The Circular Economy and product policy

Petrus Kautto, Harri Kalimo, Hanna Salo, Tero Heinonen, Reid Lifset, Eleanor Mateo, Ari Nissinen, Antti Jukka, Paula Leskinen, Mirella Miettinen, Topi Turunen

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The Circular Economy and product policy

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Abstract

The aim of the 'Circular Economy and Product Policy' project was to explore how the objectives of a sustainable circular economy can be integrated into environmental product policy. Building on interviews and workshops with international and Finnish experts, the multidisciplinary project identified and examined in detail four areas of product policy in the rapidly evolving regulatory environment of the European Union: 1) the Ecodesign Directive, 2) extended producer responsibility (EPR), 3) product service systems (PSSs), and 4) environmental product claims.

The review of the policy instruments in, e.g., the workshops showed that there is still room for improvement in existing product policy instruments, yet also a clear need for new instruments. In addition to recommendations on individual policy instruments, the project proposes cross-cutting measures: more systematic ex-post evaluations of the impacts of policy instruments, and attention to the coherence of the numerous and varied instruments, national policies, information systems, and environmental impacts. The circular economy is only a means to an end; environmental and other sustainability considerations must remain at the heart of product policy.

Provision This publication is part of the implementation of the Government Plan for Analysis, Assessment and Research. (tietokayttoon.fi) The content is the responsibility of the producers of the information and does not necessarily represent the view of the Government.

Keywords Circular Economy, product policy, policy intruments, extended producer responsibility, ecodesign, environmental claims, research, research activities

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Kiertotalous ja tuotepolitiikka

Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 2021:47

Julkaisija Valtioneuvoston kanslia

Tekijä/t Petrus Kautto, Harri Kalimo, Hanna Salo, Tero Heinonen, Reid Lifset, Eleanor Mateo, Ari Nissinen, Antti Jukka, Paula Leskinen, Mirella Miettinen, Topi Turunen

Kieli englanti **Sivumäärä** 159

Tiivistelmä

Kiertotalous ja tuotepolitiikka -hankkeen tavoitteena oli selvittää, miten kestävän kiertotalouden tavoitteita voidaan sisällyttää tuotepolitiikan ohjaukseen. Monitieteinen hanke toteutettiin tiiviissä vuorovaikutuksessa kansallisten ja kansainvälisten asiantuntijoiden kanssa käyttämällä osallistavia menetelmiä kuten haastatteluja ja asiantuntijatyöpajoja. Hankkeessa tunnistettiin neljä ohjauskeinojen osa-aluetta, joiden avulla kiertotalouden tavoitteiden sisällyttämistä tuotepolitiikkaan voitiin tarkastella kattavasti, mutta samalla syvällisesti Euroopan unionin nopeasti kehittyvässä sääntely-ympäristössä: 1) ekosuunnitteludirektiivi, 2) laajennettu tuottajavastuu, 3) tuotepalvelujärjestelmät ja 4) tuotteita koskevat ympäristöväittämät.

Ohjauskeinojen tarkastelu mm. työpajoissa osoitti, miten jo käytössä olevissa tuotepolitiikan ohjauskeinoissa on yhä kehittämistarpeita ja –potentiaalia, mutta uusillekin ohjauskeinoille on selvä tilaus. Yksittäisiä ohjauskeinoja koskevien suositusten lisäksi hanke ehdottaa poikkileikkaavia toimia: ohjauskeinojen järjestelmällisiä jälkiarviointeja tulee lisätä, ja huomiota kiinnittää koherenssiin niin eri maiden politiikkojen, tiedontuotannon järjestelmien, ympäristövaikutusten kuin ohjauskeinotyyppienkin välillä. Kiertotalous on keino, ei päämäärä; ympäristöön ja muuhun kestävyyteen liittyvien näkökohtien on pysyttävä tuotepolitiikan ytimessä.

Klausuuli Tämä julkaisu on toteutettu osana valtioneuvoston selvitys- ja tutkimussuunnitelman toimeenpanoa. (tietokayttoon.fi) Julkaisun sisällöstä vastaavat tiedon tuottajat, eikä tekstisisältö välttämättä edusta valtioneuvoston näkemystä.

Asiasanat Kiertotalous, tuotepolitiikka, ohjauskeinot, tuottajavastuu, ekosuunnittelu, ympäristöväittämät, tutkimus, tutkimustoiminta

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Författare	Petrus Kautto, Harri Kalimo, Hanna Salo, Tero Heinonen, Reid Lifset, Eleanor Mateo, Ari Nissinen, Antti Jukka, Paula Leskinen, Mirella Miettinen, Topi Turunen		
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Referat

Målet med projektet Cirkulär ekonomi och produktpolitik var att utreda hur målen för en hållbar cirkulär ekonomi kan integreras i styrningen av produktpolitiken. Detta tvärvetenskapliga projekt genomfördes i nära samarbete med nationella och internationella experter, med hjälp av inkluderande metoder, såsom intervjuer och expertworkshoppar. I fråga om styrmedlen identifierades i projektet fyra delområden med hjälp av vilka integreringen av målen för cirkulär ekonomi i produktpolitiken kunde undersökas på ett heltäckande och djupgående sätt i Europeiska unionens snabbt föränderliga regleringsmiljö: 1) ekodesigndirektivet, 2) utökat producentansvar, 3) produktservicesystem och 4) miljöpåståenden om produkter.

När styrmedlen undersöktes bland annat i workshopparna konstaterades att det fortfarande finns utvecklingsbehov och utvecklingspotential i de produktpolitiska styrmedel som redan är i bruk, men det finns också ett tydligt behov av nya styrmedel. Utöver de rekommendationer som gäller enskilda styrmedel föreslås övergripande åtgärder: de systematiska efterhandsutvärderingarna av styrmedlen bör ökas och uppmärksamhet bör fästas vid koherensen mellan olika länders politik, system för informationsproduktion, miljökonsekvenser och styrmedelstyper. Cirkulär ekonomi är ett medel, inte ett mål; miljöaspekterna och hållbarhetsaspekterna ska stå i centrum för produktpolitiken.

Klausul

Den här publikation är en del i genomförandet av statsrådets utrednings- och forskningsplan. (tietokayttoon.fi) De som producerar informationen ansvarar för innehållet i publikationen. Textinnehållet återspeglar inte nödvändigtvis statsrådets ståndpunkt

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Contents

FOREWORD

The green transition, together with the circular economy, plays a key role in solving the serious problems of our time, such as climate change, biodiversity loss and overexploitation of natural resources. Fortunately, we have a strong political commitment to the circular economy both at EU level and in many Member States. In Finland, our Government is highly committed to promote circularity and has set itself the goal of building our economy on a carbon-neutral circular economy in the future. Finland has prepared a Strategic Programme for Circular Economy to set out policy targets, measures and actions.

The EU's new circular action plan paves the way for green transition, reducing pressure on natural resources and creating sustainable growth and jobs. It announces initiatives along the entire life cycle of products. Sustainable and circular product policy is one of the main building blocks. The European Commission is currently preparing a Sustainable Products Initiative and as a part of it will revise the Ecodesign Directive and introduce other legislative and non-legislative measures.

There is an urgent need for research data and assessments on various product policy instruments. Which policy instruments would best promote a sustainable product policy at EU level? How should the instruments be designed and implemented? In order to respond to these questions and to address information gaps in the product policy instruments, we launched this project under the name Policy Instruments for Circular Product Policy.

In this report, we focus on the policy instruments for sustainable product policy and explore the integration of circular economy objectives into some of the main policy instruments. The report is prepared in a project funded by Government's analysis, assessment and research activities under the Prime Minister's Office. Good administrative preparation and decision-making on policy instruments are based on well-researched information. The main aim of the Government analysis, assessment and research activities is to generate information that supports decision making, working practices and management by knowledge.

Now is the time to thank the authors for their excellent work, dedication as well as on their interactive approach with relevant stakeholders. Special thanks are due to the project leader, Petrus Kautto from SYKE, and his counterpart in UEF & VUB, Harri Kalimo. I would also like to thank the entire talented research team: Hanna Salo, Tero Heinonen, Reid Lifset, Eleanor Mateo, Ari Nissinen, Paula Leskinen, Mirella Miettinen and Topi Turunen. The project was guided by a broad steering group, which has also deserved its thanks. Thank you for interesting discussions and guidance: Tarja-Riitta Blauberg, Taina Nikula and Pekka Kalliomäki from the Ministry of the Environment, Erja Fagerlund and Pekka Kärpänen from the Ministry of Economic Affairs and Employment, Merja Sandell from the Ministry of Finance and Johanna Kentala-Lehtonen from the Prime Minister's Office. In addition, I would like to thank all those experts and stakeholders who have contributed this project by participating in the workshops and by commenting different part of the draft report. Your ideas and views have been useful and constructive.

To the reader, we wish you a fruitful journey with the report and we hope that you will find useful answers and that the recommendations will help to promote a sustainable and circular product policy.

At remote work 31.5.2021

Sarianne Tikkanen
Chairperson of the project steering group, Ministry of the Environment

LIST OF ABBREVIATIONS

B2B	Business to Business
B2C	Business to Consumers
CE	Circular Economy
CHL	Chemical Leasing
CPC	Consumer Protection Cooperation Network
DG	Directorate General
EC	European Commission
EPD	Environmental Product Declarations
EPR	Extended Producer Responsibility
ErP	Energy-related product
EU	European Union
EuP	Energy-using product
FCCA	Finnish Competition and Consumer Authority
ISO	International Organization for Standardisation
LCA	Life Cycle Assessment
LLCC	Least Life Cycle Cost
MS	Member State
MEErP	Methodology study for Ecodesign of Energy-related Products
NGO	Non-Governmental Organization
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
PSS	Product-Service System
RDI	Research, Development and Innovation
SME	Small and medium-sized enterprise
UCPD	The Unfair Commercial Practices Directive
VAT	Value added tax

LAAJENNETTU YHTEENVETO: TUOTEPOLITIIKKA KIERTOTALOUDEN KESKIÖSSÄ

Kiertotalouteen siirtymistä pidetään keskeisenä osana nykyistä kestävämmän talouden luomista. Koska tuotteet ovat talouden keskiössä, voidaan viisaalla tuotepolitiikalla edistää ympäristöllisesti, taloudellisesti ja sosiaalisesti kestävään kiertotalouteen perustuvaa yhteiskuntaa. Tuotepolitiikan ohjauskeinoja kehitetään parhaillaan vauhdilla sekä kansallisin että eurooppalaisin toimin. Käytössä jo oleviin ohjauskeinoihin on suunnitteilla lupaavia parannuksia, ja kokonaan uusia ratkaisuja kokeillaan. Samalla on keskeistä säilyttää kokonaiskuva tilanteesta: tasapainoinen ohjauskeinovalikoima perustuu kattaviin arviointeihin ohjauskeinojen todellisista vaikutuksista ja ottaa keinovalikoiman koherenssin huomioon useasta eri näkökulmasta.

VN TEAS -hanke Kiertotalous ja tuotepolitiikka (KITUPO) tuotti tietoa siitä, miten kestävän kiertotalouden tavoitteita voidaan sisällyttää tuotepolitiikan ohjaukseen. Tutkimushanke ja erityisesti sen kohdennus ja suositusten muotoilu ovat edenneet vaiheittain läheisessä vuorovaikutuksessa ohjausryhmän ja johtavien eurooppalaisten asiantuntijoiden kanssa. Työn alkuvaiheessa tutkimus kohdennettiin kirjallisuusselvityksen perusteella tutkimusryhmän ja ohjausryhmän (TEM, VM, VNK, YM) keskusteluilla neljään pääteemaan ja näiden tarkastelua rajattiin edelleen erityisen relevanteiksi tunnistettuihin alateemoihin. Tutkimusryhmä organisoi tämän jälkeen kaikkiaan kuusi teemakohtaista työpajaa, joihin kutsuttiin aihepiirin valikoituja asiantuntijoita Euroopasta ja laajemminkin. Työpajoissa käytiin keskustelua valikoiduista teemoista asiantuntijoiden alustusten pohjalta. Näiden keskustelujen perusteella tutkimusryhmä jatkoi politiikkatoimiin liittyvien mahdollisuuksien ja haasteiden tarkastelua ja muotoili ensimmäiset luonnoksensa politiikkasuosituksista. Näiden alustavien suositusten muotoiluun saatiin työpajojen ja kirjallisuuden ohella aineksia myös kahdessakymmenessä yrityksessä toteutetuista haastatteluista. Lopulta suositusluonnokset altistettiin asiantuntijoiden kriittisen tarkastelun kohteeksi puolipäiväisessä suositustyöpajassa. Tutkimusryhmä muotoili käytyjen keskustelujen perustella ja ohjausryhmän palautteen huomioon ottaen tutkimusryhmä hankkeen politiikkasuositukset niin yksittäisten ohjauskeinojen kuin laajemminkin kiertotaloutta tukevan tuotepolitiikan kehittämiseksi. Koska tuotepoliittisen ohjauksen keskeiset linjaukset tehdään perustellusti koko Euroopan unionille, koskee osa suosituksistamme politiikkaa, jota Suomen tulisi laajemmin edistää. Samalla teemme kehittämisehdotuksia kansallisen tason toimiksi.

Monipuolinen ohjauskeinojen valikoima

Kiertotalouden sääntelyn painopiste Euroopassa ja Suomessa on siirtymässä jätteitä koskevasta politiikasta tuotteisiin. Tuotepolitiikan ja erityisesti tuotesuunnitteluun kohdennetun ohjauksen vaikutuspotentiaali onkin kiistaton. Haasteelliseksi ohjauksen tekevät tuotteiden valtava määrä, niiden nopeat muutokset useilla sektoreilla sekä ohjauksen kohdentuminen yritystoiminnan kannalta keskeiselle alueelle. Erityisesti parhaiden tuotteiden tukeminen sääntelyohjauksen keinoin on ollut toivottua hankalampaa. Hankkeen haastattelut osoittivat, että yritykset eivät useinkaan oma-aloitteisesti kohdenna toimintojaan kestävän kiertotalouden mukaisesti, vaikka se hyödyttäisi niitä. Tarvitaan ohjauskeinoja kiertotalouden markkinoiden luomiseksi ja innovatiivisen tuotesuunnittelun ohjaamiseksi.

Uusia politiikkatoimia ja käytössä olevien kehittämistä

KITUPO-hankkeessa tunnistettiin neljä ohjauskeinojen osa-aluetta, joiden avulla kiertotalouden tavoitteiden sisällyttämistä tuotepolitiikkaan voitiin tarkastella kattavasti mutta syvällisesti EU:n vauhdilla kehittyvässä sääntely-ympäristössä: 1) ekosuunnitteludirektiivi, 2) laajennettu tuottajavastuu, 3) tuotepalvelujärjestelmät ja 4) tuotteita koskevat ympäristöväittämät. Ohjauskeinojen läheisempi tarkastelu osoitti, miten yhtäältä jo käytössä olevissa tuotepolitiikan ohjauskeinoissa on edelleen runsaasti kehittämistarpeita ja –potentiaalia, mutta toisaalta että uusillekin ohjauskeinoille on selvä tilaus.

Ekosuunnitteludirektiivin on arvioitu olleen merkittävin energiatehokkuutta edistänyt ja hiilidioksidipäästöjä vähentänyt politiikkatoimi EU:ssa. Materiaalienkäytön ohjauksessa sen merkitys rajoittui kuitenkin pitkään joidenkin yksittäisten haitallisten aineiden käytön rajoittamiseen. Kiertotalouden myötä vaatimukset varaosien saatavuudesta, korjattavuudesta ja huollettavuutta koskevan informaation saavuudesta on tuotu osaksi useiden tuoteryhmien ekosuunnitteluvaatimuksia ja tällä hetkellä mielenkiinto kohdentuu erityisesti mahdollisuuteen pidentää tuotteiden käyttöikää ja edistää varaosien saatavuutta. Samalla materiaalien käyttöä tuotteissa koskeva sääntely erilaisine valintoineen on osoittautunut huomattavasti hankalammaksi kuin tuotteiden käytönaikaisen energiankulutuksen ohjaus.

Laajennetun tuottajan vastuun periaatetta ryhdyttiin toimeenpanemaan jo 1990-luvulla, alun alkaen kestävään tuotesuunnitteluun kannustamaan pyrkivänä keinona. Käyttöönotetut tuottajavastuujärjestelmät ovat kuitenkin muodostuneet lähinnä jätehuoltoa ohjaaviksi ja vaikutukset tuotesuunnitteluun ovat jääneet kiistanalaisiksi tai olleet osin toiveiden vastaisia. Kiertotalouden noustua keskeiseksi poliittiseksi tavoitteeksi ovat pyrkimykset kehittää tuottajavastuuta kestävämpään materiaalien käyttöön ja tuotesuunnitteluun kannustavaksi palanneet tavoitteiden joukkoon. Keskeisenä haasteena on luoda tätä tukevia taloudellisia kannusteita samalla, kun etäkaupan kasvu hankaloittaa järjestelmien hallintaa. Keskitymmekin tutkimuksessamme erityisesti mahdollisuuksiin rajoittaa epäkauppaan kytkeytyvää vapaamatkustajuutta ja niin sanottuun ekomodulaatioon eli tuotteiden

ympäristöominaisuuksien mukaisesti asetettavien taloudellisten palkkioiden ja korotettujen maksujen käytön mahdollisuuksiin.

Niin sanotut tuotepalvelujärjestelmillä (Product Service Systems, PSS) viitataan liiketoimintamalleihin, joissa arvonmuodostus perustuu tavaroiden myynnin ja omistamisen sijaan palveluihin. Niihin siirtymistä on esitetty yhtenä mahdollisena tapana kuluttajien tarpeiden tyydyttämiseksi ja samalla tehostaa resurssien käyttöä ja vähentää kulutuksen ympäristövaikutuksia. Tarkastelemme mahdollisuuksia edistää kiertotaloutta esimerkkeinä kemikaalien ja liikkumisen tuotepalvelujärjestelmät.

Suuria odotuksia on liitetty myös mahdollisuuksiin edistää kuluttajien kiertotaloutta tukevia valintoja luotettavien, hyvin tunnettujen ja kyllin yksinkertaisten ympäristömerkkien ja -väittämien avulla. Valitettavasti väittämien kirjo sisältää myös todentamattomia väitteitä tuotteiden ympäristöominaisuuksista. Harhaanjohtavat väittämät voivat aiheuttaa hämmennystä ja vääristää kilpailua. Näiden ongelmien ratkaisemiseksi on esitetty yhtenäisten ja vertailukelpoisten menetelmien, kuten tuotteiden ympäristöjalanjälkimenetelmän (Product Environmental Footprint, PEF), kehittämistä ja käyttöä. Kiertotaloutta koskevien väittämät korostavat edelleen tällaisten menetelmien kehittämisen tarvetta, mutta myös haasteellisuutta.

Tarkastelumme johti jäljempänä esitettävien, yksittäisiä ohjauskeinoja koskevien suositusten lisäksi poikkileikkaaviin huomioihin. Ensinnäkin on silmiinpistävää, että vaikka kiertotalouteen on kiinnitetty viime aikoina valtavasti huomiota, poliittisten ohjauskeinojen vaikutuksista on yllättävän vähän analyysejä. Erityisen merkittävää on politiikkojen biofysikaalisia, taloudellisia ja käyttäytymiseen liittyviä vaikutuksia koskevien tutkimusten niukkuus. Kehotammekin järjestelmällisiin tuotepolitiikan vaikutusten jälkiarviointeihin. Tämä vahvistaisi päätöksenteon tietoperustaa.

Kaikilla tutkituilla tuotepolitiikan osa-alueilla on myös selvästi tarpeen kiinnittää huomiota politiikan johdonmukaisuuteen eli koherenssiin. Koherenssin vaatimuksella on ainakin neljä ulottuvuutta kestävän kiertotalouden politiikoissa.

Keskeiset teemat tasapainoisen tuotepolitiikan kehittämisessä kiertotaloudessa

Tuotepolitiikan ohjauksen laajentuessa tulee keskittyä ohjauskeinojen vaikutusten arviointiin, ympäristötavoitteiden toteutumiseen ja ohjauskeinojen koherenssiin. Kiertotalousnäkökohtien sisällyttäminen tuotepolitiikkaan on uusi ja suurta kiinnostusta herättävä poliittisen päätöksenteon ala. Ohjauskeinot vaikuttavat tehokkaimmin ja aiheuttavat vähiten vääristymiä markkinoilla, kun ne toteutetaan EU:n laajuisina. Siksi jäsenvaltioiden olisi syytä suhtautua myönteisesti EU:n tuotepolitiikan kehittämiseen ympäristötavoitteiden edistämiseksi. Kansallisten toimien laaja kirjo Euroopassa sisältää hyödyllisiä aloitteita, mutta myös suuren riskin markkinoiden pirstoutumisesta sekä epäjohdonmukaisista

kannustimista ja ohjelmista EU:ssa ja jopa maailmanmarkkinoilla. Pirstaloituminen heikentää kiertotaloutta edistävien toimien taloudellista ja ympäristöllistä tehokkuutta. Kansallisten ohjauskeinojen suhteen kehotamme EU:n jäsenvaltioita sekä kansallisesti että suhteessa EU:n lainsäädäntöön asettamaan yhdenmukaistamisen ja ohjauskeinojen koherenssin etusijalle lopullisissa poliittisissa ratkaisuissaan.

Myös ohjauskeinovalikoiman sisäinen koherenssi on tärkeää. Tuotteen kiertotalouteen liittyvät näkökohdat kuuluvat tyypillisesti monien eri ohjauskeinojen soveltamisalaan. Jos keinot asettavat tuotteelle toisistaan poikkeavia, saati ristiriitaisia vaatimuksia, niiden koherenssi vaarantuu. Olisikin arvioitava sekä nykyisiä että ehdotettuja politiikan ohjauskeinoja ja niiden yhdistelmiä. Yhteensopivuuden kysymyksiä voidaan käsitellä sekä keinoja kokoavissa ja koordinoivissa horisontaalisemmissa lainsäädäntökehyksissä että prosesseissa, joissa tarvittavat keinot ja toimijaverkostot tuodaan yhteen.

Kiertotaloutta tukevan tuotepolitiikan toimenpiteiden aiheuttama sääntelytaakka ei johdu ainoastaan erilaisista ohjauskeinoista, vaan myös keinoihin liittyvistä erilaisista tiedontuotantovaatimuksista. Tätä taakkaa voidaan vähentää ottamalla käyttöön standardoituja, tai ainakin koherentteja menetelmiä (kuten PEF) ja virtaviivaistamalla tietovaatimuksia keinoja varten. Tuotteiden ominaisuuksien hallinnan muotoileminen ”kiertotalouspolitiikoiksi” on saattanut johtaa siihen, että tuotteiden ympäristönäkökohdat ovat jääneet taka-alalle. Kiertotalouspolitiikkojen ympäristönäkökohtien huomioimisen ei myöskään tule rajoittua materiaalitehokkuusnäkökohtiin, vaan kattaa myös vaikutukset ilmastoon, biologiseen monimuotoisuuteen ja ympäristöön muilta osin. On muistettava, että kiertotalous on vain keino päästä päämäärään; ympäristöön ja muuhun kestävyyteen liittyvien näkökohtien on pysyttävä politiikan ytimessä.

Tiivistelmä ohjauskeinokohtaisista suosituksista

Ekosuunnitteludirektiiviin liittyviä kehittämisehdotuksia kiertotalouden tukemiseksi:

- Selvittää EU:n yhteisen digitaalisen tuotepassin luomista ja sitä, millaista informaatiota tuotepassiin sisällytettäisiin (tuotteen alkuperästä, käytetyistä materiaaleista, rakenteesta, kierrätettävyydestä jne.).
- Selvittää sakkojen käyttöä pelotteena ympäristövaatimukset täyttämättömien tuotteiden myynnille (tuotteiden hävittämisen sijaan).
- Perustaa helppokäyttöinen ekosuunnittelun tietopankki viranomaisten, yritysten ja tutkimuslaitosten yhteistyönä. Tietopankkiin koottaisiin tietoanykyisistä ja valmisteilla olevista vaatimuksista, käyteytyistä menetelmistä sekä muuta aihetta koskevaa tietoa. Ekosuunnittelu.info-sivustoa voidaan hyödyntää alustana.

- Tukea tutkimusta ja teollisuuden osallistumista ekosuunnitteludirektiivin laajentamiseen energiaa käyttävistä tuotteista energiaan liittyviin tuotteisiin ja mahdollisesti laajemmin myös muihin tuoteryhmiin.

Tuottajavastuun kehittämiseksi kiertotaloutta paremmin tukevaksi esitämme:

- Harmonisointia jäsenmaiden ekomodulaation tavoitteiden, kriteerien ja maksujärjestelmien laatimisessa, jotta tuotteiden valmistajiin kohdentuvat kannusteet olisivat mahdollisimman vaikuttavia.
- Vaiheittaista strategista etenemistä ekomodulaation toimeenpanossa. Kokeiluista, sääntelyn vaikutuksista ja tuotteissa ja markkinoilla tapahtuvista muutoksista saatavien kokemusten seuraamista. Keskittymistä toimivimpiin ratkaisuihin ja hankalasti kumottavissa olevien säännösten ja uusien ekomodulaatiojärjestelmien kalliin kehitystyön välttäminen.
- Kustannustenjaon tarkentamista erilaisten tuote- ja pakkaustyyppien kesken, jotta kierrätettävyydelle syntyy mahdollisimman selkeä kannuste. Maksun perimistä vain kertaalleen, jos pakkaus on uudelleenkäytettävissä.
- Vapaamatkustajuutta koskevan tietopohjan parantamista muun muassa tukemalla Komission digitaalisia palveluita koskevaa lainsäädäntöaloitetta ja lisäämällä ympäristölainsäädännön rajapintoja siihen. Tällöin tietojen välittäminen verkkokaupan alustoilta ja viranomaisten välillä paranee.
- Jäsenmaiden yhteisten lähestymistapojen ja tuottajarekisterien tukemista verkkokaupan ohjaamisessa ja vaatimusten toimeenpanossa.

Kiertotaloutta tukevien tuotepalvelujärjestelmien strategiat ja kokeilut:

- Tietämyksen kartuttaminen autojen yhteiskäytöstä ja jakamispalveluista osana kestävää kiertotaloutta.
- Kokeilut autojen jakamistaloudesta osana liikkuvuuden strategioita ja sen seuraaminen, missä määrin nämä a) vähentävät autojen määrää, b) vähentävät matkattujen kilometrien määrää ja c) lisäävät vähäpäästöisten ajoneuvojen määrää.
- Julkisten hankintojen hyödyntäminen edistettäessä tietämystä ja innovatiivisia ratkaisuja autojen yhteiskäytössä osana liikkumispalveluja.
- Tietoisuuden lisääminen kemikaalipalveluiden parhaista käytännöistä sekä julkisella että yksityisellä sektorilla muun muassa pilotoimalla ja koordinoimalla julkisten hankintojen ja REACH-vaatimusten kanssa.
- Kemikaalipalveluiden käyttöä edistävien taloudellisten kannusteiden kuten verotuksellisten ratkaisujen kokeilut.

Kiertotalouden ympäristöväittämien kehittämissuositukset:

- Edistää EU-lainsäädäntöpakettia, jolla yritykset velvoitetaan perustamaan ympäristöväittämänsä vertailuun ympäristöjalanjälkimenetelmän tai tyypin 1 ympäristömerkin (ISO 14024) kanssa.
- Opastuksen laatiminen erityisesti PK-yrityksille niin kiertotaloutta kuin muitakin ympäristönäkökohtia koskevien väittämien käytöstä tuotteiden markkinoinnissa. Menetelmien kuten tuotteiden ympäristöjalanjäljen tukeminen.
- Väittämien käyttöä valvovien viranomaisten voimavarojen vahvistaminen kilpailun vääristymien estämiseksi ja kuluttajien suojaamiseksi.

PART I: SETTING THE SCENE

1 Introduction

1.1 Product policies and the Circular Economy

The circular economy (CE) has been proposed as a response to the prevailing unsustainable economic model and has become one of the top policy priorities both in the EU and Finland (Wilts and O'Brien 2019; Brandão et al. 2020). The transition to a more circular economy is expected to bring significant environmental, economic and social benefits (Ellen MacArthur Foundation et al. 2015; EC 2015 2020a; Sitra 2014).

The European Commission adopted the first Circular Economy programme in 2014. It was soon replaced by a 'more ambitious' package entitled 'Closing the loop – An EU action plan for the circular economy' (EC 2015), and in 2020 the Commission published 'A new Circular Economy Action Plan for a cleaner and more competitive Europe' (EC 2020a). While the 2015 package had the renewal of waste legislation at its core, the 2020 CE Action Plan presents a new beginning for sustainable product policies.

Finland was the first country to adopt a national CE roadmap to promote the transition and one of the strategic objectives of the present Government is to 'strengthen Finland's role as a leader in the circular economy' (Programme of Prime Minister Sanna Marin's Government 2019). In order to achieve this objective, the Finnish Government has recently approved an ambitious CE vision, according to which 'a carbon-neutral circular economy is the foundation of our successful economy' by 2035 (Finnish Government 2021). The Finnish government has set the following objectives[1]:

- The consumption of non-renewable natural resources will decrease, and the sustainable use of renewable natural resources may increase to the extent that the total consumption of primary raw materials in Finland in 2035 will not exceed what it was in 2015. The natural resources used to manufacture exported products are not covered by the objective.
- The profitability of resources will double by 2035 from what it was in 2015.
- The circular economy rate of materials will double by 2035. (Finnish Government 2021)

1 Similar kind of quantitative objectives have been set by several other countries such as the Netherlands, Germany and Japan.

Policy makers in Finland and in the EU thus widely share the aim that a circular economy entails the retention of the value of products and materials in the economy, the sustainable minimisation of waste generation and the closing of material loops through recycling. Yet, it is far less clear what the means of such a systemic transformation towards circularity are (Finnish Government 2021; EC 2015; 2020a; for a critical review see Lazarevic and Valve 2017; Gregson et al. 2015; Pitkänen et al. 2020). In this report, we assess in particular what kinds of changes to the existing regulatory structures are required.

Although policy instruments[2] may affect several stages of a product's life cycle, their objectives can be classified following a life cycle perspective: (i) resource-efficiency and sustainable use of natural resources, (ii) the retention of the value of products and materials in the economy, and (iii) the recycling of wastes into secondary raw materials (Kalimo 2006; Kautto and Lazarevic 2020). The objective of this report is to analyse instruments to promote the objectives of a circular economy through product policies. Thus, the emphasis of our analysis is mainly on the second goal, i.e., policies that enhance a sustainable circular economy through value-retention.

Environmentally oriented product policies have been enacted in the EU since the 1990s. In the early 2010s, the regulation of the environmental aspects of products was focused heavily on energy consumption during product use. The emergence of the Circular Economy framing has turned the attention back to material resource aspects of products, and so to the regulation of the material use, recyclability, reparability and durability of products.[3] (EC 2015). Simultaneously, the geopolitics of resources has increased the importance of regulating critical raw materials such as rare metals (EC 2020f).

It is evident that steering the qualities of products has enormous potential for sustainability. The governance of products is, however, complicated. There is a vast number of products, many product areas change rapidly and products are obviously of great economic significance for companies (Kautto 2008). While companies are already encouraged to implement business models based on reuse and re-manufacturing, policies

2 Following Howlett (2005, 31), policy instruments can be understood as 'techniques of governance that, one way or another, involve the utilization of state authority' to achieve policy goals. Numerous other definitions exist, partly reflecting differing approaches in the public policy literature on instruments and institutions (e.g., Salamon 2002), the politics of instrument selection (Linder and Peters 1989; Rist 2011) and 'cataloguing the tool kit in a generic way' (Vedung 1998). In addition to policy instruments, policy mixes include policy strategies and policy processes (Rogge and Reichardt 2016).

3 According to several studies, the lifetimes of household appliances has diminished during the 2000s (EEA 2017 20-21; German Environment Agency 2017: 7.) This can be due to material, functional psychological and economic obsolescence (German Environment Agency 2017: 10).

promoting for instance product lifetime extension are still in many ways in their infancy. As noted, we distinguish in this report policies on products from those that concern the final, end-of-life stage of products as "waste", even though product and waste policies often are two sides of the same coin.

1.2 Policy instruments for circular product policies

So far, product policies in the EU have followed mainly the following strategies: 1) the Ecodesign directive (2009/125/EC) and chemicals legislation (REACH[4], POP[5], RoHS[6]) phase out from the market the worst-performing products - those that consume the most energy or include hazardous substances 2) mandatory energy labels steer consumers towards more energy-efficient products, while 3) Extended Producer Responsibility (EPR) incentivises producers to design products and packaging to facilitate their end of life management, and 4) ecolabelling and other voluntary environmental information schemes, as well as support for service-based business models encourage the supply and the demand of the most environmentally sound products.

The 2020 CE Action Plan gives fresh impetus to these strategies by integrating them into a renewed, broader sustainable product policy regime in the European Union. The regime includes the proposal for a new Sustainable Products Initiative and more than 30 other policy actions on products (EC 2020b).

In this report, we explore the integration of circular economy objectives into product policies within this evolving regulatory landscape. To provide an analysis that covers issues across the different strategies, yet is sufficiently detailed, we have in collaboration with the project Steering Group chosen to focus on four instruments: 1) the Ecodesign Directive, 2) Extended Producer Responsibility, 3) Product-Service Systems and 4) Environmental product claims. In addition, we briefly discuss some other initiatives to enhance circularity of products.

4 Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

5 Regulation (EU) No 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants (POPs Regulation).

6 Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Firstly, the Ecodesign Directive has been identified as an important success story in improving energy efficiency[7]. Still, on material use the impact of Ecodesign has been limited; the Directive has until recently focused on this front on the removal of individual hazardous substances. Following the aims of the circular economy, requirements on the availability of spare parts, easy replaceability and access to repair and maintenance information for professional repairers have been introduced for several Ecodesign Directive product groups over the past few years, including refrigerating appliances, household dishwashers, washing machines, and electronic displays. However, due to the trade-offs that result from addressing different environmental impacts, regulating the circularity of materials and products has proven much more complicated than the mere regulation of energy consumption during product use (see e.g., (Faure & Dalhammar 2018; Richter 2019).

The discussion on broadening the scope of Ecodesign has extended from standards for minimum product lifetime and requirements for the availability of spare parts and repair services, to initiatives on e.g., more extensive guarantees and independent systems to prevent the planned obsolescence of products (German Environment Agency 2017; EEA 2017). In this report, we analyse the means how the Finnish government could promote the circular economy objectives of the Ecodesign Directive.

Secondly, Extended Producer Responsibility (EPR) was introduced already in the early 1990s as an instrument to promote a more environmental design of products. (Kalimo et al. 2012 2015; Lifset 1993; Lindhqvist & Lindgren 1991). It has proven challenging to achieve that objective, but attempts to update the EPR systems are ongoing to support the original goals of sustainable material use and eco-design. Key challenges include the means to introduce financial incentives that would translate into environmentally beneficial changes in products, and the application of EPR to products sold online from third countries. This report scrutinises therefore specifically eco-modulation—imposition of bonuses and penalties based on environmental characteristics of products and packaging—and free-riding through online sales in the context of EPR in Finland.

Thirdly, product-service-systems (PSSs) refer to business models comprised of offering a mix of "tangible products" and "intangible services" as a means of fulfilling consumer needs and reducing environmental impacts. PSSs provide opportunities to shift from the traditional linear economy that is based on selling products to value creation through other means, such as providing access or by delivering a function or a result. Promoting PSSs can thus be a driver for innovative ways to improve resource efficiency and decrease the resulting environmental impacts of products. The third theme of our report are PSSs

7 The Ecodesign Directive is estimated to have been the most significant policy measure to promote energy efficiency and reduce CO2 emissions in the EU (CSES 2012).

in promoting the circular economy in Finland, using mobility and chemical leasing as promising areas for policy interventions.

Fourth, high hopes have been set on sharing information with consumers on product durability, spare parts availability and other environmental aspects of products. Ideally, this kind of information could be delivered by a simple, reliable and well-known ecolabel. Indeed, some requirements for promoting the circular economy through durability are already included in labels (Suikkanen & Nissinen 2017). In practice, companies utilize various ecolabels yet, regrettably, also disseminate unverified environmental claims about the products. Misleading claims may lead to confusion among consumers, unfair competition in the market, and seriously weaken the basis for honest eco-design activities and business opportunities for companies innovating and striving for better products. These problems have led to calls for uniform and comparable methods such as the Product Environmental Footprint, PEF (EC 2019a; Nissinen et al. 2019). The challenges in ensuring in an efficient manner that environmental claims are truthful and effective are exacerbated when assessed from the angle of the circular economy. Resource efficiency considerations are often novel and may be hard to demonstrate and verify.

In summary, we study in this report four themes that are essential for the development of the circular economy and product policy as follows:

- Ecodesign (chapter 3)
- Extended Producer Responsibility (chapter 4)
- Product Service Systems (chapter 5).
- Environmental product claims (chapter 6)

We also briefly sum up the expected impacts of our key recommendations on each group of analysed instruments.

The analysis of the four themes is framed against a short analysis of the key drivers and barriers for the Circular Economy in companies in Finland (Chapter 2). We also briefly discuss some other product policy initiatives such as a right to repair and warranty (Annex 1). In the final Chapter, we summarise the recommendations of the Chapters 3-6 on how the Finnish Government can promote product policies in Finland and in the EU[8] (Chapter 8).

8 Due to Single Market and competetion regulation, product policies are inevitable policy area, in which the most important regulatory strategies has to made at the European level.

1.3 Approach of the project

This project proceeded in iterative phases, during which the focus of the study as well as its conclusions and recommendations were shaped by the research team in close interaction with the steering group and external experts.

The research themes of ecodesign and Extended Producer Responsibility (EPR) were initially identified by the research team (the Finnish Environment Institute, University of Eastern Finland, the Institute for European Studies (Vrije Universiteit Brussel) and Yale School of the Environment). The themes were then refined and expanded together with the project steering group from Prime Minister's Office, Ministry of Finance, Ministry of Economic Affairs and Employment and Ministry of the Environment. Environmental product claims and Product Service Systems (PSSs) were selected as further focus areas, while within EPR, the work was further concentrated on online sales and ecomodulation. On PSSs, the work was subsequently focused on mobility and chemical leasing. All in all, the project thus covers six specific areas of circular product policies.

The project started with a literature review, followed by six thematic workshops organized to bring together on an invitation-only basis selected leading circular economy experts from Europe and beyond. The experts included policymakers, practitioners and academics, all with specific expertise and experience in the thematic areas. The participants did not take part in their official capacity to engage the group in an open, mutually instructive exchange of views on the indicated topics. Each of the workshops was limited to 5-7 active speakers to allow for a focused discussion. A small group of less than 15 experts, including the research team, followed the discussions and contributed with additional observations. Many of the invited experts were interviewed before the workshops in order to further focus the discussions of the workshop on the most essential questions. The workshops deepened our understanding on the opportunities and challenges of product policies in promoting a circular sustainable economy in Finland and in the EU.[9]

Simultaneously with the workshops, we conducted a series of semi-structured interviews with 20 companies on the drivers and barriers of circularity. The interviewees represented electronics, textiles, shoes, furniture and home products sectors from micro to large companies. The interviews took place in distance, either on MS Teams or over the phone.[10]

9 The workshop sessions were recorded, but only to facilitate the processing of the results dataof the workshop.

10 The interviewees received an informed consent form and the 11 questions beforehand (Annex 2). At the beginning of the recording, the interviewees gave their verbal consent stating that they have been given the consent form and they have understood it. Most of the interviews lasted approximately 45 minutes, although the lengths varied between 20 and 85 minutes.

The interview transcriptions were analysed with NVivo12 software for a systematic qualitative assessment of the interviewees' perceptions of the CE, reasons for considering the CE in their operations and public policies to support the companies in deploying circular business models.

The literature review, interviews, and workshop exchanges (see Table 1) were the basis for the policy recommendations. Draft versions of the policy recommendations were then presented for critical reflection to 26 leading experts from Finland and Europe in a half-day workshop organized in April 2021. In this event, experts were able to offer in four research theme-specific panels (ecodesign, EPR, PSSs and environmental claims) critical observations and suggestions on the viability and appropriateness of the recommendaitons and on how to further improve them. Also this workshop was arranged on Chatham House rules basis to ensure an open and constructive exchange of thoughts. Due to Covid-19, all workshops were arranged online on MS Teams.

A final round of insightful feedback from the steering group and other experts from the ministries was undertaken before we completed the recommendations.

Table 1. Data collected and analyzed for our study.

Mode of data collection	Data
Participatory observation of group meetings in order to focus the workshops	Six meetings of up to 1,5 hours with experts from ministries and national authorities
Participatory observation of thematic workshops	Six workshops (2-3 hours each) where presentations given by the experts served as stimulus for working group discussions on different themes (ca. 60 experts, December 2020 - March 2021)
Interviews	Drivers and barriers: 20 industry representatives (online/ phone, from 20 minutes to 85 minutes 2020-2021) Preliminary discussions with experts invited to the thematic workshops
Critical reflection: A dialogical half-day workshop	Discussion on the basis of preliminary results and recommendations (40 participants, April 2021)

2 Drivers and barriers for the Circular Economy in companies

Companies can seek to improve their performance and CE practices because of multiple drivers (e.g. van Hamel & Cramer 2002; Salo et al. 2020; Salmenperä et al. 2021). They may be pressured from the outside to meet the set regulations and legislation, or even go beyond them to maintain their competitiveness (García-Sánchez et al. 2019; Gouvinhas et al. 2016). Common drivers for the CE include company values, legislation, customer demand and competitiveness[11]. At the same time, companies also face barriers that hamper or even prevent them from promoting circularity. Typical barriers include a lack of regulations motivating circularity and markets not demanding more environmentally-sound products and solutions, as well as a lack of time and knowledge[12].

The reasoning derives from both internal and external factors, the former originating within the company and the latter from the outside. Internal drivers originate from within the company and are seen as prerequisites for it to act (van Hemel & Cramer 2002; Salo et al. 2020). These include company's values, commitment to reducing its environmental impact and costs, new business opportunities, improving corporate image, and motivating the personnel (van Hemel & Cramer 2002; Byggeth & Hochschorner 2006; Santolaria et al. 2011). Internal barriers are related to, for example, conflicting values, lack of internal capacities and resources, and information. At the same time, external reasoning arises from, for example, legislation, taxes, customer demand and competition or lack of it (Horbach 2008; Kammerl et al. 2016; van Hemel & Cramer 2002).

In this project, the barriers and drivers faced by companies while they aim to promote the CE have been identified based on a multi-disciplinary literature and twenty interviews with Finnish companies. The interviews were conducted to complement the international research literature with Finnish perspectives. The sector- and size-specificity of drivers and barriers should also be acknowledged, as not all companies face similar factors. The aim has been to study how companies approach the CE, why they aim to promote circularity, the challenges they have faced and how they perceive public policies in relation to the CE.

11 van Hemel & Cramer 2002; Santolaria et al. 2011; Cluzel et al. 2014; Marin et al. 2015; Gusmerotti et al. 2017; de Jesus & Mendonça 2018; Hojnik 2018; Ranta et al. 2018; Salo et al. 2020

12 Byggeth & Hochschorner 2006; Dekoninck et al. 2016; García-Sánchez et al. 2019; van Hemel & Cramer 2002; Salo et al. 2020

The sectors presented in the interviewees were electronics, textiles, shoes, furniture and home products (Table 2). The sectors were identified relevant in terms of their volume, environmental impacts and significance in the Finnish market. Different company sizes were considered in the interviews as they often have varying approaches to the CE and face different barriers and drivers (Santolaria et al. 2011; Mura et al. 2020; Salo et al. 2020). The size of company was determined based on the number of employees following the EC (2021e) and Oslo Manual (OECD & Eurostat 2005) into micro (< 10 people employed), small (10-49), medium-sized (50-249) and large (250-) companies. (Table 1). The sample represents the key sectors and various company sizes but within the sectors, the distribution varies. Interviewees from the electronics and home products sectors were larger in size, whereas shoe companies were often smaller. The invitation to participate in the interviews was sent out to 25 companies, 16 of which agreed, response rate being 64%. Furthermore, the transcriptions of four interviews conducted in the "Ecodesign Roadmap" project[13] (Horn et al. 2021) were included in the materials on the permission of the interviewees.

Table 2. Sectors and company sizes presented in the interviews. N describes the number of interviewees.

	Micro (n=5)	Small (n=4)	Medium (n=4)	Large (n=7)
Electronics (n=4)	0	0	2	2
Textiles (n=6)	2	2	1	1
Shoes (n=3)	2	1	0	0
Furniture (n=5)	1	1	1	2
Home products n=2)	0	0	0	2

2.1 The most common drivers

2.1.1 Internal drivers

Organizational drivers

Values of the company are one of the most common and important drivers for promoting circularity and environmental issues (van Hemel & Cramer 2002; Santolaria et al. 2011; Gusmerotti et al. 2017; Salo et al. 2020). Environment is one of the company's and its management's top priorities and ethical motives. They feel responsibility for acting

13 https://www.syke.fi/fi-FI/Tutkimus__kehittaminen/Tutkimus_ja_kehittamishankkeet/Hankkeet/Ymparistomyotainen_tuotesuunnittelu__tiekartta

upon their values even if it is not the most economic option at all times. A change agent initiating the shift towards service-oriented solutions is a key driver for such transition. Company's values were also the most common driver mentioned in the interviews. It was often related to the overall mainstreaming of the CE and customers. Although values were the underlying reason for promoting the CE in all sectors and different sizes of companies, they were not the sole stimuli to take action. The interviewees stated, for example that

> *"Corresponds with own values"* (Small shoe company)

> *"Due to personal values, and the values of the company are really the same. "* (Small textiles company)

> *"We invest in environmental matters and the circular economy, which underlies our existence as a whole."* (Medium-sized electronics company)

> *"For ourselves, the Circular Economy and sustainable development are really at the heart of the strategy."* (Large home products company)

The integration of CE and environmental aspects into the company is also considered to motivate the employees (van Hemel & Cramer 2002). The employees feel that their work has a purpose and is meaningful and new recruitments are more willing to join the company. The phenomenon was quite common among the interviewees, who stated that

> *"Motivates employees at every level."* (Medium-sized furniture company)

> "*People who act at us have a similar passion."* (Small textiles company)

> *"Driving the common good and the good of the customer is always more motivating than just a financial perspective."* (Large furniture company)

> "*Many work at us because they feel that the company is doing good, that we have solutions that make the world better, and that our actions are responsible, so it can increase motivation and improve the image of the employer, at least I know for myself that when one product was announced I was feeling wow, we're involved in a great development."* (Large electronics company)

Improving and maintaining the company image is also important for its reputation and competitiveness[14]. The companies want to be profiled as forerunners and companies that make good for the society. Hence, they promote circularity and share information about their products and processes partly because it helps them bring forth their agenda and market themselves. For example,

> *"We want to be a role model (…) we want to be a trendsetter too. (…) if we have any environmentally or otherwise bad news about us, then it affects the business right away (…) bad news is bad for business."* (Large textiles company)

Some companies who have long traditions with circular actions have used it mainly for marketing reasons, like mentioned in the interviews:

> *"It has not really changed our activities, perhaps mainly polished the public image that using or buying reused products is very important and an acceptable activity instead of them going into waste or recycling."* (Large home products company)

Costs and financial drivers

An important financial driver is the opportunity to reduce costs and increase financial profitability of the company[15]. They aim to gain competitive advantage through resource efficiency (e.g., resource and energy optimization, use of by-products, recycling, reduced waste disposal costs) and value creation. Such approaches aim to lower production costs. Economic benefits incentivize non-circular companies especially in the traditional industrial sectors to adopt more circular economy practices. To support such financial drivers, incentives for technological innovation could be strengthened and fiscal benefits given for recycled products, as well as supporting measures for a secondary materials market (Gusmerotti et al. 2019). Although a common driver in the literature, cost reductions were rarely described as a driver in the interviews. When mentioned, cost reductions were considered as a win-win situation combining the economic and environmental goals. On the other hand, cost increases were considered a common barrier.

14 Rennings et al. 2002; van Hemel & Cramer 2002, Byggeth & Hochschorner 2006, Santolaria et al. 2011; de Jesus & Mendonça 2018; Salo et al. 2020

15 van Hemel & Cramer 2002; Rennings et al. 2002; Horbach 2008; Dekoninck et al. 2016, Santolaria et al. 2011; Plepsys et al. 2015; Ormazabal et al. 2017; Ranta et al. 2018; Gusmerotti et al. 2019; Hogg et al. 2020; Salo et al. 2020

2.1.2 External drivers

Market drivers

Demand for companies' products or services are an important driver and decisive in generating momentum[16]. Customer preferences and attitudes are reflected in the decisions that companies make. Both consumers and businesses as customers are important depending on the target group of the company. A majority of the interviewees described customer demand as a driver for the CE activities. Most of them sold mainly to consumers and a minority to business customers. Consumer demand was especially important for smaller companies and those operating in the textile sector. They stated, for example, that:

> *"Of course, the main driver of change is certainly individual people and individual consumers."* (Small textiles company)

> *"Customers also demand this more and more."* (Large textiles company)

> *"Our customers are very conscious, so they expect it — it suits us well and forces us to work for it too.* "(Small furniture company)

At the same time, demand from business customers was more common among larger companies operating in the furniture and electronics sectors. They described it, for example, as:

> *"Naturally the client's will then determines."* (Large furniture company)

> *"It has had a very good reception among our dealer network."* (Large electronics company)

In addition to demand, market opportunities and competition push many companies forward[17]. Companies aim to improve their performance to become a leader, keep up with the competitors or to follow the evolution of markets. Improved performance was the second most common driver after values among the interviewed companies. They described that the second-hand market related to furniture, electronics and clothes had

16 van Hemel & Cramer 2002; Santolaria et al. 2011; Hannon et al. 2015; Vezzoli et al. 2015; Witjes & Lozano 2016; de Jesus & Mendonça 2018; Hojnik 2018; Richter & Dalhammar 2019; Hernandez et al. 2020; Salo et al. 2020

17 Mont 2002; van Hemel & Cramer 2002; Rennings 2002, Byggeth & Hochschorner 2006; Cluzel et al. 2014; Marin et al. 2015; Plepsys et al. 2015; Vezzoli et al. 2015; OECD 2017; Maire-Ekern & Dalhammar 2019; Hogg et al. 2020

been booming during the last couple of years, which has been a huge business potential. One electronics company described it as "an enormously good business". It has been also economically wise to take part in such a transition.

Financial drivers

Financial drivers include taxes and subsidies that may increase the profitability of the companies[18]. As the CE is often more labour-intensive and secondary materials are still more expensive (Tukker & Tischner 2006; Rizos et al. 2016; Hartley et al. 2020), economic instruments are able to make them more appealing. In the interviews, financial drivers were rarely addressed, but especially taxation that would benefit CE-based companies were mentioned as potential approaches. Options include, for example tax deductions on labour and increases for new products or resource use, to benefit circular products and services in relation to the conventional ones (Dalhammar et al. 2020; Hartley et al. 2020). The effectiveness partly depends on how the deduction impacts the price and how a price reduction would impact the demand. Another approach could be to consider externalities in product pricing, for example including the negative environmental impacts related pollution caused by raw material acquisition (Rizos et al. 2016; Polverini & Miretti 2019).

Legal and regulatory drivers

Legislation and regulation obligate companies to change their way of action[19]. The effect is recognized in situations where the legislation is strict enough to generate pressure. Strict regulations also help manage risks and reputation. Legislation is a driver especially for larger companies. Few interviewees pointed legislation as a driver for their action, many of them rather aimed to be proactive and go beyond compliance. However, they also recognized the need for regulations, e.g. by stating:

> *"Good things do not progress without regulation, at least not at sufficient speed. It is not enough to rely on on the means of market liberalism."* (Large electronics company)

Guarantees also affect companies. They aim to protect consumers against faulty products and can incentivise producers to prolong product lifetime and consumers to go for repair instead of discarding broken items (Maitre-Ekern & Dalhammar 2019). However, this is not

18 Tischner 2001; Hojnik 2018; Dalhammar et al. 2020; Hartley et al. 2020; Salo et al. 2020

19 van Hemel & Cramer, Belmane et al. 2003; Byggeth & Hochschorner 2006, Rennings 2002; Santolaria et al. 2011; Plepsys et al. 2015; de Jesus & Mendonça 2018; Hojnik 2018; Ranta et al. 2018; Gusmerotti et al. 2019; Salo et al. 2020

the case today because of insufficient legal provisions and high market constraints. The interviewees supported guarantees by stating, for exampe:

> *"Guarantee periods are a clear and well-established model for measuring expected durability of a product in a way."* (Small textiles company)

> *"Guarantee periods could be longer and perhaps they would be good traits for the consumer to promote longer life cycles."* (Large electronics company)

Stakeholder demands

Companies may be requested by collaborators, suppliers and investors to implement circular practices and make changes to their products (Ranta et al. 2018). For example, suppliers may request materials and products with less negative environmental impacts and investors may look for closed-loop models. Especially the role of collaborating companies was addressed in the interviews. They stated that they cooperate a lot with other companies and push each other to do more, such as:

> *"Let's talk about, for example, our products, what we have, or about any of our partners, then no other principles should be at war with our values. We have these accountability discussions with every brand and we want, or demand, for transparency and answers to a variety of issues."* (Small textiles company)

> *"It is not a trade secret, nor do we want to keep the information to ourselves. We have partners too (…) we tell them how we want them to work with us, and they do it, and we want it to spread."* (Small furniture company)

Technical drivers

New materials, components or manufacturing methods enable developing more circular products (van Hemel & Cramer 2002; de Jesus & Mendonça 2018). Alternative solutions are an essential condition for balancing product durability, efficiency, quality, and designing optimal product life-cycle scenarios for new products and processes. Many of the companies also actively look for new solutions, for example:

> *"I have been actively trying to look for new materials in the factory, new ways to make it better, but so that it does not eat the design."* (Micro-sized shoe company)

> *"There are many research groups that study how to separate and exploit these materials where there are more components."* (Medium-sized textile company)

Information drivers

Many enterprises have started to focus greater effort on the CE, e.g. design for durability or recyclability, due to increased public awareness of the issue (de Jesus & Mendonça 2018; Hogg et al. 2020). Increased awareness is connected to customer demand and the issues that customers value. Many of the interviewees felt that the environmental concerns have mainstreamed lately, which has helped them. For example,

> *"Let's just say that in the last few years, more attention on big forums has been given to the Circular Economy and other green and environmental values really strongly."* (Large electronics company)

> *"It makes it much easier for us to do our work when there are these big headlines, and companies have also awaken to think what is their sustainability programme."* (Large home products company)

> *"We have always tried to act responsibly, but it has now been noted that it is important to tell the consumer. People are also increasingly interested in environmental issues and ethical manufacturing."* (Small shoe company)

The aim to contribute to the change was also evident in the interviews. A majority of the interviewees wanted to be a part of the transition and change the unsustainable consumption and production structures. Oftentimes, the companies aimed to promote durable and/or reused products and services related to those. They stated, for example, that:

> *"Our culture of consumption moves all the time more and more in that direction, and if we can be involved with this innovative service, then it's a great thing."* (Micro-sized furniture company)

> *"Our mission is to change consumer habits towards second hand, away from fast fashion."* (Medium-sized textiles company)

> *"I want to move the world in a more sustainable and better direction from an ecological and social perspective with my own actions."* (Micro-sized textiles company)

> *"Part of our ambitions is to teach consumers to make wise choices when they buy a new one, so that they would buy something that has a resale value and a long lifetime."* (Large home products company)

2.2 The most common barriers

2.2.1 Internal barriers

Organizational and capacity barriers

According to several studies, especially the most proactive companies face a lack of human resources[20]. They do not have enough resources and time to educate employees or try new solutions as much as they would like to. The transition to a new business model may involve new set of skills and radical changes in the organizational structure of a (sales-oriented) firm. However, among the interviewed companies, lack of resources was a relatively rare barrier.

The lack of resources is also connected to the lack of expertice and time[21]. The lack of expertise to implement CE measures deters firms from engaging in them. However, there seems to be a learning effect and the expertise barrier loses importance when companies become more engaged. Making changes in materials, products and processes is time-consuming in companies. Therefore, it would be beneficial to provide companies with sector-specific information in a format that is easy to use and understand. The interviewees described the situation, for example, as:

> *"In practice, you often find time for familiarizing yourself at a point when you have to do something."* (Large electronics company)

> *"In a company of this size, there is no time to think about those things more because we have to aim at running the company, plus to make sure that there is the money every month at the time of the payments."* (Micro-sized shoe company)

> *"This is not the most profitable business in the world, so in a way it's very labor-intensive."* (Large home products company)

Companies and their management may be hesitant, lack awareness, sense of urgency and responsibility to adopt sustainable practices (van Hemel & Cramer 2002; Masi et al. 2018; Kirchherr et al. 2018; Salo et al. 2020). The company culture may be resistant or hesitant towards changes. The CE may be appreciated in Corporate Social Responsibility and environmental departments but not in more influential departments, e.g. operations

20 Beuren 2013; Hannon et al 2015; Tukker 2015; de Jesus & Mendonça 2018; Ormazabal et al. 2018; Garcés-Ayerbe et al. 2019; Vermunt et al. 2019; Dalhammar et al. 2020; García-Quevedo et al. 2020

21 van Hemel & Cramer 2002; Knight & Jenkins 2009; Ormazabal et al. 2018; Garcés-Ayerbe et al. 2019; Dalhammar et al. 2020; García-Quevedo et al. 2020; Salo et al. 2020

and finance. The lack of awareness and perceived responsibility is a strong barrier that companies cannot overcome. Furthermore, the management, e.g., CEOs and directors,can be unwilling to commit to the CE (Mont 2002; Santolaria et al. 2011; Ceschin 2013; Vezzoli et al. 2015). Wholesale cultural and organizational changes are often required from product-oriented companies in order to shift to PSS models, and firms may lack the organizational commitment to undertake the changes. Some of the interviewees, especially in larger companies, felt that their actions to promote circularity and sustainability were in a minority within the company, for example:

> *"Inside the house, for example, there may be underestimation, or "business-first" thinking."*(Large textiles company)

Costs and financial barriers

Insufficient financial resources are a common barrier especially for less proactive companies.[22] New investments, meeting the environmental criteria and regulations and increased coordination in supply chain cause additional costs. The lack of resources results in slower adoption of CE activities. The companies may also have difficulties in accessing finance. Recycled materials and labor-intensive services (e.g. repairs, recycling) are often more costly than new products made of virgin raw materials. The companies lack a clear idea about cost benefits, improved work processes or investment required. For example:

> "*To begin with (…) we had to make decisions on whether to undertake this because some investments needed to be made, and whether this is profitable for the company.*" (Large electronics company)

The interviewees had often balanced between the costs and benefits. They considered that the CE is in a marginal and may not be economically profitable. They are also connected to the external barrier of uncertain market benefits. For example:

> *"In second hand you need to understand that we have a rather multistageous sales process with a quite lot of operational expenses: we collect, take pictures, handle the furnitures, storage costs. We have to get to a certain scale to make it a sensible business."* (Micro-sized furniture company)

22 Santolaria et al. 2011; Moser 2014; Hannon et al. 2015; Vezzoli et al. 2015, Dekoninck et al. 2016; Kirchherr et al. 2018; de Jesus & Mendonça 2018; Ormazabal et al. 2018; Svensson et al. 2018; Garcés-Ayerbe et al. 2019; Maitre-Ekern & Dalhammar 2019; Vermunt et al. 2019; Dalhammar et al. 2020; García-Quevedo et al. 2020; Hernandez et al. 2020; Hogg et al. 2020; Salo et al. 2020

> *"Cost versus benefit, can we make enough impact with the resources and financial contributions that we are would be able to spend."* (Large electronics company)

Linear business models still prevail and sustainable circular business models often have high up-front investment costs, material recycling is costly, secondary materials cost more than virgin materials[23]. In PSS, there is a risk of weakening a firm's sales-oriented business if it was a producer/manufacturer. Therefore, subsidies for CE investments and operations e.g. repair, recycling and renting businesses could help to overcome barriers related to high investment and other costs. In addition, reduced VAT that favours circular products (e.g. repaired, remanufactured), RDI funding and innovation deals could support companies in developing and adopting more sustainable business models.

Information barriers

Companies may be unsure about the environmental effects and not perceive environmental benefits related to altered ways of action[24]. The uncertainty of environmental benefits is considered to be a barrier that companies are not likely to overcome themselves as they do not see the value of changing their ways. Especially service firms often struggle to quantify the economic and environmental savings/benefits arising from their services.

Companies also lack reliable, transparent and trustworthy information on options and their impacts.[25] Designing optimal product life scenarios requires in-depth knowledge of durability and the replacement schedule of parts. Companies may not understand the concept of a circular business model, markets and business opportunities. It may also be hard to track the impacts and materials throughout the complex value chains. The lack of information or understanding is also related to the limited resources, especially in smaller companies. Therefore, concentrated and up-to-date knowledge banks with sector-specific information on, e.g. different materials, tools and methods to assess environmental impacts and recommendations would be beneficial as well as RDI funding and projects conducted together with businesses. Some interviewees mentioned, for example:

23 Tukker & Tischner 2006; Rizos et al. 2016; SOU 2017; Kirchherr et al. 2018; Rood & Kishna 2019; Gusmerotti et al. 2019; Dalhammar et al. 2020; Hartley et al. 2020

24 Mont 2002; Mont & Lindhqvist 2003; Ceschin & Vezzoli 2010; Santolaria et al. 2011; Beuren et al. 2013; Dekoninck et al. 2016; Dubois et al. 2016; OECD 2017; de Jesus & Mendonça 2018; Svensson et al. 2018

25 Ormazabal et al. 2018; Maitre-Ekern & Dalhammar 2019; Vermunt et al. 2019; Dalhammar et al. 2020; Hernandez et al. 2020; Salo et al. 2020

"We cannot directly obtain that information with our resources." (Small furniture company)

"Another big problem is that there is terribly lot of information available on different environmental aspects, but it's scattered and it's kind of a data mining. There should be clearly structured information available that you can grasp better." (Large textiles company)

Another information barrier relates to the company image and negative reputation. Especially second-hand products and recycled materials may have had a bad reputation, and therefore consumers and businesses preferred to buy 'new' (Tukker 2015; Rood & Kishna 2019). The reputation is closely linked to an external barrier related to customers, as the customers may perceive products made of secondary materials as unsafe to use to second-hand products to be inferior, for example:

"There has been a mindset that buying secondhand has a stigma, and of course we struggle against it too (…) it may have a certain stigma, a very Finnish old model of thought that cannot you afford to buy a new one." (Micro-sized furniture company)

2.2.2 External barriers

Market barriers

The lack of customer demand is an important barrier for all companies, nevertheless for those with a circular business model[26]. New practices are slowly adopted and face inertia (de Jesus & Mendonça 2018). Consumers may not be willing to change their habits of buying a new product and circular products are often different for them and more expensive (Ranta et al. 2018; Hernandez et al. 2020). The lack of economic incentives is a part of the issue as it is harder to change one's habits if the alternative, more sustainable options are more expensive, as has been the case. They may also see sustainability as a trade-off between price and performance and lack interest in the environment (Masi et al. 2018; Ormazabal et al. 2018; Ranta et al. 2018). Products that are more durable also last longer than a fashion trend and can be considered to be outdated. Another issue is the lack of attachment to products in general and discard them more easily (Hernandez et al. 2020).

26 Tukker 2015; Kirchherr et al. 2018; Ranta et al. 2018; Ormazabal et al. 2018; Vermunt et al. 2019; Dalhammar et al. 2020; Hartley et al. 2020; Hogg et al. 2020; Salo et al. 2020

The lack of demand calls for offering consumers and businesses reliable, transparent and trustworthy information on options and their impacts[27]. Customers may not understand the life cycle costs which can lead to the perception that the value of a circular product or service being excessively high compared to traditional products and their ownership. The interviewees expressed this barrier by stating:

> *"The customer is still stubbornly staring at the price of the purchase and therefore not seeing the effects of the life cycle of the product on the environment and the rest of society."* (Large furniture company)

> *"It is more expensive to manufacture, but consumers may not necessarily want to pay more."*(Micro-sized shoe company)

> *"The novelty of the concept, the idea of sharing and borrowing, (…) getting use to the new type of use and consumption of clothes."* (Micro-sized textiles company)

The lack of customer demand is related to uncertain market benefits, as the companies may not see direct benefits in the short term, such as the growth of production or sales (van Hemel & Cramer 2002; Santolaria et al. 2011; de Jesus & Mendonça 2018). For example:

> "*It would be easier if the world was so simple that when you have an ecolabel and a third-party certificate, customers would be racing to buy a more environmentally friendly product, but that's not true, they want the cheapest product..*" (Large furniture company)

> *"... We had those importers and I asked them if they would be interested or think there would a business opportunity. Many of them thought that this would not work out."* (Large electronics company)

> *"In the Circular Economy, (…) the result of that product does not arise from you selling it once and getting a certain amount of money out of it, but rather counting in the long run how many times you have to rent the product."* (Micro-sized textiles company)

27 Mont 2002; Mont & Lindhqvist 2003; Beuren 2013; Vezzoli et al. 2015; OECD 2017; Nissinen et al. 2019

Legal and regulatory barriers

The lack of coherent legislation hampers companies due to differing regulations in various policy fields and regions or lack of up-to-date regulation in the first place[28]. The failure to adopt a strict, coherent legislative framework often impedes SMEs from integrating green solutions into their operations. There is quite strong institutional support for recycling but not so much for other CE principles (Ranta et al. 2018; Domenech & Bahn-Walkowiak 2019; Hartley et al. 2020). In addition, government policy has failed to sufficiently internalize environmental impacts and reward sustainable business activity (Plepys et al. 2015; Tukker 2015; Rizas et al. 2016). An increasing administrative burden is also related to addressing complex procedures, such as leasing or waste shipments (Dalhammar 2016; Garcés-Ayerbe et al. 2019; Vermunt et al. 2019; García-Quevedo et al. 2020). Several interviewees felt that legislation and regulations complicate their actions, especially related to reuse and secondary materials. For example:

> *"Often the policies seem to aim to restrict something or inhibit some activity or that it complicates it unreasonably, no matter the purpose."* (Large electronics company)

> *"We understand that these laws exist and must exist, but in our case it has slowed down or made things difficult."* (Small textiles company)

> *"It has been necessary to take into account the legislation of different countries that is a big job to keep up with it. It has affected a lot."* (Large textiles company)

> *"They are perhaps more of legislative challenges that you need to have different kind of proofs of evidence if you, for example, would like to transport equipment (…) to another country for security processing. There are some types of legislative sections on waste shipments that complicate our work. The legislator (…) sees it as waste, and it's not waste yet at that point."* (Large electronics company)

Barriers arising from relationships across the value chain

Companies, especially SMEs, may be limited to actions within their organization as they do not have information on the lifecycle. The problem is more evident in the downstream, e.g. the use phase (Ormazabal et al. 2018). Furthermore, companies may face limited willingness for collaboration in their value chain (Kirchherr et al. 2018). The companies may be afraid of intellectual property theft or industrial espionage, whereas customers

28 Mont 2002; van Hemel & Cramer 2002; Ceschin and Vezzoli 2010; Ceschin 2013; Vezzoli et al. 2015; de Jesus & Mendonça 2018; Kirchherr et al. 2018; Ranta et al. 2018; Vermunt et al. 2019; Maitre-Ekern & Dalhammar 2019

can face potential threats to their privacy due to reuse, repair and PSS[29]. The issue spreads throughout the field, as companies, investors, consumers and other actor groups may be unfamiliar with the CE concept (Kirchherr et al. 2018; Rood & Kishna 2019; Vermunt et al. 2019). Therefore, they are not willing to embrace it. They may also lack inspiring examles of frontrunners and successful business cases (Vermunt et al. 2019). These relationship issues were addressed in the interviews in cases such as:

> *"We have also taught our users and our customers increasingly that this is, in fact, circular economy. The term is not very well known, and it is often categorized to sorting my waste."* (Large home products company)

Technical barriers

There may not be alternative materials, components or processes to substitute the less sustainable option[30]. For example, thus far there has not been separate collection plants for textile waste in Finland, and therefore secondary materials or the end-products have been transported from abroad. The first refinement plant will begin its full operation in 2023 after a pilot phase (Lounais-Suomen Jätehuolto 2020). The interviewees emphasized that:

> *"We have received criticism on why I don't produce in Finland, but there is no manufacturing industry here."* (Micro-sized shoe company)

> "*Mixed materials require quite a bit like innovative solutions.*" (Small furniture company)

> *"When the product is at the end of its life cycle, you can return it to me, but even I don't know what to do with it, there is no place."* (Micro-sized shoe company)

> *"[A separate textile collection plant] is whole different class to enable utilizing domestic consumer textiles and, of course, reduce the carbon footprint because you don't have to operate in countries where the infrastructure and our raw material material at the moment is."* (Medium-sized textiles company)

In addition to the lack of alternative solutions, the low quality and limited access to spare parts have made repairing difficult if not impossible (Maitre-Ekern & Dalhammar 2019;

29 Mont 2002; Mont & Lindqvist 2003; Moser 2014; Moser & Jakl 2014; Hannon et al. 2015; Vezzoli et al 2015; OECD 2017; Svensson et al. 2018; Hernandez et al. 2020

30 van Hemel & Cramer 2002; Dekoninck et al. 2016; de Jesus & Mendonça 2018; Vermunt et al. 2019; Salo et al. 2020

Dalhammar et al. 2020; Hernandez et al. 2020). Many products are of low quality and are not considered worthy of repairing. Higher quality and more expensive products are more likely repaired than replaced with a new product than those of lower quality and price. There may also be planned or premature obsolescence to decrease product's useful life and functionality by e.g. limited software updates or inability to repair, aiming to decrease costs and increase sales of new products. Their disassembly may also be impossible, if the products e.g. glued together or with non-renewable batteries are unable to be disassembled and repaired without damaging them[31]. Repairs may be more expensive than buing a new product. Even if they are to be repaired, spare parts might not be available at all or within a reasonable time and distance, or they are unaffordable. In the interviews, this was reflected in terms of the potential of reuse, such as:

> *"The quality of products is a big challenge, I think. It is clearly reflected in our activities, especially in textiles and furniture. I think they have been significantly more diverted to waste in recent years. Of course, it may depend on what kind of stuff customers donate to us, but also on what kind of stuff is produced, i.e. its reusability is significantly lower than before."* (Large home products company)

Specific for services and PSS is e.g., the lack of enabling infrastructure and technologies, for product collection, remanufacturing or recycling (UNEP 2002; Plepsys et al. 2015, Vezzoli et al. 2015). PSS solutions rely on supportive infrastructure (i.e. parking, road lanes, etc.) that enable diffusion and competitiveness of certain PSS solutions.

2.3 Company perceptions on public policy instruments in the interviews

When asked about whether public policy instruments push the company towards the CE, approximately half of the interviewees did not know what the concept of public policies meant. The observation was especially common for smaller companies. They asked, for example, *"What does it mean?"* (small shoe company). Furthermore, largely related to the forerunner position of the interviewees, some of them felt that the instruments do not specifically encourage, nor discourage them to promote circularity stating that:

> *"We are at the heart of the Circular Economy so public policies do not, at least, drive us out of there and not necessarily drive us deeper because we were already there."* (Large home products company)

31 Svensson et al. 2018; Vermunt et al. 2019; Hernandez et al. 2020; Dalhammar et al. 2020

"I cannot say [that it would have affected]. We're all proactively engaged in it."

(Medium-sized electronics company)

"We are, in a way, moving little ahead of regulation, aiming to be more of a proactive player pushing regulation to contribute more towards and even promote the Circular Economy more than it currently does." (Large home products company)

Like described earlier, the stimuli often arose within the interviewed company rather than from the outside, e.g. in the form of regulations, taxes or subsidies. Some companies hoped for more steering, especially incentives although they also acknowledged the need for regulations as voluntary methods may not be adequate. Many interviewees also recognized that even though policy tools had not affected or stimulated their operations directly towards circularity, policies are needed to steer the market overall as not all companies are inherently proactive in terms of circularity. For example, the interviewees stated:

"We have had time to find out things that public policies address later. You can say that it pretty much supports but lags behind." (Small textile company)

"A hybrid approach is probably the best one. Just informing and telling and seeking to inform people as, unfortunately does not seem to work. There has to be a bit of pain and a little bit of cake that can perhaps make things happen..." (Medium-sized electronic company)

The interviewees were asked to reflect on the positive and negative sides of given product policy instruments (Annex 2). The list included instruments that have been implemented in Finland (e.g. the Ecodesign Directive, Extended Producer Responsibility and ecolabels), abroad (e.g. VAT deductions for repair services, responsibility to inform about the repairability or expected lifetime) or have been discussed in the literature (e.g. minimum requirements on the use of secondary materials and quality certificates for repaired products). Not all instruments were relevant for the specific sector or company and therefore the interviews focused on instruments that the interviewees were familiar with.

Concerning the existing regulative instruments, the interviewees saw liability for defects and warranty periods in the most positive light. Some felt that they support improving the quality, durability and longer lifetime of products. Companies who operated with repaired, reused or remanufactured products felt that the liability and warranty periods should be at least as long as for new products to promote the CE. A few interviewees also saw the potential to lengthen warranty periods to increase the product lifetimes, although some were also sceptical about the actual effects that could be easily verified and measured.

The interviewees were not as familiar with the Ecodesign Directive and EPR. Companies who knew the instruments considered sector-specificity of the Directive well-working but difficulty in identifying which regulations consider their products, whereas EPR was also seen functioning especially thanks to the PROs but making sure that all producer's participate and that it does not become disproportionate for smaller companies.

Responsibilities that have been partially introduced to legislation in France, for example, concern providing information on repairability, availability of spare parts, expected lifetime and offering manuals. The interviewees saw the greatest potential in introducing requirements on repairability to enhance product lifetimes and reuse in various sectors. Many interviewees felt that these should be addressed in Finland and in the EU. Repairability is closely connected with the availability of spare parts. However, some companies saw that it is impossible for older products, but therefore the responsibility should consider new products and for a specific time frame, such as 5, 10 or 20 years depending on the product group. The responsibility concerning expected lifetime divided opinions more as many interviewees saw that such information would help customers make more informed and sustainable decisions and prepare financially for repairs or buying new products. However, it was considered to be very difficult to measure and verify as the actual lifetime depends on how the product is used and maintained. Lastly, many interviewees considered that manuals are very important, although they have already been widely shared. The manuals should be open and digital to make them accessible throughout the lifetime of the product.

Voluntary and information-related instruments considered sharing information and general education, ecolabels for sustainable products and Finnish voluntary Green Deals. A majority saw information and education important in enhancing the knowledge-base on the CE and sustainability issues in the broader society as well as within and between companies, which are reflected on customer demand, everyday operations and marketing. Several interviewees also found it difficult to find trustworthy information relevant for their sector and market their preferability in terms of sustainability to consumers. Ecolabels were considered a good approach to communicate the environmental preferability, although the wide number of different labels makes it difficult to choose which one are trustworthy and some considered the profitability to be rather low. The voluntary Green Deals agreed between the state and a body representing the business and industry sector or e.g. the municipal sector, were largely unfamiliar for the interviewees. When described in the interviews, many felt that they are a good and flexible approach to supplement other instruments.

Instruments that have been discussed in the literature to support the development of a CE market include minimum requirements on the share of secondary materials, prohibition of planned or premature obsolescence and termination of legislation that prohibits repairs

(Svensson et al. 2018; Maitre-Ekern & Dalhammar 2019; Dalhammar et al. 2020; Keirsbilck et al. 2020). Some interviewees supported a gradual introduction of requirements on secondary materials into some product groups, such as packaging. However, several felt that it would be very hard to determine a target level for the share and it would hamper designers. The prohibition of planned/premature obsolescence was strongly supported by a majority of the interviewees, although rather irrelevant for furniture and shoe sectors, for example. On the opposite, the interviewees often saw termination of legislation that hampers repairs, including patents and intellectual property rights, as discriminating the designers and manufacturers. Policies should otherwise support repairs and reuse more.

Following the Swedish example and experiences (Dalhammar et al. 2020), we asked how the interviewees saw deductions in VAT to repair services, repair cafés and quality certificates for repaired products. A majority of the respondents supported introducing VAT deductions to make repairs more profitable and appealing. Repair cafés were more unknown to the respondents, but many considered them as an interesting and fun way to increase know-how about repairing, although not strong enough as an individual instrument. Lastly, certificates for repaired products were considered to support customers in decision-making with reliable information and promote repairs and reuse.

Several interviewees mentioned public procurement although it was excluded from the list of policy instruments as a recent HILMI project[32] had studied it in more detail (Kalimo et al. 2021). Many interviewees felt that public procurement does not take circularity into account or give the proper valuation for environmental criteria.

Textile companies were specifically asked about the upcoming separate textile waste collection. All six textiles companies saw it in a very positive light in supporting Finnish textiles' recycling, use of secondary materials and closed loops.

32 Carbon and environmental footprint in procurement – legislation and measuring Hiili- ja ympäristöjalanjälki hankinnoissa – lainsäädäntö ja mittaaminen (HILMI). http://urn.fi/URN:ISBN:978-952-383-097-4

PART II: KEY POLICIES

3 Ecodesign

3.1 The current Ecodesign Directive and its methodology

3.1.1 The Ecodesign Directive

It is often argued that 80% of the environmental impacts of a product can be determined in its design stage (JRC 2018). Therefore, the Ecodesign framework has substantial potential to reduce the negative environmental impacts of consumption and production. The Ecodesign Directive (2009/125/EC) has been successful as a regulatory push to regulate energy efficiency and some circularity features of energy-related products (ErP)[33]. The main aim of the current Directive is to remove the worst performing products from the EU market, guide national efforts towards sustainable production and consumption and reduce energy consumption of products during the use phase. The Directive also aims to prevent barriers to trade and unfair competition by harmonising national laws. Furthermore, ecodesign should be beneficial to consumers and other end-users by reducing expenses related to use stage while also supporting competitiveness and innovativeness in industries (Polverini & Miretti 2019; Talens Peiró et al. 2020). At the same time, the ecodesign requirements must not be fulfilled at the expense of the functionality of a product, its safety or health (EC 2014a). In early 2021, 27 product-specific Ecodesign Regulations were in force covering both B2C (televisions, refrigerators, washing machines, etc.) to B2B products (ventilation units, power transformers, etc.) (Polverini 2021).

The original Ecodesign Directive (2005/32/EC) concerned energy-using products (EuP) which use, generate, transfer or measure energy, such as freezers and computers. The scope of the EU ecodesign regulation was broadened in 2009 when the new Ecodesign Directive for ErP was set out (Directive 2009/125/EC). ErPs include products like windows and insulation materials, which do not use energy but have an effect on energy consumption. Products that fulfil the minimum product-group specific requirements are granted a 'CE marking'[34] and can be placed on the market in the EU. The manufacturer or its authorised representative needs to ensure the compliance.

33 EC 2020b; Bundgaard et al. 2017; Kristensen 2019; Polverini & Miretti 2019

34 CE marking (in French Conformité Européenne) is a declaration that the product meets all legal safety, health, and environmental protection requirements and can be sold throughout the European Economic Area.

The Directive is executed through implementing measures and voluntary agreements. The implementing measures are adopted by the Commission and concern those ErPs with great demand, environmental impacts and potential. They act as a regulatory push that is applied to products that sell more than 200 000 units a year within the Union, have a significant environmental impact and present significant potential for improvement in their environmental impact without excessive costs. The implementing measures include generic and specific requirements. The generic mandatory requirements do not set thresholds but may demand compliance with relevant European standards or information requirements (like material coding), whereas the specific requirements set limit values on more detailed technical aspects (e.g. maximum energy consumption).

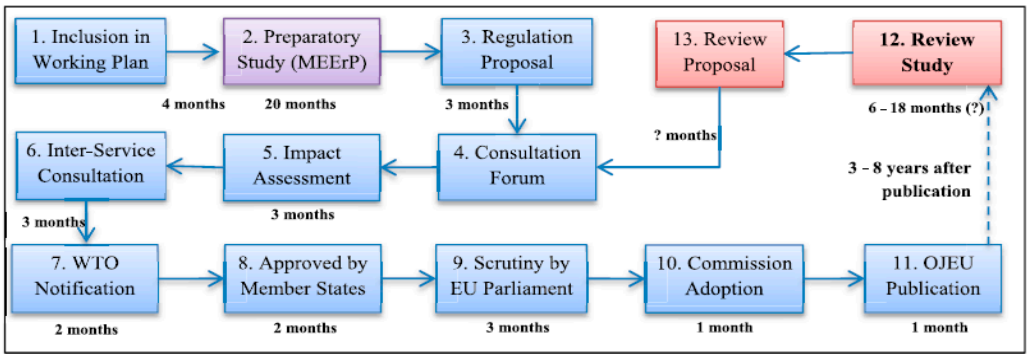
The Directive considers the absence of other relevant legislation, failure of market forces to address the issue and disparities in the environmental performance of products with equivalent functionality. According to the Directive, implementing legislation may be needed if market forces fail to develop the products in the right direction or at an adequate speed. Thus, voluntary approaches are prioritised, such as self-regulation, as they enable rapid progress, cost-effective implementation and flexibility. Here, voluntary agreements formulated by the industry act as a market pull (Bundgaard et al. 2017). The industry plays a larger role in voluntary agreements than they do in implementing measures (Tanasescu 2009; Bundgaard et al. 2017). Voluntary agreements are signed by actors whose market coverage is at least 70% and at least 90% of their products placed on the market comply with the requirements (EC 2013b). Therefore, the voluntary agreements do not necessarily remove the worst performing products from the market but rather pull the market (Bundgaard et al. 2017).

3.1.2 The process of setting Ecodesign requirements

The Ecodesign process begins with preparatory studies on product groups that have been identified relevant in the working plans (Figure 1) (Directive 2009/125/EC; Bundgaard et al. 2017; Talens Peiró et al. 2020). The product groups are prioritized based on their potential energy and environmental savings achievable with the Ecodesign regulations. The preparatory study is conducted for selected product groups based on the Methodology study for Ecodesign of Energy-related Products (MEErP). The MEErP consists of a techno-economic-environmental assessment. The preparatory study usually takes place in two years including two or three stakeholder meetings to gather views, experiences and data (Hinchcliffe & Akkerman 2017). Tanasescu (2009) has identified an imbalance between the stakeholder's expertise and resources, and typically industry representatives were able to influence the process more than other stakeholders.

The next step is a policy impact assessment of different policy options in terms of cost competitiveness, impact on small and medium enterprises, technological development and innovation, product functionality, and end-user affordability (Bundgaard et al. 2017; Talens Peiró et al. 2020). As a part of the assessment, the results of the MEErP are formulated as recommendations sent to the Consultation Forum that presents and discusses the working documents with up to 30 stakeholders including industry, EU Member States (MSs), consumer oganisations and NGOs (Tanasescu 2009; Bundgaard et al. 2017; Talens Peiró et al. 2020). The consultation process is considered to be well-structured and draw broad support. It is the platform of many decisions. Following the impact assessment, a draft implementing measure is formulated and sent to the Ecodesign Regulatory Committee, EU Parliament and, finally, the Commission (Directive 2009/125/EC; Bundgaard et al. 2017; Talens Peiró et al. 2020). The draft is also sent to the World Trade Organisation. After an approval by the Regulatory Committee, with representatives from the MSs, a three-month scrutinity period by the European Parliament and the Council takes place. Then, the Ecodesign regulations are finally published in the Official Journal of the EU. This process applies to implementing measures as opposed to voluntary approaches.

Figure 1. The Ecodesign Regulatory Process (according to Hinchcliffe & Akkerman 2017).



Voluntary agreements can be made instead of implementing measures based on Annex VIII of the Directive and the guideline on self-regulation measures (EC 2013b). In the case of voluntary agreements, the process includes a preparatory study, Consultation Forum and potential recognition by the Commission. In addition, the industry should provide the Commission a draft proposal before, during or after the preparatory study. The Commission can choose to recognize or reject the voluntary agreement. Voluntary agreements are often more agile, cost-efficient and market-oriented than implementing measures because their process is quicker and allows adaptation of appropriate technical solutions considering the market sensitivities (Bundgaard et al. 2017). However, the voluntary agreements aim to pull markets towards a more environmentally-sound

direction by making an agreement with at least 70% of the industry in question to improve 90% of their products. Hence, they may not phase out the worst performing products on the market. Overall, the implementing measures seem to work more effectively than voluntary agreements (Dalhammar et al. 2014).

The MEErP methodology (Kemna 2011) is used as a part of the preparatory studies to assess the technical, economic and environmental aspects of a product group under analysis to identify the potential for setting ecodesign requirements. The methodology aims to help policymakers to assess the feasibility of setting the requirements for the specific product group by identifying functional parameters that can be regulated and their level of stringency. The MEErP includes seven tasks:

1. Definition of the product scope, assessment of existing relevant legislation and test standards;
2. Establishment of market and stock data, market trends and end-user expenditure base data;
3. Assessment of system aspects related to the use phase;
4, 5, 6. Studies of one or more average EU products, called base cases, and more advanced solutions at product level (the design options), which are ranked based on the least life cycle cost (LLCC) and the Ecoreport tool.
7. Analyses of the previous tasks and suggestions on potential policy measures. (Polverini & Miretti 2017).

The design option means a specific product architecture with technical features that make it more advanced and/or more efficient when compared to the 'base case', which is the average EU product defined for analysis. The LLCC assesses the total cost of ownership of a product, including the costs related to owning, operating, maintaining and disposing of it. Therefore, it is considered to provide the optimum level in terms of regulation because it minimises the total cost of ownership for the consumer and pushes manufacturers to make improvements to their products. The approach aligns with the principle of technological neutrality meaning that individual manufacturers choose how and with which technologies they comply with the requirements. The Ecoreport tool is used to assess the environmental and resource impacts in nine impact categories related to the product group (global warming potential, acidification, volatile organic compounds, persistent organic pollutants, heavy metals emission to air, polycyclic aromatic hydrocarbons emissions to air, particulate matter, heavy metals emission to water and eutrophication). It is openly available and does not require to purchase a Life Cycle Assessment package.

The Commission has started to prepare a revision of the Ecodesign Directive and the MEErP to a) update the data and make sure the MEErP is still fit for its purpose, b) extend the scope beyond ErP, and c) include the elements of the Circular Economy Action Plan to make products more sustainable (EC 2020b 2020e; Eurovent 2020). The consultation takes place in 2021 and a Commission draft of the revised Ecodesign Directive should be available at the end of 2021. The implementation is likely to take place in 2024-2025. Another important activity linked to the Directive is the preparation of the next Ecodesign Working Plan in 2021 (Polverini 2021). The new plan will prioritise products for which ecodesign preparatory studies should be conducted, and could also develop regulatory routes for the reinforcement of CE aspects.

3.2 Broader scope – the current situation and plans

3.2.1 Broader scope in terms of product groups

The first Circular Economy Action Plan identified the Ecodesign Directive as a key instrument in enhancing CE strategies in production and consumption systems in the EU (EC 2015). The New Circular Economy Action Plan identifies the potentials to broaden the scope of the Ecodesign Directive beyond ErP and develop a new instrument (EC 2020b). The core of the sustainable product policy legislative initiative suggested by the ECis to make the Ecodesign framework applicable to the broadest possible range of products and make it deliver on circularity. The initiative gives priority to product groups identified in the Action Plan, including electronics, ICT and textiles, furniture and high impact intermediary products such as steel, cement and chemicals. Further product groups will be identified based on their environmental impact and circularity potential.

The scope of the Ecodesign Directive was broadened in 2009 when the original Directive on energy-using products (EuP Directive) was replaced with one regulating energy-related products (ErP Directive). Despite the wider scope, there are no requirements for non-energy-using products at the EU level (Keirsbilck et al. 2020). Based on the existing literature, it is recommended to cover those product groups with relevant environmental impacts and a large improvement potential in the Directive (Keirsblick et al. 2020; Talens Peiró et al. 2020). Therefore, there is strong support to include for example textiles, electronics and furniture mentioned in the initiative (EC 2020b).

3.2.2 Broader scope in terms of circularity

The ecodesign framework could have a substantial impact on the circularity of products by setting requirements relating to CE aspects of the product (e.g. recoverability, repairability, durability). The CE perspective has been taken into account in the EC's New Circular Economy Action Plan and initiatives to develop the ecodesing framework further will be laid down in the coming years (EC 2020b: 3-4):

> *"In order to make products fit for a climate-neutral, resource-efficient and circular economy, reduce waste and ensure that the performance of front-runners in sustainability progressively becomes the norm, the Commission will propose a sustainable product policy legislative initiative.*
>
> *The core of this legislative initiative will be to widen the Ecodesign Directive beyond energy-related products so as to make the Ecodesign framework applicable to the broadest possible range of products and make it deliver on circularity. As part of this legislative initiative, and, where appropriate, through complementary legislative proposals, the Commission will consider establishing sustainability principles and other appropriate ways to regulate the following aspects."*

Through ecodesign framework and product-specific ecodesign requirements, it is possible to lay down specific minimum standards for placing different products on the market. In general terms, the policy options available to address resource efficiency of products are limited. The Directive is a politically feasible option and already in place. It is possible to set different resource efficiency related obligations under the Directive (Dalhammar et al. 2014). The Directive is also likely to bring about other benefits, such as competitive advantages for EU industries who can act as forerunners setting the standards and example to other jurisdictions.

The Sustainable Product Initiative is proposed to improve conformity between existing product regulations. It aims to regulate the following aspects among others: product durability, reusability, upgradability and reparability, the presence of hazardous chemicals in products; energy and resource efficiency; the use of recycled content in products; remanufacturing and high-quality recycling; carbon and environmental footprints; restricting single-use and countering premature obsolescence; banning the destruction of unsold durable goods; incentives for product-as-a-service models; digitalisation of product information; rewarding products based on their different sustainability performance, including by linking high performance levels to incentives. (EC 2020b)

Requirements on circular aspects covering different life cycle phases have been lacking from the ecodesign requirements although environmental impacts are part of the scope according the Ecodesign Directive (2009/125/EC, Recital 3):

> *"In the interest of sustainable development, continuous improvement in the overall environmental impact of those products should be encouraged, notably by identifying the major sources of negative environmental impacts and avoiding transfer of pollution, when this improvement does not entail excessive costs."*

In addition, according to the Annex II of the Directive, "the specific ecodesign requirements (…) may take the form of requirements for reduced consumption of a given resource, such as a limit on the use of a resource in the various stages of an product's life cycle, as appropriate". Furthermore, the Annex I of the Directive outlines that "In so far as they relate to product design, significant environmental aspects must be identified with reference to the following phases of the life cycle of the product:

(a) raw material selection and use;
(b) manufacturing;
(c) packaging, transport, and distribution;
(d) installation and maintenance;
(e) use; and
(f) end-of-life, meaning the state of a product having reached the end of its first use until its final disposal."

Annex I also mentions potential parameters for evaluating environmental impacts that include weight and volume of the product, use of materials issued from recycling activities, ease for reuse and recycling, minimum guaranteed lifetime and minimum time for availability of spare parts.

Despite the recognition of other than energy-related aspects in the Directive, energy consumption during use has been highlighted in the requirements. Recital 14 of the Directive states that "although a comprehensive approach to environmental performance is desirable, greenhouse gas mitigation through increased energy efficiency should be considered a priority environmental goal pending the adoption of a working plan." The emphasis on energy-related aspects is related to the tradition of the Directive as it first focused on energy-using products, whose most relevant environmental impacts are related to energy use. A broader scope would require including circular criteria already in the early phases of the preparation, meaning the preparatory study, MEErP and Ecoreport tool (Bundgaard et al. 2017). Now, requirements on resource efficiency have been included only in a later stage of the ecodesign preparation process following the publication of the Roadmap to a Resource Efficient Europe in 2011 (EC 2011).

In the future, ecodesign requirements should also consider material efficiency aspects including durability, repairability, use of recycled materials and the ability to update, dissemble, reuse and recycle products (Dalhammar et al. 2014; Keirsbilck et al. 2020; Talens Peiró et al. 2020). To be able to affect these aspects with the Directive, minimum requirements for each product group should be defined as they vary greatly depending on the product group. For some products, like vacuum cleaners and lamps, minimum durability requirements already apply (Commission Regulation (EU) No 666/2013; Commission Regulation (EU) 2019/2020). A pilot to set more general CE aspects into the Ecodesign regulation on enterprise servers took place in 2015-2018 (Talens Peiró et al. 2020). The new regulations were developed in a close and continual interaction with the stakeholders. The regulations were published in 2019 and included requirements on design for disassembly, critical raw materials, latest firmware and secure data deletion. In addition, some inherently unsustainable products, like most halogen light bulbs, have been phased out and banned to enter the EU market.

The broader scope is already taking place as ten new implementing measures will come into force in 2021 (EC 2019b). The measures concern repairability, availability of spare parts and offering repair information (EC 2019b; Polverini 2021). According to the measures, products will need to be designed for disassembly with commonly used tools without damaging the product permanently for repair and end-of-life. The spare parts shall be available for seven to ten years depending on the product group and they need to be delivered within 15 working days. In addition, repair manuals need to be available. The new measures will be set for the following product groups: refrigerators, washing machines, dishwashers, electronic displays (including televisions), light sources and separate control gears, external power suppliers, electric motors, refrigerators with a direct sales function (e.g. fridges in supermarkets, vending machines for cold drinks), power transformers, and welding equipment (EC 2019b). Eight of these regulations revise already existing requirements, while refrigerators with a direct sales function and welding equipment are regulated for the first time.

3.3 Barriers and risks in broadening the scope

3.3.1 Methodology

The Ecodesign Directive has worked well in reducing the energy consumption of energy-using products (Kristensen 2019; Polverini & Miretti 2019). The broadening of the scope of the Directive in terms of product groups and circularity aspects may risk the well-functioning system, and cause competitive disadvantages and restrictions to innovation (Dalhammar et al. 2014). The broader methodology taking material efficiency and energy efficiency into account is expected to be more time, expertise and resource consuming

than the current approach. Legislative changes made in the Directive are rather slow. It takes approximately five years before preparatory studies lead into finalized product-group specific implementation measures (Dalhammar 2014; Dalhammar et al. 2014). It is showcased by the ongoing revision of the Ecodesign Directive that up to five years from the consultation until implementation is expected. With a lengthy process, the data is often three to four years old, the studies to make the decisions may be outdated and there is a risk for the regulations to become obsolete when they enter force due to technical developments (Dalhammar 2014; Egenhofer et al. 2018). A more complicated methodology taking many more aspects and horizontal requirements into account is likely to prolong that period further. Furthermore, the consultation period is an essential stage but it prolongs the entire process (Egenhofer et al. 2018).

One of the technical challenges of a broader scope for the Directive is to incorporate circularity concepts, such as reparability, durability and recyclability, in the product policy discussions (Talens Peiró et al. 2020). The concepts may be understood differently by different stakeholders and the broader society.

Another significant barrier to broaden the scope of the requirements is the lack of reliable, precise and repeatable methods and standards for product durability and material efficiency[35]. For example, the share of recycled content cannot be determined at the time of placing the product on the market but requires verification throughout the supply chain. According to Polverini and Miretti (2019), the MEErP should systematically consider lifetime and material consumption that are expected to increase the product durability, repairability, refurbishment, spare part availability, use of secondary materials and reuse of components. Already, the MEErP could take into account other environmental aspects, but there is a lack of environmental data, and there are controversies in determining the relevant environmental impact groups and lack of common methodology for assessing recycling, reuse and recovery (Bundgaard et al. 2017; Polverini & Miretti 2019; Tecchio et al. 2017). Furthermore, metrics can be very product specific, which requires a dedicated testing method and vertical standards (Talens Peiró et al. 2020; Polverini 2021).

Another challenge is the underdeveloped circularity metrics in relation to more established energy efficiency and the burden of developing and including circular economy relevant impact categories. The Ecoreport tool is considered to exaggerate the importance of energy consumption during use which is partly connected to the methodological problems related to circularity metrics. The existing nine impact categories of the Ecoreport tool could in theory be used to rank the possible design options. However, this would be a burdensome exercise and none of the nine existing

35 Bundgaard et al. 2017; Hinchcliffe & Akkerman 2017; Tecchio et al. 2017; Polverini & Miretti 2019; Talens Peiró et al. 2020

impact categories can be distinctively related to circular economy aspects only. (Polverini & Miretti 2019)

One reason for the underdeveloped circular economy metrics and indicators is that it may be harder to define, for example, health and environmental effects with a monetary value that is used in the LLCC in the MEErP (Polverini & Miretti 2019). A strength of the current MEErP is that it concerns the economic benefit for the consumer during the product life cycle based on the LLCC. However, if circularity is to be included into the Directive, the product lifetime, externalities and material consumption should be considered in the LLCC. The benefits of the LLCC may be at risk as from the consumer perspective there are limited economic benefits gained from choosing a more recyclable product in an economy that does not consider externalities (Egenhofer et al. 2018; Polverini & Miretti 2019).

3.3.2 Wording of the Directive

Some legal issues relate to the interpretation of the wording of the Ecodesign Directive. Especially article 15(2) of the Ecodesign Directive is problematic. The reference to "significance" has caused interpretation difficulties. For example, article 15(2)(b) reads as follows: "the product shall, considering the quantities placed on the market and/or put into service, have a significant environmental impact within the Community" and article15(2)(c): "the product shall present significant potential for improvement in terms of its environmental impact". However, it is not clear what is meant when referred to significant environmental impacts. Furthermore, the Directive applies to products when they are placed on the market, not when they are manufactured or in CE marking conformity assessment, repaired or remanufactured (Polverini 2021).The wording of article15 might even prevent some rules that are considered important for environmental reasons, such as imposing rules for rare earth elements (Dalhammar et al. 2014). For example, the wording of article15 might prevent rules that would enable us to recycle effectively in the future due to cost increases caused by the altered design in the short term. Design alterations are needed now even though recycling is not yet possible. The wording of article 15 and reference to "significance" has previously often led to energy efficiency requirements. It is important to shift the focus on environmental aspects with large improvement potential (Bundgaard et al. 2017).

3.3.3 Leadership

The leadership of product group preparation affects how circularity is or can be considered in the measures (Bundgaard et al. 2017). Currently, several Directorate-Generals (DG) lead different product categories. However, their focus areas affect the scopes. For example, the DG ENER focuses on energy and DG GROW on production, and therefore they might not have enough interest or knowledge on the circular economy. DG ENV focuses more broadly on different environmental impacts. Therefore, Bundgaard et al. (2017) recommend strengthening the role of DG ENV in the ecodesign process and giving DG ENV leadership of more product categories.

3.3.4 Trade-offs

The Ecodesign Directive is not designed to regulate systems and that leads to problems when attempting to regulate systems instead of products. According to article 15(2)(c)(i): "the product shall present significant potential for improvement in terms of its environmental impact without entailing excessive costs, taking into account in particular: the absence of other relevant Community legislation or failure of market forces to address the issue properly." However, such systems are usually regulated already. In addition, problems arise when one product is addressed by a number of different regulations. (Hinchcliffe et al. 2014)

There are also challenges related to the trade-offs between the environmental impacts of a broader scope. Traditionally, the Directive has strongly focused on energy consumption and the design options analysed and compared have been straightforward (Dalhammar et al. 2014; Polverini & Miretti 2019). However, the inclusion of broader criteria requires balancing between different options and impacts. For example, refrigerators have become more energy efficient over time. At the same time, energy consumption and the operating costs often increase over time in older products to provide the same functionality, for example in refrigerators due to degradation and long-term micro-leakages (Kasaeian et al. 2018; Polverini & Miretti 2019). Also, the materials required for manufacturing new, energy efficient machines should be considered. In addition, chemicals in products may also pose difficulties for instance for recycling (Dalhammar et al. 2014). Durability and long lifetime may not bring about overall environmental benefits per se if the product no longer meets the demand and its components wear (Polverini & Miretti 2019). Hence, a whole life cycle perspective should be applied. In addition, consultants engaged in preparatory studies tend to refer to the use of other EU directives to address other environmental aspects than energy efficiency (Dalhammar 2014). According to Dalhammar (2014), they should investigate how well these instruments perform for the product group in hand to see if product-group specific Ecodesign regulation could complement horizontal legislation.

3.3.5 Resources

According to Egenhofer et al. (2018), smaller MSs have generally less staff working on Ecodesign in public administration. In some cases, one person may be working on ecodesign and other instruments, such as energy labelling. The Scandinavian countries are an exception is this regard as they are seen to have more emphasis on environmental issues.

3.3.6 Market surveillance and testing

National authorities responsible for market surveillance duties verify whether products sold in the EU follow the requirements laid out in ecodesign and energy labelling regulations. However, market surveillance has difficulties in all EU MSs according to Egenhofer et al. (2018). It is hard to determine how much surveillance is needed. In Germany, there are minimum surveillance requirements on product safety. This kind of minimum requirements could also be useful for ecodesign framework. Furthermore, market surveillance of products sold online is more complex as the dealers are typically located outside of the EU.

Market surveillance needs to make yes/no decisions on whether the product complies with the requirements or not (Art. 3 and 7 Ecodesign Directive). The overall environmental impact of such a decision is not considered here. Non-compliance may be caused by a lack of a small detail in the product information, but may cause the product to be withdrawn from the market and the existing units to be demolished.

Testing the compliance of products is a costly, work- and time-consuming effort, and the CE aspects may challenge the situation further (Egenhofer et al. 2018). For example, testing durability is likely to increase the time needed to conduct the tests. The tests should be carried out in a cost-effective manner. It also must be taken into account that such CE related requirements for specific product groups have not been laid down yet. In order for the market surveillance to be effective, these requirements should also be verifiable which may prove to be more difficult for example regarding durability of the product than its energy consumption which is fairly easy to measure. In addition, measuring the durability and the age of the product can take a long time which can be problematic for products that are currently on demand. It is also possible that there are no suitable testing laboratories for the necessary tests). However, the Environmental Coalition of Standards (ECOS) argued that many resource efficiency (or CE) related aspects 'can be easily verified, often at low cost and with minimal training, while ensuring objectivity, consistency and repeatability' and that '(s)uggestions to delay the introduction of resource efficiency requirements due to a perceived market surveillance obstacles are unfounded' (ECOS 2018).

3.3.7 Consumers

At the moment, the scope of the Directive to ehance energy efficiency in product design brings direct benefits for consumers in the form of decreased energy bills (Bundgaard et al. 2017; Egenhofer et al. 2018; Polverini & Miretti 2019). The Directive removes the least performing products from the market and thus supports the sustainability of products. In addition, the energy label informs consumers about the energy use of the product during the use phase and supports decision making based on the information. However, the circularity aspects are more dependent on the users: do they buy or rent the product, how do they use it, do they repair it if it breaks down or do they replace it with a new product, do they recycle the product once its lifetime comes to an end, and so on. Here, the consumers have the power to use the product in a sustainable way. The product design merely enables these actions, for example by making the product disassemblable. According to Egenhofer et al. (2018), Germany's national policy priority is to move the Directive closer to actual consumer behavior to make the policy more effective.

3.4 Potential solutions to broaden the scope

3.4.1 Methodologies

The techno-economic methodological approaches of the Ecodesign Regulation including the MEErP, methods for evaluating the impacts and standards would benefit from extensive research activities (Polverini 2021). Research should define, model and enforce circularity in the requirements and their sensibility. It would be beneficial for identifying and developing tools that are needed to fully incorporate circular aspects into the preparation of the Ecodesign Regulations.

At the moment, there is no approach to evaluate circularity aspects. None of the nine current impact categories included in the Ecoreport tool covers circular economy sufficiently (Polverini & Miretti 2019). There should be a robust technical analysis to systematically identify, analyse and discuss circularity aspects to provide for usable data and indicators (Talens Peiró et al. 2020). The Ecoreport tool could identify circularity aspects including modelling of recycled materials, new materials, and end-of-life (Bundgaard et al. 2017; Polverini 2021).

To overcome the burdensome process of determining the best parameters to describe the circularity aspects of different product groups, the Product Environmental Footrprint (PEF) could be used (Kristensen 2019). The representative product defined in PEF Category Rules (PEFCR) could be used as the 'base product' in the MEErP. PEF could help identify the impact categories with the highest impact and risks of burden shifts. However, energy aspects are likely to dominate without substantial back-up from the Commission. PEFCRs

have already been tested as a possible supplement to the MEErP in two pilot studies for solar photovoltaic panels and rechargeable electrochemical batteries. If a new tool or methodology is to be included, it should be usable for all stakeholders and the overall approach should be understandable (Kristensen 2019).

The potential solutions for a broader scope in terms of the methodology include concentrating systematically on lifetime extension, material consumption and use of secondary materials when assessing design options and impacts of the requirements early on in the preparatory studies (Polverini & Miretti 2019; Talens Peiró et al. 2020; Polverini 2021). Polverini & Miretti (2019) explored options to broaden the LLCC used in the MEErP. First, the 'equivalent annual cost' would enable a straightforward comparison with different expected lifetimes affected by the durability and repairability of a product. Second, including externalities into the LLCC. The most prominent option included 'environmental damages fee', but it would require piloting as it is hard to calculate, for example, the effect of product design on recyclability on aggregated values. The proposed fee would, however, be coherent with the Ecodesign methodology and the EPR scheme, and allow for the inclusion of additional elements, such as increased value for the used material to be recycled, as they become available. Third, the material consumption, or virgin material consumption, could be included in the techno-economic assessment of the MEErP. The approaches would not be perfect, but adequate to improve circularity notions in the Ecodesign framework.

3.4.2 Standards

In response to the lack of standards, the joint CEN-CENELEC technical committee 10 (JTC10) was established for material efficiency. The following standards have been published in 2019-2020:

- EN 45552:2020 'General method for the assessment of the durability of energy-related products';
- EN 45553:2020 'General method for the assessment of the ability to remanufacture energy-related products';
- EN 45554:2020 'General methods for the assessment of the ability to repair, reuse and upgrade energy-related products';
- EN 45555:2019 'General methods for assessing the recyclability and recoverability of energy-related products';
- EN 45556:2019 'General method for assessing the proportion of reused components in energy-related products';
- EN 45557:2020 'General method for assessing the proportion of recycled material content in energy-related products';

- EN 45558:2019 'General method to declare the use of critical raw materials in energy-related products';
- EN 45559:2019 'Methods for providing information relating to material efficiency aspects of energy-related products'.

These standards set basic principles for consideration when addressing the material efficiency aspects, such as durability, remanufacturing, and reuse (Talens Peiró et al. 2020). Standards that support measurable requirements also enable enforcement by market surveillance authorities. They also provide a set of definitions for key terms of the circular economy.

3.4.3 Market surveillance

One way to address the difficulties relating to market surveillance of the products could be penalty fees. Currently the market surveillance authorities are able to prevent the placing on the market of non-compliant products and allocate the testing costs to the economic operator as well as to rule on demolition of the existing non-compliant products. However, the authority cannot lay down financial sanctions per se. From the perspective of overall environmental impacts, it might not be reasonable to demolish a functioning, even if in some way non-compliant product. If the market surveillance authorities could set proper financial penalties for non-compliant products, it could also motive the economic operators to follow the product requirements. Currently, penalty fees require police investigation and proving the intent of the operator making the process administratively heavy.

3.4.4 Digital Product Passports

Another way to improve the fluency of market surveillance is to develop an EU level digital passport system for products that is properly designed, has a clear purpose and an improvement potential from a sustainability perspective. A product passport could serve the purpose of including open data on a product for business-to-business, business-to-user, business-to-market surveillance authority and other stakeholder use. The information on the origin, composition, and compliance with relevant standards could be collected through the product passport system (de Römph 2018; EC 2014b).

The CE aspects of Ecodesign regulation would require more information on the life cycle of the product (Egenhofer et al. 2018). Thus, the digital passports suggested in the New Circular Economy Action Plan could be used to track the products, their material content, recyclability, spare parts, etc. (EC 2020b). From the circularity perspective, the passports should at least initially be limited to the most significant impacts and be based on existing

data. Together with the stakeholders, the authorities need to identify what information is still needed to increase the utility and acceptability of the passports.

3.4.5 Stakeholder participation

In general, stakeholders of the ecodesign process perceive the integration of circularity into the Directive positively (Egenhofer et al. 2018). It is wise to 'advance slowly' to avoid setbacks (Dalhammar et al. 2014; Talens Peiró et al. 2020). The well-working characteristics of the Ecodesign Directive should remain even with a broader scope (Bundgaard et al. 2017; Egenhofer et al. 2018; Talens Peiró et al. 2020). The Directive should continue to apply the principle of technological neutrality. It should also acknowledge that companies are not homogenous within the same sector, which calls for product group specific assessments. The environment should also be flexible and leave room for innovations.

Companies and other actors need a foreseeable and credible operational environment when considering a broader scope for the Directive or developing another instrument to steer the circularity of products (Mickwitz et al. 2008; Talens Peiró et al. 2020). They need time to adapt to the changes. One of the strengths of a stable regulation is that companies may seek to go beyond the regulatory requirements to foresee the changes and avoid potential sanctions (García-Sánchez et al. 2019; Salo et al. 2020). Some companies may even promote tighter requirements to seek competitive advantage (Mickwitz et al. 2008). To support companies, a joint databank could be established in a format that is easy to understand and use. The information should include the current Ecodesign regulations and their minimum requirements and methodologies, regulation under preparation, studies on environmental impacts, important life cycle stages and methods like PEF to assess them, and research results on e.g. market demand in an easily accessible form. The database should be divided between information that concerns companies and is mandatory, and other, supplementary information. The databank and its content should be developed in collaboration between the authorities, companies and research institutions. Ekosuunnittelu.info could provide a basis for this.

It is recommended to continue the open process with stakeholders providing comments and following the process closely (Tanasescu 2009; Bundgaard et al. 2017). Stakeholder consultations should be strengthened during the preparatory study as they have a great role in determining several key aspects. The process of planning new requirements or tighten the existing ones should entail timely and continuous involvement of relevant stakeholders, policy makers and CE experts with information on the product group in question (Bundgaard et al. 2017; Talens Peiró et al. 2020). The consultation period could, however, be shortened to make the regulation more timely (Egenhofer et al. 2018).

Information should be developed together with market surveillance authorities as the compatibility with circularity requirements may require new verification approaches (Kristensen 2019; Talens Peiró et al. 2020; Polverini 2021). To overcome the challenges, market surveillance could be enhanced with strengthened coordination and information exchange between MSs (Egenhofer et al. 2018). Currently, among other things, the Commission is setting up a product database to facilitate market surveillance between MSs (European Court of Auditors 2020).

Furthermore, the DG ENV could have a stronger role in the ecodesign process and there should be more product categories. The experts should cover the whole field of the CE, while reuse and repair are generally not present in the meetings currently. The experiment with enterprise servers was the first product group in a policy process to involve different stakeholders already in the very early stages and this proved successful. However, it should also be acknowledged that stakeholders may have conflicting interests and objectives and there should be an adequate process to tackle these. Thus, there should be wide collaboration thoughtout the process (Bundgaard et al. 2017; Talens Peiró et al. 2020).

3.5 Recommendations for Finnish Policymakers

1. Develop the information basis

1.1 Study the potential conflicts between different requirements (energy/material/durability/repairability etc.) in the regulations that apply to product groups throughout their life cycle and **assess ways to overcome identified incoherencies**.

1.2 Investigate penalty fees as a more (eco-)efficient deterrent against environmentally non-compliant products.

1.3 Study the creation of EU digital product passports and the information that they would include (products' origin, composition, material content, recyclability, etc.)

2. Appoint resources for national actions in Finland

2.1 Reserve enough resources especially for the Ministries, Energy Authority and the market surveillance authority Tukes a) to participate in the preparation of the Ecodesign requirements, b) to strengthen coordination and information exchanges between Member States and to enable testing the compliance of products, c) to support Finnish research organisations and others to use and develop expertise on Ecodesign, and d) to spread information among Finnish stakeholders and to collect their feedback.

2.2 Establish a joint databank for Finnish companies with sector-specific information that is easy to use. The information should include information on the current mandatory Ecodesign regulations and their minimum requirements and methodologies, regulation under preparation and supplementary information on research results on environmental impacts and market demand in an easily accessible form. The databank and its content should be developed in collaboration between the authorities, companies and research institutions. Ekosuunnittelu.info could provide a basis for the joint databank.

2.3 Include the CE in educational curricula, especially in studies in product design, engineering and business economics.

3. Promote Ecodesign in the EU

3.1 Set a monitoring framework to evaluate the expected and realized outcomes and effects of, for example, the new Ecodesign requirements on repairability, availability of spare parts and offering repair information. The evaluation should cover three phases: 1.defining the desired ecodesign benefit, 2.the inclusion of the benefit in a policy, and 3. the achieved impact of the policy vis-a-vis the benefit..

3.2 Support research and industry to study measures for new product groups to broaden the scope from energy-using to energy-related product groups in line with the Directive and potentially to non-energy-related products in alignment with the Circular Economy Action Plan (2020). The emphasis should be on product groups with high environmental impacts and large improvement potential in the Directive prioritized in the Circular Economy Action Plan. Finland should be actively involved in the preparations utilizing the Finnish expertise.

3.3 Support the development of the Ecodesign Directive in setting requirements and preparation of measures. Support setting stricter minimum requirements on a regular basis to incorporate the essential Circular Economy requirements into the Ecodesign Directive. Promote including circularity measures in the early phases of the preparation. Support the preparation of minimum requirements for specific circularity aspects – especially for repairability and spare parts availability – on product group level in a close interaction with stakeholders. Furthermore, planned/premature obsolescence should be prohibited either as a part of the Ecodesign Directive, consumer legislation or separate legislation.

3.4 Enhance synergies and conformity between different product policies while avoiding duplicate work, by e.g. using the PEF information to define the 'base product' of the Methodology study for Ecodesign of Energy-related Products and relevant environmental impacts categories.

3.6 Preliminary impact assessment for key recommendations

The expected impacts of the key recommendations are assessed in the table below.

	Expected economic impact	Expected environmental impact	Effectiveness	Efficiency	Acceptability (for the relevant stakeholders)
Joint databank for Finnish companies	Administrative costs for development and maintenance likely to be tens of thousands / year. Long-term impacts: Support for Finnish companies in achieving forerunner position and preparing for the future regulations.	Predictability of the operating environment creates potential for innovations with environmental savings.	Would create potential for better awareness and preparation.	Potentially significant impacts by small resource use (supplementing existing ekosuunnittelu.info webpage)	Widely accepted (but more resources needed for the Energy authority)
Support research and industry to study measures for new, non-energy-using product groups	Great potential for promoting Finnish goals on the EU level but actual impacts are hard to define beforehand Potential for achieving a forerunner position in non-energy-using product groups.	Great potential for decreasing environmental impacts but hard to define beforehand.	Would enhance Finnish know-how and its usage at the EU level.	Relatively low costs to enhance the utilization of existing knowledge and support for companies.	Research is widely accepted and supports cooperation and a functioning information flow with industries.
Penalty fees as a more (eco-) efficient deterrent against environmentally non-compliant products	Creates potential for cost and resource savings and additional resources for market surveillance.	In case the non-compliance is caused by a lack of small detail in the information, reduces the need to demolish functional products and material consumption.	Could provide an efficient economic sanction but requires careful investigation to avoid a risk of companies evading the regulations.	Potential for efficient measures with small resources.	No strong opposition based on the workshops. Supported by the market surveillance authority.
Digital product passports	Can make activities more efficient and create market potential for Finnish companies.	Great potential to increase the flow of CE-relevant information (in principle).	Medium: Incentives for enhanced product information depending on the means of implementation.	Depending on the means, may have great effects but also demands remarkable investments if applied to all product groups in the EU.	In general, high acceptability but entails a risk of sharing information that affects the market benefits of individual companies.

4 Extended Producer Responsibility (EPR)

4.1 Introduction: Ecodesign and EPR

As Finland advances its efforts in the development of the circular economy through product policy, EPR is a prominent tool for that purpose. When EPR emerged in the early 1990s as an environmental policy strategy, it was envisioned that it would generate incentives for producers to (re)design their products and packages in ways that would improve their end of life (EoL) management. By making producers responsible for EoL it was thought that the producers would seek to minimize costs by making their products more recyclable and/or otherwise improve their environmental performance.

Producer responsibility organizations (PROs) emerged as the primary means by which producers would meet their obligations under EPR. By organizing the collection and treatment and the performance of related services on behalf of producers collectively, PROs achieve economies of scale that individual producers are unlikely to attain. Typically, producers pay for PRO services according to the share by weight of their products or packages put on the market (PoM) in a given year, rather than according to the recyclability or other environmental characteristics of their product. This simplifies the administration of data and funding and realizes economies of scale, but removes a pivotal connection between the cost of EoL management and the characteristics of the product: A producer that makes its products more recyclable, for example, will not, ceteris paribus, see its fees decline.

The result is that while EPR has been successful in bringing much needed funding to municipal recycling along with advancements in EoL technology (Rahmani et al. 2021) increases in recycling rates, EPR's impact on eco-design has been both unclear and limited. According to the Organisation for Economic Co-operation and Development (OECD), ecodesign arising from EPR is thought to be small and is especially difficult to differentiate from design changes caused by other factors such as material and production costs, consumer demand, stakeholder pressure, and other legal obliga-tions (Dubois & Peters 2016).

Eco-modulation emerged as a means to restore the eco-design incentives that had been sought when EPR was conceived. By adding bonuses (i.e., discounts on PRO fees) and penalties (i.e., additional/increased fees[36]) on top of the fees paid to pro-vide the

36 Called maluses by French and in some international discussions.

collection, treatment and related services, eco-modulation can incentivize improvements in the environmental character of products and packages. The task then becomes designing and implementing eco-modulation to achieve these goals.

A second issue shapes the opportunities to use EPR as a vehicle for eco-design and other circular economy objectives: free-riding by producers selling their goods through online platforms. Non-domestic producers, especially those outside of the EU, may fail to meet EPR obligations and pay fees when selling directly to consumers online or, most conspicuously, selling via Amazon, eBay, AliExpress and similar online platform. The effects of such free-riding on product policy and circularity are multiple: Revenues to support PRO operations are diluted, potentially reducing collection and treatment; producers who do meet their EPR obligations may be disadvantaged with respect to cost; and free-riders do not face design incentives arising from EPR.

The analysis of EPR and the circular economy will thus focus in this report on the implementation of eco-modulation and strategies for reducing free-riding arising from online sales. For reasons of length and detail, the analysis will focus on packaging and waste electrical and electronic equipment (WEEE).

4.2 EPR and eco-modulation

4.2.1 Eco-modulation in EU Law

The revised Waste Framework Directive (2008/98/EC, WFD) states that Member States are required to take the necessary measures to ensure that the financial contributions paid by the producer of the product to comply with its EPR obligations:

> *"in the case of collective fulfilment of extended producer responsibility obligations, are modulated, where possible, for individual products, or groups of products, notably by taking into account their durability, reparability, reusability and recyclability and the presence of hazardous substances, thereby taking a life-cycle approach and aligned with the requirements set by relevant Union law, and where available, based on harmonised criteria in order to ensure a smooth functioning of the internal market" (art. 8a(4)(b) (2018/851/EU))*

MSs must transpose the mandate for eco-modulation into national law. The EU has provided guidance for MSs regarding the implementation of eco-modulation (EC 2020a; Hogg et al. 2020) and has indicated that it may subsequently issue implementing acts to provide additional, clarifying requirements, most notably to support harmonization across Europe. The result has been, as of Spring 2021, active discussion in MSs, PROs, and other

EPR-related stakeholders with MSs working to transpose the amended provisions of WFD into national law.

Eco-modulation has several characteristics that make a strategy for the Finnish government complicated. Eco-modulation:

- is mandatory as per the WFD, so it entails various responsibilities for Finland as a member state,
- remains under-defined, providing flexibility but also ambiguity,
- is not widely practiced so there is little history from which to learn,
- is complicated, involving many dimensions to consider,
- is in evolution–efforts to implement the WFD obligations are in development and the requirements and practices are likely to change.

4.2.2 Situation in Finland

The first producer responsibility schemes were created in Finland in 1990s and the organization and development of EPR as an instrument was largely delegated to PROs. The EPR system for used tyres was adopted as a model and subsequently employed in other, more complex product groups such as electronics. This "excep-tional desire for lightness" in regulation was reflected, e.g., in a preference for collec-tive systems for EPR compliance, in very limited monitoring until renewal of the old Waste Act (1072/1993) in 2004, and in the capability of the PROs to decide them-selves to what extent they utilize municipalities for waste collection. In several other countries, PROs are obliged to purchase waste collection from municipalities that have an extensive collection networks in place. The adopted approach and conflicts between WEEE PROs led to considerably lower collection rates in WEEE than in other Nordic Countries and, since the 2011 Waste Act (646/2011, WA), gradually regulatory requirements for packaging and WEEE collection and collection organization have been tightened (Hildén et al. 2011; Kautto et al. 2009).

Legal requirements with respect to EPR for packaging and WEEE are currently set out in the WA. There are individual PROs for fiber[37], wood[38], metal [39], plastic[40] and glass

37 Suomen kuitukierrätys Oy, <https://www.kuitukierratys.fi/> (9.5.2021).
38 Puupakkausten Kierrätys PPK Oy, <https://www.puupakkauskierratys.fi/> (9.5.2021).
39 Mepak-Kierrätys Oy, <https://www.mepak.fi/fi/> (9.5.2021).
40 Suomen Uusiomuovi Oy, <http://www.uusiomuovi.fi/> (9.5.2021).

packaging [41]. In addition, a service organization [42] owned by industry and retail trade associations organizes packaging collection and recycling; data collection, manage-ment and reporting; and related services on behalf of producers. Five PROs in varying degrees compete to provide EPR services for various types of WEEE. The Centre for Economic Development, Transport and the Environment of Pirkanmaa acts as the national authority for EPR, overseeing compliance.

Several changes in the WA related to eco-modulation are currently under considera-tion. These include requirements that producers have the possibility of assigning their producers' obligations for different types of products to a single actor so that pro-ducers can avoid the need to contact multiple PROs. [43]

4.2.3 Key choices in Eco-modulation

The WFD provides considerable discretion to Member States in how eco-modulation is implemented. Key aspects which MSs can decide include:

- which of the listed (or other) objectives to pursue in eco-modulation,
- the criteria used to define bonuses and penalties,
- the structure and magnitude of fees associated with criteria, and
- reporting and related data management.

However, a variety of stakeholder groups have urged the Commission to provide further direction and requirements, presumably through an Implementing Act, in order to achieve as much harmonization of eco-modulation requirements as possible (APPLiA et al. 2019; EXPRA 2019). Thus, if the Commission enacts an implementing act Finland's choices may be constrained in the future.

For many of the criteria, existing EU and national laws and policy already impose requirements that overlap eco-modulation criteria. In particular, the EcoDesign Directive (2009/125/EC) aims to extend its scope, and elements of Packaging & Packaging Waste (94/62/EC), WEEE (2012/19/EU), and Battery (2006/66/EC) Directives, and the Single Use Plastics Directive (2019/904/EU) include requirements related to recyclability, durability,

41 Suomen Keräyslasiyhdistys ry, <https://rinkiin.fi/tietoa-ringista/suomen-kerayslasiyhdistys/> (9.5.2021).

42 Suomen Pakkauskierrätys RINKI Oy, <https://rinkiin.fi/pakkauskierratys/> (9.5.2021).

43 HE 40/2021 vp, Hallituksen esitys eduskunnalle laeiksi jätelain ja eräiden siihen liittyvien lakien muuttamisesta, p. 34, 96–97, 157 206.

reparability, and re-usability. Implementing eco-modulation criteria in some cases is thus just a matter of augmenting requirements in place. This especially the case for WEEE.

In making decisions about how eco-modulation will be implemented, several overarching issues must be considered. These include granularity, harmonization, tractability, verifiability and transparency, and environmental effectiveness.

4.2.3.1 Granularity

Granularity refers to the extent to which categories of products and packaging in an EPR system are subdivided into groups that are more homogenous. For example, rather than having a single category for plastics packaging – with one fee applied to all types of such packaging – separate categories are created for PET, HDPE, PVC packaging. Increased granularity reduces opportunities for cross-subsidization among product and packaging types. For example, if highly recyclable PET is grouped with less recyclable polystyrene (PS), the lower processing costs and higher market reve-nues of PET are averaged together with the higher processing costs and lower market revenues of PS. The result is that producers using PET packaging pay higher EPR fees than would otherwise be the case and producers using PS pay lower EPR fees. This reduces the incentives for producers to shift to more recyclable materials. Increased granularity does not require the use of bonuses and penalties. In fact, it can be implemented by PROs without policy intervention (Mayers et al. 2013).

The fee schedule for plastics used by Fost Plus, the PRO for packaging in Belgium has 11 categories for plastic packaging (FostPlus 2021). Finland does not require PROs to divide plastic packaging into subcategories for the purposes of reporting recycling performance. PROs, however, differentiate between consumer and business plastic packaging for the purpose of setting fees, collecting information on PoM quantities of biobased plastic packaging, and, in order to monitor the Plastic Carrier Bag Agreement ("Green Deal") between the Ministry of Environment and Commerce Federation, report PoM quantities of plastic bags (Finnish Ministry of the Environment 2016).

The Canadian Stewardship Services Alliance (CSSA) works to develop a cost differientation methodology may provide some lessons for Finland. The CSSA a national, not-for-profit organization providing administrative services to 4 packaging and printed paper PROs in Canada, is developing a sophisticated material cost differentiation methodology to increase granularity in EPR fees for packaging and paper. It includes thorough identification of the EPR-related processes to determine supply chain and program expenses, differentiating recycling costs by material and calculating fees according to those costs (Simpson 2020).

4.2.3.2 Harmonization

Harmonization of eco-modulation is crucial if economic incentives for eco-design are to be effective. Most products and packages are designed for multi-national markets. If producers do not face the same requirements across markets, they are unlikely to find the benefits or costs arising from eco-modulation to be sufficiently large to warrant changes in design or materials. In addition, variation in eco-modulation across MSs will impose compliance costs on producers that will be unrelated to the intended incentives.

The Commission recommends that categories used to enhance granularity and the criteria be set centrally (EC 2020a). Harmonization is especially important for the criteria used to define eco-modulation objectives. While the pursuit of different eco-modulation *objectives* across Member States is likely to diminish the market influence of eco-modulation, differing *criteria* for the same objectives will also add complexity to producer compliance. The WFD bars the Commission from setting the magnitude of eco-modulation fees[44], but the Commission recommends that the magnitude be set centrally within a Member State to avoid competition among PROs based on lowest eco-modulation fees.

Harmonization is however likely to be difficult, especially if an Implementing Act is not enacted. Not only will coordination across MSs and EPR systems be complicated, but some stakeholders will have an interest in the status quo or specific eco-modulation approaches.

4.2.3.3 Tractability

Implementation of eco-modulation will be an addition to extensive existing EPR requirements as well as add new details in the WFD related to definition of waste management costs and treatment of SMEs. It is thus important to avoid criteria and fee structures that are especially complex as this will affect the level of participation and cost of compliance by producers, costs to PROs for administration, and costs and effectiveness of oversight by authorities.

Tractability of eco-modulation may be improved by using existing standards, schemes and policies as the basis for criteria. For example, the EU Ecolabel for televisions, the TCO label for information technology equipment, and the Electronic Product Environmental Assessment Tool (EPEAT) include criteria related to product life extension, hazardous substances, recycled content and material recovery (Hogg et al. 2020). Similarly, as described below, standards and guidelines for recyclability and recycled content are emerging from a variety of sources. These systems have established (or are likely to

44 Article 8(5) of the WFD states that "the Commission may adopt implementing acts in order to lay down criteria with a view to the uniform application of point (b) of Article 8a(4), but excluding any precise determination of the level of the contributions."

extend) rating systems relevant to the objectives in the WFD thereby reducing the need for novel policy development by the Finnish government. At the same, "piggybacking" on such system carries with it a loss of control—details in or changes made in the system will by default be incorporated into any eco-modulation scheme that incorporate them.

Recyclability

Recyclability is a prominent objective and, according to the recent study by Eunomia for the European Commission, has widespread support among packaging producers and PROs (Hogg et al. 2020). In light of the Commission's plans to amend the Essential Requirements for packaging to require that only recyclable or reusable packaging may be put on the market starting in 2030 (Hogg et al. 2020), efforts to increase recyclability are in the interest of many stakeholders.

Design for recyclability guidelines and standards are emerging from a variety of sources such as paper-based packaging guidelines developed jointly by European industry associations for paper; paper and board converters; beverage cartons; and corrugated packaging (CEPI et al. 2020) and a catalogue of requirements and assessment criteria for the examination and verification of recyclability (Institute cyclos-HTP 2019). Guidelines, higher EPR fees, and penalties for disruptive packaging elements are not uncommon. Given their relative simplicity, they may be an obvious first step in eco-modulation. Eco-modulation based on hazardous substances in EEE could be based on candidate lists of substances of very high concern (SVHC) in REACH or lists of restricted substances used by global EEE producers though the complexity of such a strategy is unclear (Hogg et al. 2020).

Recycled content

The focus of most discussion related to recycled content is on plastics. The Single Use Plastics Directive requires that plastic bottles be made of at least 25% recycled plastic by 2025 and 30% by 2030. Use of eco-modulation would thus involve expansion of the scope of products and packages targeted for increased recycled content.

Increased recycled content will strengthen market demand for recyclate. It can also help shift the focus of recycling away from downcycling that involves uses with lower quality requirements because producers will seek recyclate for their products and packaging competing for that material with less demanding uses.

Confirmation of recycled content is, however, difficult because it often cannot be verified through simple physical tests (Hogg et al. 2018). This implies that certification schemes that track supply chain activities will be needed. Initiatives are emerging for this purpose

as with the Recycled Material Standard (GreenBlue 2021) in North America and in green public procurement in the EU through the EU Ecolabel (see, e.g. EC Directorate General for Environment 2020). It is likely that Finland will need to rely on consensus, perhaps international, standards in order to effectively promote recycled content through eco-modulation.

Reusability, Durability and Repairability

Reusability, durability and repairability have only modest relevance to packaging. For reusable consumer packaging, use of a separate fee category based on EoL costs with fees paid on the first occasion when the reusable package is placed on the market, appropriately advantages such packaging, but without the use of bonuses or penalties. Reusability, durability and repairability are potentially more relevant to for commercial and industrial packaging. Member States must establish EPR schemes for commercial and industrial packaging under Article 7(2) of the Packaging and Packaging Waste Directive by the end of 2024. EPR for packaging in Finland already encompasses commercial and industrial packaging.

Eco-modulation objectives of repairability, reusability, and durability together aim to extend the lifespan of EEE. Some requirements for disassembly and repair of EEE already exist in regulations of the EcoDesign Directive. Thus if eco-modulation is contribute to extension of product lifespan, it would need to extend to product groups not already addressed and/or impose more extensive requirements with respect to disassembly, spare parts availability, and upgradeability. It has been proposed that eco-modulation could be used to encourage extended free warranties, both as a proxy for durability and as an incentive for improved repairability (Hogg et al. 2020). There is some possibility, however, that producers may meet warranty obligations for products in need of service by replacing, rather than repairing the out-of-service product. If this is the case, extension of warranties may not lead to increased durability.

Among the criteria that can be applied to packaging and WEEE, an emphasis on tractability suggests a focus on the following:

- Increased granularity of product and packaging categories for calculation of EPR fees;
- Use of international standards and external certification systems for the definition of eco-modulation criteria, subject to careful examination of the scientific rigor and institutional sustainability of such systems;
- Targeting of product and packaging attributes that are disruptive to the functioning of EPR systems as with specific components, labels, inks, adhesives that limit or complicate recycling of packaging.

Tractability also comes into play in efforts to define thresholds exempting small and medium enterprises (SMEs) from eco-modulation fees and associated reporting requirements. De minimus thresholds can relieve SMEs of burdens incommensurate with the goals of eco-modulation, but can also reduce PRO revenues, engender an unlevel playing field, and reduce understanding of relevant market activity.

4.2.3.4 Strategic Delay

Many of the potential approaches to implementing the four eco-modulation objectives have little to no track record. These include eco-modulation with respect to recycling rate, repairability and extension of warranties. For those more novel approaches for which there has been some preliminary efforts, data and policy evaluation are difficult to obtain.[45]

Use of novel strategies will require development of new policies more or less de novo and their implementation. In that respect, Finland would benefit from the experience of other MSs and a focus on EPR problems or goals of particular concern in Finland and/or those that are anticipated to be tractable.

In the words of the EU guidance document on eco-modulation:

> *"It is not strictly necessary to apply modulation to all product categories at the outset – it would be appropriate to focus first on those where the greatest benefit can be achieved and/or the criteria are more easily applied and adherence can be readily demonstrated." (Hogg et al. 2020)*

4.2.3.5 Verifiability and Transparency

The success of eco-modulation will be very sensitive to the availability, cost, and verifiability of the data used to calculate appropriate fees and discounts and to apply them to the relevant products and packages. Data on components of packages and products that impede recycling are an example of criteria that are likely to be (relatively) feasible to obtain and verify. As noted above, verification of recycled content, unless an external certification scheme emerges, is likely to be a more difficult.

PROs, on behalf of their member producers, already face requirements to collect and report data related to quantities of goods and packages put on market and those related to recycling rates. Reporting requirements include the amounts of waste recovered, reused (wholly or partially), recycled, utilized in energy production, and disposed

45 France, for example, has used eco-modulation in various forms since 2010, but few data on outcomes are available.

at landfills. The amounts of waste exported must also be reported. Eco-modulation objectives and criteria will require further data collection, reporting and verification. In addition to verification that goods and packages meet criteria for bonuses or penalties, data on the proximate results of eco-modulation requirements will be important for the evaluation by authorities of producer responses to bonuses and penalties. Such data would include:

- number and type of bonuses applied for and the number of producers seeking bonuses,
- number and type of bonuses rewarded and the associated number of producers,
- number and type of bonuses denied and the associated number of producers,
- number and type of penalties imposed and the associated number of producers,
- cost of administration of eco-modulation by PROs and producers.

4.2.3.6 Environmental Effectiveness

In addition to challenges of programmatic effectiveness – establishment of eco-modulation structures, PRO and producer compliance, monitoring and enforcement, etc. – and impact on producers, there are background issues of environmental impact to consider. Recent research has indicated that reliance on packaging attributes, i.e., recyclability, recycled content, compostability, biobased content, as an indication of life cycle environmental impact is problematic (Vendries et al. 2020). According to that meta review, "results indicate that, as a rule, relying on any one attribute as a design or procurement parameter to achieve environmentally preferable outcomes is not scientifically supported." Put in more concrete terms, while a package made from recycled materials is likely to be environmentally preferable to the package made from the same, but virgin materials, "packaging with high recycled content often does not have lower environmental impact than packaging of another material with lower or no recycled content" (Vendries et al. 2020). Thus, while eco-modulation may facilitate improvements in recyclability, recycling rate and analogous objectives, it may not lead to the ultimate environmental outcomes that are sought. This poses a challenge to many product policies; it is not, however, one uniquely tied to eco-modulation.

With respect to EEE, the environmental benefit of increases in product lifetimes varies. Extending the lifespan of products that consume energy in use, e.g., large appliances, through increased durability and repairability, may be counterproductive if it forestalls the replacement by a more energy efficient product (Cooper & Gutowski 2017).This suggests that implementation of eco-modulation that encourages increased durability and repairability should differentiate between those products for which increased lifespan generates relatively certain environmental benefits and those for which it does not.

4.2.4 The Role of PROs in Eco-modulation

According to the WFD, there are a variety of aspects of eco-modulation that PROs may play a role in designing and/or implementing. These include:

- the choice of criteria (recyclability, reusability, repairability, durability and hazardous content46),
- the manner in which the criteria are defined,
- the magnitude and structure of the fees associated with the criteria,
- collection and verification of data from producers,
- calculation of fees,
- reporting to relevant authorities.

In subsequent draft guidance from the Commission, it was indicated that the objectives, criteria, and the magnitude of the modulated fees should be set centrally (EC 2020a). This, however, does not necessitate top-down development and imposition of eco-modulation by the government. Consultation with PROs and producers is mandated and PROs may have a central role in developing criteria, fee structures and related elements of eco-modulation. It is the consistency across Finland of those elements that is vital.

4.2.5 Policy Evaluation

Eco-modulation is meant to achieve environmental outcomes through changes in product and packaging design that EPR has heretofore been largely unable to accomplish. Outcomes can be assessed at a variety of stages in the causal process that eco-modulation can set in motion: number of EPR schemes adopting eco-modulation (or specific elements of it); number of producers receiving bonuses or penalties; number of products or packages subject to bonuses or penalties; changes in products or packages; and changes in material flows and emissions arising from the life cycle of the products and packages.

Associating changes in products and packages with eco-modulation will be very difficult because other factors may play a role in decisions by producers. For some specific changes in products and packages by individual producers, a plausible inference may be made as to the impact of eco-modulation, but at the aggregate level determination of efficacy is much more complicated. Associating changes in resource use and emissions—with the additional intervening factors at play—will, for the same reasons, be even more difficult.

Nonetheless, assessment of eco-modulation that has been implemented will be crucial for responsible policy-making Several approaches are possible. Data on the proximate results

46 Only with respect to EEE.

of eco-modulation requirements, as described above in section 4.2.3.5, is a necessary but not sufficient condition for evalution.

Detailed data should be maintained so that periodic in-depth research on the effectiveness of eco-modulation can be performed. A variety of more complex analytical techniques may be employed such as natural experiments and counterfactual modeling. These, however, will require favorable conditions and access to specific types of data.[47]

4.2.6 Recommendations for Eco-modulation

1. **Prioritize harmonization** in the choice of eco-modulation objectives, criteria, and fee structures across Member States and across other EU and Finnish policy where at all possible. The incentives for eco-design arising from eco-modulation are likely to be more effective if producers face consistent requirements across jurisdictions. In addition, inconsistent regulations can impose costs on producers without generating commensurate environmental benefits.

2. Implement eco-modulation one step at a time and consider **strategic delay** in the implementation of some aspects of eco-modulation. Policies are evolving, experimentation is taking place, and physical (e.g., waste and energy systems), and market changes are occurring globally. "Piggy-backing" on the innovations of other countries—and any hard lessons learned—can allow Finland to focus on key issues as well as avoiding the cost of development of novel eco-modulation structures and policy lock-in.

47 "Natural experiments" are empirical studies that seek to approximate some of the rigor provided in randomized controls studies common in medicine and related fields. In natural experiments the objects of analysis are exposed to differing conditions out-side the control of the researchers in a specific manner that allows isolation of the character of interest while maintaining similarity in all other relevant characteristics.

3. Use **regulatory "sandboxes**". Some aspects of eco-modulation are novel with limited precedent upon which to rely. Policy experiments, framed as such, can provide an opportunity to assess policy outcomes without the institutional challenges of lock-in

4. **Mandate provision of data and *ex post* policy evaluation.** Little is known about how or how well eco-modulation works.

5. Find opportunities to tie **eco-modulation to environmental outcomes**. Increased recycling and extension of product lifetimes are means to an end—lowered environmental impacts. Where possible, design and evaluate eco-modulation considering actual environmental impacts. For example, increasing the lifespan of EEE through increased durability or repairability may be counterproductive when it forestalls displacement of existing products by those that are more energy efficient.

6. **Monitor developments** regarding modulation based on definitions of recyclability, and recycling rate, recycled content, and durability and repairability. Chose **"no-regrets" options** that will remain useful even if other aspects of eco-modulation change.

7. **Increase granularity of product and packaging categories** for calculation of EPR fees.

8. **Charge EPR fees for reusability only on first use of packaging.**

4.3 Free-riding and Online Sales

Online sales of products from other EU Member States and from countries outside the EU directly to Finnish consumers create opportunities for producers to avoid EPR obligations. The effect of such free-riding with respect to product policy and circularity are multiple: Revenues to support PRO operations are diluted, potentially reducing collection and treatment; producers who do meet their EPR obligations may be disadvantaged with respect to cost; free-riders do not face design incentives arising from EPR; and recycling rates are inflated.

Online sales through platforms such as Amazon, eBay, and AliExpress are growing rapidly. Sellers using online platforms often have no physical or legal presence in the purchaser's country of residence. Monitoring of such sales is difficult and extensive enforcement of EPR obligations is underdeveloped. Information on the extent and nature of free-riding

is scarce, hindering evidence-based policy making.[48] As a result neither the magnitude of the free-rider problem nor the nature of its incidence across product groups can be determined adequately.

Two key legal challenges underlie efforts to address free-riding via online sales. Finland—as with all countries—does not have the legal authority to enforce EPR obligations on sellers lacking a physical or legal presence in Finland. Online platforms when operating as intermediaries, allowing non-domestic producers to sell directly to consumers,[49] are not considered producers in Finland and most other countries.[50] How to address the role of the platforms—in addition to the efforts to deal with the non-compliant producers—is a central consideration in current debates.

Some remedies can be implemented by Finland directly; others require international collaboration. Strategies include from informing producers of their obligations, verifying producer compliance, forcing compliance as a requirement for market access, obtaining data on sales and producers, identifying free-riders, and prosecuting free-riders. No "silver bullets" exist and a mixture of strategies is needed. Because of their scope and potential comprehensiveness, strategies that systematically engage producers prior to sales of products—including "at the gate" when starting sales —are likely to be more effective than those focused on enforcement after sales. Enforcement typically involves prosecution of individual free-riders and thus is more difficult to scale to the full extent of free-riding than mechanisms with the potential to prevent free-riding.

48 In order to quantify the extent of free-riding, data on products subject to EPR requirements sold via online platforms to Finnish consumers and the producers selling those products would need to be obtained. A list of those producers could then be compared to producers currently registered for participation in Finnish EPR programs. Those producers on the first list, but not the second, could thus be tentatively identi-fied as free-riders. This is currently not possible for reasons described below.

49 When platforms sell their own branded goods, as when Amazon sells its own products, they are considered producers. While no data on compliance by large platforms are available, it is thought unlikely that they are free-riding, because they have a high profile that they do not want tarnished. There are also single-seller platforms that sell an individual company's products online. When such companies are prominent, it is thought that they too represent less of a challenge to compliance.

50 In 2022, France will treat such platforms as producers, when a platform cannot show evidence of the seller's EPR compliance.

4.3.1 Description of Situation in Finland

As in other countries, online sales in Finland are growing. In 2020, Finns purchased about €5.1 billion products online of which around 35% or €1.8 billion was from abroad The most common purchases were clothing and electrical and electronic equipment (Federation of Finnish Commerce, n.d.).(Federation of Finnish Commerce, n.d.) All distance purchases[51] are accompanied by packaging, so distance selling has an impact on producer responsibility for packaging. In 2012, it was estimated that around 5,500 tonnes of packaging waste entered Finland through distance selling, while the value of foreign goods sold at a distance was around €1.0 billion (Finnish Ministry of the Environment 2015). Assuming that the increase in the quantity of packaging has been in line with the increase in the monetary value of the distance sales of foreign goods, the amount of packaging entering the market through distance sales in recent years would represent around 2.5% of the total amount of fibre and plastic packaging placed on the market by producers and 4.8% of the amount of consumer packaging. The share of tyres purchased through foreign distance selling in Finland is estimated to be around 5%. For electrical and electronic equipment, it is estimated internationally that distance selling would account for around 5–10%.

As in other Member States, the amount of free-riding by producers selling to Finnish customers through online platforms is not known. All Finnish PROs for packaging and WEEE were interviewed by the research team and, while none indicated specific difficulties, the Federation of Finnish Commerce has expressed strong concern (Federation of Finnish Commerce 2021). Other industry groups, PROs and authorities elsewhere in the EU have also indicated the importance of addressing free-riding (EucoLight, EUCOBAT, et al. 2020; Hilton et al. 2019).

Current Finnish law has limited provisions related to free-riding by producers. However, the Finnish government has proposed that Section 46[52] of the Waste Act be revised to read

> *The producer's obligation under subsection 1 applies to products brought to the Finnish market or **distance sold** directly to users by the producer, and to a certain amount of other similar products considered reasonable in relation to the producer's market share, irrespective of the date on which the products were placed on the market. [emphasis added]*

51 Distance sales refers to both online sales from domestic (Finnish) and foreign sellers to customers in Finland. It can include sales from single-seller platforms, sales by online platforms of their own branded goods, and sales by 3rd parties via online platforms. Unless otherwise noted, distance sales and online sales are used inter-changeably in this report to refer to sales from producers outside Finland to consum-ers in Finland.

52 HE 40/2021 vp, p. 201.

Proposed revisions to Section 48[53] also address distance selling:

> *Regardless of the method of sale, producer responsibility shall apply to the following products and producers that place these products on the market or* **distance sell** *them directly to users in a professional capacity…[emphasis added]*

Proposed provisions in Section 66a require Finnish producers selling to consumers in other Member States to fulfil EPR obligation in those MSs, indicate obligations of producers in other MSs selling to Finnish consumers, and allows online platforms to assume the EPR obligations of distance sellers:

> *"An operator established in Finland who sells at a distance directly to users in another country products covered by producer responsibility shall be responsible for fulfilling his producer responsibility obligations in that country. An operator selling electrical and electronic equipment at a distance directly to users in another Member State of the European Union must appoint an authorised representative established in that Member State to be responsible for fulfilling his obligations.*
>
> *By way of derogation from Article 62(1), a producer established in another Member State of the European Union who sells electrical and electronic equipment at a distance directly to users in Finland shall, instead of joining a producer responsibility organisation, appoint an authorised representative to be responsible for fulfilling his obligations in Finland. Other distance sellers established in another country who sell the products referred to in Article 48 may, instead of joining a producer responsibility organisation, appoint an authorised representative established in Finland to assume their obligations in Finland.*
>
> *An operator established in another country who is responsible for a producer who supplies products to the Finnish market by means other than distance selling may appoint an authorised representative established in Finland instead of a producer established in Finland to assume his obligations or, for the same purpose, conclude an agreement with a recognised producer responsibility organisation. An equivalent right is granted to an operator of an online platform, who has received an authorisation from a distance seller operating on that platform, to assume the producer responsibility obligations."*

The WEEE Directive and the WFD enable producers located outside of Finland to appoint an authorised representative (AR) that ensures compliance with EPR obligations. The AR registers with the relevant PRO on behalf of the producers, pays the relevant fees, and

53 Ibid

bears legal responsibility for compliance.[54] Amendments to Section 66 b[55], relating to the use of authorized representatives also proposed:

> *"An authorized representative established in Finland must be authorized in writing. As regards products sold with means other than in distance, the authorized representative must inform the producers and producer responsibility organisations, which would otherwise be assigned the responsibility obligations for these products, of its authorization, of changes to it, or of its revocation. The provisions of this Act relating to producers shall apply to an authorised representative, with the exception of the possibility, established in Section 62(1), for producers to set up a producer responsibility organization. More specific porvisions can be enacted in a Government Decree - - ."*

These provisions apply to online sales originating within Finland and to the extent that Finnish law applies outside of Finland, to non-domestic producers.

4.3.2 New developments: EU e-commerce policy and a proposal from Amazon

4.3.2.1 E-commerce Policy in the EU

Article 8a(5) of the Waste Framework Directive requires that Members States establish adequate monitoring and enforcement to ensure producers and PROs meet their obligations, including in the case of distance sales such "that the financial means are properly used and that all actors involved in the implementation of the extended producer responsibility schemes report reliable data."

However, the EU *Blue Guide* stipulates the role of online intermediaries (i.e., platforms as discussed in this report) as follows:

> *"Following Article 15 of the E-commerce Directive, Member States cannot impose either a general obligation on these providers to monitor the content or a general obligation to actively seek facts or circumstances indicating illegal activity. This means that national authorities cannot establish a general obligation for intermediaries to actively monitor their entire internet traffic and seek elements indicating illegal activities such as unsafe products. The ban on requesting general monitoring, however, does not limit public authorities in establishing specific monitoring requirements, although the scope of such arrangements have to be targeted." (Federation of Finnish Commerce 2021)*

54 Importers can also comply with EPR obligations on behalf of non-domestic produc-ers. Use of an AR presents an additional means of compliance for producers.

55 HE 40/2021 vp, p. 201.

This means that Member States cannot obtain data on products sold to their inhabitants via platforms on an ongoing, systematic basis. It is not clear to what extent Article 15 prohibits MSs from requiring platforms to provide significant amounts of data on an occasional and/or partial basis.

In December 2020, the European Commission proposed[56] the Digital Services Act (DSA) to improve transparency and accountability on the online market place by updating the e-Commerce Directive (2000/31/EC). Two articles in the DSA, 9 and 22, are of relevance for implementing EPR in online sales.

Article 9 of the proposed DSA would allow a court or an administrative authority to make a request for "certain information about one or more individual recipients of the service from online platforms"[57]. The request cannot concern the transactions (e.g., sales of products), as that would amount to a general monitoring obligation on the platforms. The proposed DSA does not allow that, nor the setting of a general obligation to actively seek facts or circumstances indicating illegal activity. DSA follows thus the principle established by e-Commerce Directive Article 15.

Article 22 of the proposed DSA can be seen as a due diligence obligation to ensure the traceability of 3rd Party operators (traders). The proposed DSA states that traders need to self-certify that they are in compliance with all relevant rules and regulations, thus including EPR. It is possible under the proposed Regulation to block non-compliant traders. It does not seem possible however to tailor the DSA so as to set a duty to follow compliance with all sector-specific requirements such as those for EPR, as there are too many such sectoral requirements. Despite that, it may be possible to link a particular sectoral law (e.g., the Directives on WEEE, Packaging or Batteries) to the DSA, and thereby allow for specific requests by the authorities to be made to the platforms. Nonetheless, as noted above, the information requested cannot be specific to transaction, as that would amount to a general monitoring obligation. The DSA as proposed by the Commission would however make it possible that information that is "in-between" specific data on product sales and more generic data on products could be obtained under the DSA. Member States would be able to request data "on the gate" on each trader as they enter

56 COM(2020) 825 final.

57 The DSA refers to "traders" whereas online platforms typically use the term "sellers." For the purposes of this discussion, there is not an important difference. The align-ment of these terms with "producers" as used in EPR systems is partial. When pro-ducers based in foreign countries sell to Finnish consumers, importers (or authorized representatives as noted above) based in Finland are deemed to be the producers. The manner in which traders and sellers based outside of Finland that do not have a presence in Finland can be treated as producers for the purpose of EPR (or otherwise brought into compliance with EPR requirements) is precisely the issue under consider-ation.

the platform, and this might include requests of data on product groups (even if not on an individual product) offered by the trader.

4.3.2.2 Amazon's Proposal

Amazon has proposed an approach, the Simplified Compliance Model (SCM), for the monitoring and payment of EPR fees. Under this approach, Amazon would fulfill simplified EPR obligations on behalf of producers selling through its platform. Sellers would be required to join the SCM unless separate compliance is documented. Sellers participating in the SCM would pay a fee for compliance to the online platform that it is using. That fee would then be transferred to the relevant PRO (Magalini 2020; Magalini et al. 2019). There are four main components in the calculation of the fee:[58]

1. the fee (€/kg or €/unit) currently charged by a PRO for the products in relevant product category,
2. the total sales of the product per product category estimated by weight or units sold on the platform,
3. the PRO fee (1) multiplied by the total sales (2). This would constitute the total "budget" for EPR compliance,
4. the SCM fee per product category calculated by dividing the "budget" (3) by the weight of the relevant product category. That would determine the amount of money to be paid to the relevant PRO.

The SCM would significantly simplify administration for producers, especially SMEs. They would not need to register with national authorities or PROs and the data that they would need to provide to the online platform would be less than under current approaches. It is presumed that compliance would increase both because of the simplification of the process and because the platforms would monitor and "enroll" sellers.

At the same, categories of products subject to EPR would be aggregated to facilitate administration of the SCM—in sense reversing granularity and losing any eco-design incentives associated with increased granularity. Eco-modulation would not be possible because data on individual products would not be provided—only the weight or number of units sold by producers in a given aggregated product category.

58 There are a variety of elements in the proposal that are not detailed here for purpos-es of brevity. It is likely that some elements will change as Amazon interacts with EPR stakeholders.

Italy is currently engaged in a pilot test of the SCM, scheduled to conclude in 2022 (D. Bonato, personal communication, December 22 2020). Other stakeholders such as the German Ministry of the Environment (Hermann et al. 2020) and associations representing PROs and industries related to lighting products, tyres, batteries, packaging, and WEEE as have expressed strong opposition (EucoLight, ETRMA, et al. 2020; EucoLight, EUCOBAT, et al. 2020).

4.3.3 Strategies and Remedies

4.3.3.1 Strategies outside of Finland's control

Among the potential approaches to addressing free-riding are several that would be executed at the EU level. EU-wide strategies have the advantage that they can lead to a higher level of harmonization of policies, allow more coordination for enforcement, and make use of policies that are within the competence of the EU. Generally, supra-national and international strategies will take longer to develop and implement. For some strategies, Finland could proceed on its own, but international action would be more effective and entail the use of fewer resources in policy development and enforcement by Finland.

E-commerce codes of practice

Voluntary e-commerce codes of practices could be established based on standards mandating the display by sellers of information on the PRO registration, legal address, and related details. If the adoption of the code were widespread, market and political pressure could spread good practices across the industry and create a benchmark for legitimate sellers (Hilton et al. 2019). Such codes would likely focus on at-the-gate strategies, though that would depend on the scope of the code.

Simplification and harmonization of EPR regulations

It is thought that some free-riding arises because of the complexity and expense of compliance with EPR regulations – complexity that is currently likely to increase due to variation in ways to implement requirements on ecomodulation. Simplification and harmonization of requirements including those relating to registration along with clear guidelines for compliance could reduce free-riding and support enforcement efforts (Hilton et al. 2019). Getting Member States to alter their EPR regulations for the purpose of harmonization is likely to be very difficult without central coordination or mandates from the EU.

Revision of the Digital Services Act

The DSA as proposed by the Commission would continue the prohibition on general obligation by Member States for online platforms to monitor the content as well as a general obligation to actively seek facts or circumstances indicating illegal activity. Several PRO associations have called for changes to the DSA to enable imposition of obligations for addressing free-riding (EucoLight, EUCOBAT, et al. 2020).

The Commission's Proposal for DSA is under the first reading by the European Parliament and the Council of Ministers at the time of the publication of this report. Thus, there is a window of opportunity to revise the scope and contents of the prohibition of general obligations on online platforms. Further changes are likely to be difficult once the DSA is enacted as Regulation.

Make EPR requirements a condition for use of CE markings in the EU

CE markings indicate conformity with health, safety, and environmental protection standards for products sold within the European Economic Area. While marking is not used for environmental laws generally, conformity with some product-based, single-market regulations such as the Restriction on Hazardous Substances (RoHS) Directive and the EcoDesign is indicated by the CE mark. In this strategy, the CE declaration of a product would indicate that a producer has registered for EPR in all countries where the product is intended to be marketed. This at-the-gate strategy is thought to require a long lead time (Hilton et al. 2019).

4.3.3.2 "Simple" strategies

Single registry of producers and authorized representatives

Creating a single digital registry for all producers subject to EPR requirements in Finland would facilitate checking of producer compliance with registration obligations by authorities. It would also facilitate a related enforcement strategy – reporting of non-registered producers by registered producers and other private actors. Depending on how the Packaging & Packaging Waste Directive, the WEEE Directive and the Battery Directive have been transposed into Finnish law, some harmonization of registration data requirements may be needed and some amendment of the relevant statutes may be required for conformity.[59] Supporting EU action related to standardization of definitions

59 The German Environment Agency conducted a detailed study of how existing EU and German law bear on various strategies for addressing free-riding (Hermann et al. 2020). The Agency found that German EPR laws for packaging, WEEE and batteries differed in some respects—with respect to producer definition, scope, and proce-dures—and might need revision in order for a unified producer registry to be estab-lished.

across directives would facilitate Member State efforts of consolidation of registries (Hermann et al. 2020).

More enforcement powers

There are a variety of enforcement powers that could be established or enhanced to improve the identification or prosecution of non-compliant producers. Requirements for clear and explicit definitions of obligated entities – especially distant sellers – and for record keeping make compliance, identification of producers, and prosecution where needed easier. Irish WEEE regulations have been pointed to as a potential model (EC 2020a).

The UK has regulations that facilitate international cooperation. If authorities from another Member State identify UK distance sellers failing to fulfill their EPR obligations in that MS, UK regulations provide a legal basis for prosecution by the UK. Including analogous provisions in Finnish law or regulations would not allow Finland to prosecute non-compliant producers selling into Finland but could contribute to reciprocity and international cooperation among EPR regulators.

PROs have an overt incentive to identify free-riders and pursue enforcement of EPR requirements because non-compliance directly effects their budgets. The incentives facing individual producers are less strong. Establishing a right of private action for producers and other entities that allows them to identify free-riders and obtain compensation from the non-compliant producer could engender "crowd-sourced" enforcement. In Germany, the "Gesetz gegen den unlauteren Wettbewerb – UWG" law permits a competitor to issue what is effectively a cease-and-desist letter and demand compensation from the free-rider, block the free-rider from selling non-registered EEE, and request disclosure of sales and buyers (Hilton et al. 2019). Information on the frequency of such private actions in Germany or their impact is not available. In the US, private citizens affected by point-source water pollution have the right to sue polluters directly to enforce the law under the Clean Water Act.[60]

More engagement with EWEN and related enforcement networks

Enforcement of EPR obligations on producers based outside of Finland that do not have a physical or legal presence in-country is inherently difficult because Finland does not have extra-territorial legal authority. Enforcement therefore requires cooperation with foreign authorities.

60 See chapter 4 of Nylen et al. (2016) for description of how citizen suits work on the US Clean Water Act.

The German Environmental Agency (UBA) has established networks for coordination of enforcement related to WEEE Directive: the European WEEE Enforcement Network (EWEN) and the European WEEE Registers Network (EWRN). Greater engagement with these networks could help Finland identify and prosecute free-riders.

4.3.3.3 More ambitious strategies

Piggybacking on existing regulatory apparatus

A variety of regulatory systems exist that obligate producers to provide information and/or pay taxes, duties, or fees that could be used on a systematic basis to provide information to producers about EPR obligations, force compliance, generate data, or identify free-riders. Customs, trading and tax regulators track and enforce standards, payment of import duties, prevention and prosecution of sales of counterfeit goods, and VAT evasion. These duties suggest on the one hand that various regulators may have a history and capability of enforcing diverse requirements and, on the other, that they may not have the capacity to take on new responsibilities.

Use of the VAT system to address free-riding. The collection of value-added taxes (VAT) entails an extensive infrastructure throughout the EU that tracks sales and parties responsible for payment of taxes. The VAT system could in principle be used in a variety of ways to address free-riding through online sales:

- Information on EPR obligations could be provided to sellers as part of VAT registration,
- VAT registration could be tied to proof of EPR registration. Companies selling EEE in Belgium that are required to register for VAT are, for example, also required to register with Recupel, the PRO for WEEE (Hilton et al. 2019),
- VAT authorities could provide data on transactions and sellers that PROs or authorities could use to identify non-compliant producers, verify data provided by producers, or to provide aggregated data to assist in estimates of the scope or character of distance sales,
- EPR fees could be collected with VAT payments.

Whether VAT could be used for these purposes depends on whether the structure of the VAT system is amenable to the listed tasks and whether current EU and Member State laws and regulations would allow such actions. Collection of non-VAT fees through VAT mechanisms requires EU legislation, because the system for collection of VAT for distance sales of goods is harmonized: One MS cannot add a separate fee to the system.

Revisions to VAT to address distance selling of goods to consumers will be implemented in July 2021. "One-stop shop" (OSS) registration, reporting, and payment systems will be

available for sellers and platforms based outside of the EU or in another Member State. Under this approach, a single Member State can act as the point of entry on behalf of all MSs for a distance seller or platform. If a seller or platform chooses to use a one-stop shop system, all distance sales of goods are also subject to the one-stop shop procedure. There are two separate OSS systems for distance sales of goods: one for imported goods (IOSS), i.e., for goods supplied from outside of the EU into the EU, and one for distance sales from one MS to another.

The system for imported goods covers only goods sent in consignments of a value not exceeding EUR 150. Under this procedure for imported goods, the seller or the platform charges VAT on their sale to the consumer – the VAT is in other words incorporated into the consumer purchase price of the product. Although the import is exempt from VAT – because the consumer has already paid the VAT when paying for the product the consumer still must declare the good to customs authorities. The seller or the platform has to report the supplies[61] and pay the VAT monthly to all Member States of taxation via the tax administration of the Member State acting as a MS of identification.

If a seller or a platform does not opt to use the one-stop shop system for imported goods, regardless of value, the consumer purchase price does not include VAT. Instead, the consumer pays the VAT to customs authorities. The postal service or a courier enterprise has a right to use the special arrangement for declaration and payment of import VAT where it collects the VAT from the recipients of the goods (i.e., the importers) and pays it monthly to the customs on behalf of the recipients. When the IOSS is not used, the supply of the goods is not considered to be take place within the EU, and the seller or the platform is not liable to pay VAT in the EU and there are no reporting requirements for them.

The concept of import only applies to goods transported from non-EU countries. That is, as regards supplies of goods between the Member States only VAT is collected from the supplier and there is no obligation to give a customs declaration at the border. If the OSS-system for distance sales within the EU is not used, the seller or the platform has to be registered in each country of taxation and pay the VAT there to the tax authorities. The authorities collecting payment of VAT and customs duties have data on sellers and products sold that could potentially be matched against lists of producers in EPR registries.

Use of customs to address free-riding. Some stakeholders argue that use of customs to enforce EPR requirements is not feasible because it would require international agreement,

61 For the purposes of this report and the discussion of EPR, "supplies" which has a specific meaning in the context of VAT, can be thought of as the goods sold.

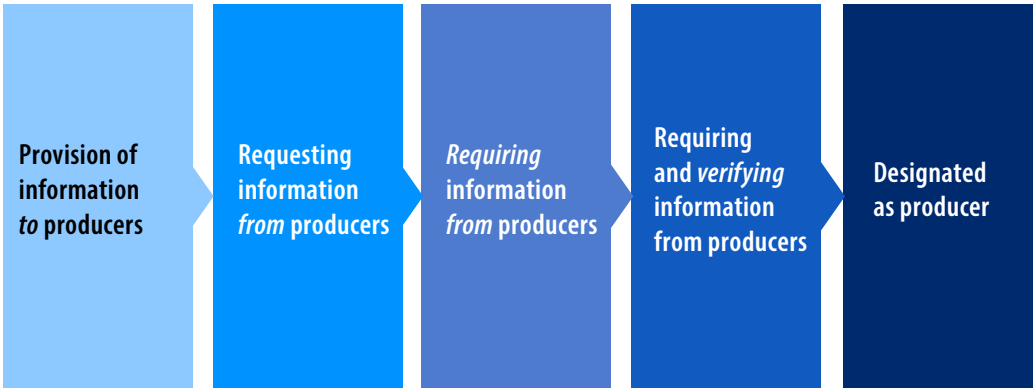
products may not be correctly coded, containerization of products makes surveillance complicated, and customs authorities may not have the capacity and resources to track the shipment of the large quantity of products involved (Hilton et al. 2019).

Provision of data rather than enforcement of EPR requirements may be less onerous for customs authorities. The Customs and Border Protection Service in Australia are required to provide data to the Department of Sustainability, Environment, Water, Population and Communities to support the operation of the EPR systems in that country. However, this would require changes in the EU legislation as the use of data collected via VAT system used by the customs authorities can currently be used only for taxation purposes.

4.3.3.4 Imposing obligations on online platforms

Online platforms such as Amazon, eBay, and AliExpress are a key element in the rising challenge of free-riding through online sales. A variety of strategies for dealing with free-riding have been proposed that focus on the role of online platforms. Figure 2 shows the requirements that could be imposed on platforms in terms of increasing levels of obligation.

Figure 2.



Platforms could be obliged to provide information about the requirements facing producers at-the-gate," i.e., when sellers begin their engagement with the platform or at the time that specific products are offered for sale. This would assist in reducing unintentional noncompliance.

Requirements for occasional or episodic provision of data by platforms – if not blocked by Article 15 of the e-Commerce Directive (or the proposed DSA) – as well as auditing of platform could improve the understanding on the nature and extent of free-riding.

Information such as producer registration numbers could be requested on a voluntary basis from sellers using online platforms or collection of such information could be made mandatory. That information could in turn be provided to national authorities and/or PROs. The same requirement could also be accompanied by an obligation that platforms verify information from sellers. Germany has proposed compulsory independent verification of registration by platforms and fulfilment service providers (Hermann et al. 2020); sale of products by producers failing to meet requirements would be prohibited.

France has likely gone the furthest, enacting in its Anti-waste Law for the Circular Economy provisions that, starting in 2022, impose the responsibility for EPR obligations on platforms, unless the platform facilitating the distance sale has proof that the seller has fulfilled those obligations (Freitas Salgueiredo 2020).

4.3.4 Recommendations for Addressing Free-riding

1. Prioritize opportunities for **harmonization of EPR obligations and reporting** (e.g., across MSs). Some free-riding arises from the difficulty and cost of compliance. Reducing administrative complexity can lower free riding especially among SMEs.

2. **Combine producer registries**. Centralization of information about producers subject to EPR facilitates tracking and enforcement domestically and in cooperation with other nations.

3. Impose **seller-facing communication requirements on online platforms**. While deeming online platforms as producers for the purposes of EPR may be politically or legally challenging, mandating systematic provision of information about EPR obligations by platforms to producers can address non-compliance that arises from producer ignorance.

4. **Monitor German efforts re platform verification of EPR participation**. The German Environmental Agency is pursuing a vigorous and important strategy of mandating that online platforms verify that producers are registered with the appropriate EPR clearinghouses or PROs. Less aggressive than insisting that platforms be treated as producers, this use of control over market access by producers is an important, middle ground and systematic approach to online free riding.

5. Create **more enforcement capabilities and powers** including increased participation in the European WEEE Enforcement Network (EWEN) & related enforcement networks. Increase enforcement opportunities by changes in law that facilitate streamlined and reciprocal action with other countries. Create a right of private action for compliant producers to identify and sue free riders.

6. Look for **piggy-backing opportunities for data and enforcement.** Investigate whether the VAT could be used either to systematically provide information on EPR requirements to producers, to generate data useful to understanding patterns of non-compliance, and/or to facilitate registration of producers. Customs, trading and other tax systems may also provide opportunities for piggy-backing detection or enforcement.

7. **Find ways to get data!** Information about the nature and extent of free riding is needed for the formulation of effective policy. However, Article 15 of the E-commerce Directive prohibits the imposition of both a general obligation on online platforms to monitor the content and a general obligation to actively seek facts or circumstances indicating illegal activity. Thus, it is difficult to obtain data on an ongoing basis that can be used to comprehensively compare producers selling into a member state on a product-by-product basis to producers registered in EPR systems. Supporting efforts to amend the EU Digital Services to allow more leeway in the imposition on online platforms of data provision requirements may mitigate this barrier.

   Purse second-best sources of data including provision of the seller EPR registration details by platforms to authorities, potential use of parcel deliver companies as data sources, periodic audits of online platforms, and mandated occasional provision of detailed data by platforms.

4.4 Preliminary impact assessment for key recommendations

The expected impacts are assessed in the chapters describing proposed policy instruments and their modifications. In the table below we aim to summarize these impacts and assess effectiveness, efficiency and acceptance of these instruments.

Each instrument has multiple even with a given category of impact and depend to a great extent on specific way in which the instrument is implemented. The table highlights the impacts thought of be special significance, rather than providing an exhaustive inventory.

	Expected economic impact	Expected environmental impact	Effectiveness	Efficiency	Acceptability (for the relevant stakeholders)
Eco-modulation	PRO: higher admin cost Producer: advanced companies seek competitive advantage	Producer improves the product design from environmental perspective	Estimated small to medium (depends on size of modulation/bonues/ penalties and propensity of producers to react to them)	Medium: moderate admin cost + small to medium effectiveness	Producers: neutral (desirable to advanced companies that seek competitive advantage, undesirable for laggards)
Repairability	Waste sector: Lower waste mgmt cost because of slowing of waste generation; Repairs: more labour input Consumers: initially more expensive product; lower life-cycle cost Producers: Increased cost (designs need updating; more products repaired)	Slower replacements of products	Producers -- Medium: increases opportunity for repair Consumer: Medium -- depends on impact of the modulated fee on the cost of repair	No data available yet; depends on likehilood widespread adoption	Producers: undesirable Consumers: neutral to modulation; repairability desirable PROs: administrative burden Waste mgmt: neutral Repairers: desirable
Durability	Waste sector: Lower waste mgmt cost because of slowing of waste generation; Repairs: more labour input Consumers: initially more expensive product; lower LC cost Producers: Increased cost (design need updating), slower replacement sales	Slower replacements of products	Producers -- Medium: if eco-modulation linked to warranty, increases likely lifespan Consumer: Medium -- depends on impact of the modulated fee on the cost of the more durable product	No data available yet: Estimated medium-high: medium effectiveness + medium cost for admin to create rules and for industry to react	Producers: undesirable Consumers: neutral to modulation; durability desirable PROs: administrative burden Waste mgmt: neutral

	Expected economic impact	Expected environmental impact	Effectiveness	Efficiency	Acceptability (for the relevant stakeholders)
Reusability	Producers: slower replacement sales Consumers: benefits consumers (1st: income from sale, avoid waste cost: 2nd: recipient gets cheaper good)	Depends on whether 2nd hand goods displace primary goods	Low: Dependent on repairability and durability and market behaviour	No data available yetLow-meidum: low effectiveness + medium cost admin to create rules and for industry to react	Producers: undesirable Consumers: neutral to modulation; reusability desirable PROs: administrative burden Waste mgmt: neutral
Recyclability	Waste generator cost: lower Cost of product higher Producer: higher cost PRO: lower cost	Lowers resource use and related environmental impacts, but depends on substitution	Medium: depends on magnitude of bonus/ penalty and level of harmonisation	No data available yet	Producers: somewhat undesirable Consumers: neutral to modulation; mildly desirable PROs: desirable but administrative burden Waste mgmt: desirable
Hazardous substances	Waste mgmt: lower cost Producer: cost of removing/replacing substance Consumer/waste generator: neutral	Reduces exposure to hazardous substances	High: less complicated; depends on cost and availability of substitutes Less effective than an enforceable ban.	High: for non-SVHCs, takes into account the cost of removal in waste system	Producers: somewhat undesirable Consumers: neutral to modulation; mildly desirable PROs: desirable but administrative burden Waste mgmt: desirable
Remedies to free riding through online sales	Free riders: increase cost Compliant producers: lower EPR fees; reduced market distortion PROs: improved financial viability Consumers: increased cost for free riding products	Indirect improvement through financial incentives to combat free riders; more revenue to support EOL mgmt.	Highly variable: no silver bullet, multiple strategies required	Variable due to variabilty in effectiveness (No data available yet)	Free riders: undesirable Compliant producers: desirable Online platforms: undesirable Consumers: undesirable if purchases of free riding products PROs: desirable

5 Product-Service Systems (PSS)

5.1 Product-Service Systems and the Circular Economy

Product-Service-Systems are emerging as one of the means of transitioning to a more circular economy by providing producers different ways of satisfying consumer needs while fostering resource efficiency. One definition of a product-service system is that it is a business model comprised of offering a mix of "tangible products" and "intangible services" as a means of fulfilling consumer needs and reducing environmental impacts (Tukker 2015).

There are three main categories of PSS based on how they aim to satisfy consumer needs (Tukker 2004): product-oriented, use-oriented, and results-oriented PSS. In a product-oriented PSS, a manufacturer sells a product but augments its offering by providing complementary services (such as maintenance and take back provisions). Meanwhile, a use-oriented PSS is based on selling consumer access or use of product, rather than its ownership. The type of use can vary depending on whether the product is made available to a single user (e.g. this involves product leasing arrangement with the user having unlimited and individual access to the product) or multiple users, either through consecutive use (e.g. carsharing) or simultaneous use (i.e. product pooling). Finally, results-based PSS is focused on the attainment of a desired result agreed with the customer, there being no pre-determined product involved.

The type of PSS represents increasing responsibility on the part of the PSS provider over the underlying product and control over its use. In a product-oriented PSS, the PSS provider still transfers ownership to the consumer and retains limited responsibility over the product through the added service component (i.e. maintenance). In a use-based PSS, the PSS provider retains ownership over a product and can therefore exercise control over its maintenance, upgrade, and terms of use. Finally, in a results-based PSS, the PSS provider may even exercise control in determining under which conditions a product is going to be used and apply the product itself in order to deliver the intended result or function.

5.2 Resource Efficiency Drivers of PSS

The increased responsibility and control over the underlying products and shift of profit drivers in PSS create different opportunities and incentives for manufacturers to undertake resource efficiency strategies. These strategies (Bocken et al. 2016; Bressanelli et al. 2018; Tukker 2015)these technologies support the implementation of the circular economy (CE include prolonging product lifetime, increasing product utility, closing material loops, increasing cost and material efficiency and decoupling value from the delivered physical product.

PSS provides opportunities to increase operational efficiency. In access-based and results-based PSS where the costs to deliver a service are borne by the PSS provider, there is an incentive for the PSS provider to improve processes to increase operational efficiency or use of more efficient technologies in order to reduce resource use and consequently its costs. Use-oriented services offer the possibility to shift to / use highly efficient technologies which become more affordable to consumers and providers alike due to economies of scale, or which simply become more practicable as the increased utility can hasten the rate replacement rate (Tukker 2015). If the consumer also pays the costs associated with the service (i.e. fuel, detergent, etc.) in addition to the cost for access, there is a further incentive to improve cost and material efficiency to drive down resource use at the time of consumption (Tukker 2015). In results-oriented PSS, the firm is motivated to minimize life-cycle costs and use of other auxiliary materials necessary to provide a service or function, as a means of increas-ing its profitability. This is also supported by the flexibility afforded the service provider in ensuring that environmental impact reductions are maximized (Tukker 2015).

In PSS where the provider retains ownership over the product, there could also be an economic interest to prolong the lifetime of products to minimize asset investment, by slowing the need to replace such products. This is usually, albeit not always, environmentally beneficial when also considering the GHG emissions.

Use-oriented PSS also enables increased utility of a product. This makes it possible to satisfy multiple user needs using the same asset and thereby reduce the burden on production. Use-oriented PSS that results in displacing private ownership can reduce resource use from production and extraction and is thus generally suitable for products where significant life-cycle impacts are related to the production phase and which are typically underutilized (tools or garment for occasional use or limited purpose) (Kjaer et al. 2019).

Finally, a PSS also enables the substitution of more material intensive system by facilitating the use of a service to replace more material intensive products/systems (use of an

equipment instead of owning them) or by incentivizing the use of secondary materials (refurbished, reused parts) instead of primary materials (Kjaer et al. 2019).

5.3 Environmental Impacts of PSS

Adopting a PSS business model does not always guarantee achieving environmental benefits. It cannot be assumed that shifting from products to services automatically leads to dematerialization, as oftentimes the shift entails different types of resources. The shift may also be energy-intensive, which leads to increased GHG emissions. The shift to a results-oriented PSS could entail increased logistics and coordination across the different actors in the value chain. The PSS solution could also mean investing in new infrastructure, e.g., digital or physical, in order to make the system accessible to users. The impact of these new resources should also be taken into account, and there is a need to ensure that the adoption of a PSS will result in resource savings and net positive environmental impacts over time. Since a PSS provides an alternative to satisfying or fulfilling a need or function, one needs to assess a PSS' performance against the products or systems it is replacing. It is crucial that a PSS is not replacing, whether intentionally or not, more environmentally effective solutions.

Thus, it is important to look at life-cycle impacts of PSS on a case-by-case basis. There is a need to assess from a life-cycle perspective whether a PSS's resource efficiency strategy is suitable to achieve significant positive environmental impacts and under which parameters. This requires understanding what the environmental trade-offs are within the different life cycle stages of a PSS, which phase of the life cycle has the highest environmental impact and the factors contributing to these impacts.

For example, use-oriented PSS may be desirable for certain products only under certain parameters. In the case of use-oriented business models for clothing / textiles, it was found that the benefits from reduced production in clothing due to prolonged garment life can have positive environmental impact provided these are not offset by increased customer transportation under particular scenarios (Zamani et al. 2017). Carrano et al also compared the environmental impact of different PSS options for pallet management, from outsourcing, leasing pallets and buying pallets where seller implements a buy back option. The authors found that any of the three approaches could be the optimal strategy depending on the service (handling, loading and distribution distance requirements) and EOL conditions (Carrano et al. 2015). Meanwhile, for products where resource consumption is most intensive during the use phase, particularly for energy-using products with long life cycles, PSS that enables operational efficiency would be suitable to produce positive environmental impacts. Sigüenza et al looked at the material and climate change implications of circular business models involving washing machines in the

Netherlands based on different scenarios. The authors found that the large scale and quick adoption of product-leasing PSS resulted in positive and the largest material use benefits, followed by the pay-per-wash business model. However, decarbonizing the electricity mix proved to have a far more important role in reducing GHG emissions given that the use phase of washing machines generated the highest climate impact compared to its production phase (Sigüenza et al. 2021).

Finally, the impact of the adoption of PSSs on user behavior (micro level) and vise-versa, and on the economy at large (macro level) also determine their environmental sustainability. Thus, rebound effects need to be carefully considered, where the lower prices or increased accessibility lead to a higher overall consumption rather than reduction (Kjaer et al. 2019). For example, increased utility in use-based PSSs can speed the replacement rates of the underlying product, which can be exacerbated when users do not exercise diligent care on products leased or rented as compared to products owned by them (Tukker 2015).

In order to investigate/illustrate in more detail the creation of environmental benefits when shifting to PSSs in a Circular Economy, two case studieswere chosen with the KITUPO Steering Group: car sharing and chemical leasing. These PSSs were considered particularly relevant, yet interestingly different, for Finland's aspirations towards more circular, sustainable product policies.

5.4 Case Study 1: Car-Sharing

5.4.1 Car-sharing as a Use-Oriented PSS

Emissions from vehicle travel are a well-established part of policy debates. The use of materials in vehicles have been subjected to much less attention however. Substantial material efficiency gains on vehicles with positive impacts on GHG emissions can be reached. The shift towards PSSs can be an essential step in this endeavour.

Car-sharing is a type of use-oriented PSS. In car-sharing, individuals typically access vehicles by joining an organization that maintains a fleet of cars and light trucks, which the members of the organization then have the right to use for a distance and/or time-based fee (Shaheen et al. 2019).

5.4.2 Resource Efficiency Drivers for Car-Sharing

Car-Sharing, as other forms of shared mobility, has different components that impact its sustainability: vehicle, fuel, infrastructure (parking spaces, charging facilities, lanes) and the operational aspects (International Transport Forum 2020; Mitropoulos & Prevedouros 2014). Its relative environmental impacts need to be also understood around the other mobility options that it is displacing or complementing, and how the service will impact the overall longer-term demand for mobility (IRP 2020).

Car sharing can have two major types of resource efficiency benefits. It has the potential to lower virgin material demand through the intensified use of vehicles (IRP 2020). Car-sharing makes it possible to meet mobility needs while using less passenger vehicles, which can help reduce the need to manufacture cars over time. This potentially lowers the environmental impacts, including in particular GHG emissions during the production phase (IRP 2020). This could also translate to lower demand for parking space and result in reduction of the associated materials (Chen & Kockelman 2016). Policies that can reach this outcome are discussed in 5.4.2.1.

Car-sharing also has the potential to facilitate operational efficiency by making the use of highly-efficient vehicles more accessible (Ceschin & Vezzoli 2010; Tuominen et al. 2019)(2. Environmental impacts of car-sharing, in terms of GHG emissions and energy consumption per passenger kilometer, are still higher on the fuel component than the vehicle component (Chen & Kockelman 2016; IRP 2020). Thus, policies addressing the operational efficiency of cars to reduce environmental impacts from fuel consumption per passenger kilometer (total distance travelled, in kilometers, in a given period, by the number of passengers) during the use phase are also relevant.

Policies should strive to look for synergies when implementing policies to reduce overall car production while increasing operational efficiency of the car-sharing fleet. The replacement of private ownership should also result in fewer vehicle trips overall, while supporting the use of sustainable transport modes (public transport, biking). These latter choices will in other words also influence the overall sustainability of car-sharing.

5.4.2.1 Reduced Material Stock through Increased Utility

In Finland, the total number of registered vehicles continues to increase. As of 2020, this number increased by 2.1% compared to 2019, so to 6,926,137 (Official Statistics of Finland 2021). The number of passenger cars per 1000 inhabitants is the 4th highest in the EU as of 2019 (Eurostat 2021b). According to 2017 figures, passenger cars by far dominate the multi-modal split of passenger transport, accounting for 84.2%, followed by motor coaches, buses and trolley buses at 10.4% and trains at 5.4% (Euro-stat 2021a). The share of passenger cars in the multi-modal transport in Finland is higher than the EU-27 average

of 82.9%. Thus, there is room to increase material resource savings by reducing overall passenger car demand through car-sharing.

Many studies have reported that car-sharing is able to displace private ownership of vehicles (Cohen & Shaheen 2018; Martin & Shaheen 2016; Namazu & Dowlatabadi 2018). There appears to be no conclusive study as to whether station-based or free-floating car-sharing is better at inducing a shift away from car ownership (Best & Hasenheit 2018; Shaheen et al. 2019). As will be discussed below, decreasing private car ownership can lead to a smaller stock required for meeting the travel demand, and hence less raw materials extracted. Reduced private car ownership can also lead to decreased parking infrastructure requirements, which further contributes to material efficiency (Chen & Kockelman 2016; Engel-Yan & Passmore 2013).

The benefit of reducing overall vehicle stock is not only dependent on the extent that car-sharing is able to displace private ownership. It depends also on the replacement rate of shared vehicles (Amatuni et al. 2020; Chen & Kockelman 2016). Car-sharing fleets are likely to be replaced considerably more often than average private cars, because of their use intensity. Consequently, reducing the intensity of shared car use may contribute towards lowering the car manufacturing rates. Determining the optimal moment of replacement is difficult, but can be determined by considering the trade-offs between the environmental impacts of, in particular, the GHG emissions from the material extraction required for manufacturing a new car and the higher GHG emissions during the use of an older, less efficient model. Yet, car-sharing providers rarely choose the moment of replacing vehicles in their fleet on environmental grounds. Many providers of free-floating car-sharing services are owned by car manufacturers (Tuominen et al. 2019)(2 or rental companies. Their overall strategic objective may be, in fact, to increase the sales of cars. Mont (2004) has found that car-sharing providers typically replace their cars every 2 to 3 years due to faster wear and tear. Thereafter, these shared cars are sold to private individuals. The service providers may also enter the car-sharing business for strategic reasons, for example to promote their new vehicle fleet and to gain direct access to consumer insights (Monitor Deloitte 2017). Then again, the value of sensitizing and introducing consumers to new models may be particularly important to affect paradigmatic change, such as the move to hybrid and electric vehicles. Hence, while car-sharing may influence private ownership, it is not evident that car-sharing actually reduces overall car production over time.

The above discussion highlights that in terms of promoting material efficiency, the focus should not just be on replacing private ownership, but on the broader impact of slowing down the manufacturing rates of vehicles over time.

5.4.2.2 Lowered Vehicle Kilometers Travelled and Modal Shift

One of the ways by which car-sharing can reduce environmental impact is if it results in an overall reduction in Vehicle-kilometers travelled (VKT). Besides the possibility of decreasing the car fleet, the shift to car-sharing can also induce behavioral change. It can influence the distances travelled and the shift to other modes of transport. Many studies have estimated the effects of adopting car-sharing to the overall distances travelled by car with varied results (Martin & Shaheen 2011 2016; Nijland & van Meerkerk 2017). Understanding the impact of car-sharing in reducing VKT is relevant when considering car sharing as a material efficiency strategy because their influence on emissions savings can be greater than those attributed to vehicle manufacture and maintenance directly (Amatuni et al. 2020; Chen & Kockelman 2016). To be sustainable, the shift towards a sharing model requires thus a combination of policies that steers consumer behavior towards a use-oriented business model (instead of ownership) whilst also creating safeguards against increased vehicle trips.

One of the ways that carsharing is thought to result in lower VKT is by emphasizing variable driving costs, such as per hour and/or mileage charges (Shaheen et al. 2019). Chen and Kockelman (2016) also supports the effect of the costs of car-sharing on vehicle trips, as well as the advance planning needed in order to use car-sharing vehicles as drivers in reducing VKT. Thus, in a study conducted in Flanders, the use of subsidies to further lower the costs of car-sharing for users was discouraged to avoid the negative effect of increasing kms travelled. It is thus important that car-sharing is cost-efficient compared to private car-ownership, but not cheaper than using public transport (Carmen et al. 2019). A delicate balance needs to be struck between car-sharing options as a viable alternative to owning a car or a second car among users, and the increase in car trips due to the (too) easy accessibility of vehicles, made possible by car-sharing.

Reducing VKT through car-sharing is also determined in part to the extent that car-sharing induces a modal shift to more sustainable modes of transit, like public transport, walking or biking. Thus, car-sharing would be beneficial if it is used as a last mile solution to reach the nearest public transport, and if it does not lead to more km trips being driven (IRP 2020). To this end, policies that serve to integrate car-sharing into the public transport system, can help facilitate a more sustainable multi-modal transportation. There were some indications that specific types of car-sharing (e.g. station-based over free-floating), considering the profiles of users they attract, can be more conducive in facilitating multi-modal transportation (Schreier et al. 2018; Shaheen et al. 2019; Tuominen et al. 2019)(2. Robust data on the profiles and behavioural patterns of car-sharing users, and the types of car-sharing services being used (free-floating or station-based), is required to determine which type(s) of car-sharing to promote to further the aim of replacing private ownership and reducing VKT.

5.4.2.3 Increased Operational Efficiency

Besides decreasing the amount of trips, car-sharing can facilitate the users' access to low-emission vehicles or highly fuel efficient vehicles. The intensified utilization and replacement rates can facilitate shifts to more fuel-efficient technologies in the cars being used. Optimizing the use of smaller and lighter vehicles through car-sharing would also contribute to fuel efficiency, especially when these vehicles are replacing bigger less material-efficient private vehicles (Mitropoulos & Prevedouros 2014; Nijland & van Meerkerk 2017). Shifting towards electric vehicles to increase fuel efficiency may however lead to increased demand for certain materials (European Environment Agency 2018) and also affect the resource intensity of the overall supply chain (Dolganova et al. 2020; Sen et al. 2019), and should thus be considered carefully.

Increasing passenger capacity is another use stage strategy in order to increase the environmental benefits of resource efficiency. Allowing more passengers to use and occupy a vehicle could lead to smaller demand for cars and reduce the kilometers driven.

5.4.3 Strategies For Car-Sharing

5.4.3.1 Strategies to Address Car-Ownership and Reduce overall car production

One strategy is to remove financial incentives tied to private car ownership and increase the leverage of using car-sharing over private vehicles. Alkeyen et al found that one of the barriers for the uptake of car-sharing in Helsinki relates to the financial incentives that support private car ownership. Removing these incentives can help facilitate the transition to a more access-based mobility, so to car-sharing (but also to public transportation). Such incentives exist both in the private and public sectors. The benefits include the company car and commuting expense benefit. The benefits can be reduced and even entirely removed by replacing them with a mobility budget, which allows the holder to use the benefit (only) for accessing public transport and car-sharing.

In Finland, employers provide their employees with car benefit, which may or may not include all car-related expenses such as fuel costs. The car benefit received by an employee is subjected to an income tax (Verohallinto 2021). The tax base for the company car benefit (per year) is based on either a percentage of the replacement price of the vehicle or a fixed tax rate per kilometer travelled by the vehicle. Despite being subjected to income tax, the net effect of the company car benefit may still influence the decision to retain the vehicle. In a 2014 OECD study, it was estimated that most EU countries, including Finland, under-tax the company car benefit (Harding 2014), although the exact extent might be debatable due to the methodology used to calculate the benefit. The report posited that under-taxation of the capital component of the vehicle can affect

employee decisions to retain the company car as an addi-tional vehicle, while a neutral tax treatment could encourage households to reduce the number of vehicles owned.

At the same time, employees are able to benefit from tax-exempt kilometer allowance for using private cars for work-related trips (Verohallinto 2021). It has been suggested that the kilometer allowance tend to encourage use of private cars instead of public transport (Akyelken et al. 2018). The company car benefit together with the commuting allowance can work to incentivize maintaining private cars.

Increasing the leverage of car-sharing over private ownership could mean requiring employers that provide employees with company car benefits to offer an alternative equivalent benefit for sustainable transport options, including car-sharing, or similar arrangements. A legislation to this effect has been implemented recently in Belgium (Deloitte 2019). The value of the company car benefit can be commuted into a mobility budget that can be used for sustainable transport modes such as bicycles, public transport and car-sharing, excluding ride-hailing services and taxis which do not necessarily contribute to environmental benefits. Subscription to Mobility as a Service, incorporating car-sharing, as an alternative to company car benefits should be piloted.

To ensure the positive environmental effects, the policy could require that to qualify for the mobility budget, the car-sharing services need to be certified as complying with environmental standards such as emission standards and/or use of electric vehicles in the fleet.

Another strategy is to use parking policies to limit the number of private cars and support car-sharing. The mere existence of car-sharing options does not necessarily induce individuals to change behavior, because their habits may be ingrained. Accessibility and convenience remain to be the primary drivers of mobility behavior among users (Carmen et al. 2019). The policy mix should thus aim at steering user behavior by making private car ownership less attractive, increase the viability of car-sharing as an alternative, and make the promotion of car-sharing consistent with the objective of reducing VKT.

Factors that influence decision-making in owning cars vis-à-vis using other transport modes include parking costs for private cars. In urban contexts with well-developed public transportation, expensive parking space creates an incentive to reduce car-ownership (Huwer 2004). Meanwhile, the viability of car-sharing depends on the acces-sibility and availability for parking spaces for car-sharing vehicles. Consequently, a supportive parking policy is crucial to the success of car-sharing schemes (Akyelken et al. 2018). The results of a study also suggest that designating parking spaces for free-floating cars can increase the share of that mode, while also reducing private car use (Bischoff & Nagel 2017).

The experiments in Umeå Sweden indicate some evidence that increasing accessibility to acr-sharing in housing developments can facilitate use. In In Umeå, the incentive is not limited to car-sharing programmes, real estate developers can also benefit from reduced parking spaces if alternatively, they provide discounted train tickets or other sustainable mobility options (Bocken et al. 2016). Helsinki is a frontrunner in this respect in Finland. Helsinki has also included incentives to integrate car-sharing into new housing developments by allowing real-estate developers to reduce the number of required parking spaces subject to a long-term commitment to provide services by a car-sharing operator for residents (Tuominen et al. 2019). Evaluation of the impacts of the scheme should be followed as a model for other cities/municipalities.

5.4.3.2 Strategies to Reduce Vehicle Kilometres Travelled

Resource efficiency strategies and their environmental impacts need to be assessed holistically. Thus, policies should also focus on reducing car use and ensuring that car sharing does not induce more vehicle trips. Thus, policies that aim to make car use difficult (such as congestion charges) should be considered in the policy mix. The evidence on the effectiveness of the policy interventions on the matter remains limited, however (Graham-Rowe et al. 2011; Mackett 2012; Semenescu et al. 2020). Hence, these policies targeted at making car use difficult should be applied with caution. Policy experiments should be complemented by measures that allow a reliable evaluation of impacts on car use.

Another strategy that can help facilitate controlling VKT is by ensuring that car-sharing complements, rather than replace, public transportation. Shaheen et al (2019) considered multimodal integration as a best practice to encourage the use of shared mobility and public transportation (see also (Miramontes et al. 2017). The The Mobility-as-a-Service (MAAS) concept, which is already being developed in Finland, is one way of fare and information integration among the different types of transportation. However, car-sharing needs to be integrated into public transportation also physically. Mobility hubs are an important example: they are spaces of physical co-location for public transportation and car-sharing, creating nodes which enable car-sharing as the first- and last-mile solution (Shaheen et al. 2019). Such mobility hubs are expected to be generally situated on major public transport corridors to support the role of public transport in cities and large towns (CoMoUK 2019).

Finally, another strategy to reduce VKT is by incentivizing increased number of passengers per trip. Allowing more passengers to use and occupy a vehicle could lead to smaller demand for cars and reduce the kilometers driven. Aside from car-sharing, ride-sharing as a form of mobility should also be further explored.

5.4.3.3 Strategies to Increase Operational Efficiency

In Bremen, car-sharing incentives are tied to meeting environmental performance. Accordingly, car-sharing vehicles benefit from parking space only if they fulfil an environmental standard demonstrated by obtaining a certification from the German blue angel certification scheme. The technical criteria under the eco-label includes limit values for NOx and particulate emissions, as well as a quota for the integration of electric vehicles into the fleet owned by an operator (Blue Angel 2018). The approach of tying car-incentives to environmental standards optimize the environmental impacts of car-sharing by promoting not only reduction of vehicles but also increasing their overall operational efficiency.

For Finland, it is recommended that car-sharing incentives are tied to meeting emission-related requirements. As discussed above, availability and allocation of parking space is considered crucial to the viability of car-sharing operations and can thus be used as a tool to motivate the use of clean technologies. To keep administrative burden low, the environmental standard related to fuel efficiency should be easy to verify. This could be implemented by imposing an increasing percentage of low emission vehicles (such as electric vehicles), which information can be easily verifiable.

5.4.3.4 Public Procurement

Public Procurement can have a vital role in promoting private sector innovations (Uyarra et al. 2014) or creating facilitative environment for a niche market, such as car-sharing, to develop (Bocken et al. 2016). This can be implemented by considering car-sharing during the needs assessment phase when procuring for mobility. The public procurement of vehicles is regulated by Directive 2009/33/EC (as amended by Directive (EU) 2019/1161)) on Clean Vehicles [Clean Vehicle Directive]. The Directive requires Member States:

> *" - - to ensure that contracting authorities and contracting entities take into account lifetime energy and environmental impacts, including energy consumption and emissions of CO_2 and of certain pollutants, when procuring certain road transport vehicles with the objectives of promoting and stimulating the market for clean and energy-efficient vehicles and of improving the contribution of the transport sector to the environment, climate and energy policies of the Union." (Clean Vehicle Directive, Art. 1)*

The 2019 amendment to the Procurement Directive explicitly extended the scope of the law to include practices "such as" lease, rental and hire-purchase. This extension means that car-sharing falls within the practices through which mobility services can be procured. Weighing different options for mobility solutions other than vehicle procurement is beginning to be actively considered in the needs assessment phase in

other countries, such as the UK (UK Department for Environment Food & Rural Affairs 2020). The UK Government buying standards for transport, for example, specifically set out a number of questions that should be considered by the procuring authorities before proceeding with any vehicle procurement, including: "If a vehicle is required, is it justified to purchase or lease one? Given the different market readiness for car-sharing, it is crucial for contracting authorities to actively engage the market and foster dialogue with suppliers to identify the potential and feasibility of undertaking procurement for car-sharing (Directive 2014/25/EU on Procurement by Entities Operating in the Water, Energy, Transport and Postal Services Sectors and Repealing Directive 2004/17/EC 2014) [Procurement Directive], Art. 40, 41). Many cases of public procurement for shared mobility exist from which examples of implementation and possible evaluation of effectiveness can be taken (i.e. Bremen, Gothenburg, Umea) (Bocken et al. 2016; EC 2018a).

On the other hand a contracting authority may itself be(come) a de facto manager of a car sharing service when it equips its employees with the means of mobility that are required for performing their duties. Portugal's Ministry of Health, as an example, procured from an external contractor a fleet management electronic platform instead of buying new fleet (EC 2018a). The desired outcomes of the public procurement was expressed in terms of functional requirement. The system made it possible to generate reports on the real-time use of resources and indicators of inefficient use, among others making it possible to reduce the number of vehicles, costs (such as insurance, fuel and maintenance costs) and environmental impacts.

5.4.4 Policy Recommendations

1. **Support further studies to obtain robust data on** the impacts of car-sharing on sustainable circular economy. Studies are required in particular on:
   - **profiles** and **behavioural patterns** of car-sharing users, **types of car-sharing** services being used (free-floating or station-based), and car-owners and **fleet types** (emission performance)
   - how thus to optimally **reach the below objectives of** reducing overall car production (2.1), reducing vehicle kilometers travelled (2.2) and the environmental qualities of the car-sharing fleet (2.3).
2. **Test targets for car-sharing in transport strategy.** In areas where car sharing seems viable, local governments should evaluate and test car sharing targets based on three parameters: 2.1) reduced numbers of vehicles, 2.2) lower vehicle-kilometres travelled and 2.3) increasing share of low-emission vehicles. The role of car-sharing in the overall transport strategy should be stated as a part of the mobility hierarchy.

2.1 **Reduce car ownership and overall car production.** The ability of car-sharing to reduce private car-ownership introduces possibilities to reduce car production over time. We recommend developing, testing and evaluating strategies that include:

- removing or replacing existing **financial incentives on private car-ownership**
- promoting car sharing (separately or as a part of a Mobility-as-a-service (MAAS) schemes) as a **company car benefit.** This policy should be limited to car-sharing services certified with environmental and other emission standards and/or use of electric vehicles in the fleet;
- offering car sharing better **accessibility and convenience in parking** than private cars by providing dedicated public parking and incentive schemes for real estate developers to integrate car-sharing parking.

2.2 **Reduce Vehicle Kilometres Travelled (VKT).** To be sustainable, policies should be in place to safeguard against increased vehicle trips.

- Conduct policy experiments (e.g. use of congestion charges) with **reliable ex post data monitoring** to reduce car use to ensure that carsharing does not induce higher vehicle trips.
- Invest in **mobility hubs** to integrate car-sharing with public transportation for more sustainable mobility behavior. The physical integration of car-sharing into public transportation will complement the fare and information integration that the sustainable multimodal transport forms such as MAAS already offer.
- **Test policies** such as dedicated high-occupancy vehicle lanes and city-tolls to **incentivize increased number of passengers per trip, and thus as a way of reducing vehicle kilometers travelled.**

2.3 **Optimise environmental impacts of car-sharing incentives with emission-related requirements on the car fleet.**

- Fleet requirements can impose an increasing percentage of low emission vehicles and link the allocation of parking space to the use of clean technologies.
- Access to incentives for car-sharing can be subjected to environmentally sound replacement rates for car-sharing providers.

3. **Consider Car-sharing in Public Procurement.** Public Procurement can be used to generate awareness on car sharing whilst supporting innovative and sustainable mobility solutions. The government can set a target date by which it becomes mandatory for contracting authorities to consider car-sharing as an option when procuring mobility, and to justify if it procured vehicles rather than subscribed to a car-sharing service.

5.5 Case Study 2: Chemical Leasing

5.5.1 Chemical-Leasing as Results-Based PSS

The second example of PSSs that can increase resource efficiency that was investigated in KITUPO project is Chemical Leasing (CHL). CHL has been defined as a a service-oriented business model that shifts the value proposition from the sales of chemicals as goods to the fulfillment of a function. The supplier is thus compensated on the basis of services delivered (OECD 2017), with functional units such as the volume of treated water in m^3 or the surface area of cleaned carpet in m^2 as the basis of payment (OECD 2017). CHL shifts the focus from increasing the sales volume of the chemicals, towards a value-added approach" (UNIDO 2011). The concept has the triple aim of fostering environmental protection through a more efficient use of and reduced risks from chemicals; the protection of human health; and a better economic performance of companies (Lozano et al. 2014).

CHL removes the perverse incentive of the traditional concept of sales that, in order to increase her profits, the supplier also has to increase the volume of chemicals sold (Joas 2008). In CHL, the price structure is a key factor in aligning the interests of the provider with those of the client to reduce the use of chemicals (Ohl & Moser 2008)Evaluation and Authorisation of Chemicals (REACH. The CHL provider stands to increase her profits by reducing the volume chemicals as that will also reduce the costs of delivering the function required. The CHL provider is incentivized to improve and optimize its processes that require the application of chemicals so that it can deliver the function required with less chemicals involved to increase its profitability, thus consequently also reducing associated chemical waste or discharges (Lozano et al. 2014). While a chemical user normally has an incentive to optimize its use of chemicals, it does not necessarily have the technological competence or specialist know-how to do so (Ohl & Moser 2008)Evaluation and Authorisation of Chemicals (REACH.

Despite the term "leasing", CHL is not the same as the leasing of chemicals. In conventional leasing, the chemical supplier would retain the ownership of the lease, and the client would pay only for its use (UNIDO 2020). Although CHL may in some cases also include the recovery of chemicals, this is not a necessary element (UNIDO 2020). In a conventional leasing approach, the value added would be based on the user's application of the leased chemicals, whereas in CHL, the value added is the delivery of an entire function. This means that certain elements that define the relationship between the supplier and the client in CHL, such as process improvement and knowledge transfer, are absent in the traditional leasing concept (UNIDO 2020). Furthermore, the price structure is different as the functional unit is the basis for payment in a CHL.

CHL is well suited for users whose core competence does not include the manage-ment of chemicals (Lozano et al. 2014; Mont et al. 2006). The chemicals in CHL are often for indirect use (i.e. for cleaning, dissolving, reacting) and do not form a part of the final product (Schwager & Moser 2006), although CHL has also been applied in painting and coating (OECD 2017). A function-based business model is feasible where there exists a possibility to increase a chemical's functionality relative to the amount used to deliver a function (Reiskin et al. 1999). Chemicals that are considered a high risk for human health or environment and that are high value substances have also been considered good candidates for the application of the model (Lozano et al. 2014; Schwager & Moser 2006). In a review conducted by Buschak and Lay (2014), Speciality chemicals dominate existing contracts involving servicised solutions, with base and consumer chemicals having minor significance (Buschak & Lay 2015).

Documented studies show that CHL is applied in a wide range of sectors, varying from manufacturing and agriculture to hospitals, including the public sector such as hospitals and water treatment as portrayed in the Annex 3 (OECD 2017; UNIDO 2020).

5.5.2 Resource Efficiency Drivers for Chemical Leasing

In CHL, there are in principle opportunities to reduce the costs and the use of chemicals at each stage of their lifecycle (Stoughton & Votta 2003). Savings in chemical use can occur as improvements in the efficiency of the process itself. Reduced use of chemicals can also be achieved through improved inventory control (e.g. reduced spoilage), via Just-In-Time delivery to the point-of-use (e.g. reducing wastage due to inappropriate container sizes); or through the identification of options for the supplier to re-sell the unused or unneeded chemicals (Stoughton & Votta 2003). The realization of resource efficiencies under CHL depends critically on the scope of the service and ability of the compensation mechanisms to provide incentives to reduce chemical use (Stoughton & Votta 2003).

Several ex ante and ex post case studies have been conducted on CHL based on the various environmental parameters: in addition to the reduction of chemicals, also re-ductions of other raw and auxiliary materials, the consumption of water, energy (e.g. as a result of optimising processes), waste (e.g. waste water load), emissions (generally associated with the decreased energy consumption) and risks of hazardous substances. The conducted case studies have recorded reductions in chemical use of up to 63% (Lozano et al. 2013; Schwager & Moser 2006; UNIDO 2015). However, there seems to be a lack of life-cycle analyses that take into account the entire value chain and not just the environmental impacts resulting from the reduction of chemicals and/or only during the moment of using the chemical. The broader environmental im-plications arising from e.g.

increased logistics, transportation, or from the impacts of using the new equipment or machines in order to deliver the function can be context specific.

The verification of the reductions in the use of chemicals and other resources, and the monitoring of other environmental impacts, will usually require an agreement between the parties. Monitoring is required if the reductions were included in the performance indicators agreed between the parties. UNIDO (Unitied Nations Industrial Development Organisation), a key proponent of CHL, provides an example of how to anchor CHL on sustainability principles that address the reduction of chemicals and resources in their application in the production process. The principles also address other critical impacts on the environment and human health, such as the prohibition to substitute chemicals of higher risk, reduction of energy use and proper handling to minimize risks. Use and compliance with these sustainability criteria are however voluntary on the CHL partners involved.

5.5.3 Barriers for Chemical Leasing

For Suppliers, shifting from selling products to services entails changing the core competency of a firm and new resources (Reiskin et al. 1999). This would require in-vesting in information systems, as well as new staff to develop the necessary competency. This transition can be challenging for small firms without substantial resources and can thus be a barrier (Lozano et al. 2014). Several risks have been identified as potential barriers for a supplier. A CHL requires more upfront capital investment (Buschak & Lay 2015), while the return on investment may have to be staggered over a longer period of time compared to a traditional sales-oriented business model. The CHL provider takes the responsibility for performance during the use phase and re-sponsibility for waste and EoL management of chemicals (Frazão & Rocha 2006; OECD 2017). The OECD 2017 report also indicated certain barriers that apply to chem-ical management services may also apply to chemical leasing. For example, a provider may be hesitant to offer the service involving a full transfer of liability from their own and customer's conduct. However, such full transfer of liability is not a prerequisite in CHL. The OECD also reported that other market barriers include lack of maturity or awareness of the markets and the organizational inertia by prospective users. The profitability of CHL also depends on the service requirements of the client. A disincen-tive for the CHL is when a customer is so small that providing the service becomes a cost rather than a benefit (Lozano et al. 2014). Given recipes for the use of chemicals (UNIDO 2020), strict and differing waste legislation are also the identified regulatory barriers (OECD 2017).

For user of servicised solutions, one of the barriers include fear of losing know-how to the provider as regards the use of chemicals and some internal processes, which may have

an influence on their products and ultimately their competitiveness (Mattes et al. 2013; Mont et al. 2006). For certain users, there might not be enough economic incentive to opt for a servicised solution (Frazão & Rocha 2006). Finally, a user may not have the necessary knowledge about the concept or of the life cycle management costs of handling chemicals. This could prevent a prospective user from appreciating the economic rationale of the service (Mont et al. 2006).

5.5.4 Policy approaches for Chemical Leasing

Current policy approaches on CHL either promote the uptake of CHL or directly or indirectly target resource use or consumption. These policy approaches will be discussed in turn.

5.5.4.1 CHL Sustainability Criteria

Germany has developed sustainability criteria for CHL, which are also used by UNIDO and its partner countries. The sustainability criteria includes the reduction of energy and resource consumption and adverse impacts for environment and health caused by chemicals, their application and production processes. The sustainability criteria also requires that the contract should include the objective of continuous improvement, allow for fair and transparent sharing of benefits between partners and that monitoring of improvements should be possible. Adoption of these sustainability criteria however is voluntary on the parties agreeing on the CHL project. At the international level, UNIDO's Chemical Leasing Award (see further below) provides an incentive for the use of the sustainability criteria. At the national level, there is currently no government incentive to encourage parties who would opt to apply and monitor their progress vis-à-vis these sustainability criteria. Use of the criteria can be treated as a practical quality assurance instrument to measure performance and identify areas for improvement. Achieving resource efficiency may be incentivized by the terms of the contract itself, but monitoring other data (such as other environmental impacts) can be costly for certain companies (e.g. in the agricultural sector, external companies need to be commissioned to undertake such measurements). The voluntary nature of the sustainability criteria and the additional costs to measure progress against these criteria can serve to deter their use. Lack of monitoring of the other environmental impacts could pose a risk that companies pursue resource efficiency at the expense of climate (energy) or other environmental considerations (i.e. use of less toxic substitutes).

A credible certification system that can establish the environmental benefits has been considered as a means to support the dissemination of the CHL model (Moser & Jakl 2015). One proposal has been to apply a standard called "Certified Chemical Leasing"

that would integrate the quality, environmental, occupational health and safety, and other specific requirements of the chemical industry. Such a third-party quality assurance system would serve to certify whether a project meets the relevant criteria for CHL and verify its performance (Nagel & Schaff 2008). However, the proposal appears to be on hold. It is feared to create additional costs for users until a more sector-wide mainstreaming of CHL is achieved (UNIDO 2016).

5.5.4.2 Taxation

Strict taxation of chemicals is considered a policy to reduce use and increase resource efficiency. In the chemical sector, imposition of high level of taxes have been used to reduce pesticide and fertilizer use in countries like Norway, Sweden and Denmark (Böcker & Finger 2016). In the pesticide example, the use of sufficiently high level of taxes (Böcker & Finger 2016) complemented with efforts towards integrated pest management (which allows for servicised solutions) were considered responsible for the reduction in pesticide use. The use of differentiated taxation to reduce chemical use should not result in switching to higher risk chemicals. The differentiated tax rates should not also result in high tax differences between substances that perform environmentally in a similar way (Böcker & Finger 2016). Lessons learned from the pesticide case can be applied to other hazardous chemicals complemented with information for resource-efficient solutions and alternatives.

Conversely, taxes can also be used to create economic incentives for PSS providers. Gains realized from reduced use of chemicals may otherwise not be significant enough to overcome the initial costs of moving to CHL. Besides the possible gainsharing inherent in a CHL arrangement, there is no incentive for companies to measure other key environmental impacts, which will have cost implications. At the same time, there is a need to ensure that companies offering sustainable servicised solutions are equally, if not more, profitable than businesses anchored on selling by volumes. In this regard, compliance with resource efficiency measures and relevant environmental parameters can serve as the basis for the application of economic in-centives, such as reduced VAT rates within the parameters allowed under EU law (De Camillis & Goralczyk 2013) or tax discounts or exonerations. The incentives need to take into account trade-offs between resource effiency gains and environmental and health benefits. In the selection of the appropriate instrument, the following considera-tions should be taken into account: (i) be substantial enough to induce a change in behavior; (ii) the incentive should directly incentivize positive externalities (ie resource efficiency) rather than a product, which improves its cost-efficiency; (iii) the design should be sufficiently dynamic so as to trigger research and innovation rather than purely avoiding the negative externalities; and (iii) should take into account whether the tax instrument and its design is liable to influence consumption behavior (Directorate-General for Taxation and Customs Union

(EC) 2021). Further, according to literature, price elasticities, market structure, availability of substitutes, and information on the exposure characteristics of regulated hazardous chemicals should facilitate the choices and design of suitable market-based instruments (Slunge & Alpizar 2019). Mechanism should be in place to allow for flexibility to adopt to the market responses to the policy and achievement of the desired objective.

5.5.4.3 Public Procurement

Green or sustainable public procurement has been identified in literature as an area where servicised solutions can be supported and developed (Witjes & Lozano 2016). Besides industrial companies, public organizations from the service sectors can be important customers for these services. Public procurement can be designed to ensure that CHL achieves its environmental and financial objectives, which can then transform sectors where government spending is significant. Government purchases can further reduce the market risk and create markets to allow for innovative service-based business models to mature and get replicated (UNEP 2015).

The EU Procurement Directive provides the legal basis to support sustainable and resource-efficient CHL. The support can be implemented through the formulation of technical specifications or in the award criteria in the bid documents. It is crucial however that contracting authorities do not restrict the tenders to the supply of goods as this would prevent prospective bidders from the possibility of offering a servicised solution. This barrier appears to exist in Finland as well, based on industry interviews. The contracting authorities should thus be required during the need identification phase to consider whether the procurement can be framed as a service rather than a procurement of goods. In determining whether or not to proceed based on products and services, life cycle costing should be considered. This allows the contracting authorities to base their decisions not only on the initial cost of the chemicals but on the overall product life cycle cost.

To encourage resource efficiency, Alhola et al. 2018 suggested for public procurers to set ambitious CE targets to encourage the market to develop new solutions. This means high targets also for reducing chemical use. The targets should be based on an understanding of the existing potential of market and technology development e.g. whether significant chemical reduction potential for a particular application exists (Joas & Abraham 2014). Where innovation and technology possibilities exist, the high chemical reduction requirement can be used as a mandatory criteria. Otherwise, the resource-savings requirement can be used for providing points as award criteria (Case C-513/99, *Concordia Bus Finland*, EU:C:2002:495). This is to avoid limiting the number of bidders participating in the tender (Alhola et al. 2019). It is important to also include other environmental considerations, such as trade-offs with energy and energy and climate-related indicators

and not substituting with more hazardous alternatives, to ensure the overall sustainability of the preferred solution.

Collaboration and dialogue among the stakeholders are important to facilitate understanding of the concept, and for innovation, value creation and stakeholder acceptance (Alhola et al. 2019). Joas & Abraham (2014) also suggested several measures to address some of the risks discussed above, such as conducting pilot projects applying UNIDO's sustainability criteria to assess feasibility and environmental benefits, investing in systems for monitoring of progress and results. Targeted information on CHL for procurers was deemed useful.

The payment metrics will directly influence the supplier behaviour, and therefore contracting authorities should determine the appropriate outcome, metrics and payment levels to ensure that suppliers are incentivized to achieve the desired resource efficiency and environmental objectives. Payment terms of the procurement contract can thus include bonus payments for achieving environmental parameters linked to resource savings.

5.5.4.4 REACH and Chemical Leasing

One of the policy approaches described in literature links the application of a CHL towards compliance with EU Regulation 1907/2006 on Registration, Evaluation, Authorisation and Restriction of Chemical (REACH Regulation). The approach increases the awareness about the business model and creates potential synergy between resource efficiency and chemicals policy. Austria is also looking at the possibility to grant authorization for certain applications of chemicals only when they are based on a CHL concept (Torkkeli 2015). Another route that is being explored is to reduce the processing time for granting an authorization when the substance will be used in a CHL application (UNIDO, n.d.).

Information sharing and coordination becomes necessary when the CHL provider assumes responsibility for applying and disposing of chemicals. This relationship can serve as the basis for the implementation of REACH requirements, because the REACH regulation requires intensified cooperation between actors in the value chain in order to document, evaluate and minimize hazards (Jakl 2008; Lozano et al. 2013), through the various registration, reporting, notification and authorization requirements. For example, the coordination, monitoring and control during the chemical use phase exercised by the provider in a CHL support the identification of the use and exposure category required in the Chemical Safety Report (Moser & Jakl 2015).

Substances listed under Annex XIV of the REACH Regulation need authorization prior to their manufacture or use (REACH Regulation, Art. 56). Granting of the authorization is premised on demonstrating that the risk to human or environment from the use of such

substance in view of its intrinsic properties would be "adequately controlled" (REACH Regulation, Art. 60 (2)). Moser & Jakl (2015) posited that applicants for an authorization can demonstrate meeting the "adequate control" criteria by basing their application on a CHL concept. Joas & Abraham (2014) noted that an applicant needs to guarantee that certain boundary conditions will be followed once the chemical enters the market (e.g. specific exposure levels will not be exceeded). A chemical manufacturer can in CHL guarantee control over the risks and exposure during the use stage by having control of its application during the use phase.

Furthermore, the sustainability criteria for CHL as defined by e.g. UNIDO also requires that substances are not replaced with more hazardous alternatives, another area of compatibility with the REACH Regulation (Art. 55).

5.5.4.5 Information Tools

One of the identified barriers to CHL is the lack of awareness on the business opportunities of the model and lack of knowledge on how to apply the business model. UNIDO and its partner countries have been leaders in filling the knowledge gaps. The German Federal Environment Agency and its partners have implemented CHL projects as means of disseminating and raising awareness of the business model. Germany and Austria have supported various research activities to develop the concept further, e.g. as one of the approaches towards sustainable chemistry (Zeschmar-Lahl 2017). They also share information about CHL on their official government websites, with practical information and tools for companies (ie Chemical Leasing Toolkit for Companies, SMART 5 as an evaluation tool), policymakers as well as publications. Both countries have also designated dedicated committees or working groups to coordinate multi-stakeholders and national projects (UNIDO 2016).

Perceptions on the hurdles in implementing Chemical Leasing are one of the key barriers to its uptake. The hurdle can be lowered by providing access to contractual templates can help companies navigate the types of risks or legal issues (such as intellectual property rights) peculiar to CHL contracts. OECD's 2017 report explored how CHL can overcome some of the risks from information asymmetries, moral hazards, and adverse selection inherent in traditional contracts and the new types of risks arising from Chemical Leasing. Tools to assess whether the CHL business model is suitable for a company and how to set it up are also important. Initiatives on this in Finland include Accenture's collaboration with SITRA, Kemianteollisuus and Business Finland, which has resulted in a Circular Economy Playbook on Chemical Companies (Accenture 2020). The playbook serves as a tool for assessing the very steps to transition to circular business models based on key sustainability and circular economy drivers. A more targeted assessment guide for CHL for

specific applications with environmental potential can also help disseminate information and overcome information barriers.

The Chemical Leasing Award of UNIDO is an example of another information tool that serves not only to disseminate best practices but also to benefit companies that are able to demonstrate and validate their projects against UNDIO's sustainability criteria for Chemical Leasing. The scheme is organized and implemented in collaboration with UNIDO, Austria, Germany and Switzerland. The award promotes innovation and provides greater visibility and credibility for companies implementing CHL projects with demonstrated resource efficiency and environmental gains (UNIDO 2020).

Having these information instruments consolidated in one site (ie Ministry of Environment, Chemicals Policy page) can be useful for users.

5.5.5 Policy Recommendations

1. **Conduct further life-cycle based studies on CHL in areas with potential** to determine the potential of chemical leasing as an environmentally-sound resource efficiency policy. Resources for conducting studies is called for. The system boundaries of the assessments should not be limited to the mere phase of applying the chemicals, but cover the entire value chain and all essential environmental impacts of this service-based business model.

2. **Raise Awareness on Chemical Leasing**

   – Test the **approaches and benchmarks established by leading proponents of Chemical Leasing** to increase awareness and build local expertise in Finland. Consider a pilot project (e.g., on chemical leasing for disinfectants in collaboration with Austria and Germany) and signing the joint Ministerial Declaration of Intent on Chemical Leasing.

   – **Disseminate best practices to overcome** the perception that there are many hurdles to implementing Chemical Leasing. Provide access to information and tools, contract clause templates (e.g. on liabilities; IPRs) and best practices (e.g. business models; export opportunities) and consolidate this information in one place, for example in the Ministry of Environment or Keino's website.

   – **Assess and communicate the potential benefits of Chemical Leasing in achieving REACH compliance.** This would signal political support, facilitate awareness and encourage experimentation by industry players to create further examples and local best practices.

3. **Test Public Procurement as a means to raise** awareness on and means to apply CHL. Test if the Contracting Authorities (Cas) could be required during the need identification phase to consider framing the procured chemicals as a service rather than as goods. Where the procurement of services is considered preferable, assist the CAs in structuring the evaluation criteria and contractual (payment) terms of the procurement so as to encourage resource efficiency e.g., by providing additional points in the evaluation criteria on environmental parameters and/or bonus payments for achieving environmental parameters linked to resource savings. Requirements should include that chemicals must not be substituted with more hazardous alternatives.

4. **Test tax instruments to incentivize resource efficiency in the chemicals sector.** High taxes on certain chemicals can push companies to adopt measures promoting resource efficiency. Meanwhile, economic incentives for CHL with demonstrated resource efficiency and environmental gains can also increase their competitiveness and influence consumer choice. Possible complementarity and synergy of these instruments should be tested.

5.6 Preliminary impact assessment for key recommendations

The expected impacts are assessed in the chapters describing proposed policy instruments and their modifications. In the table below we aim to summarize these impacts and assess effectiveness, efficiency and acceptance of these instruments.

	Expected economic impact	Expected environmental impact	Effectiveness (in achieving environmental impact)	Efficiency	Acceptability (for the relevant stakeholders)
Reduced parking space requirements for real estate development that incorporates car-sharing programme	Reduces costs associated with establishing parking facilities for developers; more effective use of real estate property Increased viability for car-sharing providers Slight increase in cost for car-owning residents62; neutral impact to residents who do not own cars. Slight administrative cost on local planning (optimal parking reduction ratios; compliance verification) Possible slight loss of profit on car manufacturers (slight decline in sales)	Reduces consumption of material resources to build parking infrastructure and liberates space for other (potentially more environmental) purposes. Promotes reducing number of private vehicles owned by individuals living in these new areas and thus decreases material consumption Reduction in vehicle km trips: residents may replace private vehicle trips with car-sharing trips or drive less overall. Increased use of more efficient shared vehicles	Medium-high on real estate developers to reduce parking spaces Low-medium on behavior on using cars less Low-medium on residents to delay or decide against the purchase of, or forego, a car	Medium: Low costs involved for developers with medium possibility to reduce private car ownership	Residents: Neutral: Some prefer to retain private cars, others prefer increased car-sharing. Real Estate Developers: Desirable due to lowered parking space requirements and increased profitability, assuming there is no reduction in (real-estate) customers Undesirable for car manufacturers; favors car-sharing providers. Municipalities / Cities: Desirable for environmental impacts and efficiency in the use of space

62 "Resident" includes for non-residential buildings the persons that use the property regularly, such as the people working in the building.

	Expected economic impact	Expected environmental impact	Effectiveness (in achieving environmental impact)	Efficiency	Acceptability (for the relevant stakeholders)
Development of of mobility hubs (i.e. spaces of physical co-location for car-sharing and public transportation)	Initial cost on cities to create the hub (building car sharing parking/charging stations) infrastructure; planning routes, but reduces overall costs of mobility and infrastructure in the cities in long term; increases revenue from public transportation Reduces mobility costs for consumers by making inter-modal connections easier (if consumers drive less and use public transport more)	Reduces vehicle kms travelled – lower climate impacts Creates incentive to reduce vehicle ownership and thus decreases material consumption Reduces need for parking space – decreases material consumption Reduces congestion	Medium (increases attractiveness of car sharing in combination with public transport)	High: low costs combined with medium effectiveness	High (Desirable for most stakeholders: limited funding needed but increasing mobility options and decreasing congestion beneficial for all) Slightly undesirable for car manufacturers
Requirement to consider car-sharing when procuring for mobility, and justify if vehicles are procured instead of a car sharing service	Lower life-cycle costs for mobility solutions for contracting authorities Medium administrative costs of adequate support for contracting authorities. Reduced demand for cars can impact profitability of car manufacturers / distributors	Smaller and more environmentally efficient vehicle fleets in the public sector lower resource use and emissions Reduced demand for parking spaces in public buildings reduces material resources use in parking infrastructure and liberates space for other (potentially more environmental) purposes.	Potentially high but depends on implementation. Effective, in principle, in making shared mobility the preferred option, but uptake by contracting authorities in practice may be slow/limited, unless support structures are created. Also, effectiveness reduced for lack of a review mechanism and consequences on justification decisions of contracting authorities. Publication of justifications increases accountability.	Potentially medium-high: low/ medium cost of implementation with medium/high effectiveness	Not desirable for car manufacturers Neutral to contracting authorities. Reduces costs of procured items, but changes and needs in procurement process could face organizational inertia High desirability for taxpayers

	Expected economic impact	Expected environmental impact	Effectiveness (in achieving environmental impact)	Efficiency	Acceptability (for the relevant stakeholders)
Encouraging (and in environmentally significant cases, mandating) contracting authorities to procure chemicals as-a-service rather than a good	Reduces material and administrative costs for public entities (hospitals, schools etc.) Profit opportunity for chemical companies and service providers (such as cleaning companies)	Reduces material consumption and the amount of waste and hazardous. waste Improves waste management	Medium-High: Mandatory consideration of the service against environmental criteria facilitates resource-efficient solutions, provided sufficient support and monitoring mechanisms/capabilities exist In non-mandatory cases, low-medium effectiveness; Can be increased if supplemented with specific or general instruments (e.g. resource efficiency targets, etc). Solutions can be replicated in the private sector	Medium-High: Where mandatory, there is high effectiveness, but may entail investments in building capacity (administrative costs include contract development, monitoring) For non-mandatory cases medium: low cost but with low-medium effectiveness	Medium Contracting Authorities: Neutral: outcome positive, but requires changes in the administrative practices of procurement process PSS Providers: Highly desirable Chemical Suppliers (if not also offering servicised solutions): depends on impact on sales Taxpayers: High desirability; more efficient use of public resources / tax
Tax incentives for Chemical Leasing	Government: Incentives represent economic cost. Users: lowered costs; benefits can trickle down to end consumers Increased demand for servicized solutions can increase profitability of CHL providers, but additional administrative costs to comply with the tax criteria	Reduces chemical use and environmental impacts associated with production and use of chemicals (eg. health and safety risks from hazardous chemicals, reduced waste, eutrophication from waste water, etc.)	Medium Reduced rate creates greater incentive to move to CHL (a service model) and in turn comply with and verify compliance with environmental criteria Tax incentives can create possible macro rebound effects in the economy Possibility for tax fraud	Low-Medium Administrative cost for taxing authorities and overall environmental impact (long-term) may be negated by rebound effects or fraudulent claims Potential free-riding effect	PSS providers: Moderately desirable (depending on how tedious the criteria are for the incentive and how to demonstrate compliance with this criteria) Chemical suppliers (if not also offering servicised solutions): Undesirable Users: High, as this will lower their costs

6 Environmental Claims

6.1 Introduction

In the Inception Impacts Assessment of the 'Legislative proposal on substantiating green claims' EU Commission gave the following description of problems related to misleading environmental claims (EC 2020d):

> *"There is a proliferation of methods to measure and assess environmental impacts and a proliferation of labels and claims related to environmental information, which goes hand in hand with a proliferation of misleading environmental, including climate-related, claims. There are currently 457 voluntary environmental labels worldwide and even more environmental claims, which are often poorly defined, explained and understood, and underpinned by non-comparable methods to measure and assess environmental impacts. In the EU, over 100 labels are active. This multiplication of methods and labels/claims makes it difficult for market actors (consumers, businesses, investors, public administrations) to identify and trust environmental claims.*
>
> *The number of misleading claims remains also significant. Three in ten citizens have come across exaggerated or misleading statements on the effect of products on the environment. This limits the uptake of truly green products and, hence, leads to missed opportunities for developing a circular and green economy."*

It is clear that reliable and comparable environmental information about products is urgently needed both for eco-design in producing companies (e.g. in Nordic countries: Salo et al. 2019) and for the demand side, i.e. companies as clients, public procurers and private consumers (Nissinen et al. 2019, EC 2020b: 5, Suikkanen & Nissinen 2020). The number of unverified environmental claims is rapidly increasing. Regarding textiles, for example Palm et al. (2019) found 56 ecolabels for textiles in the Nordic countries, and 37 of them were self-claimed ones with-out verification. In the sweap conducted by European authorites in November 2020, "59% of cases the trader had not provided easily accessible evidence to support its claim" and "in 42% of cases authorities had reason to believe that the claim may be false or deceptive". The sweap ranges a variety of product categories, but is not representative set of companies or claims and thus may be subject to selection and other biases. Still, the result is alarming: potentially half or even more of environmental claims at the European market are misleading. Statistics or research on the amount and qualities of environmental or circularity marketing are not available. Yearly, well over a

billion euros (Statistics Finland 2021) is spent on advertising alone (covering only fraction of the costs of marketing). It is not known what is the value of environmental or circular advertisement, or which product categories are most advertised. And importantly, there is not a representative or systematic on-going market sweeping on this matter.

Possibly misleading claims ruin fair competition and seriously weaken the basis for honest eco-design and companies' strive for better products. They also destroy the possibility of consumers to make well-informed choices and erode their confidence in product information and in all marketing. As a result of all this, the market mechanism does not function as it should for Europe's intention to become world leader in the circular economy and make Europe a climate neutral continent by 2050. (EC 2021a)

The EU Commission (EC) declared in the New Circular Economy Action Plan (EC 2020b) that it will propose obligation to companies to substantiate their environmental claims using Product and Organisation Environmental Footprint methods (PEF and OEF). The Commission will test the integration of these methods in the EU Ecolabel and also include more systematically durability, recyclability and recycled content in the EU Ecolabel criteria. The rules for making PEF analysis are found in the PEF guidance (EC 2018b) and product-group- specific PEF Category Rules (PEFCRs). At the moment the PEFCRs exist for 20 product groups, and 5 are under development.

Product Environmental Footprint (PEF) indeed has many properties that increase the consistency, accuracy and comparability of the results compared e.g. with 'stand-alone' Life Cycle Assessments (Nissinen et al. 2019). It offers a good information basis for product policy instruments, but many aspects have not been finished yet. It is important to continue the development of the method (especially adding impact class for biodiversity), to implement a trustworthy verification, to start the organisation of the PEF scheme, to provide support to potential users and especially SMEs, and to invest in efforts to rapidly increase the number of product and service groups with PEFCR and actual product-specific PEF reports (Nissinen et al. 2019).

The EC has presented four options for managing and further development of PEF, see more in Chapter 6.4.

6.2 Legislation and other rules about self-declared environmental claims

Unfair Commercial Practices Directive

The Unfair Commercial Practices Directive (UCPD; 2005/29/EC, amended by 2019/2161) and the amended Consumer Rights Directive (2011/83/EU, amended by 2019/2161) provide the legal basis to ensure that traders do not present environmental claims in ways that are unfair to consumers. Companies must give furnish adequate evidence to justify any self-declared green claim, if requested by the market surveillance authority or court.

But so far the UCPD directive and the related guide (EC 2016b) do not give very detailed rules or guidance about misleading environmental claims[63]. The guide mentions that LCA or the Type 1 Eco-label can prove excellent environmental performance so a general benefit claim can be presented. Regarding LCA, it should be made according to recognised or generally accepted methods applicable to the relevant product type and should be third-party verified.

Standards about eco-labelling and claims

Three types of eco-labelling are defined in the standard ISO 14020:2000. These are type 1 eco-labels (e.g. EU Flower and Nordic Swan), self-declared environmental claims, and Environmental Product Declarations (EPDs). Type 1 eco-labels and EPDs have their own schemes and structures for defining and verifying the relevant characteristics and controlling the presentation of the information. Self-declared environmental claims do not so far have similar definitions and controls.

Self-declared environmental claims, i.e. type 2 environmental labelling, are defined in the standard ISO 14021:2016. According to the standard, self-declared environmental claims may be made by manufacturers, importers, distributors, retailers or anyone else likely to benefit from such claims. They may take the form of statements; symbols or graphics on product or package labels, or in product literature, technical bulletins, advertising, publicity, telemarketing or marketing in electronic media. The standard focuses on the assurance of the reliability of the claims.

It is worthwhile to note also the new standards about circular properties of products (see chapter 4.1.2 Standards). They could in principle guide in making appropriate claims.

63 As announced in the New Consumer Agenda of November 2020, the Commission will update the guidance documents on the Unfair Commercial Practices Directive and the Consumer Rights Directive by 2022 (EC 2021d).

Green claims and PEF

According to the EC recommendation on the PEF (EC 2013a), there was no EU legislation specifically harmonising all green claims and marketing in 2013:

The EU has regulated the use of claims by either requirements in specific legislation regulating different types of products performance (such as for example the Energy Star Regulation); or by setting general rules for preventing misleading environmental claims, leaving to national authorities the task to interpret and enforce them on a case-by-case basis as provided for by the Unfair Commercial Practices Directive (UCPD). In the context of the implementation of the UCPD, in 2009 the Commission has issued specific guidance to promote the use of clear, accurate and relevant environmental claims in marketing and advertising. The Commission intends to provide further guidance in this respect, to ensure an adequate and uniform enforcement in Member States.

Since 2013, EU Commission has led the development of PEF as a tool for verifying green claims (EC 2021b). PEF has been presented as a central tool in the Action Plans for Circular Economy (EC 2015, EC 2020b) and in the initiatives for sustainable product policies (EC 2019a, EC 2021c).

Consumer Protection Act and guidance

National Consumer Protection Act (1978/38) is a tool to assess the appropriatness of a claim towards circularity or the environment. 6 § prohibits to give untruthful or misleading information, especially among other qualities on the following: properties of a product, it's origins and impacts of use, it's repairability and risks. Further 3 § states that marketing must not lead the consumer to make purchasing decision which (s)he otherwise would not make. In addition to 3 § and 6 §, the following selected parts may have relevance regarding the environment or circularity. According to 2 § marketing should not be in conflict with universal or common values at the society especially it should not attract or be accepting or encouraging to harm the environment or human health without an appropriate basis for such action. 7 § states that any relevant information should be given to the consumer, especially information regarding the consumers health and safety.

The Finnish Competition and Consumer Authority (FCCA) has published guidelines for companies on environmental marketing (FCCA 2019). The guidelines are based on consumer protection legislation and legal praxis. According to the guideline, 1) the claimed environmental benefits need to be essential, 2) communication needs to be clear, 3) overall image matters and it needs to fact based, 4) general environmental superiority can only be claimed-made if all lifecycle impacts have been found outare known and 5) comparisons should only be made to similar the same product categories. Also e.g. in the UK, in the USA and in Australia there are guidelines published by the authority over-seeing

the market (Niemistö et al. 2021). In Sweden, Consumer Agency has made it clear, that compensations and carbon/climate neutrality claims should be well explained so that it is clear what is being calculated and done – even if the claim itself was true, it is not enough alone (Konsumentverket 2021; Rogelj et al. 2021).

International Chamber of Commerce has provided a somewhat detailed Framework for Responsible Environmental Marketing covering good practices regarding many circular economy terms (e.g. compostable, designed for disassembly, recovered energy and more) along with general guidelines. (ICC 2019.)

6.3 Present market surveillance

National authorites may cooperate and share information via consumer protection cooperation (CPC) network if widespread and major infrindgements of consumer affect consumers' interests at EU level. A competent authority in a Member State should at least alert other Member States and the Commission if it suspects an infringement is taking place also at some other Member States. (EC 2017)

A coordinated action in major cases is possible. But supposingly such cases demand vast resources not only from the Member States but also from the Commission as coordinator. The emission scandal of private vehicles is an example of the level of coordinated action regarding the environment that has previously taken place.

Due to prioritizing and interpretation reasons and differing national consumer protection legislations a same claim by a company operating on the EU market may be questioned in one Member State, but dealt with in a *laissez faire* manner in another.

Each Member State conducts market surveillace separately in majority of the cases. In Finland, overseeing of environmental and circular claims (as part of overseeing all misleading claims) is done by Consumer Ombudsman which operates within the FCCA. Both the Consumer Ombudsman and FCCA have also numerous other duties.

Competence of Consumer Ombudsman is restricted to oversee only claims made by companies to consumers. Claims by interest groups are not supervised, even if seemingly aimed to convince consumers the environmental superiority of certain type of products or a product category (Tamminen 2019).

Claims by companies to other companies within the product chain are not supervised. Suppose a circular improvement in reality that is made by a subcontractor at an early stage of a product chain. Then only the claim(s) made at the end of the chain directly

to consumers sales are supervised by an authority. The burden of verification lies at the end of the product chain. , This is reasonable to preventsellers to put the blame on some of the numerous subcontractors. But in some cases this logic potentially burdens small businesses redundantly and may even hinder small businesses to promote their circularity. A small business probably doesn't have the resources to deeply verify e.g. the true environmental superiority of recycled or durable materials it uses as a part it products. Then the small business faces a dilemma: wheter to believe the subcontractors claim ans pass it as such to consumers or (if in fear of sanctions) not to claim the improvent at all.

The web has in many respects changed how claims and marketing is conducted. Sharing of detailed circular and environmental information is possible and in many cases desirable to address the qualities of a claim. Adverstisement increasingly takes place in the web: web advertising's share of total advertising was one fourth in year 2015, more than one third in 2018 and nearly half in 2020 (but 2020 may have been exeptional due to covid-19 pandemic). In particular, the rise in web marketing has taken place in social media and as search engine marketing. (Official Statistics Finland 2021a). Advertisement in web uses profiling, not only selecting which ads will be shown to the current user profile but also what kind of ads/claims. The same company can make a totally different claim for different user profiles (Merrill 2021), which increases the complexity of observing not only what claims exist at the market, but also substantiaiting whether a particular claim gave all essential information on circularity and the environment to that particular consumer.

The Web enables not only numerous stores which claim to sell ecological or more circular choices, but also c2c and b2c specified market places or platforms. These platforms act as middlemen for sellers, buyers or "sharers" and renters, e.g. Ecompi which claims to require certain criteria from the sellers to be fulfilled and e.g. Franckly, which is a 2nd hand market place for design offering ease, qualifications and security in deals. Sometimes it is not evident which body would be responsible of the claimed more circular choice with less environmental impacts. But as the claim is by a company/-ies to a consumer, the Consumer Ombudsman is compentent anyway. However, platforms may make interpretation of the consumer legislation challenging. Moreover, some of the sharing platforms operate in many Member States and thus require cooperation via the CPC network.

Overseeing of circular and environmental claims differs from overseeing marketing claims in general. It is demanding to observe and substantiate overall environmental benefits of a product. The inspection and analysis demands interdisciplinary expertise. In reality, a single quality may be claimed, e.g. recycled content or carbon dioxide emissions, but that quality is perhaps not at all relevant or essential if all environmental impacts of the product are regarded. Thus, there would be a need to substantiate the claim as part of assessing overall environmental impacts. Sometimes the environmental superiority may be evident without any substantiation (e.g. 2nd hand selling of decades

old muscle-powered machine delivered to the consumer by bike), but these cases are probably exceptions.

Some of the present claims regard company goals or promises that take place in the future, include pictures or logos hinting a mental image, include vague terminology or present a big company as a whole as "green" because of smaller circular actions it is engaged in; some of these features characterize only environmental claims.

Some particular aspects of circularity (i.e. recycled content, recyclability, resource efficiency) may be interpreted always as claiming an environmental improvement. Therefore, the essentiality of the claimed environmental improvement would need to be analyzed and substantiated. But in some other circular aspects (namely durability, reparability, items sold 2nd hand, leasing and sharing) the product may primarily offer some other benefits for the consumer (e.g. providing a quality product, saving money and time) and thus would perhaps not need to substantiate their environmental superiority. But even in these circular cases at least some consumers might consider the environmental benefits also important factor in purchase decision. Further studies of consumer perspections and choices are needed in this matter.

6.4 EU Green Claims Initiative

In the New Action Plan for Circular Economy (EC 2020b) the EU Commission declared that it will propose that companies substantiate their environmental claims using Product and Organisation Environmental Footprint methods. When introducing the Green Claims Initiative, EC further remarks: "It is important that claims on the environmental performance of companies and products are reliable, comparable and verifiable across the EU. Reliable environmental information would allow market actors – consumers, companies, investors – to take greener decisions." (EC 2021a)

Product Environmental Footprint is a key tool in the initiative. Input regarding potential future uses of the Environmental Footprint methods has been gathered through various channels (EC 2020e): The final conference of the Environmental Footprint pilot phase (23-25 April 2018); A stakeholder meeting on potential future policy uses of the Environmental Footprint methods (26 April 2018); Targeted online consultation addressed to businesses and business associations, investors and financial institutions, public administrations and international organisations, NGOs and method/ initiative owners (12 November -18 December 2018); A section of the public consultation on a product policy framework for the circular economy (29 November 2018 - 24 January 2019). The number of respondents for the various channels has been over 1000, but some organisations have answered through several channels.

The following policy options were presented in the Inception Impacts Assessment of the 'Legislative proposal on substantiating green claims' (EC 2020d):

- Baseline: No modification to the 2013 Recommendation and no further action.
- Option 1: Updating the 2013 Recommendation based on the outcome of the 2013-2018 pilot phase.
- Option 2: Establish a voluntary EU legal framework enabling companies to make green claims in accordance with the Environmental Footprint methods, as a complement to existing methods (developed by private or public entities, at national or international level).
- Option 3: Establish an EU legal framework requiring companies making claims related to the impacts covered by the Environmental Footprint methods to substantiate them via the Environmental Footprint methods. When Product Environmental Footprint Category Rules (PEFCRs) or Organisation Environmental Footprint Sector Rules (OEFSRs) have been adopted, green claims should be substantiated on that basis, as they are establishing a more detailed calculation of the environmental footprint. When no such rules exist, claims could be substantiated via a study compliant with the PEF/OEF method.

Regarding policy options, and considering the input from all events and questionnaires, stakeholders who replied to these consultations expressed most support for using PEF by providing requirements on how to communicate on the Environmental Footprint (it is not mandatory to communicate environmental information, but if communicated, these have to comply with specific requirements) (EC 2020e: 82).

EU Commission has organized a series of workshops in 2020, in which it has explained various aspects of the proposals, including e.g. verification, and ideas about the future role of type 1 eco-labels (EC 2021a).

Many benefits can be seen in the Option 3. One can even argue that this is the only Option that would efficiently tackle the diverse serious problems related to unreliable green claims.

However, the role of eco-labels is not clear, and one could consider changing amending the Option to give eco-labels a more specific role: Establish an EU legal framework requiring companies making environmental claims to substantiate them via the Environmental Footprint methods or type 1 eco-labels. One reason for including eco-labels is that many claims do not address directly the 16 impacts classes but deal with aspects that affect them, like packages, and such environmental aspects are often taken into account in the eco-label criteria for various products and services, making then also the assessment of the essentiality of the claim. Another even more important reason is

that type 1 eco-labels like Nordic Swan have a well-established and standardised (ISO 14024) methodology to identify the critical environmental aspects in the life cycle of each product and service category, to develop the criteria that affect these aspects and impacts, and to assess and demonstrate compliance (Suikkanen & Nissinen 2017, Suikkanen et al. 2019). However, it is evident that PEF will soon have an important role in the criteria development, and later also companies applying for the eco-label should do the PEF for the product or service to be eco-labelled.

It is also important to recognize that PEF has been designed to function as an integrate information background to all product policy instruments, and this unified environmental information basis may increase the efficiency of all the product sustainability policies (Kristensen 2019, Nissinen et al. 2019). It can also reduce administrative burden and costs for companies. This applies e.g. to eco-design directive, sustainability reporting, and green public procurement. The more integrated approach is under development in the Sustainable Products Initiative (EC 2021c).

6.5 EU Green Consumer Empowerment

The Empowering Consumer Initiative, managed by DG JUST of the EU Commission, runs simultaneously with the Green Claims Initiative (EC 2020b). It has recognized that consumers lack reliable evidence to contribute to the green transition. And that consumers face untrustworthy information or practices preventing them from contributing to the green transition. It will focus on sustainability claims (more broad than just environment), and specific measures like early obsolescence, and repair. One difference is that PEF would be the tool to substantiate the green claims, and such claims that cannot be substantiated by PEF would be considered under Green Consumer Empowerment.Impact Assessment of sustainability labels is ongoing in parallel with ENV's green claims initiative to ensure coherence and complementarity, leading possibly to minimum requirements for sustainability labels.

6.6 Summary of identified challenges related to environmental and circular economy claims

In summary, we have identified the following challenges that should be addressed. First, there is not enough knowledge about the occurrence, properties and impacts of green claims at the market. Second, more regulation and guidance is obviously needed regarding the claims. Third, to have coherent policy framework, unified methods for assessing environmental impacts of products are required. Fourth, labels can be an

effective tool to help people and purchasers. Some labels are trustworthy, but clearly guidance and rules are needed due to a large number of labels with very different messages and background methodologies. Fifth, the products that have the most harmful environmental impacts should also be focused, otherwise only the ones who try to stand out with low environmental impacts get the extra burdens. Sixth, developing positive approaches, encouraging and guiding to eco-design products are demanded by the companies. Seventh, more resources are needed to the market surveillance, in order to enforce the present and the possibly forthcoming new legislation.

6.7 Recommendations

Recommendations on policy and legislation

1 Develop the information basis:

1.1 Develop a knowledge base on the types of environmental claims (framing, product category etc.) that are the most common and the most misleading to consumers. Use this information to develop the rules, guidance and interpretations under the Consumer Protection Law. Cooperate, compare and exchange results internationally, making use of the existing forums.

1.2 **Define which products create the most severe environmental impacts** and have properties that are major obstacles for circular measures to focus the regulation of claims on them.

2 Strive for 'an **EU legislative package' that obliges companies to substantiate their** claims about the circular or other environmentally superior qualities of their products against the PEF-methodology or type 1 eco-labels:

2.1 For market surveillance purposes, **clarify which circular economy -related or other claims are environmental. If environmental, they should be verified against PEF** (if applicable) or type 1 eco-labels; if not, they are verified against UCPD and general consumer protection legislation.

2.2 **Require third party verification for impact assessments and claims**. This means third-party audit/verification based on PEFCR in PEF scheme, third-party audit/verification based on PCR in EPD scheme, third-party

critical review (in use for LCAs and Carbon Footprints), type 1 eco-labels, and other *reliable* third-party verifications.

2.3 **Ensure that market surveillance authorities**, and e.g. environment NGOs and consumers **can review and verify themselves** the reports and calculations supporting the claims. For instance, require the evidence (e.g., a PEF study report) to be publicly available, or stored into a register/ database managed by the European Commission or an authorized entity. Publishing merely the results is not enough for a well-functioning market.

3 Support the ongoing work to integrate PEF as the unified basis of all product policy instruments, such as the green claims initiative, eco-design directive, eco-labelling, green public procurement, sustainability reporting and the taxonomies for sustainable finance. **Of the policy options on claims and PEF proposed in the Green Claims Initiative, we recommend the option "Legislation on Green Claims", in a *slightly amended form***: "Establish an EU legal framework requiring companies making environmental claims *about products* to substantiate them **based on the *Product* Environmental Footprint methods *or type 1 eco-labels.***"

4 Prepare an official guideline on 'the label jungle':

4.1 Endorse type 1 **eco-labels** like EU Flower and Nordic Swan as a well-established and standardized (ISO 14024) methodology to demonstrate compliance with critical environmental aspects over the life cycle of each product.

4.2 Consider labels as claims and apply legislation on them. Assess official verifications, at least for the most common labels. Clarify, whether it is the issuer of the label, the seller or the manufacturer of the product that is responsible for the claim.

5 There is a risk of increasing the administrative burden for marketing products which verifiably have smaller environmental impacts, while products with high environmental impacts could be sold and advertised unhindered. The products that create the most severe environmental impacts and have properties that are obstacles for circular measures should be defined. **Any marketing about these products deserve further analysis from the viewpoint of the following requirements:**

5.1 consider the **environmental impacts** of the avoidably linear or most polluting products as **essential product information** that must be **given to a consumer before the purchase**.

5.2 consider prohibiting the advertisement of the most polluting products by virtue of e.g. a wider interpretation of essential product information when applying Consumer Protection Law and UCPD.

5.3 consider mandating the circular, or otherwise most environmental, choice as the default option when the seller has products with significantly different environmental impacts on offer, especially if the seller has **preselected** the options.

Recommendations on resources and guidance needed

6 Guide businesses on how to communicate circularity and other environmental improvements in their marketing, and promote the creation of environmental information tools for businesses. Availability of tools to deliver supply-chain-specific circular economy and environmental data on suppliers and components is crucial. PEF offers the possibility to use secondary data from databases, but tools to deliver production-chains-specific environmental information are important.

7 Add permanent resources in **market surveillance** and **enforcement tackling** environmental claims:

7.1 National market surveillance – currently most environmental claims are extremely demanding to verify. The responsible authority (the Finnish Competition and Consumer Agency FCCA), oversees all consumer marketing and has various other duties. It does not have the scientific personnel or resources to buy the expertise to verify the "scientific soundness" of environmental or circular economy claims. Appropriate, **interdisciplinary expertise is thus called for**.

7.2 Increase **cooperation among the EU Member States regarding environmental claims**, both through the CPC network and as coordinated actions. Pooling sufficient resources together is potentially more efficient than each state carrying out similar actions separately. More cooperation and coordination would unify the European market from the current heterogenous situation in what claims are regarded misleading.

6.8 Preliminary impact assessment for key recommendations

The expected impacts are assessed in the chapters describing proposed policy instruments and their modifications. In the table below we aim to summarize these impacts and assess effectiveness, efficiency and acceptance of these instruments.

	Expected economic impact	Expected environmental impact	Effectiveness	Efficiency	Acceptability (for the relevant stakeholders)
EU-level legislative package which mandates that environmental claims be verified against PEF or Type 1 eco-labels.	Overall positive: supports growth and fair competition. Companies making claims: initially new PEF methods and ISO-labels a cost; later a saving when harmonisation levels playing field and multiplicity of methods reduced, especially in cross-border trade.	Promotes genuinely environmental aspects in designs and manufacturing of products, and in supply chain collaboration. Facilitates private and public (procurement) consumption of sustainable circular products due to identification of more environmentally friendly options.	Medium: voluntary, but promotes green design and manufacturing across product categories.	Medium: medium cost + medium effectiveness Public administration: Medium costs for creating and monitoring PEF and labels. Market surveillance: Clear rules and guidelines decrease costs. Business: initial costs turn into increased efficiency by focusing on relevant factors and easy-to-use calculation tools.	Citizens: desirable (clearer information) Compliant companies: desirable (initial cost but levels playing field; competitive advantage; harmonises processes) Laggards: undesirable (competitive disadvantage)
Communication Guides and other tools on Claims for businesses	Small-moderate costs on public administration from producing, updating and disseminating material. Decreases companies' costs in searching and using claims.	Promotes genuinely environmental aspects in designs and manufacturing of products, and in supply chain collaboration. Facilitates private and public (procurement) consumption of sustainable circular products due to identification of more environmentally friendly options	Medium: voluntary, but promotes green design and manufacturing across product categories. High, if reaches industrial associations, students, and professionals.	High: small investment in education and guidance + medium effectiveness.	High Companies: desirable to have more education and guidance.
Permanent resources in market surveillance and enforcement	Moderate cost on public funds to ensure sufficient personnel. Compliant companies: increased profits as competitive position enhanced and free riding avoided across European common market. Laggards: profits on unfair claims lost. Consumers: cost of false claims removed.	Promotes genuinely environmental aspects in designs and manufacturing of products, and in supply chain collaboration. Facilitates private and public (procurement) consumption of sustainable circular products due to identification of more environmentally friendly options.	Moderate-high: depending on the amount of resources and sanctions, unfair claims can be reduced considerably.	Moderate-high: small cost + moderate/high effectiveness.	High: Compliant companies: desirable (level playing field; no free riding). Consumers: desirable not to be misguided. Laggards: undesireable.

PART III: CONCLUSIONS

7 Summary and key recommendations

7.1 Summary

The circular economy (CE) has been proposed as a response to the prevailing unsustainable economic model and it has become one of the top policy priorities in Finland and the European Union more broadly. Policy makers in Finland and the EU share the goal of the development of a circular economy in which value of products and materials is retained in the economy, waste generation is minimised and the material loops are closed through recycling. Moreover, the 2020 CE Action Plan shifted the emphasis between these general objectives from waste legislation towards the development of sustainable product policies. This report therefore set out to analyse instruments to promote the objectives of a circular economy through the specific lens of product policies.

The 2020 CE Action Plan proposes a renewed, broader sustainable product policy regime for the European Union. The Commission is preparing a new Sustainable Products Initiative, complemented by a wide range of other policy actions on products (EC 2020c). To provide [instructive] perspectives on the integration of circular economy objectives into product policies, the first task for the research team was to choose which instruments to analyse in detail. Indeed, the selection process leading to the studied instruments (the Ecodesign Directive, Extended Producer Responsibility, Product-Service Systems and Environmental product claims) reflects the central conclusion of the project: the sustainable circularity of products is governed by a rich palette of tools. A closer look at the policy instruments showed that, on the one hand, there is clearly a need and potential to further improve the existing product policy instruments, while on the other hand, there is a also a demand for new instruments. Overall,

> *It is vital to develop a robust scientific understanding on the environmental impacts of such tools and to develop the palette into a coherent policy regime.*

We revert to these cross-cutting observations after we have described our recommendations on the six instruments under research.

7.2 Key recommendations on specific instruments

We have identified many opportunities, on the basis of which we have made recommendations, for the advancement of circular product policies in Finland. This section highlights the core recommendations from Chapters 3-6 on individual policy instruments. For complete lists of the recommendations, please see the end parts of the respective Chapters. Four themes can be seen in these recommendations:

- Increase understanding with better and more data and analysis
- Measures to raise awareness and to test policies
- Proposals for enacting and implementing policies
- Provision of resources to support essential actions

These themes order the recommendations in ways that resemble in broad terms the classic policy cycle. The alignment with the policy cycle is partial, because the researched instruments apply to rather different phases of the policy cycle; we identified both a need and opportunity to update existing product policy instruments to promote a circular economy, but also a demand for completely new instrumens to do so. The phases in the policy cycle in any event support one another. Defining first of all what is an environmentally sustainable circular policy is often a very demanding endeavour. Therefore, the importance of a robust informational basis is the starting point in all four areas, a finding that re-emerges in the cross-cutting recommendations. Second, many products in contemporary societies are the outcome of extremely intricate economic, material and also environmental connections. Regulating such complexities is itself very demanding and requires resources. It is also usually pertinent to compare and test the regulatory instruments, before making final decisions about them. And once implemented, the impacts of the policies need to be measured, leading back to adjustments in the policies. Hence, the four types of recommendations: analysis, testing, policy choice, and the resources for implementation.

7.2.1 Ecodesign

1 **Develop the information basis**

1.1 **Study the potential conflicts between different requirements** (energy/material/durability/repairability etc.) in the regulations that apply to product groups throughout their life cycle and assess ways to overcome identified incoherencies.

1.2 **Investigate penalty fees** as a more (eco-)efficient deterrent against environmentally non-compliant products.

1.3 **Study the creation of EU digital product passports** and the information that they would include (products' origin, composition, material content, recyclability, etc.).

2 **Reserve resources for national actions in Finland**

2.1 **Reserve enough resources especially for the Ministries, Energy Authority and the market surveillance authority Tukes** to enable active participation in the preparation of the Ecodesign requirements, strengthen coordination and information exchanges between Member States, develop and use expertise on Ecodesign, and spread information among stakeholders.

2.2 **Establish a joint databank for Finnish companies** with sector-specific information that is easy to use in collaboration with authorities, companies and research institutions. The databank should consider the current mandatory Ecodesign regulations and their minimum requirements and methodologies, regulation under preparation and supplementary information on research results on environmental impacts and market demand in an easily accessible form. Ekosuunnittelu.info could provide a basis for the joint databank.

3 **Promote Ecodesign in the EU Recommendations for EU actions**

3.1 **Support research and industry to study measures for new product groups** to broaden the scope from energy-using to energy-related product groups in line with the Directive and potentially to non-energy-related products in alignment with the Circular Economy Action Plan. Utilize Finnish expertice.

3.2 **Support the development of the Ecodesign Directive in setting requirements and preparation of measures**. Support setting stricter minimum requirements on a regular basis to incorporate the essential Circular Economy requirements into the Ecodesign Directive. Support the preparation of minimum requirements for specific circularity aspects on product group level in a close interaction with stakeholders.

For the complete list of recommendations on Ecodesign,
please see end of Chapter 3.

7.2.2 EPR – Ecomodulation

1 **Develop the information basis**

1.1 **Mandate provision of data and *ex post* policy evaluation**. Data from PROs on the number of bonuses sought & granted, penalties imposed, by producer and product is necessary to conduct policy evaluation. This should be augmented by detailed case research on impacts of eco-modulation on ecodesign.

1.2 Find opportunities to design and evaluate eco-modulation considering actual environmental—biophysical--impacts.

2 **Apply a measured approach on eco-modulation**

2.1 **Prioritize harmonization** in the choice of eco-modulation objectives, criteria, and fee structures across Member States and other policy areas where possible to make the incentives for eco-design arising from eco-modulation more effective.

2.2 **Implement eco-modulation one step at a time** and consider **strategic delay** in the implementation of some aspects of eco-modulation. Policies are evolving, experimentation is taking place, and physical and market changes are occurring globally. **Monitor developments** and "piggy-back" on the innovations of other countries on ecomodulation —and any hard lessons learned. This allows Finland to focus on key issues as well as avoiding the cost of development of novel eco-modulation structures and policy lock-in.

2.3 **Use regulatory "sandboxes".** Policy experiments, framed as such, provide an opportunity to assess policy outcomes without the institutional challenges of lock-in and shed light on potential market response. Choose **"no-regrets" options** that will remain useful even if other aspects of eco-modulation change.

3 **Apply specific eco-modulation rules on packaging**

Increase granularity of product and packaging categories for calculation of EPR fees to increases incentives for recyclability, as strongly recommended by the Commission. **Charge EPR fees for reusability only on first use of packaging**. This will reward such packaging without development of new and elaborate fee structures.

For the complete list of recommendations on EPR – Ecomodulation, please see end of Chapter 4.2.

7.2.3 EPR – Online sales

1 **Develop the information basis**

1.1 **Find ways to get data.** Information about the nature and extent of free riding is needed for the formulation of effective policy.

1.2 **Support efforts to amend the EU Digital Services Act** to allow more leeway in the imposition on online platforms of data provision requirements mitigating the barrier created by the strictures of Article 15 of the E-commerce Directive. Seek **amendments to adjacent EU environmental law** (e.g. WEEE Directive) to ensure necessary data exchanges between environmental and other branches of administration, including taxation and customs. (See "Piggy-backing" below.)

1.13 Pursue **second-best sources of data** including provision of the seller EPR registration details by platforms to authorities, potential use of parcel deliver companies as data sources, periodic audits of online platforms, and mandated occasional provision of detailed data by platforms.

2 **Apply a cross-EU approach on online sales**

2.1 Prioritize opportunities for harmonization of EPR obligations and reporting (e.g., across MSs) to reduce (administrative) difficulties and cost of compliance. This will also reduce free riding, especially among SMEs. **Combine producer registries**. Centralization of information about producers subject to EPR facilitates tracking and enforcement domestically and in cooperation with other nations.

2.2 Look for **piggy-backing opportunities for data and enforcement.** Investigate whether the VAT could be used either to systematically provide information on EPR requirements to producers, to generate data useful to understanding patterns of non-compliance, and/or to facilitate registration of producers. Customs, trading and other tax systems may also provide opportunities for piggy-backing detection or enforcement. **Monitor German efforts re platform verification of EPR participation**. Less aggressive than treating platforms as producers, this use in Germany of control over market access by producers may offer an important, middle ground and systematic approach to online free riding.

3 **Update requirements on online platforms and producers**

3.1 **Impose seller-facing communication requirements on online platforms**. Monitor the deeming of online platforms as producers for the purposes of EPR, while mandating systematic provision of information about EPR obligations by platforms to producers.

3.2 Create **more enforcement capabilities and powers** including increased participation in the European WEEE Enforcement Network (EWEN) & related enforcement networks. Increase enforcement opportunities by changes in law that facilitate streamlined and reciprocal action with other countries. Create a right of private action for compliant producers to identify and sue free riders.

For the complete list of recommendations on EPR – Online sales, please see end of Chapter 4.3.

7.2.4 PSSs – Car sharing

1 **Develop the information basis by supporting further studies to obtain robust understanding on** the impacts of car-sharing on sustainable circular economy. Studies are required in particular on **profiles** and **behavioural patterns** of car-sharing users, **types of car-sharing** services being used (free-floating or station-based), and car-owners **and fleet types** (emission performance) and how they can optimally support the objectives in 2 below.

2 **Test targets for car-sharing in transport strategy.** In areas where car sharing seems viable, local governments should establish and test car sharing targets and strategies based on three parameters: 2.1) reduced numbers of vehicles, 2.2) lower vehicle-kilometres travelled and 2.3) increasing share of low-emission vehicles. The role of car-sharing in the overall transport strategy should be stated as a part of the mobility hierarchy.

3 **Consider Car-sharing in Public Procurement.** Public Procurement can be used to generate awareness on car sharing whilst supporting innovative and sustainable mobility solutions. The government can set a target date by which it becomes mandatory for contracting authorities to consider car-sharing as an option when procuring mobility, and to justify its decision if it procured vehicles rather than subscribed to a car-sharing service.

For the complete list of recommendations on PSSs – Car sharing, please see end of Chapter 5.4.4.

7.2.5 PSSs – Chemical leasing

1 **Develop the information basis by conducting further life-cycle studies on CHL to determine the** potential of chemical leasing as an environmentally-sound resource efficiency policy. The system boundaries of the assessments should cover the entire value chain and all essential environmental impacts of this service-based business model.

2 **Build and disseminate best practices and awareness on CHL**, inter alia by testing approaches and benchmarks, in both the private and public sectors, through pilot projects, public procurement and coordination with the REACH chemical regulation.

3 **Test tax instruments,** leveraging on the scientific and industry data and insights developed in 1 and 2 above, to incentivize resource efficiency in the chemicals sector.

For the complete list of recommendations on PSSs – Chemical leasing, please see end of Chapter 5.5.5.

7.2.6 Environmental claims

1 **Develop the information basis:**

1.1 **Develop a knowledge base on the types of environmental claims (framing, product category etc.) that are the most common and the most misleading to consumers**. Use this information to develop the rules, guidance and interpretations under the Consumer Protection Law. Cooperate, compare and exchange results internationally, making use of the existing forums.

1.2 **Define which products create the most severe environmental impacts** and have properties that are major obstacles for circular measures to focus the regulation of claims on them.

2 Strive for 'an **EU legislative package' that obliges companies to substantiate their claims** about the circular or other environmentally superior qualities of their products against the PEF-methodology or type 1 eco-labels.

3 **Support the ongoing work to integrate PEF as the unified basis of all product policy instruments**, such as the green claims initiative and the eco-design directive.

4 Prepare an **official guideline on 'the label jungle':**

4.1 **Endorse** type 1 **eco-labels** like EU Flower and Nordic Swan as a well-established and standardized (ISO 14024) methodology to demonstrate compliance with critical environmental aspects over the life cycle of each product.

4.2 **Consider labels as claims and apply legislation on them**.

5 **There is a risk of increasing the administrative burden for marketing products which verifiably have smaller environmental impacts**, while products with high environmental impacts could be sold and advertised unhindered. The products that create the most severe environmental impacts and have properties that are obstacles for circular measures should be defined. Any marketing about these products deserve further analysis.

6 **Guide businesses** (especially SMEs) on **how to communicate circularity** and other environmental improvements in their marketing, and promote the creation of environmental information tools such as PEF for businesses. Tools to deliver supply-chain-specific circular economy and environmental data on suppliers and components is crucial.

7 Provide ongoing resources in **market surveillance** and **enforcement** tackling environmental claims:

7.1 Provide the **resources for** appropriate, interdisciplinary expertise **for national market surveillance** (the Finnish Competition and Consumer Agency FCCA) in the very demanding task of verifying the scientific soundness of environmental claims.

7.2 Increase and support **cooperation among the EU Member States** regarding environmental claims, both through the CPC network and as coordinated actions.

For the complete list of recommendations on Environmental claims, please see end of Chapter 6.

7.3 Cross-cutting recommendations

While the recommendations above are specific to the instrument at hand, we have also identified [two] cross-cutting themes that deserve attention.

7.3.1 The lack of robust ex post analyses

First of all, it is striking that despite the massive attention on the Circular Economy, there seem to be surprisingly limited analyses on the impacts of the policy instruments. Particularly noteworthy is the lack of *ex post* studies on the bio-physical, economic and behavioral impacts of the policies.

Recommendation: We thus urge measures for the systematic collection of data and rigorous ex post analysis of the impacts of circular product policies in order to maintain a science-based approach to policymaking.

7.3.2 Multi-dimensional policy coherence

We also identify in all of the studied areas a clear need to pay close attention to policy coherence. In fact, the need for coherence is relevant in multiple ways; there are at least four dimensions to coherence in sustainable circular product policies.

7.3.2.1 Coherence of measures between the EU Member States

The integration of Circular Economy considerations into product policies is a new area of policy-making that raises considerable interest among the industry and consumers as well as the civil society at large. The wide range of national activities that is taking place does thus not come as a surprise. Still, while potentially beneficial, they also entail a great risk of fragmentation and conflicting incentives and programmes on the EU and even global markets. Fragmentation in turn reduces the effectiveness of efforts to advance the CE, both economically and environmentally.

Recommendation: while acknowledging the usefulness of policy experimentation, we urge the EU Member States to prioritise harmonisation and policy coordination in the final policy solutions.

7.3.2.2 Coherence across different policy instruments

The circular aspects of any given product typically fall within the scope of many different policy instruments. If the policy instruments set diverging requirements on the product, their coherence is compromised. Because the number of different product policy initiatives and tools is rapidly increasing in the coming years, questions of policy coherence, and their credibility, comprehensiveness and comprehendibility are becoming even more topical (Rogge and Reichardt 2016).

Recommendation: Before regulating, appraisals should be conducted on both the existing and proposed policy instruments, as well as their combinations. Policy areas beyond the mere environmental (and circular) product policies also have an impact on products, and should thus be kept in mind in the assessments. Issues of coherence can be addressed through more horizontal policy frameworks that collect and coordinate the instruments, and through processes that integrate these instruments and the relevant actor networks in a systematic and synergistic fashion.

7.3.2.3 Coherence across knowledge production

The regulatory burden caused by cumulative policy interventions within the field of circular product policies is not only a question of different instruments, but also of the different knowledge production requirements connected to the instruments.

Recommendation: Diminish the burden of diverse knowledge production requirements by establishing standard, or at least similar, methods (such as Product Environmental Footprint Category Rules) and streamlined knowledge requirements where possible and appropriate.

7.3.2.4 Coherence across environmental impacts

Framing the governance of the qualities of products as "circular economy policies" has had the tendency of pushing the environmental aspects of products to the background. Further, the environmental considerations of circular policies are not limited to the material efficiency considerations, but extend to impacts on the climate, biodiversity and across environmental media.

Recommendation: Ensure that in all policy initiatives the Circular Economy or "circularity" are considered a means to an end; the environmental and other sustainability considerations need to remain at the core of the policies.

Annex 1. Experiments with product policies to enhance circularity

While this report has focused on four issue areas, there are many other areas where regulators at different levels of governance are experimenting with policies that, they believe, may enhance a circular economy. This annex provides examples of such experiments that, although not considered within the scope of KITUPO project, are provided here as supplementary background material, especially as related to policies supporting the right to repair and the availability of spare parts.

The right to repair and availability of spare parts

The EC aims to strengthen the consumers' right to repair with legislative and non-legislative measures. The aim of the right to repair is to extend product lifetimes, reduce the amount of waste and offer consumers a possibility to repair their products in an economic way. The right to repair is typically coupled with policies regarding the availability of spare parts. The Commission gives priority to ICT and other electronics and is investigating their potential for disassembly, repair and updates including a right to update obsolete software. (EC 2020b).

Policies mandating the right to repair have been implemented only recently and therefore there is not yet evidence available on its effects.

Existing legislation on Right to Repair

The right to repair would complement the Ecodesign Directive to promote longer product lifetimes (Hernandez et al. 2020). Ten new ecodesign implementing measures include requirements for repairability and spare parts (EC 2019b). The measures will come into force during 2021.

In France, new measures including and related to the right to repair as part of policies against waste and in support of the development of a circular economy have been enacted recently. Two amendments were made to the Consumer Code in 2014 and 2015, prohibiting planned obsolescence and aiming at increasing the repairability of products by requiring sellers to provide information about the availability of spare parts. These measures also require producers to deliver the relevant spare parts. (Dalhammar et al. 2020; Maitre-Ekern & Dalhammar 2019).

In addition, France has adopted a new law against waste and for a circular economy, which includes provisions on repairability in 2020 (LOI n° 2020-105 2020). The law introduces about fifty measures including some new obligations, prohibitions and tools, which aim to change consumption patterns and develop new production methods for companies in order to reduce greenhouse gas emissions and decrease biodiversity loss (Ministry for the Ecological Transition 2020).

Several new measures introduced in the LOI n° 2020-105 aim to provide more information for consumers. Article 13 requires manufacturers and importers to inform consumers about the environmental characteristics of products, such as their repairability. In addition, Article 27 requires manufacturers to provide information for the seller concerning updates which certain devices require in order to remain functional. Article 27 applies to electric and electronic equipment and furniture. Prior to the implementation of this law, manufacturers were not obligated to inform consumers if no spare parts were available for the product. However, from 1 January 2021 onwards, manufacturers and importers are required to provide that information, as well as information about the available spare parts, to retailers. In addition, manufacturers must provide spare parts for the seller or repairer in 15 working days rather than the previous requirement of two months. The Article also enables the use of 3D printing for the repair of objects, however, while acknowledging some intellectual property rights. The law also introduces a repairability index. According to Article 16, the aim of the repairability index is to create a simple visual tool for informing the consumer about the repairability of the product. It gives the product a score on a scale depending on how difficult or easy the product is to repair.

Producers, importers and distributors must provide information for the sellers concerning the repairability of the electrical and electronic equipment. A durability index will replace the repairability index in 2024. The durability index introduces new criteria, such as reliability and endurance.

In addition to the above-mentioned provisions, the LOI n° 2020-105 aims to prohibit practices that have a negative impact on the repairability of the product. Article 25 prohibits all techniques, including software, by which the developer intends to prevent or hinder the repairability of the product outside its own approved channels. In addition, the law prohibits the use of agreements or practices that may limit access to repair services. The law also extends the legal guarantee of conformity from two to 2.5 years.

Maitre-Ekern & Dalhammar (2019) argue that there are two important limitations of the French law. First, it relies on the goodwill of producers to provide information that could alter their business models. Second, it is a one-country approach to enforcing a rule that affects the entire EU market. This may limit its effectiveness.

In the USA, the approach to repairability is a bit different as several states have introduced bills that let independent repairers repair goods that have patents and copyrights. For example, this type of a law has been introduced in Massachusetts for cars. However, many major manufacturers are lobbying against the right to repair for electronics. (Svensson et al. 2018)

VAT deductions for certain repair services and lower taxation on repair work in Sweden

In 2017, Sweden introduced a reduced VAT rate for certain repair services in order to reduce the cost of repair services, increase the demand for such services, and promote domestic employment, especially for the less skilled (Skatte- och tullavdelningen 2016). The reduction lowers the VAT rate from 25% to 12%. The reduction applies to repair and maintenance work on bicycles, shoes, leather goods, clothing and household textiles that preserves the original purpose of the product.

In addition to the VAT deduction, Sweden has had since 2007 a tax deduction for certain repairs and maintenance work carried out at home (the so-called RUT deduction) (Nationalencyklopedin, n.d.). The tax deduction was updated in 2017; since then, the deduction has halved the tax on the work of repair and maintenance services for cleaning, maintenance and washing equipment at home. The deduction is granted for repair services where the product retains its earlier function. The repairer must apply for the rebate.

Dahlhammar et al. (2020) studied the impact of tax rebates by interviewing 22 Swedish repairers. The repairers represented four sectors: shoes, IT equipment, bicycles and household appliances. Just under half of the repairers had noticed an increase in demand for repair services in 2017, when the reduced VAT rate and RUT deduction were introduced. In particular, repairers of bicycles and IT equipment noticed an increase in demand. However, no direct link to the tax deductions was found. Interviewees felt that consumers are not sufficiently aware of the tax cut. In addition, the small price difference between repair and new products, low prices of new products, poor product quality, and unrepairable product designs discouraged or reduced repairability. Interviewees thought that customers are more likely to repair higher quality and more expensive products, such as household appliances or high-quality shoes, where the repair price relative to the purchase of a new product provides an incentive to repair. Some interviewees were afraid that the tax reduction would increase competition between repairers and thus temporarily weaken existing repairers.

At the time of the interviews, two years had passed since the Swedish VAT rate reduction, which means that the change may not yet have been noticed. The Swedish government has also proposed a "Hyper tax" deduction for product rentals, second-hand products and

repair services (SOU 2017). Dahlhammar et al. (2020) therefore recommend extending the tax deductions to new product categories, spare parts, repairs outside the home and raising consumer awareness of the possibility of tax deductions. Although the VAT rebate is primarily an economic instrument, Dahlhammar et al. argue that it has the potential to influence people's awareness of repair services in particular.

Liability for defects, guarantee and warranty in Finland

In Finland, there is no specific time limit for liability for defects. The duration of the liability for defects is determined separately on the basis of the characteristics of the product. Chapter 5 of the Consumer Protection Act (38/1978, KSL) provides rules on the statutory guarantee for defects and the provision of a voluntary warranty. The Commercial Code (355/1987), on the other hand, applies to the sale of movable property, however without prejudice to the Consumer Protection Act.

According to Article 5:12 of the Consumer Protection Act, the goods must correspond in type, quantity, quality, other characteristics and packaging to what can be regarded to have been agreed. If nothing else can be deemed to have been agreed, the goods must, inter alia, correspond in durability and other respects to what the consumer would normally have reasonable grounds to expect in a transaction of such goods. According to Article 5:15(2) of the Consumer Code, a defect is presumed to exist at the time when the risk passes to the buyer if it becomes apparent within six months of that date, unless it is proved otherwise or the presumption is contrary to the nature of the defect or the goods. This provision is based on Article 5(3) of the Consumer Sales Directive (1999/44/EC). That Directive has been replaced by a new Directive (2019/771) which, under Article 10, makes the seller liable to the consumer for defects existing at the time of delivery of the goods and occurring within two years of that time. Member States may maintain or introduce longer time limits. In Finland, the time limit set by the Directive is not enshrined in national law, as the protection provided by national law is considered to be more comprehensive (HE 89/2001).

Compared to guarantees, warranty has a voluntary basis. It cannot limit the statutory guarantee for defects and must therefore be more comprehensive than the statutory provisions. According to Consumer Protection Act 5:15a, where the seller has assumed the liability for the fitness for use or other characteristics of the goods for a specified period, the goods are deemed to be defective if they deteriorate within the meaning of the guarantee during that period. However, no liability for defects arises if the seller makes a case that it is likely that the deterioration is due to accident, improper handling of the goods or any other cause attributable to the buyer. However, the burden of proof is on the seller. The goods may also be considered to be defective if the warranty was given by someone other than the seller at an earlier level of the supply chain or on the seller's behalf.

Annex 2. Kiertotalous ja tuotepolitiikan ohjauskeinot: Haastattelurunko

Lähtökohtia haastattelulle:

- Haastatteluun osallistuminen on vapaaehtoista.
- Haastattelu kestää noin 45-60 minuuttia ja se nauhoitetaan.
- Teille on lähetetty etukäteen sähköpostitse alla oleva suostumus haastatteluun osallistumisesta. Olette voineet antaa suostumuksenne sanallisesti tämän haastattelun alussa.

Kuvaus

Kiertotalous ja tuotepolitiikan ohjauskeinot -hankkeen tarkoituksena on tuottaa tietoa kiertotalouden ohjauskeinoista, yritysten kokemista haasteista ja ajureista. Osallistuminen koostuu haastattelusta ja on vapaaehtoista. Haastattelu nauhoitetaan tutkimuskäyttöä varten. Nauhoitetta ei julkaista ja se hävitetään sen jälkeen, kun nauhoite on kirjoitettu tekstimuotoon. Haastatteluaineistoa käytetään julkaisukäyttöön.

Suostumus

Minulle on luvattu, että tietojani käsitellään luottamuksellisesti eikä niitä luovuteta ulkopuolisille. Ymmärrän, että tutkimusjulkaisuun sisällytetään suoria otteita haastatteluista. Suostun siihen, että tekstimuotoon tallennettua haastattelua saa käyttää yritysten kiertotaloutta ja ympäristömyönteisyyttä käsittelevissä tutkimuksissa. Haastateltavan henkilöllisyyttä ei voi yhdistää tuloksiin. Voin halutessani tarkistaa ja kommentoida haastatteluni aineistoja ennen niiden julkaisua. Kysymysten osalta voin olla yhteydessä tutkijaan käyttämällä alla kerrottuja tietoja. Voin perua osallistumiseni missä tahansa vaiheessa syytä ilmoittamatta lähettämällä viestin tutkijalle.

Osallistun vapaaehtoisesti ylläkuvattuun tutkimukseen lähettämällä kirjallisen hyväksynnän osoitteeseen hanna.h.salo[at]syke.fi tai sanallisesti haastattelun alussa.

1. Aluksi, kertokaa yrityksestänne.
2. Otatteko yrityksenne toiminnassa huomioon kiertotaloutta? Jos, niin miten?
3. Minkä vuoksi yrityksenne panostaa ympäristöasioihin/kiertotalouteen?
4. Mitä haasteita olette kohdanneet ympäristöasioiden/kiertotalouden edistämisessä?

5. Minkälaisia vaikutuksia kiertotalouteen liittyvällä toiminnalla on ollut...
    a. kilpailukykyynne
    b. työntekijöihinne
    c. asiakkaisiinne
    d. muuhun, mihin?

6. Miten otatte huomioon kiertotalouden tuotesuunnittelussa?

7. Ohjaako julkinen ohjaus yritystänne kiertotalouden suuntaan? Jos, niin miten?

8. Millaisen julkisen ohjauksen näette hyödyllisenä kiertotalouden edistämisen kannalta? Miksi?
    a. Suomessa?
    b. EU:ssa?

9. Heikentääkö tai estääkö julkinen ohjaus yrityksenne mahdollisuuksia edistää kiertotaloutta? Jos, niin millainen?

10. Mitä hyvää ja huonoa on seuraavissa ohjauskeinoissa:
    a. ekosuunnitteludirektiivi sekä tuoteryhmän asetukset
    b. tuottajavastuu
    c. takuuajat
    d. virhevastuu
    e. tiedotus ja yleinen koulutus
    f. ympäristömerkinnät kestäville tuotteille
    g. kierrätysmateriaalien käytön vähimmäisosuus
    h. suunnitellun ikääntymisen kieltäminen
    i. velvollisuus tiedottaa kuluttajille tuotteen korjattavuudesta
    j. velvollisuus tiedottaa tuotteen odotetusta eliniästä
    k. velvollisuus varmistaa varaosien saatavuus
    l. velvollisuus tarjota käyttöoppaita
    m. korjattujen tuotteiden laatusertifioinnit
    n. korjauspalvelujen alennettu ALV-kanta
    o. korjauskahvilat
    p. korjaustoimintaa estävän lainsäädännön purku (esim. patentit, tekijänoikeudet)
    q. green deal
    r. tekstiilien erilliskeräysvelvoite?

11. Lopuksi, onko kysymyksistä mielestänne puuttunut jotain olennaista?

Annex 3: Chemical Leasing applications by sector and chemicals used

Industrial Sectors	Chemicals Identified	Basis of Payment
Manufacture of electronic equipment	Powder coatings	Per m^2 of powder coated area
Manufacture of fabricated metal products (cars, food, processing equipment)	Organic solvents, detergents	Per vehicle produced
Various industries / steal treatment	Galvanizing and phosphating agends	Per Ampere-hour
Beverage Production	Lubricants for Packaging Conveyors	Per # of working hours of the conveyor
Waste Water and Drinking Water Treatment	Water Treatment Chemicals	Per m^3 of purified water
Accommodation and Service (eg Hospitals) Sector	Cleaning Chemicals (Detergents, Disinfection agents, softeners, other cleaning agents)	Kg of laundry; meals served, m^2 carpet area; m^2 cleaned floor
Beverage and Food Processing	Glues, Adhesives, Detergents, Sanitising Chemicals	Per number of bonded Boxes
Agriculture	Pesticide, Fertilizers	Yield
Textile	Chemicals for sizing	m^2 textile surface treated

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