk, to define, develop and implement initiatives and improvements of companies' transition pathways. The insights gained from the partnerships with companies have been the basis for the development of the Transition paths tools.

The tool is primarily relevant for manufacturing companies of all sizes, including those offering PSS solutions. The ready2LOOP platform entails three tools primarily relevant for businesses wishing to develop strategies to provide PSS solutions or further develop their existing PSS solutions:

- The MECO analysis tool screens the products' environmental impact
- The Readiness workshop toolkit enables the identification of focus areas for transitioning by prioritising readiness dimensions
- The Circular Strategy Scanner provides a comprehensive overview of CE strategies.

Besides the three tools available for all, additionally, 21 tools are available for members of the website, including the Circular Economy Sustainability Screening tool, Recirculation Strategy Decision Tree, and a Business Ecosystem Mapping tool. Many of the tools provided are relevant for PSS providers wishing to collaborate with new partners or further develop already existing partnerships. Furthermore, five databases of tools are available on the website, providing a collected overview of resources of relevance for PSS providers and other providers of circular products or services.

²⁰⁹ ready2LOOP.org, 'Making the Transition to Circular Economy'.

ready2LOOP	
Developed by	The Technical University of Denmark in consortium with other Nordic partners
Origin of funding	The Danish Industry Fund
Format	Online platform – free of charge. Membership provides additional tools and support.
Language	English
Useful to	Support manufacturing companies and their value chains to make the transition to CE
Link to tool	https://ready2loop.org

4.2.5 The Nordic Circular Economy Playbook Toolkit²¹⁰



The Nordic Circular Economy Playbook by Nordic Innovation provides an in-depth understanding of current knowledge on how to achieve circular advantages for companies. Companies can leverage the playbook to meet customer expectations better, deliver outcome-oriented solutions, and improve efficiency through technology and digitalisation. The playbook is oriented towards companies in the Nordic manufacturing industry, with examples from five sub-sectors: Machinery and equipment; Maritime; Energy; Transportation; and Construction. All sub-sectors are covered in the product groups included in the project *Product Service Systems in the Nordics*. The Nordic Circular Economy Playbook includes nine tools and templates for developing, evaluating, and assessing PSS business models. Four tools are provided in the shape of Excel files, enabling automated outcome calculations:

1. A business Model Development tool to enable the iteration of the most promising circular business models for a company. The tool consists of a set of exercises to support the identification of inefficiencies and customer pain points, the relevance of the circular business model, and prioritising development aspects.
2. A Value case tool to support economic aspects and estimate revenue potential, cost impact and investment needed. This enables an understanding of the value levers of circular business models and their sub-models.
3. A Capability Maturity Assessment tool to ensure that the needed human resources are available to achieve the estimated revenue potential. This tool supports companies in assessing the maturity of the business in circular capacities and prioritising internal and external capacity building.
4. The Technology Maturity Assessment tool can determine the maturity of used technologies, enabling an overview of needed technology and prioritising the development of new technology. These tools can help overcome challenges in market readiness, technological capacity, and lack of capital, as experienced by many PSS providers in the Nordics.

Additionally, five templates are available to facilitate reflective processes on the market aspect and internal development potential:

1. A Culture Gap Analysis template explains how company culture supports adopting circular business models and identifies how to bridge culture gaps.
2. An Ecosystem Partner Identification template enables an overview of external partners that can help build internal capacity by listing needed support from establishing new partnerships.
3. A Funding Requirement Analysis template facilitates reflective processes on areas where funding could enable piloting new business ventures.
4. A Roadmap Development templates support planning the first step towards circular transformation through listing key activities, estimated completion time and prioritisation in short- to long-term goals.

²¹⁰ 'Nordic Circular Economy Playbook Toolkit'.

- To tie it all together, a Business Model Canvas template is provided, to assist in an overview of key building blocks, including value proposition, infrastructure, customers, and financing. These enables an overview of the many product-, resource-, and business flow processes, which many PSS providers in the Nordics are seeking tools to provide.

All tools and template take less than an hour to fill out and are available to everyone free of charge. Even though the toolkit has been developed with manufacturing companies in mind, most of the exercises provided through the tools and template are relevant for distributors and retail PSS providers as well. This is especially the case when it comes to the Ecosystem Partner Identification template and the Roadmap Development template.

The Nordic Circular Economy Playbook Toolkit	
Developed by	Nordic Innovation
Origin of funding	Not disclosed
Format	All tools and template taking less than one hour to fill out – free of charge
Language	English
Useful to	Companies in the Nordic manufacturing industry, in particular within Machinery and equipment; Maritime; Energy; Transportation; and Construction.
Link to tool	https://www.nordicinnovation.org/tools/nordic-circular-economy-playbook-toolkit

4.2.6 PROTEUS PSS Tool Book²¹¹

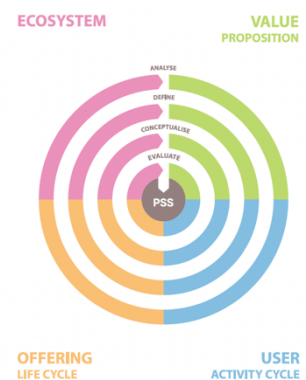


The PROTEUS project was a 3 ½ year Innovation Consortium financed by the Danish Agency for Science, Technology, and Innovation (DASTI). PROTEUS is an acronym for the research project title: “**PRO**duct/service-system **T**ools for **E**nsuring **U**ser-oriented **S**ervice”. The Consortium was formed by ten companies, a branch organisation, two research institutions and an engineering consultancy.

The tool book is built around the four fundamental dimensions of PSS composed through observations of industrial PSS practices. A successful PSS concept needs to address and incorporate a value proposition considering and serving central stakeholders, including an extensive understanding of the customer and the actual users’ activities, an in-depth understanding of the entire life cycle of the offerings, and careful consideration and integration of various stakeholders in the business ecosystem.

11 tools are provided in the tool book – all related to one of the four fundamental dimensions of PSS, including:

- A PSS Audit Matrix template facilitates the communication between product-service developers and strategists in an organisation by translating modular design rules to PSS development strategies.
- An Ecosystem Map template facilitating an overview of interactions between stakeholders relevant to a PSS concept.
- A User Activity Cycle template for the identification of activities and associated needs of the user of a PSS solution.
- A Product Life Gallery template ensures an overview of each physical product’s life cycle.



Besides the templates related to the four dimensions, additional templates and tools are offered, including a Service Blueprint template, a TCO chart tool, a Value Strategy Canvas tool, a PSS configurator tool, a PSS Morphology template, a PSS Concept evaluator tool, and a Design for PSS template. The tool book provides

²¹¹ Finken et al., ‘PSS Tool Book – A Workbook in the PROTEUS Series’.

overall relevant tools for PSS product development, pricing, and strategy development. The workbooks provide the needed context, case examples and an understanding of the underlying processes of developing and conservating PSS solutions in a transitioning market.

PROTEUS PSS Tool Book – PROduct/service-system Tools for Ensuring User-oriented Service	
Developed by	A consortium of companies, a branch organisation, research institutions and an engineering consultancy, DK
Origin of funding	Danish Agency for Science, Technology, and Innovation (DASTI), DK
Format	Online tools for PSS product development, pricing, and strategy development and workbooks providing the necessary context, case examples and an understanding of the underlying processes of developing and conservating PSS solutions in a transitioning market.
Language	English
Useful to	All business providers wanting to develop and implement PSS solutions
Link to tool	https://proteus.dtu.dk/results/workbooks

4.2.7 CIRCit Norden²¹²



CIRCit is a research project that, between 2017-2021, worked on developing, testing, and implementing science-based tools for Circular Economy in the Nordics. The project was a part of the Nordic Green Growth Research and Innovation Programme and was funded by NordForsk, Nordic Energy Research and Nordic Innovation. Six workbooks contain a total of 32 templates and tools:

1. Circular Economy Sustainability Screening
2. Circular Economy Business Modelling
3. Circular Product Design and Development
4. Smart Circular Economy
5. Closing the Loop for a Circular Economy
6. Collaborating and Networking for a Circular Economy

All templates and tools provided on the CIRCit Norden Platform consist of step-by-step approach descriptions and a phase overview indicating when the template should be applied in a development process.

Depending on the stage of the product services of a PSS provider, all workbooks and related tools can provide relevant insights for a reflective and thorough PSS design, including:

- ‘Guidance for Navigating Trade-offs to Support Sustainability-related Decision-making’ to support any decision-maker focusing on the early stages of development of a sustainability-related initiative at a tactical and operational level. The guidance tool provides support for building argumentation and justification of decisions with a hands-on approach to avoid haphazard choices. The guidance can support multidisciplinary teams, teams of business developers, product designers, or production or service managers. *Developed within the Circular Economy Sustainability Screening.*
- ‘Circular Economy Customer and End-user Journey Map’ to assist in the configuration of value positioning. The template can be used to define the appropriate value or set of experiences for customers and end-users based on perceptions of benefits and sacrifices. The template is designed to facilitate defining and refining new business models, and resource decoupling practices, which could help overcome some of the challenges experienced by PSS providers. *Developed within the Circular Economy Business Modelling workbook*

²¹² CIRCit Nord, ‘Tools’.

- ‘Market and Product Decision Tree’ for identifying possible recirculation strategies to improve existing business approaches. The tool uses a range of yes and no questions related to products and markets to guide providers in identifying the best opportunities for a specific product. Depending on the answers, the most optimal strategy will be recommended. Long-term strategies can be developed based on the results, enabling PSS providers to tackle their specific challenges. *Developed within the Closing the Loop for a Circular Economy workbook.*

To identify the most relevant tool for a specific business, a Circular Strategies Scanner is provided, and serves as a good starting point to create a comprehensive understanding of CE strategies through mapping of existing initiatives.

The CIRCit Norden platform	
Developed by	Nordic Green Growth Research and Innovation Programme
Origin of funding	NordForsk, Nordic Energy Research and Nordic Innovation
Format	Online platform – free of charge; downloadable features available;
Language	English
Useful to	Provide relevant insights for a reflective and thorough PSS design
Link to tool	https://circuitnord.com/tools/

4.2.8 Accelerating system Transitioning Towards Circularity - ATTC 2 toolbox



The ATTC 2 managerial toolbox, developed by RISE researchers²¹³, offers a selection of methods for diagnosing and facilitating change and business model innovation towards circularity in organisations and business ecosystems. The selection resulted from a combination of factors considering theoretical investigation and practical managerial experience, which aim to provide theoretically sound tools that are easy to use and suitable for bringing about organisational changes, particularly towards higher degrees of circularity. The main aim is to help organisations move away from “management of unsustainability” lock-in and transition towards more sustainable configurations – a shift from “doing things better” to “doing better things”.

The toolbox contains 15 diagnosis methods, nine methods for facilitating organisations or being used by organisations, and nine methods for facilitating business ecosystems creation and development or for business ecosystem leaders to use. Not one of them is individually more effective than the others. It is recommended that their selection is a task that should be carefully planned and executed, preferably with the support of change management experts who would coach companies in identifying the “root problem” of an unsustainable system they are in and carefully combine the methods that are the most suitable for their specific organisation and context^{xciV}.

Accelerating system Transitioning Towards Circularity - ATTC 2 toolbox	
Developed by	RISE
Origin of funding	RISE Research Institutes of Sweden AB
Format	Pdf document
Language	English
Useful to	Organisation moving towards the development of a circular business model
Link to tool	https://www.researchgate.net/publication/355406848_attc_2_toolbox_1_accelerating_system_transitioning_towards_circularity_a_toolbox_for_practitioners

²¹³ Vanacore et al., ‘Accelerating System Transitioning Towards Circularity - A Toolbox for Practitioners’.

4.3 Relevance of available tools

A broad selection of tools, templates and guides are available for PSS developers, but only a few tools are known and used by the Nordic PSS actors. This is confirmed by the stakeholder identification of desired tools in the present project as many of the requested functionalities are already available in free-to-use tools:

- ‘Tools for emission calculation’ (*The climate compass; Ready2loop; ResCoM*);
- ‘Templates to increase customer experiences and value’ (*The Circular Design Guide; The Circular Toolbox; Lean Service Creation (LSC) Handbook; Guide for developing product as a service business; The Nordic Circular Economy Playbook Toolkit; PROTEUS PSS Tool Book; and CIRCit Norden*)
- ‘Guidance on organisational transformations supporting PSS’ (*Lean Service Creation (LSC) Handbook; Guide for developing the product as a service business; PROTEUS PSS Tool Book; and ATTC 2 toolbox*); and
- ‘Guidance on revenue stream calculations’ (*The Nordic Circular Economy Playbook Toolkit*).

While Nordic governmental agencies have endeavoured to address environmental assessments through various national guidelines^{214,215,216,217,218}, that tools do not always reach the business providers. PSS providers are in a position where the *Lack of standard solutions*, such as contracts tailored to the unique configurations of PSS models, challenges efficient internal processes and communication with consumers. In many instances, PSS providers find themselves having to start from scratch to operate and enhance their business practices.

In addition to the above, stakeholders particularly request additional tools allowing more effective management of PSS business models, including:

- Tools for financial calculations such as Internal Rate of Return, Return On Investment and Net Present Value, including comparison with traditional, non-PSS solutions
- Tools for environmental calculations enabling comparison with standard solutions
- Tools for social gains mapping enabling comparison to standard solutions
- Guidance for marketing and for procurers/consumers of PSS solutions.
- Guidance (with case examples) on best practices, pitfalls, legislation and financial measures relevant to PSS
- Comparative insights into regulatory frameworks and financial measures across Nordic countries, EU member states, and non-EU countries.

The present project accommodates some of the demands from the PSS stakeholders – with the regulatory overview, best practice examples and tools for assessing the potential environmental, economic, and social impacts of PSS. Still, there is a need to ensure that these – and other existing tools and guides – are properly disseminated to the target groups and the Nordic Council and Nordic governments can play an important role in this respect.

²¹⁴ Danish Environmental Protection Agency, ‘Handbook on Environmental Assessment of Products’.

²¹⁵ Business Sweden, ‘Environmental Permitting Process’.

²¹⁶ Miljøverndepartementet, ‘Environmental Impact Assessment’.

²¹⁷ Finnish Ministry of the Environment, ‘Environmental Impact Assessment’.

²¹⁸ Icelandic Ministry of the Environment, Energy and Climate, ‘Environmental Impact Assessment’.

5 CONCLUSIONS

Existing and potential PSS providers encounter a broad array of obstacles hindering them from fully harvesting the fruits of well-functioning PSS models. Existing enablers addressing some of those challenges identified by PSS stakeholders are presented below.

5.1 Cultural Enablers

Collaboration & knowledge sharing

PSS providers across the Nordic region are demonstrating a strong inclination to engage in dialogues and establish collaborations with fellow businesses, fostering cross-country learning and mutual growth. A knowledge-sharing platform dedicated to circular business practices within the Nordic context was highlighted as a means to enable increased circularity in the Nordics. This platform should aim to facilitate the exchange of insights on enhanced circularity and the optimisation of value chains, thereby fostering novel partnerships and bolstering the overall competitive edge of the Nordic region in the circular economy arena.

Sustainable consumer focus

Consumers' growing awareness of sustainability in the Nordics is paving the way for expanding PSS solutions. PSS providers are witnessing a heightened emphasis on the environmental benefits of shared product usage and optimised material utilisation. The ability of a PSS provider to transparently demonstrate their commitment to sustainable practices becomes a pivotal factor. However, it's worth noting that this endeavour poses a significant challenge for numerous PSS providers. Since PSS does not inherently guarantee sustainability, fostering consumer confidence in PSS solutions necessitates a foundation built on tangible evidence. This approach is important to ensure that PSS solutions in the Nordic region continue to thrive without encountering unnecessary scepticism.

The actualisation of circular economy

Numerous consulted PSS providers derive a sense of optimism from the ongoing societal shift towards a Circular Economy, which holds promise for the future of PSS. Factors such as the growing availability of recycled materials and an increased emphasis on sustainable and durable product design are anticipated to be advantageous for PSS providers operating within the circular framework. However, it is acknowledged that the full realisation of a circular economy remains an evolving endeavour. Confidence among providers in the pace of transitioning to a Circular Economy is closely intertwined with the strategies and actions adopted by Nordic policymakers, underscoring the pivotal role that policy approaches play in shaping the speed of this transformative transition.

5.2 Technical Enablers

Data & documentation

From the outset of implementing their PSS solutions, PSS providers have prioritised the gathering and processing of data related to product usage and functionality. They have encountered relatively fewer obstacles when it comes to showcasing the sustainability aspects of their business model. This advantage has been particularly prominent in industries that are accustomed to handling data collection and analysis, such as the IT sector. This distinction underscores a notable divergence in technical and analytical proficiency that is essential for effectively managing and validating intricate value chains within PSS implementations.

Social Media (SoMe)

Multiple Nordic PSS providers have emphasised Social Media (SoMe) as a crucial technical facilitator for connecting with customers. SoMe platforms are notably popular among SMEs and PSS providers focusing on products and services related to household and family life. While leveraging SoMe is considered an effective method of establishing customer relationships, providers also acknowledge its costliness due to expenditures on influencers and SoMe consultants.

Nordic infrastructure

Nordic PSS providers have underscored the significance of the well-functioning Nordic infrastructure in supporting the implementation and advancement of PSS solutions. The Nordics, in general, are perceived as possessing robust physical and digital infrastructural frameworks that foster innovative business models. This supportive environment also offers opportunities for incorporating recycled materials, along with dependable accessibility to value chains and customers.

5.3 Economic & Market Enablers

Assistance for economic support

Among the Nordic PSS stakeholders consulted, discussions on funding and loans have dominated the conversation. Numerous PSS providers have observed a greater willingness to invest, provide funds, or extend loans to PSS enterprises beyond the Nordic region. Many providers have encountered difficulties in clarifying their rights, finding guidance, and accessing economic support and funding. Nordic stakeholders have proposed potential solutions such as establishing quotas for financial institutions concerning green loans or investments and creating comprehensive guides for actualising circular business models.

Collaboration with public entities

A select few of the consulted PSS stakeholders have entered collaborative partnerships with public entities, such as municipalities, to gain access to discarded products and recycled materials. This cooperative approach has proven to be a significant catalyst for implementing circular PSS solutions, resulting in reduced material costs and other benefits. Additionally, these collaborations have aided public entities in waste reduction efforts through upcycling initiatives.

Public procurement

Public procurement has been identified as a dual-faceted factor, acting as a hindrance and an accelerator, depending on the specific product category. While all Nordic countries have introduced some degree of innovation or circular emphasis in their public procurement, almost all stakeholders focusing on business-to-government (B2G) interactions have noted a disconnect between written directives and the actual selection process. Furthermore, certain (product) services appear to be generally overlooked within some sectors. Nevertheless, the majority of B2G-oriented PSS stakeholders agree that public procurement wields substantial market influence and can effectively function as a catalyst for advancing circular PSS solutions.

5.4 Regulatory Enablers

Regulatory incentive structures

Incentive frameworks driven by regulations, such as reduced taxation, subsidies, the implementation of Extended Producer Responsibility (EPR) initiatives, and ecosystem-support mechanisms, have the potential to stimulate the adoption of PSS solutions in the Nordic region. EPR, in particular, has garnered attention with the anticipation that product cradle-to-gate costs will favour circular PSS solutions. These regulatory incentives could play a pivotal role in enhancing circular PSS solutions and broader circular business

models, ensuring market support for societal transitions towards circularity. Nevertheless, the Nordic PSS stakeholders generally view existing regulatory incentive structures as inadequate, potentially distorting the market.

Consulting & guidance

Among the consulted PSS providers, many have highlighted the value of consultancy and guidance relating to legislation, funding opportunities, and business model development. Access to such assistance has often been facilitated through national business programs like the Danish SVM:Grøn or the Swedish Mistra. Innovative and circular business development initiatives are regarded as substantial support, particularly for SMEs navigating the landscape of PSS solution development.

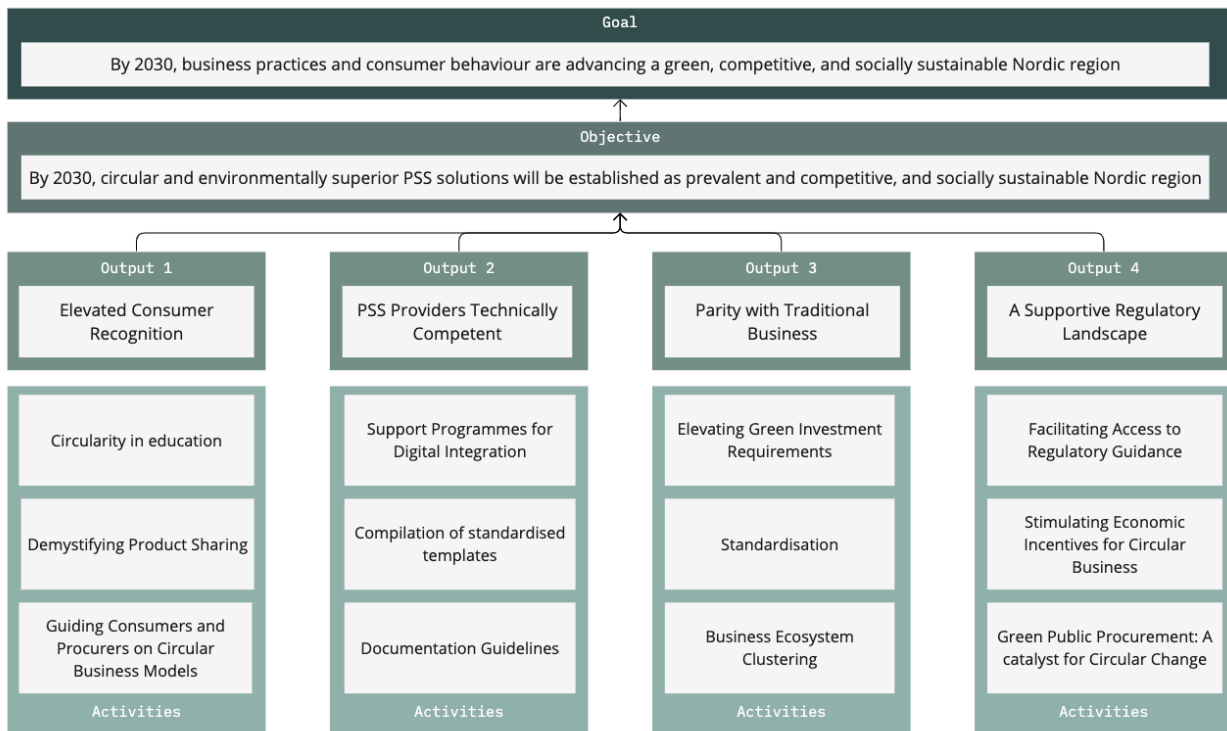
Reporting standards

A recurring concern among the consulted PSS providers pertains to the documentation of circular practices. Many providers express confusion regarding approaches, requisite levels of detail, and analysis in matters of sustainability and marketing. Reporting standards, approaches, guides, and guidelines has been highlighted as an enabler to ensure that PSS providers neither 'green wash' nor 'green hush' in their endeavours to set themselves apart from the linear sales models. While certain guides and guidelines have been introduced and published in recent years, numerous SMEs still encounter considerable challenges in ensuring compliance with marketing regulations.

6 RECOMMENDATIONS FOR NORDIC POLICYMAKERS

The exploration of barriers to PSS implementation in the Nordics, along with examining the regulatory landscape and available tools, templates, and guidance pertinent to PSS, have provided knowledge on the need for supportive measures to support the implementation of PSS solutions in the Nordic region.

The figure below illustrates the Theory of Change behind the recommendations in this section.



The figure demonstrates the causal linkages and the logical alignment between desired outcomes and suggested initiatives.

The Nordic Council of Ministers' 2030 vision guides the long-term objective: "The Nordic region will become the most sustainable and integrated region in the world". This vision, encapsulating the elements of a competitive, green, and socially sustainable Nordic region, serves as the foundation for the overarching aspiration:

By 2030, business practices and consumer behaviour are advancing a green, competitive, and socially sustainable Nordic region.

Zooming in on PSS solutions, the immediate objective expresses the ambition that PSS plays an essential role in the societal pursuit of sustainability:

By 2030, circular and environmentally superior PSS solutions will be established as prevalent and competitive business models in the Nordics.

The strategic objectives form the suggested strategy elements, which provide pragmatic resolutions to pressing challenges in the PSS landscape. The recommendations are structured into four distinct outputs, each detailed by three actionable activities and collectively constituting a cohesive and holistic approach towards achieving the immediate objective. The following four outputs are delineated to guide the path:

1. Elevated Consumer Recognition: PSS and circular business models are widely recognised by consumers

2. PSS Providers Technically Competent: PSS providers are equipped with the technical proficiency needed for business development and documentation
3. Parity with Traditional Businesses: Circular PSS business models are matured to compete on a level playing field with the traditional linear models
4. A Supportive Regulatory Landscape: The Nordic regulatory framework supports circular business development

6.1 Elevated Consumer Recognition

The PSS landscape is characterised by a particular cultural hesitance among consumers and procurers in fully adopting the PSS concept, with which admittance to product use is the highest priority, whereas product ownership is left with the manufacturer. This first output ensures that consumers widely recognise PSS and circular business models as preferable to the traditional buy-and-own model. This output and strategy are unfolded below.

6.1.1 Circularity in education

Shaping the consumers of the future to contribute to sustainable development actively demands educational interventions. Educational initiatives are paramount to empower the next generation with a profound understanding of the circular economy, encompassing the impacts of extraction, production, utilisation, and disposal of products, as well as their influence on climate change.

Introducing circularity into the school curriculum can equip children with the knowledge and skills to become conscientious consumers. Moreover, this approach has the potential to positively influence parental consumption patterns through the increased insights gained through the children. The following activities are recommended:

- a) Investigate and design an optimal pedagogical approach, drawing inspiration from successful initiatives²¹⁹ to enhance children's comprehension of circular and sustainable production and consumption.
- b) Incorporate circular economy concepts, cradle-to-cradle production principles, circular consumption approaches, and climate change topics into the syllabus of 5th to 9th-grade students.
- c) Facilitate experiential learning through field studies of circular businesses, municipal waste facilities, and similar contexts for 7th to 9th-grade students.

6.1.2 Demystifying Product Sharing

Product sharing, a fundamental component of the PSS concept, holds a remarkable potential to significantly curtail material consumption without compromising the quality of life. While consumers and procurers generally comprehend this concept as applicable to high-value investments like cars, the concept is typically found less relevant to smaller and cheaper products. To bridge this gap, enlightening informational campaigns can highlight the benefits of product sharing, embracing both everyday, inexpensive products and more significant investments.

To bolster consumer confidence and understanding, guidelines on hygiene, quality, and maintenance within PSS business models should be broadly disseminated. These guidelines not only offer reassurances to customers and procurers about the safety of shared products but also hold the potential to extend the lifespan of the products through improved maintenance during the usage phase. The following activities are recommended:

²¹⁹ Højer, 'Det bedste rum at være og lære i'.

- a) Launch comprehensive informational campaigns highlighting the advantages and environmental benefits of product sharing, including its role in reducing raw material extraction, product manufacturing and overall consumption.
- b) Develop standardised categorisation for PSS models (as well as other circular business models) to enhance consumer comprehension and align expectations, fostering clarity and engagement.
- c) Introduce quality labels for PSS solutions, providing hygiene, quality, and maintenance assurances. These labels could draw inspiration from previous experiences, such as the "safe-to-visit" labels utilised in hotels and restaurants during and after the COVID-19 pandemic²²⁰.

6.1.3 Guiding Consumers and Procurers on Circular Business Models

Nordic PSS providers experience a significant surge in customer interest towards circular consumption, and green public procurement has been in focus for many years. However, consumers and public procurers often grapple with a vague understanding of what circular consumption entails. Like companies, consumers and procurers are bombarded with an abundance of information from various sources, some more trustworthy than others, on how to adopt circular practices – often contributing to the confusion. The significant knowledge gap can be filled if the public sector submits reliable information on aspects like product quality, anticipated lifespan, considerations on Total Cost of Ownership, maintenance and repair options. National informational campaigns akin to initiatives like www.forbrug.dk (as described in section 3.5.2) are recommended.

Furthermore, it's essential to establish a clear link between the proposed initiatives and the key factors that shape consumer behaviour,²²¹. To ensure that the desired outcomes translate into an actual increase in circularity, it is prudent to delve into the mechanisms that influence consumption and procurement patterns and behaviour. The following activities are suggested:

- a) Develop and widely disseminate government-endorsed information campaigns focused on circular consumption, fostering understanding and encouraging informed choices.
- b) Facilitate or fund comprehensive investigations into the mechanisms influencing consumption and procurement patterns and behaviours, aiming to derive actionable insights.
- c) Launch a collaborative Nordic competition centred around innovative and sustainable public procurement guidance and promoting circular knowledge among Nordic public procurers.

6.2 PSS providers are technically competent

The technical barriers for PSS are predominantly relevant and economically challenging to SMEs, constituting more than 90 % of all Nordic businesses²²². Existing and upcoming Nordic PSS providers must have the technical proficiency needed for business development and documentation. This output and strategy are unfolded below.

6.2.1 Support Programmes for Digital Integration

Digital solutions are necessary for many PSS business models, but a lack of digital resources is a pivotal operational barrier for the smaller Nordic PSS providers. National business programmes have provided the needed digital tailwind for many PSS providers to overcome challenges linked to, e.g., complex logistics

²²⁰ Horesta, 'SAFE TO VISIT'.

²²¹ European Environment Agency, 'Enabling Consumer Choices for a Circular Economy — European Environment Agency'.

²²² Nordic Smart Government, 'Implementation Plan 2021-2024'.

and data sharing. Collaborative digital action across Nordic countries could pave the way for fostering generally applicable logistics and operational systems that cater to the needs of Nordic SMEs. The following activities are suggested.

- a) Develop, implement, and sustain national business programs supporting SMEs' circular and digital advancement.
- b) Establish a national assistance program tailored for companies that emphasise data-sharing as a means to enhance the lifecycle of products.
- c) Initiate a collective Nordic competition to generate universally applicable logistic and operational systems, fostering innovation and cross-border cooperation.

Compilation of standardised templates

Numerous endeavours, projects, and programs have resulted in a treasure trove of standard contracts, business development tools, customer journey maps, and similar resources. However, few of these tools are commonly implemented, either because of a lack of trust in the credibility of these resources or an overall unawareness of their existence. Relevant tools, e.g., for financial PSS calculations and social impact prediction, are not yet developed for some topics.

It is suggested that credible institutional sources such as the Nordic Business Authorities establish a repository of trusted business development tools - a standard tool bank – to empower PSS providers to continue learning and business expansion. Complementing this effort, courses could be designed to educate providers on the efficient application of these tools. The following activities are proposed:

- a) Develop and implement repositories of business development tools. Trusted public publishers should provide these repositories.
- b) Arrange and facilitate courses that impart practical knowledge on leveraging business development tools effectively.
- c) Disseminate information regarding the array of available business development tools, ensuring that PSS providers are well-versed in the resources at their disposal.

Documentation Guidelines

Nordic PSS providers are eager to contribute to the circular societal advancement through their business undertakings. Still, a common challenge arises in translating this intent into tangible documentation substantiating their commitment to circular practices. This predicament often leads to a phenomenon termed "green-hushing," which fosters misconceptions regarding the opportunities related to PSS solutions.

Guidance is needed to navigate providers through effectively crafting documentation that reflects their genuine circular efforts. This guidance should outline the prerequisites for documentation, methodologies for constructing impactful environmental and social impact assessments, and the means to validate these findings. Collaborative efforts or independent initiatives could converge to establish standardised protocols for environmental reporting. This pivotal move would set the stage for voluntary programs tailored to SMEs, catalysing the production of environmental reports and expediting compliance with EU guidelines. The following actions are recommended:

- a) Develop and widely disseminate comprehensive guidance encompassing the essentials of required documentation, the nuances of evaluating environmental and social impact, and the procedures for validating environmental assessments.
- b) Devise and implement Nordic or national standards centred on environmental reporting. This would foster a surge in environmental reporting activities among SMEs, expediting alignment with EU directives and fostering well-documented progress toward sustainable practices.
- c) Develop Nordic guidance on collaborative data-sharing, creating a platform for sharing insights and successful circular practices, amplifying knowledge exchange.

6.3 Parity with Traditional Businesses

Most circular and innovative business models, including PSS solutions, struggle with limited funding opportunities and a sluggish market. Significant support to such models can be delivered by securing funding for scaling, enhancing business and consumer confidence through insurance, and establishing equitable regulatory compliance. This output and strategy are unfolded below.

Elevating Green Investment Requirements

Nordic financial institutions often pose challenges for PSS businesses seeking bank loans and investments, as evidenced by many PSS stakeholders, who suggest imposing minimum requirements on green investments in alignment with the EU taxonomy²²³. Given that access to funds is pivotal for the growth of the circular business models, especially for operational equipment, digital solutions, and securing product stock, traditional business programs typically do not suffice. The following activities are recommended:

- a) Initiate or fund an investigation into the maturity level of Nordic SMEs concerning business model communication, economic understanding, and related aspects.
- b) Initiate or fund an inquiry into the accessibility of economic funding and business insurance for circular businesses and PSS providers.
- c) Implement minimum criteria for green investments and ensure equal access to insurance.

Standardisation

Enhancing the Nordic market surveillance system, aligning with the Eco-design Directive, can bolster PSS providers and benefit circular business models. A robust market surveillance framework can provide a favourable environment because products shared by multiple users often necessitate improved durability and repairability. Moreover, the proliferation of unsubstantiated green claims poses challenges for many PSS providers, making standardised assessment a critical need.

While the European Union can contribute to standardising measurement methods and parameters, Nordic-specific standards for Eco-design and market surveillance can be collaboratively developed by Nordic policymakers. This collaborative approach extends its benefits beyond supporting PSS providers with more durable and recyclable product options, as it also promises substantial cost savings for the Nordic countries. Estimates indicate potential savings of EUR 28 million in the Nordic region through collaborative market surveillance measures, only requiring an investment of around EUR 2.1 million²²⁴. In light of this, the following activities are recommended:

- a) Develop comprehensive Nordic standards for Eco-design and market surveillance to establish a cohesive framework.
- b) Evaluate the status of Nordic Eco-design implementation, including aspects of durability, repairability, and design-for-disassembly.
- c) Promote and reinforce the dissemination of standards for effective market surveillance.

Business Ecosystem Clustering

Navigating partnerships, configuring value chains appropriately and assessing recycled materials are just some essential factors in the development of green businesses. Emulating the success of the Kalundborg

²²³ Directorate-General for Financial Stability and Financial Services and Capital Markets, 'Sustainable Finance Package'.

²²⁴ Larsen, 'The Nordic Ecodesign Effect Project'.

Symbiosis industrial ecosystem²²⁵, business ecosystem clustering can catalyse innovative pathways for sustainable growth.

Industrial clusters have shown how geographical proximity can foster idea generation, value chain collaborations, and innovative practices. This clustering approach not only stimulates knowledge sharing but also cultivates a breeding ground for cross-industry innovation. Also non-producing businesses can capitalise on this model, nurturing collaborative environments that spark innovative processes for green growth.

In response to the demand for knowledge-sharing among Nordic PSS providers and other businesses, the establishment of a dedicated Nordic knowledge-sharing forum is recommended. This platform would provide valuable insights and practical strategies for pursuing economically viable circular transitions. Businesses can collectively pursue a more circular and sustainable future by facilitating close cooperation, fostering value chain collaborations, and providing a dedicated knowledge-sharing hub. The following activities are suggested:

- a) Facilitate or provide support for business ecosystem clustering to foster collaborative environments.
- b) Encourage value chain collaborations and innovation among non-producing companies.
- c) Create a Nordic knowledge-sharing forum focused on circular business practices, offering a valuable resource for businesses to learn, collaborate, and thrive.

6.4 A Supportive Regulatory Landscape

A critical obstacle for a more circular Nordic business sector is the absence of supportive regulation. This disparity impacts consumption behaviour and impedes the circular transition, particularly for SMEs.

Facilitating Access to Regulatory Guidance

A prevailing challenge in the Nordics lies in the lack of guidance on regulatory and legislative requirements, hindering market equality and consumer protection. To address this gap, it is recommended to develop comprehensive action plans that guarantee businesses, especially SMEs, have unimpeded access to regulatory guidance. This can be achieved through means such as dedicated courses, help desks, or specialised business programs. By providing straightforward, concise, and readily available regulatory guidance, businesses can navigate the legal framework more confidently and ensure compliance with established regulations. The proposed activities include:

- a) Develop and implement Nordic and national action plans to ensure universal access to regulatory guidance for businesses.
- b) Disseminate regulatory guidance through publicly accessible courses tailored to the needs of SMEs.
- c) Establish help desks and initiate business programs prioritising enhanced regulatory compliance, fostering a climate of transparency, trust, and adherence to legal standards.

Stimulating Economic Incentives for Circular Business

Ensuring the economic viability of a circular business model is paramount. The importance of regulatory incentive structures on circular transitions cannot be overstated, as they shape the growth of business ecosystems. Introducing Extended Producer Responsibility (EPR) systems is a focal point for PSS providers, especially those employing use- and result-oriented PSS models that align with the principles underpinning EPR schemes in the EU.

²²⁵ Kalundborg Symbiosis, 'Kalundborg Symbiose'.

In the context of EPR schemes, economic incentives for PSS adoption could be introduced through modulated fees, thereby supporting higher tiers of the waste hierarchy. As with time, EPR schemes are broadly adopted across the EU, a higher impact on product pricing is expected, creating an equitable economic landscape for PSS solutions.

Reduced taxation for business models that promote increased utilisation, reuse of products, integration of waste streams, and refurbishment could benefit circular PSS and business models on a broader scale. The following activities are recommended:

- a) Conduct investigations to assess the actual effects of Nordic regulatory initiatives on the circular transitions of SMEs and larger companies.
- b) Accelerate the implementation of EPR schemes that accommodate existing circular businesses' efforts, propelling the shift towards a circular economy.
- c) Introduce reduced taxation mechanisms designed to incentivise the adoption of circular business models, further aligning economic incentives with sustainable practices.

Green Public Procurement: A Catalyst for Circular Change

Public procurement is potentially a potent driver for shaping product markets and development. Numerous PSS providers experience that public procurement has notable effects on elements ranging from Eco-design and product quality to innovation trends and competitiveness. However, many PSS providers hesitate to participate in Business-to-Government (B2G) markets, perceiving them as inaccessible due to their distinctive business models, ownership structures, or product configurations, often diverging from conventional norms.

Addressing this issue entails comprehensively reassessing public procurement practices, identifying critical dependencies, and reiterating green public procurement guidelines. The proposed strategic activities encompass:

- a) Initiate investigations to analyse the representation of PSS solutions within Nordic public procurement processes. This effort would explore the reasons behind the selection or exclusion of PSS solutions and offer insights into optimising public procurers' legal (and cultural) selection criteria.
- b) Develop specialised courses aimed at Nordic public procurers, covering the realm of green public procurement and the intricate configurations of circular and sustainable business models.
- c) Establish a Nordic public procurement assistance task force, serving as a resource for procurers seeking expert advice when assessing potential tender candidates' circular and sustainable attributes.

6.5 Conclusion

The Nordic region has a remarkable opportunity to propel itself into a more sustainable and innovative future. By integrating circular principles into the school curriculum, we can nurture a generation equipped with a profound understanding of sustainability from an early age. Furthermore, concerted efforts can pave the way for broader acceptance and appreciation of product sharing as a key strategy in advancing PSS models in the Nordic region.

A multifaceted strategy is essential, especially in enhancing the technical capabilities of PSS providers, with a particular focus on SMEs. Collaboration and innovation are pivotal components of this strategy, with the potential to stimulate economic growth and catalyse the adoption of circular practices across the region.

The practical implementation of these initiatives has the potential to nurture a dynamic ecosystem of supportive tools, equipping PSS providers with the expertise necessary for resilient business expansion. Grounded in comprehensive guidance and readily available resources, this approach revitalises the path of PSS enterprises while strengthening the broader business landscape in the Nordic region.

By firmly establishing proactive measures, a comprehensive framework for documentation can be developed, securing recognition for the circular aspirations of Nordic enterprises and actively contributing to overarching sustainability goals. A level playing field can be established for circular business models, allowing them to thrive alongside traditional counterparts and fostering equitable growth in the Nordic region.

Implementing a more standardised and effective ecosystem can reinforce circular business models and ensure regulatory compliance, all while delivering substantial economic benefits. By embracing knowledge sharing and fostering a supportive regulatory environment, the growth of circular businesses is encouraged, further solidifying the Nordics' reputation as pioneers of sustainable innovation.

In this pursuit, the Nordic region envisions a more supportive economic landscape, promoting circular business models and reaffirming its commitment to sustainable practices. Through these endeavours, the Nordics can stand as a beacon of sustainable innovation, fostering an environmentally conscious, economically robust, and socially responsible future.

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