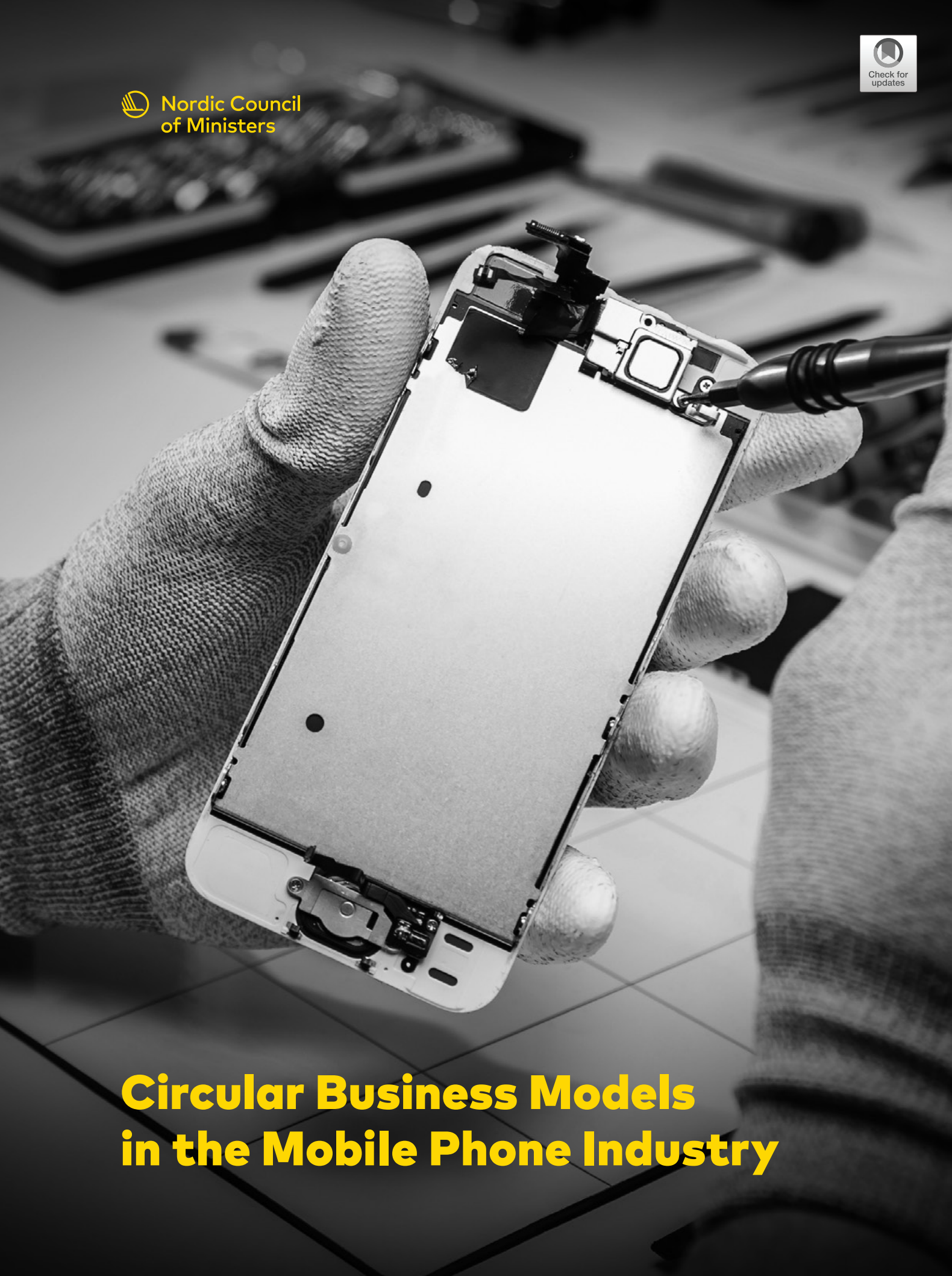

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David Watson, Anja Charlotte Gylling, Naoko Tojo, Harald Throne-Holst, Bjørn Bauer and Leonidas Milios

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Summary

Project objectives

The project objectives were to map out the extent to which more circular business models are being adopted in the mobile phone and service industry, and identify how this adoption can be accelerated. The focus was on models that extend the active lifetimes of phones and their components.

The following models/activities are considered relevant:

- *Design phase actions*: Design of phones for increased durability, reparability and upgradeability (of hardware and/or software).
- *Extended support*: Extending support for older phone models via continued provision of spare parts, continued software updates and online support
- *Repair services*: Provision of repair services for mobile phones
- *Recirculating used phones to new users*: via C2C, B2C or B2B second hand sales.
- *Refurbishment (including preparation for reuse) and resell*: refurbishment of used phones including repair and data removal prior to sale to a new user. If the used phone has been defined as waste, refurbishment is called *preparation for reuse* and special rules apply.
- *Voluntary take-back/buy-back of phones*: offered by service providers, retailers or producers. Take-back phones are refurbished and resold, components removed for use in repairs/refurbishments or sent to WEEE systems.
- *Leasing*: The business retains ownership and has thus an incentive to gain greatest possible value from the phone via recirculation to new users and scavenging of components when the phone is no longer fit for recirculation.
- *Sale of accessories*: Accessories for mobile phones (e.g. new covers) can indirectly extend active lifetimes of mobiles by giving them a fresh look and by protecting from damage

The project was split into three phases:

Phase 1 comprised a mapping of how businesses are engaging in these models. We interviewed 22 businesses within five groups: *mobile phone producers, electronics retailers, network service providers, repair services* and *refurbishers/second-hand sellers.*

Phase 2 focussed on the relevant legal framework and how this encourages and hinders businesses engagement in the models. We conducted desk-stop study and interviews with 15 consumer organisations, complaints boards/ombudsmen, environmental protection agencies and electronic branch organisations.

Finally, under *Phase 3* we held a workshop for actors in the mobile phone industry and other key stakeholders to carry out a reality check on our findings and proposed solutions.

Smart phones have changed the landscape

The emergence and subsequent penetration of smartphones in European and Nordic markets have changed the behaviour of both consumers and businesses. Smartphones inspired rapid consumer upgrade rates immediately after their introduction and have not only replaced feature phones but also a wide range of other small electronics that smartphones made obsolete.

More recently, high purchase price and lack of further disruptive new features, has slowed down consumer replacement rates of older phones with new. They have also led to increased demand for repair services and for second-hand phones as consumers become aware of their high commodity value. Bundling of new phone sales with data and network subscriptions has also reduced in dominance. The demand for SIM-only subscriptions is growing rapidly while loyalty to network service providers falls.

Businesses are responding to these trends in different ways. Some network service providers are attempting to reverse trends by re-energising sales of new smart phones. Other businesses are exploiting the new opportunities by developing circular business models and services that gain value from extending the lifetime of phones.

Engagement in green business models

The most widely reported response amongst "traditional" actors was engagement in take-back and buy-back of used phones and refurbishing these for resale and/or cannibalising them for their components. Prior to the emergence of smartphones, phones taken back in developed countries were mostly shipped to developing countries for resell. Refurbished smart phones are now often resold in the collection country or elsewhere in Europe, although export to developing countries remains important.

Refurbishment and resell businesses and repair services are reporting rapid growth in demand, although stronger growth is needed if the active lifetimes of smart phones are to be significantly increased and environmental impacts reduced. Some producers are beginning to design for greater durability and reparability to reduce warranty costs.

The majority of businesses are engaging in circular economy models because they can directly earn or save money via offering repair, take-back, refurbishment and resale. Some are also engaging as part of CSR strategies to reduce the environmental impacts of their activities.

Consumers motivated by cost saving not environment

While consumers engage in repair and second hand sales, they show limited interest in phones containing more sustainable materials. Nevertheless, some producers are engaging in efforts to reduce the environmental footprint of new phones.

Circular economy requires cross-stakeholder cooperation

The growth in circular businesses is leading to a wealth of partnerships and interactions across the value chain. Sellers of phones (producers, network service providers and retailers) are developing partnerships with repairers to assist them in meeting warranty obligations. Producers also sell components to authorised repairers.

There is also increasing cooperation between companies (network service providers, retailers and producers) who are operating take-back services and refurbishers, who subsequently process and resell the take-back phones. Initial scepticism has been reduced following a professionalisation of the larger refurbishment companies.

At the same time, some network service providers are developing in-house refurbishment and repair services rather than working with partners, in part due to the growing demand for rapid repairs.

Unauthorised repairers and access spare parts

There is a dense undergrowth in Nordic cities of small single shop businesses selling repair services, used smart phones and accessories and little cooperation between these and established mobile phone producers. This is due to concerns of producers that they cannot control the quality of repairs by non-authorised repairers, thus giving warranty support risks. Some large producers thus restrict access to original components and diagnostic tools for non-authorised actors. These in turn make use of lower quality copy components.

On the one hand, limiting access aims at ensuring a greater professionalization of the repair and refurbishment sector and at reducing operations by grey actors who do not live up to environmental and social responsibilities. On the other, these actions hinder the more professional segment of unauthorised repairers who wish to carry out reliable, high quality repairs.

Lack of design for repair/upgrade and longer life

Smartphones are still not being designed to fully optimise repair or to withstand impact and moisture. There are no minimum standards for durability or reparability at EU or national level. The landscape may change in the future as game-changing companies like Puzzlephone, Fairphone, Google and ZTE push forward with modular phone concepts. It is not only hardware design that can inhibit refurbishment. Anti-theft and security software installed on smartphones can be problematic as they can only be removed by the original owner.

Need for economic incentives to support repair and resell

Although the high price of new smart phones has made repair and refurbishment/resell viable options, businesses are challenged by the labour intensive nature of the work in combination with high Nordic salaries.

Lower VAT or tax breaks for repair and refurbishment/resell could partially redress the economic misbalance and accelerate growth. In some countries potentially favourable VAT rules for used goods already exist but need to be modernised.

Upgrade-subscriptions and the circular economy

Some network service providers are attempting to regain customer loyalty, by introducing subscriptions that offer mobile phone upgrades every 12 months. These may not be as directly in conflict with increasing active lifetimes of phones as it might seem. They are catering for that segment of the population who may under any circumstances purchase the latest phone model. By retaining or regaining ownership, the provider can better ensure that phones are recirculated to a new user. Leasing systems in general are seen as a central element in future mass redistribution systems of smart phones where smart phones are cascaded from one user to the next. Each consecutive user has a reducing wish or need for the latest model or functionality, and pays a lower price in return.

Consumer law and minimum legal guarantees

The minimum legal guarantee set by the Consumer Sales Directive is two years with allowance for Member States to increase this. In Sweden the minimum guarantee for mobile phones is set at three years, in Norway, five years and in Finland it is linked to the expected lifetime.

Extending minimum legal guarantees can theoretically support green business models by extending the period over which sellers support repair services financially. They can also provide incentives to producers to engage in design for repair and longer lifetimes. However, this is undermined by a number of weaknesses:

- *Low consumer awareness of minimum guarantee period*. If consumers don't know their rights then they won't make use of them.
- *Reduced likelihood of winning a claim after the first six months* since after that period, in all countries except Finland, the consumer has to prove that there was a fault in the phone. Claims after this period are normally not successful.
- *Mobile phones are not expected to withstand normal usage.* The most common causes of failure of a phone – dropping on a hard surface and emersion in water – are normally considered as misuse and not covered by legal guarantees although phones can be designed to withstand such handling.
- *Problems passing on costs to producers.* The EU Consumer Sales Directive allows retailers to pass on costs of non-conformity claims to producers, but some reported that they had to "top-up" single-year guarantees provided by the producer. This removes the direct leverage of extended legal guarantees on the producer.
- *Nordic markets are potentially too small* to have any marked leverage on how global mobile phone producers design their mobiles.

Use of refurbished parts challenged

A Danish case has challenged the legality of providing a phone with refurbished components as a replacement for a faulty phone. The case may discourage producers from engaging in this circular economy activity across the Nordic region. There may be a need for adjusting national implementation of the Consumer Sales Directive to legalise the use of refurbished phones as replacements for used faulty phones.

Pressure on second-hand retailers

The Consumer Sales Directive can also affect second-hand and refurbishment businesses. Under its implementation in Nordic countries, sellers of second-hand phones have the same minimum guarantee obligations as sellers of new phones. In practice, however, only a six month guarantee period is effectively applied in most cases.

Should the full guarantee period be enforced this could have both positive and negative effects: negative by increasing costs for the businesses in requiring more thorough checks; positive by increasing consumer confidence in second-hand.

Waste regulations and refurbishment

Waste regulations only affect business models where the mobile phone at some point is, or risks being, classified as waste. What is considered as waste electronics and electrical equipment (WEEE) depends on the intention of the last owner and not the receiver. This makes it difficult for refurbishers and those running take-back schemes.

Moreover, a business carrying out "preparation for reuse" of waste smartphones, can risk legal uncertainty due to lack of clear legal interpretation on what it comprises and who may carry it out.

There can also arise problems from the difficulty of establishing alternative collection pathways parallel to WEEE collection systems. While all national EPAs in principle wish to encourage reuse, they are also concerned about the risk of WEEE finding its way to countries where it will not be safely treated. Adoption of refurbishment standards and certification could partially address this concern.

Exports to developing countries remains problematic

Although second-hand markets have been established in Nordic countries and other western economies, exports of used phones for resale in developing countries is likely to remain significant. When they eventually become waste they typically end in open dumps with human and environmental health impacts. Refurbishment and export companies could take greater responsibility by collecting and transporting waste phones arising in developing countries to modern e-waste recycling facilities.

Regulation could potentially be brought to bear to ensure this. A detailed mapping study of the fate of used phones collected in Nordic countries is recommended first.

Measures for Promoting Green Business Models

We make a number of recommendations for measures to overcome regulative, economic and organisational obstacles to green business models. The recommendations have been identified by stakeholders or developed by us to address barriers identified by stakeholders. These were discussed and adjusted at the stakeholder workshop in Helsinki.

Table A: Summary of obstacles to circular models and policy measures to overcome these

Obstacle	Proposed Measure	Rationale and comment
Waste regulations concerning ownership and treatment of WEEE make life difficult for refurbishers, preparing discarded phones for reuse	Adopt refurbishment certification standards	Would address concerns of EPAs over improper treatment of WEEE collected outside producer responsibility schemes. It could also allow recognition of certified refurbishers as legal collectors of WEEE where necessary (see next point). Ideally the standard should be harmonised at EU level.
	Allow bypassing of WEEE collection systems by responsible refurbishers	An approach for this is already found in the Finnish Waste Act. Responsibility could be ensured for example, by a certification standard proposed above.
High salaries and expensive logistics in Nordics can present a problem for economic viability of repair/ take back and refurbishment	Lower VAT or Tax breaks for repair and refurbishment of electronics	Would enhance price competitiveness of repair and provide employment for disadvantaged groups. In Sweden, VAT reductions for repair of shoes, textiles and bicycles could be extended Where such rules already exist (i.e. DK) these should be modernised.
Mobile phones are not designed for easy repair, durability or resilience	Mandatory declarations of expected lifespans and resilience of new mobile phones	Could ensure that durability became a selling point for consumers. Declaration requirements at EU level or Nordic level would maximise leverage.
	Requirement that legal guarantee followed declared expected lifespans	This will set up direct economic incentives for producers to live up to declared lifespans. Would be most effective at Nordic or EU level.
	Shift onus of proof more towards the seller in case of a fault	After 6-month cut-off there are fewer successful claims. The onus of proof on seller could follow declared life expectancies as in Finland or be extended to 24 months as in France.
	Strengthen rights of retailer to pass on the costs of honouring legal guarantees to the producer	Some producers only offer single year legal guarantees that retailers have to top up to meet national minimum legal guarantee periods. This removes incentives for producers to design for durability/reparability.
	Slacken interpretations of "misuse" by users when assessing non-conformity claims	Normal wear and tear could be widened to include dropping of a phone on to a hard surface and immersion in water. Allowing retailers to replace like-with-like would remove the risk of consumers purposefully dropping phones to gain an upgrade
	Disallow unreasonable exclusions in sales contracts	In judging claims against guarantee exclusions in sales contracts, unreasonable exclusions such as not using in sub-zero temperatures would be discounted.
	Ecodesign – criteria on resource efficiency	These would need to be an EU level process but Nordic governments/stakeholders can provide input in the form of proposed minimum criteria

Obstacle	Proposed Measure	Rationale and comment
Lack of consumer awareness of the length of guarantee periods	Enforcement of the requirement for sellers to inform consumers of their rights	Low consumer awareness of minimum warranty can undermine strength of these in supporting repair services.
	Mandatory labelling of warranty rights in the sales country on new phones	Would make consumers aware of their warranty rights at the time of a failure. To allow updating the information could be provided online via a QR-code provided on the phone.
Low consumer confidence in delivering used phones to refurbishers and buying second-hand phones	Adopt refurbishment certification standards	Would increase consumer confidence in the second-hand market.
Lack of availability of original replacement components to non-authorised repairers	Requirement on producers to make original parts available to all parties for repair, for expected lifetime of mobile phone	Some producers only provide original components to authorised repairers. This can inhibit professional elements of the repair sector and lead to the use of low quality copy parts. Solutions may only be acceptable to producers for "out-of-warranty" repairs.
	Regulation and better policing of the repair sector	Some producers are unwilling to give unrestricted access to original components due to risks that repair work will be carried out by grey actors, that do not obey environmental and H&S regulations.
Variable quality of phones delivered to take-back systems	Information campaigns on the value of used electronics	May encourage consumers to take better care of their phones if they know that there are potential second users domestically or abroad.
	Measures to encourage leasing models – beginning with the public sector	Under leasing models the leasing company retains ownership meaning a near 100% return rate. Public sector leasing could be encouraged by requiring government agencies to lease mobile phones in procurement contracts.
Lack of software support during full lifetime	Adjust implementation of Consumer Sales Directive such that software support is required for the full legal guarantee period	Consumer complaints boards tend to uphold claims relating to lack of support during this period but it isn't directly written in to law.

Preface

The project was carried out in the period from August 2016 to September 2017 by experts from organisations in three Nordic countries:

- David Watson, Anja Charlotte Gylling and Bjørn Bauer, PlanMiljø, Denmark
- Naoko Tojo, IIIEE, Sweden
- Harald Throne-Holst, SIFO, Norway

The project was led by Bjørn Bauer and David Watson (PlanMiljø). It was initiated and funded by the Nordic Working Group for Sustainable Consumption and Production and guided by Katarina Järverup Frisk (Swedish Consumer Agency) and Johanna Giorgi (Swedish Agency for Economic and Regional Growth).

The project group wishes to thank representatives from a wide range of businesses from the mobile phone industry, from government agencies and consumer councils for their time and input without which this project would have been impossible.

1. Background and Objectives

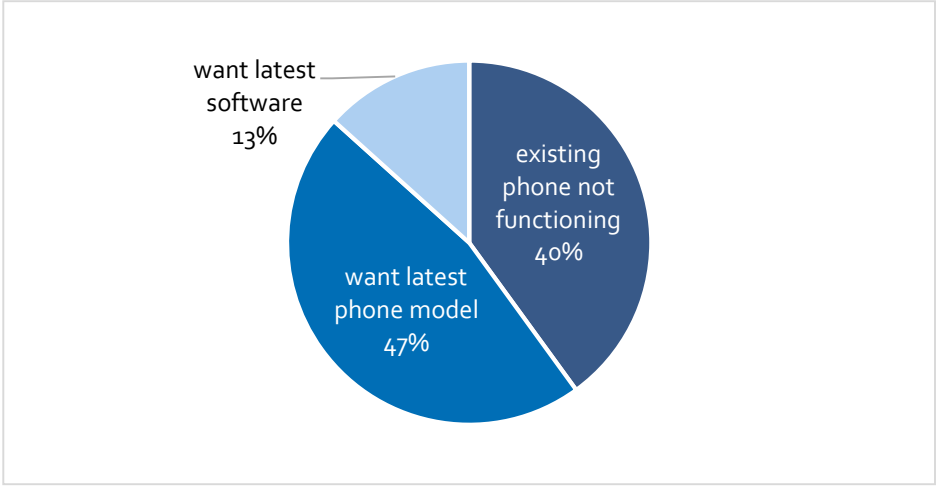
1.1 Background

The purchase, use and discarding of mobile phones has grown rapidly over the past two decades. Mobile phones contain a number of critical metals and hazardous substances. The mining, extraction and refinement of critical metals lead to a range of impacts on human health and the environment (UNEP, 2013). Electronics waste can lead to leaching of hazardous substances unless properly treated (Storm-Mathisen and Slettemeås 2016).

Despite 14 years of implementation of the WEEE[1] Directive in Europe, collection rates for small electronics remain low (Ongondo and Williams, 2011; Pérez-Belis et al., 2013). 20% of young Norwegian adults throw small electronics in the waste bin (Storm-Mathisen and Slettemeås, 2016). Meanwhile, Finnish consumers typically have between two and five functioning mobile phones stored at home that are not in use (Ylä-Mella et al., 2015).

Discarded or replaced phones are often not replaced because of malfunctions or because they are worn out or damaged. Often it is because of obsolescence within a culture driven by new system requirements, launching of new models and cultural expectations (Taffel 2012; Storm-Mathisen and Slettemeås 2016) (see Figure 1).

Figure 1: Reasons (according to businesses) for smartphone replacement



[1] Waste Electronics and Electrical Equipment (WEEE).

At the same time, care must be taken not to view trends in upgrade and obsolescence of smartphones in isolation. Innovations over the past decade have meant that today's smartphones have multi-functionality that make many other small electronic devices unnecessary;[2] digital cameras, cam-recorders and handheld GPS to mention just a few. The rapid advances that have driven upgrade rates and phone discards have also ensured that we have a need for fewer devices with associated environmental savings (Tapani Jokinen, pers comm).

Nevertheless, discarded phones represent an underused bank of valuable resource including fully functioning products, components and materials and, not least, critical metals. Bakas et al. (2016) estimate an annual value of critical metals in discarded electronics in Nordic countries at EUR 1.6 billion.

There is potential for mobilising these unused resources and value via the application of circular economy approaches (Bauer and Gylling, 2014; Bauer and Tojo, 2013) but this will require changes in both business models and in consumer behaviour.

There are already some signs of change. Mobile replacement rates by consumers are slowing following many years of rapid increase.[3] Moreover, consumers are increasingly appreciating that their used smartphone has a value that can be exploited.[4] Manufacturers have also recognised for some time the opportunities represented by the resources in used phones as the prices of raw materials and components rise and have initiated take-back systems. Finally, high handset prices have made repair a viable business, with high-street shops and online repair services now commonplace in Nordic countries.

These developments could be accelerated, with many mobile retailers and service providers slow to engage in the new opportunities presented by refurbishment, reuse, repair leasing etc. Some businesses are reacting to slowing upgrade rates, by creating a myriad of innovative purchasing/leasing plans to kick-start sales of new phones.[5] There have also been cases in Nordic countries, where electronic refurbishment and resell has been challenged due to claims that the refurbished phones were discarded as waste and therefore are not the legal ownership of the refurbishing company.[6]

These issues can challenge emerging greener business models and consumption behaviour for mobile phones.

[2] https://www.geckoandfly.com/13143/50-things-smartphone-replaced-will-replace-future/

[3] New iPhone in the US increased from 21.7 months in 2013 to 27.4 months in 2015; http://www.computerworld.com/article/2985483/smartphones/consumers-are-keeping-smartphones-tablets-and-pcs-longer.html

[4] Surveys in Germany and the U.S. found that nearly two thirds of smart phones enjoy a second-life (Gartner, 2015).

[5] http://lifehacker.com/every-carriers-confusing-phone-buying-plans-explained-1726343203

[6] https://www.dr.dk/nyheder/regionale/sjaelland/genbrugsbutikker-i-klammeri-med-dansk-industri

1.2 Project objectives and outputs

The overall aim of the project is to contribute to the adoption of "greener" business models in the mobile phone (and service) industry by exploring obstacles and opportunities to green business models in Nordic countries. These include obstacles and opportunities in consumer law and other regulations.

The study has attempted to answer the following questions:

- To what extent have businesses recognised economic/business interests in extending the active lifetime of mobile phones and the materials they contain via innovative business models?
- What opportunities and obstacles can be found in consumer law and other regulations in Nordic countries to green business models in the mobile industry?
- How can obstacles in consumer law and other regulation be overcome and opportunities enhanced?
- What further policy instruments could promote businesses to engage in greener models promoting longer lifetimes?

1.3 Structure of the project and this report

The project has been split into three phases.

Phase 1 comprised a mapping out of the various groups of businesses with a role in extending product lifetimes of mobile phones and their components, and gathering information on the extent to which they are engaging; if so why and if not, why not (policy question 1).

Phase 2 focussed on the legal framework around mobile phones and how this encourages and hinders businesses to engage in greener models (policy questions 2 to 4).

Finally, under *Phase 3* a workshop was held for actors in the mobile industry and other key stakeholders to carry out a reality check on the project's findings and proposed solutions. The workshop was held on 7 June 2017 in Helsinki as a side event to the World Circular Economy Forum. A full list of workshop participants is provided in the Annex.

Chapter 2 of this report presents findings on the emergence of green business models in the mobile industry.

Chapter 3 examines the implication of consumer laws and other relevant legislation on the emerging green business practices. Both chapters start with a brief description of the approach taken to gather information, followed by the findings.

Chapter 4 summarises the findings and suggests potential measures for promoting green business models, as illuminated by inputs from the workshop participants.

The many invaluable inputs received during the Helsinki workshop are reflected throughout the report.

2. Mapping out green business models

2.1 Approach

The mapping began with a literature study of general trends in mobile and mobile service businesses and trends that are more specifically related to reducing environmental impacts through circular economy concepts.

2.1.1 Which models are we interested in?

We are principally concerned with models which implement a circular approach to mobile phones; models that maximise the value of mobile phones (with focus on smartphones) and the resources they contain for as long as possible. These have the potential to offset the production of a share of new mobile phones and mobile phone components and the associated extraction of materials and thus reduce environmental burdens.

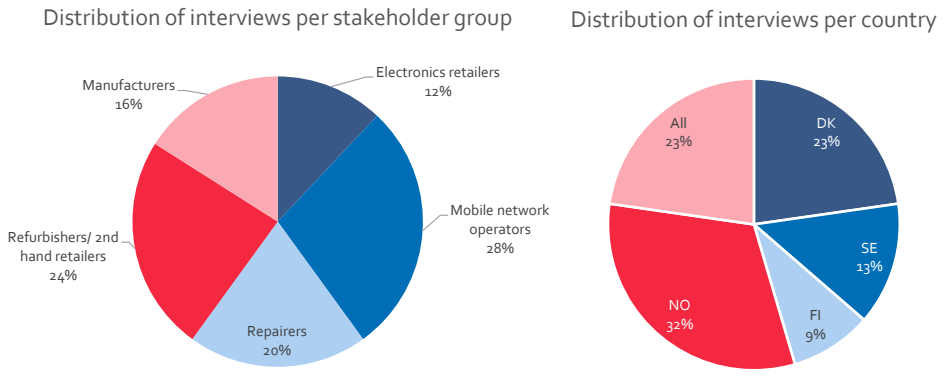
This includes models that increase the active lifetimes of phones, either by single or by multiple users, and when this is no longer possible, scavenge the valuable elements of the phone for reuse. The models are described in detail in 2.3.1.

2.1.2 Interviews with businesses

After looking at general trends in literature, we carried out a desktop mapping of the various groups of business in the Nordic region who have an influence on these trends. These comprise: *mobile phone producers, electronics retailers; network service providers; mobile phone repairers* and finally*; refurbishers and second-hand sellers.* A better overview of how these different actor groups are relevant to green business models is provided later in Section 2.3.

Representatives of these business types were identified in the four larger Nordic countries and approached for interviews. The distribution of the 22 interviewed organisations between these business types and in geographic coverage can be seen in Figure 2. Nearly a quarter of interviewed companies have full Nordic coverage (mostly manufacturers and network service providers).

Figure 2: Interviews broken down by actor group and country



The interviews were well distributed between the various business types. It should be noted that a number of companies could fit into more than one of the categories. In particular, there is a large overlap between repairers and refurbishers/second-hand retailers with many businesses crossing the full spectrum of these activities.

Interviews were carried out over the phone or via physical meetings using an interview guide. The focus of the interviews was on what elements of circular economy models the businesses engage in, what the motivation has been, what obstacles they are experiencing and how these can be overcome.

The findings from interviews have been supplemented by relevant information found in literature and by inputs provided by participants at the Helsinki workshop.

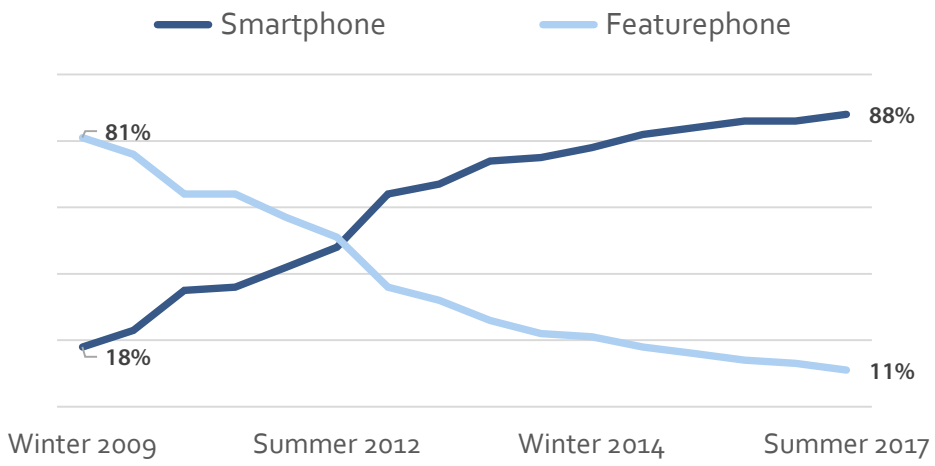
2.2 Broad Trends in Mobile Phones and Services

2.2.1 *Rapid market penetration of smart phones*

The iPhone was first launched in January 2007. It was one of the first smartphones to use a multi-touch interface. Smartphones using Android operating systems (IOS), appeared on the market in February 2010 but have rapidly increased their market share, representing 81% of the global smartphone market in 2015. Apple retains a relatively high penetration on Nordic markets (eMarteter, 2015).

Sales of smart phones have rapidly overtaken feature phones (more simple functional phones) since their emergence (see Figure 3). Every two out of three mobile phones that were shipped globally in 2014, were smartphones (Forbes, 2014). This is also the case in the Nordic countries where consumers are considered to be early adopters of new and emerging technologies (IDC, 2016) and smart phone penetration is high (eMarketer, 2016) (see Table 1).

Figure 3: Smart phone and feature phone (more simple phones) penetration of the market in the UK



Source: Farmer (2015).

Table 1: Market penetration of smartphones in Nordic countries

Country	Share of population that own a smartphone in 2015 (%)
Denmark	77
Sweden	90
Finland	69
Norway	87

Source: Danmarks Statistik 2016; TNS Gallup 2016; Statistics Finland, 2015; SSB 2016.

It would be simplistic to see the smartphone simply as a replacement to feature phones. Increasing smartphone penetration has come hand-in-hand with a simultaneous reduction in the ownership of other small electronics. The multi-functionality of smartphones has made digital cameras, handheld GPS, cam-recorders, MP3 players, calculators, voice recorders, to name but a few, effectively redundant.[7] Some even predict that tablets may eventually be replaced by the smartphone.[8]

2.2.2 Decreasing upgrade rates

Nevertheless, there are signs that after a long period of year-on-year increases in sales of smartphones, trends are beginning to peak. The slowdown is most apparent in developed economies. Sales of phones in Western Europe witnessed a fall of 6% between 2015 and 2016 (in comparable months). For Norway, annual sales of mobile phones peaked in 2013, at 2.1 million and had reduced to 1.7 million by 2015. All major players except Huawei saw a strong decline in shipments (IDC, 2016).

[7] https://www.geckoandfly.com/13143/50-things-smartphone-replaced-will-replace-future/
[8] http://www.huffingtonpost.com/paul-fidalgo/when-is-it-one-gadget-too_b_4785173.html

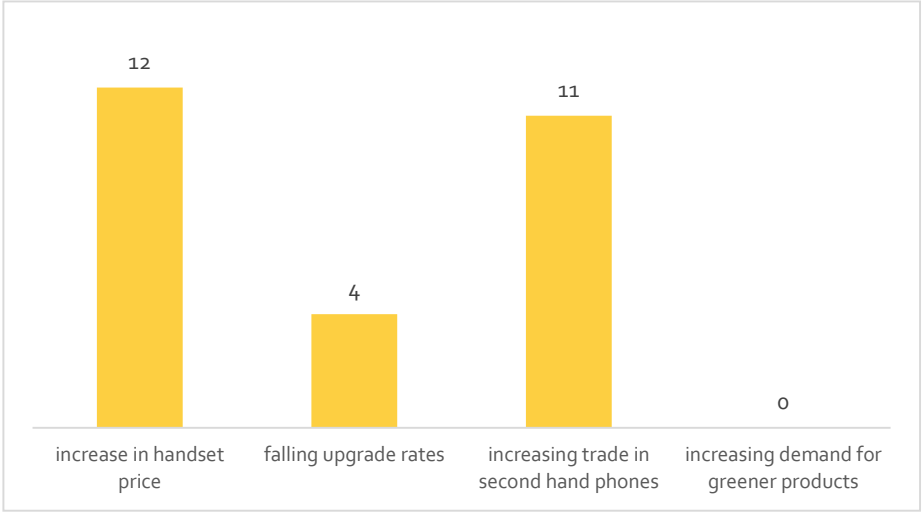
The chief explanation for the slowdown in wealthy economies is that most people that wish for a smartphone now have one and the changes from model to model are now incremental rather than disruptive (Wired 2016; GfK 2016; Gartner, 2016b). According to YouGov (2015), "there is a perceived lack of innovation in the market because smartphones aren't the new kid on the block anymore. In essence people may now be on their third iteration of smartphone and are not seeing as many new "killer" features as they did when they first got them."

Moreover, the price of buying a new phone increased significantly with the emergence of smart phones; the price of a new smart phone is comparable to that of a new laptop.

These factors have resulted in reducing replacement rates for smartphones (i.e. the period after which a consumer replaces their existing phone with a new model). The replacement time for mobile phones in the US increased from 22 months in 2013 to 30 months in 2016.[9]

The release of the iPhone7 in September 2016 didn't accelerate upgrade rates as expected since, as one article put it, "the 6S was so good….there are some minor improvements with the 7, but 90% of these aren't really needed."[10]

Figure 4: Numbers of interviewed businesses that reported selected changing conditions



Some interviewed Nordic businesses have also observed these trends (see Figure 4). More than half recognised increasing handset prices, not only for the most expensive phones, but also "mid-range" phones. In line with increasing smartphone prices, and lack of killer new features, a few interviewed companies also recognised a tendency for consumers to hold on to their phones for longer. Service providers are finding that many consumers now hold on to their phones for longer than two years.

[9] http://www.businessinsider.com/people-are-taking-longer-to-upgrade-their-smartphones-2016-6?r=US&IR=T&IR=T
[10] http://www.theclever.com/15-reasons-upgrading-to-iphone-7-isnt-worth-it/

2.2.3 *Growth in second-hand markets*

The market for second-hand mobile phones has been growing since the early 2000s in developing countries. It is only more recently, with the advent of smartphones, that second hand sales have also begun to establish themselves as a significant trend in developed countries.

Earlier, mobile phones collected in developed countries were exported for resale in developing economies. Market demand and fast replacement rates led to development of buy-back programmes in some developed economies in the latter half of the 2000s (Mobile News 2007a; Mobile News 2007b) although one study found these practices to be more prevalent in the UK and Germany than in Sweden and Finland (Tojo and Manomaivipool 2011).

With the emergence of the smartphone, second-hand markets also began to appear in developed countries. Surveys in Germany and the U.S. found that nearly two thirds of smart phones enjoy a second-life (Gartner, 2015). Much of this recirculation is taking place directly between consumers via passing on to family/friends or C2C sales.

Some interviewed stakeholders argued that phones have become a commodity. The growth in the second hand market is directly correlated with the higher price of new handsets and the numbers of unused handsets stored by consumers is decreasing. According to Østvang (2016) whenever a new high-end smart phone model is introduced, a wave of previous models become available on second-hand markets, with particular emphasis on iPhone roll-outs. This was also recognised by interviewed businesses. That said, in 2013 it was estimated that 70% of take-back phones in western economies still ended in developing countries (Green Alliance, 2015) which has its negative aspects (see Box 1).

Some businesses told nuanced stories. One operator (Telia SE) noted that there will always be a segment that wishes to have the newest model of phone (see also Figure 1), but that the trend of passing older models of smartphones on to family/friends after buying a new model may be slowing down as smart phone ownership becomes saturated.

This may mean that in the future, old smart phones may not necessarily find a new domestic user when an upgrade takes place. Individual businesses in both Norway and Sweden reported observing a limited demand for second-hand in these countries although this is not in line with reports of large growth in second-hand markets found in the literature.

Box 1: Exports of used phones to developing countries

In 2013, it was estimated that 70% of phones collected for reuse in western economies were exported for sale in developing markets (Green Alliance, 2015). This share is likely to have fallen since then as second-hand markets have taken off in western economies, but nevertheless is still likely to be significant.

The export represents a typical "cascading" phenomena also recognised from other second-hand markets such as textiles (see Watson et al. 2016), where best quality used goods are re-circulated in domestic markets, while lower quality /older goods cascade to markets with successively lower buying power and more ready acceptance of lower quality.

On the one hand this export ensures a continuing life for mobile phones (and other goods) that otherwise would end as waste, thus offsetting new production and associated environmental impacts. On the other hand, for products such as electronics which contain hazardous substances, when the products eventually do become waste, they are unlikely to be treated responsibly given lack of capacity for hazardous waste treatment in many developing markets (Salehabadi, 2013).

So far no modern e-waste recycling facilities exist in sub-Saharan Africa although there are plans to build one close to Accra in Ghana where a singificant part of Europe's used electronics are salvaged under dangerous conditions.* Building of such facilities in developing countries will be the long-term solution. Until then other solutions are needed. One innovative concept was launched in 2010 by Dutch social enterprise Closing the Loop. Closing the Loop collects used phones from companies and organoisations in the Netherlands and sells them in Africa but with the guarantee that for each phone sold there, a waste phone will be collected for transport to the Netherlands for responsible recycling (see Forbes, 2017). The phones could be transported to facilities on the African continent as these are constructed. This solution can be adopted by other refurbishment companies.

* http://www.dw.com/en/germany-supports-e-waste-disposal-in-ghana/a-38015011

Gartner (2015) predicted that approximately 120 million refurbished smartphones would be sold globally in 2016. Deloitte (2016a) predicted that in 2016 consumers would sell or trade in approximately 120 million used smartphones generating more than USD 17 billion for their owners, at an average value of USD 140 per device. This is a 50% increase from the 80 million smartphones traded in 2015, with a value of USD 11 billion, or an average value of USD 135.[11]

However, while global used smartphone sales are expected to rise from 53 million to 257 million between 2013 and 2018, Green Alliance (2015) claims that the potential is far larger. Globally, only 12% of smartphone upgrades involved the old device being sold or traded, while projections suggest only 8% of new sales will be offset by reuse in 2018.[12] These shares need to increase dramatically if the environmental impact of our smart phone consumption is to be reduced.

[11] http://www2.deloitte.com/global/en/pages/technology-media-and-telecommunications/articles/tmt-pred16-telecomm-used-smartphones-17-billion-market.html

[12] http://www.businessgreen.com/bg/analysis/2395955/how-125-million-old-smart-phones-are-going-to-waste

2.2.4 *Rise in SIM-only contracts*

Until relatively recently, one dominant means for consumers to obtain a new mobile phone in Nordic countries was via network service providers where in return for a mobile phone, customers were bound to the operator for a certain period or until the phone was paid off (see also Box 3 later).

Recently, in recognition of the growing trend amongst customers to hold on to their phones for longer periods and to buy new and used phones, through other outlets, service providers are increasingly offering SIM-only subscriptions. In the UK for example, SIM-only deals increased from 5% of the market in 2010 to 16% in 2015 (Farmer, 2015). In the Nordic countries, SIM-only subscriptions are growing significantly in Denmark, Finland and Norway.

The rise of SIM-only deals in place of bundled mobile phone sales and data subscriptions has led to reduced customer loyalty and aggressive competition between service providers. In Denmark the competition is particularly strong with 25% changing network service providers each year and Sim-only contracts more widespread than in other Nordic countries. To counter this, service providers in Nordic countries and elsewhere are offering a myriad of different upgrade plans for mobiles in an attempt to hold on to customers[13] (see also Section 2.3.4).

Even with bundled phones/service contracts Danes are reluctant to bind themselves for more than six months. Longer binding periods are more accepted in Sweden. Some network service providers in Denmark and Norway have initiated phone upgrade programmes in order to increase customer loyalty and for these customers upgrade rates are typically lower than two years (see later).

2.3 Experiences with green business models

2.3.1 *Overview of business models and actors*

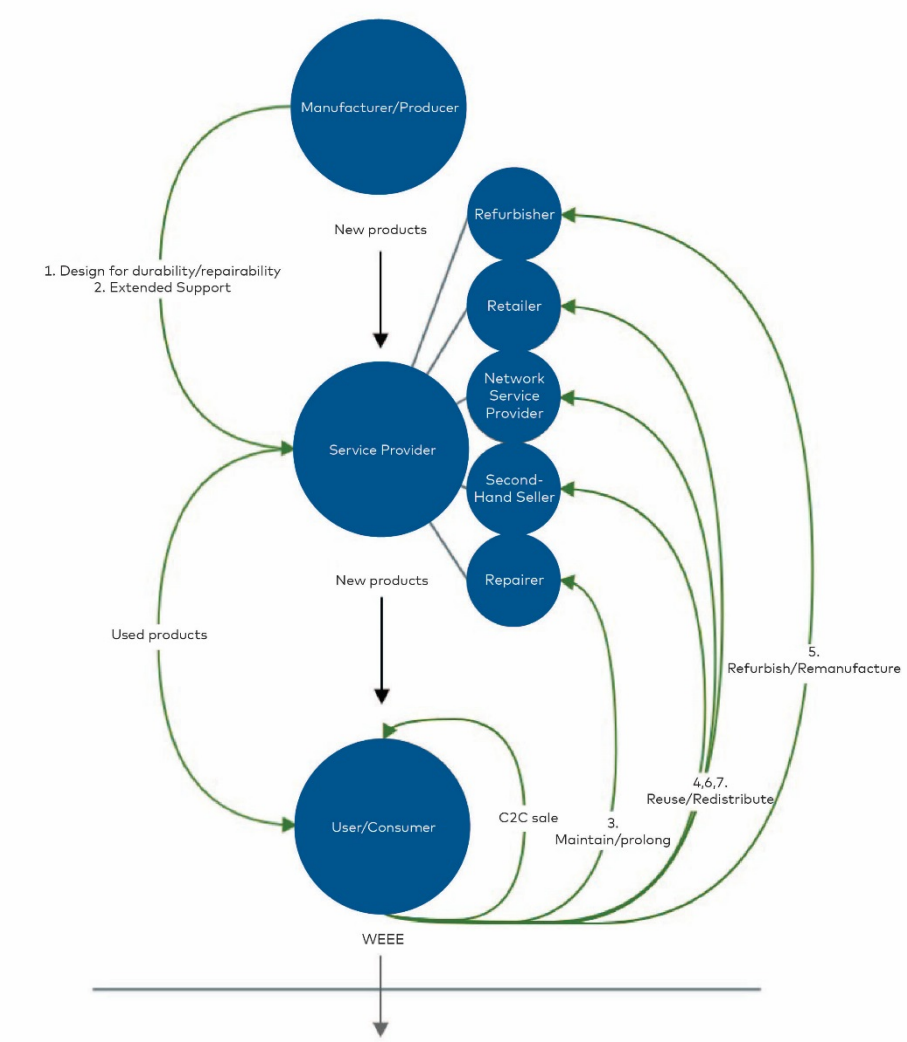
The focus for this project is business models which optimise the value that can be gained from mobile phones and the resources they contain for as long as possible. We identified the following specific business models/activities that lie within this scope (that are also illustrated in Figure 5).

1. *Design phase actions*: Design of phones for increased durability, reparability and upgradeability (of components and/or software). In addition design of phones to reduce environmental footprint through using reduced impact materials etc.
2. *Extended support*: Extending support for older phone models via continued provision of spare parts for repair services, continued software updates and online support.

[13] http://lifehacker.com/every-carriers-confusing-phone-buying-plans-explained-1726343203

3. *Repair services*: Provision of repair services for mobile phones online or via shops.
4. *Recirculating used phones to new users*: via C2C, B2C or B2B second hand sales. For this to be a business model, the business must either provide a platform for exchanges, or be the intermediary.
5. *Refurbishment (including preparation for reuse) and resell*: Here the business carries out a refurbishment of the used phone prior to sale to a new user. This might include repairs and will certainly include data removal. A special case is where the phones had been discarded as waste. In such cases refurbishment is called preparation for reuse and special rules apply.
6. *Voluntary take-back/buy-back of phones*: This can be a precursor to the previous model. Take-back/buy-back services are offered by service providers, retailers or producers. Used phones that are handed in, are refurbished and resold, components removed for use in repairs/refurbishments or are sent for recycling in WEEE systems established in each country.
7. *Leasing*: The business retains ownership and has thus an incentive to gain greatest possible value from the phone via recirculation to new users and scavenging of components when the phone is no longer fit for recirculation.
8. *Sale of accessories*: Accessories for mobile phones (e.g. new covers) can indirectly extend active lifetimes of mobiles by giving them a fresh look without the need to buy a new phone. They can also protect the mobile phone from damage when dropping.

Figure 5: Circular business models in the phone industry



Models 4, 5, 6 and 7 all represent aspects of redistribution models (see Green Alliance, 2015) characterised by a cascade of the same phone between consecutive users within an individual company, between developed countries and less developed countries, through families. Cascading generally occurs from consumers that wish for and can afford the latest model smartphone, down towards those that who are satisfied with or can only afford older models (see also Box 1).

Where economic transactions are involved in this recirculation, there is a business model. Most advantageous for the circular economy is where producers themselves gain money from the recirculation via for example leasing models and are thus encouraged to design phones to be able to be used by several consecutive users. All eight identified business models can involve a number of distinct actors from the value chain surrounding mobile phones. Box 2 gives a brief overview of these actor groups and the types of initiatives they can be involved in.

Box 2: Groups of actors relevant to green business models

- *Mobile phone producers* – These are of high relevance, both in terms of the potential for designing phones for durability and ease of repair but also for the provision of spare parts for repair and offer of take-back services. They can also work against green models by accelerating model upgrades and designing in obscelescence.
- *Electronics retailers* – They are among the biggest providers of mobile phones to consumers in Nordic countries. They have potential for nudging customers towards greener handsets, and could conceivably enter the second-hand market, either directly or via selling the used mobiles they receive to refurbishers. Many EU countries also oblige retailers under specific conditions (e.g. size of shop) to provide a collection point for WEEE.
- *Network service providers* – These remain large sellers/providers of mobile phones which they sell via subscriptions of network services or otherwise, to attract and retain customers. They therefore have a strong influence over how often customers upgrade their telephones, but also have relevance to warranties, repair and refurbishment processes. The range of models via which network service providers are offering mobile phone upgrades have been diversifying rapidly over the past few years in global markets and now can include leasing and buy-back upgrades.
- *Mobile phone repairers* – The repair industry is exploding in Nordic countries with phone repair shops appearing on the high streets of every market town. There are also mail order repairs on offer. The market is becoming somewhat, more consolidated, as phone producers/electronics retailers increasingly demand that repair shops are certified in order to activate product warranties, but their remains a wide range of repairers from authorised, through unauthorised but above-board repairers, to grey actors.
- *Second-hand sellers and refurbishers* – A lot of second hand sales in Nordic countries take place C2C via internet services, but there are also increasing numbers of shops and even chains (e.g. Blue City in Denmark) that trade in second hand IT including smartphones with warranties. This market is expanding as smartphone prices increase giving greater value to used handsets. There is a strong overlap between companies involved in mobile phone repair and second-hand sales that is being further consolidated. This group may therefore need to be combined with the previous.

2.3.2 Importance of mobile phones to actors

The importance of smartphone sales to businesses in all groups is highly variable depending on the level of specialisation of the company and it is hard to deduce any general trends.

For *mobile phone producers* the importance of smartphones to their core business is very variable. For Sony and Samsung phones, sales are an important source of revenue: representing more than 80% of Sony's sales in Nordic markets and around half of Samsung's global sales. For Microsoft on the other hand, the sale of smart phones constituted a very small part of its business.

For large *retail chains of electronics and white goods*, sales of mobile phones represent a minor element of total turnover, however these sales are growing in importance. One large Norwegian electronics/electrical goods retailer (Komplett.no) estimated that telephone sales are approximately 10% of their total turnover. Another did not want to give an estimate, but emphasized that sales of new mobile phones are growing faster than many other product categories.

Several of the big retailers have established their own distribution channels, have pooled procurements and have added significant pressure on prices. Elkjøp alone purchases goods for close to NOK 28 billion. Telfast has for some time set a limit on margins for the distributors of mobile phones.[14] These have reduced from 15% in the 1990s down to 1–2% today. Distributors will thus have to depend on large sales volumes to succeed (Aagre, 2016).

In response to narrowing margins, one interviewed retailer is actively developing add-on services that raise more profit in connection with a sale, like the transfer of contacts and pictures from an old phone to the replacement one.

For more *specialised retailers* the share of turnover represented by phone sales can be as high as 80% with the remaining 20% represented by reparations, tablets or accessories (chargers, covers etc.).

For *repair companies*, repair of mobile phones is in general a large part of the business representing up to 95% of the turnover of interviewed companies. However, even here accessories are of increasing importance e.g. design covers and other accessories that "personalize" mobile phones. For one specialised phone repair company (MyTrendyPhone), accessories have become the major focus, representing 80% of turnover.

In the past *Network service providers* dominated as providers of new mobile phones to consumers in Nordic countries. However, contrary to expectations, sales of phones do not directly generate profits for the service providers. Some service providers even claim it is a cost. The providers' main turnover is via data and network services and subscriptions for these. The role of mobile phone sales is more indirectly linked to profits.

Bundling of new mobile phones to binding subscription packages has been an important means for service providers to attract and keep hold of customers (see Box 3). In addition, service providers are motivated by a wish that their customers have the newest phones that can be used for new and novel services the network service providers subsequently roll-out.

As described earlier this is now being challenged by rising demand for SIM-only services and reluctance to accept long binding periods.

[14] In Norway there is a logistics company, Telfast owned by Telenor that is the leading distributor of mobile phones in the Norwegian market. https://www.telefast.no/OmOss

Box 3: Means for obtaining new phones via network service providers

Phone upgrade packages offered by network service providers fall into five basic plans (Ravenscraft, 2016):

- *Subsidies*: When changing to a new provider or changing a phone, customers may pay little or nothing upfront. However, they are bound to the provider for up to two years.
- *Financing*: This is similar to the Subsidies scheme, but here monthly fees are reduced after the phone has been paid off.
- *Lease*: This is a newer option offered to customers and amounts to borrowing a phone from a provider. Customers may be offered new phones via the leasing plan as upgrades arise in the market. Ownership is retained by the service provider.
- *Early upgrade*: This is a mix between the latter two options, but gives the option of upgrading more often. These plans and contracts are often rather complicated.
- *Outright buying*: Customers pay the full price of the phone upfront. Subscription rates are lower, and customers can more easily shift between service providers.

2.3.3 *Adjusting businesses to changing conditions*

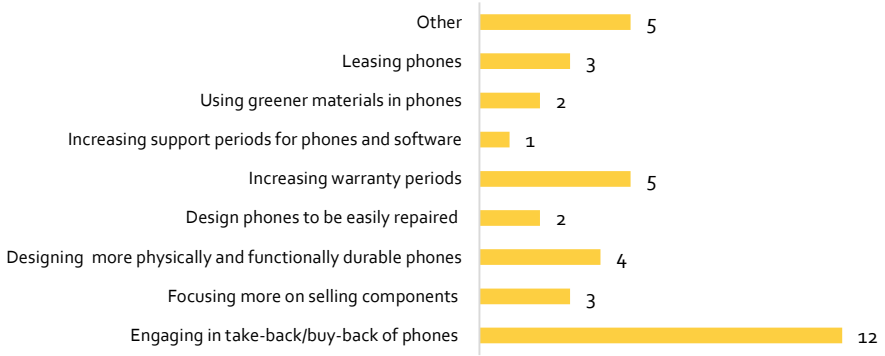
Businesses are responding to changing conditions described earlier in Section 2.2 in a number of ways.

Some are making efforts to reverse reducing upgrade rates and purchases of new mobile phones by offering increasingly outlandish features such as curved or flexible displays, 3D graphics and eyeball tracking (the Telegraph, 2015), or by offering attractive phone upgrade services.

However, many actors are also exploiting business opportunities in the increased commodity value of used smart phones and how these affect consumer behaviour.

The range in response activities reported by interviewed businesses are presented in Figure 6. The most reported response was engaging in take-back and buyback of used phones in order to gain value from these.

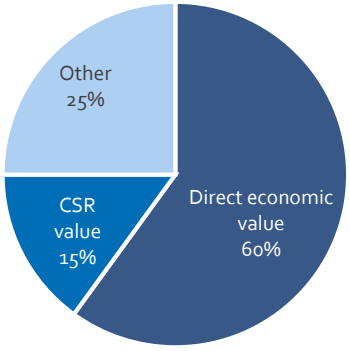
Figure 6: Reported engagement in "greener" approaches in response, or otherwise, to changing conditions



Network service providers typically sell their take-back phones (though not those they gather as WEEE collection points) on to refurbishers and second-hand sellers. Some network service providers expressed an interest in entering the second-hand market directly, but claim that it is difficult to compete due to high refurbishment costs (due to high salaries in Nordic countries) and comparatively low market price for used phones. Several smaller businesses, however, have proven that a viable business model does exist in the repair and second-hand market.

The majority are engaging because they can see a direct business opportunity for raising revenue, for example by selling or repairing phones (Figure 7).

Figure 7: Reported motivation for engaging in greener activities



For a few others – manufacturers and network service providers with an international profile – the motivation has also been to establish a greener profile and greater CSR value. This in turn is expected to provide indirect economic benefits. Other driving factors mentioned included a wish to reduce environmental impacts of the electronics industry, and to be well positioned should consumer preferences turn towards more sustainable products and solutions.

2.3.4 Transitions in the new mobile phone sector

Mobile phone producers

The landscape of producers is characterised by the large established global companies such as Apple, Samsung, Sony and Nokia[15] who are making gradual transitions to greener models and new disruptive start-up companies such as Fairphone and Puzzlephone that have a green concept as a central element of their business.

[15] Nokia's mobile phone section was bought by Microsoft and ran on a Microsoft operating system, but announced that production would seize in summer 2017. Meanwhile, Finnish company HMD began production of Nokia-branded Android phones in 2014.

Manufacturers are engaging in greener models in a number of ways including design for durability, use of greener materials, engaging in take-back and resell, design for reparability and provision of spare parts, initiating repair services and providing software updates.

Two of the interviewed manufacturers are working on enhancing physical durability due to a demand from consumers for sturdier phone (e.g. to avoid water damage) (Samsung), to improve consumer confidence (Sony) and, of key interest, to reduce warranty costs for the manufacturing of living up to their warranty commitments [Sony]. One of the newcomers (Puzzlephone) is also designing for durability.

Not all manufacturers are following suit, however. Though not interviewed, Apple only provides a single year of warranty. According to interviewed retailers, in the Nordic countries where the minimum warranty period is at least two years (see Chapter 3 of this report), the retailer typically fills the shortfall.

Despite lack of obvious demand from consumers, the three large established producers that were interviewed also reported that they have adopted green thinking to a wider degree than only working on greater durability. Two (Sony and Samsung) reported introducing recycled plastics into manufacturing and one is concerned with avoiding the use of hazardous substances[16] in production.

A further interviewed producer (Microsoft – that has since stopped smartphone production) reported using rigorous checks of their products' environmental performance using extensive life cycle assessment. Samsung also does LCA with third-party experts (The Carbon Trust). Finally, Sony, Samsung and Microsoft have been working for a number of years on the use of safer materials (having company specific material restriction as well as evaluation of new materials and production methods from environmental point of view).

Take-back initiatives of used phones is an area that some manufacturers were engaged in well before the emergence of smart phones in efforts to address low collection rates of small electronics by WEEE systems. In 2006, Nokia distributed 200,000 return envelopes in Finland with the offer of donation of EUR 2 to WWF for each device returned. This resulted in the collection of 25,000 mobile phones, which encouraged the company to extend the campaign with 13 retail companies (Nokia, nd.). Another campaign in collaboration with Finnish Post Office, involved providing consumers with prepaid envelopes and a free voucher for small entertainment/short navigation trials. With the collaboration of 150 post offices, they managed to collect 17,000 phones in two months (Nokia, 2010).

These examples are old and predate the period of smartphones that has drastically increased the price of handsets and mean that now take-back systems have the potential to give economic value to producers rather than just CSR value.

The new economic incentive has encouraged more mobile phone producers to engage in take-back. Apple began a global take-back system for iPhones and other equipment in early 2016. iPhones can be delivered to Apple stores or returned in a

[16] Specifically try to avoid the use of substances oif very high concern (SVCH) under the EU REACH Regulation.

prepaid envelope. The consumer receives a discount voucher of their next Apple purchase in return.[17] According to Apple they are prepared for reuse or recycled depending on the quality of the product.[18]

When engaging in used phone take-back phones this is often with a view to refurbishment/resell activities. There are differences among the established producers in their willingness to engage in these.

Fairphone offers significant sums of money for returned phones for refurbishment and resell. When challenged on why not all producers do not provide economic incentives for returns, one of the large multinationals answered that second-hand sales are still not part of their ethos; rather the company strives for technological advancements, not making money from the same technology.

However, these two goals are not necessarily mutually exclusive. Certainly other established companies that have a strong focus on technological advancements are also engaging in second-hand markets. Samsung reported taking back phones returned under warranties, refurbishing and reselling these, though in small volumes and Apple began selling refurbished phones via its online store in late 2016.[19]

Producers are also engaging directly and indirectly (i.e. via outsourcing) in repair services. One company (Samsung) has established repair centres that offer one-hour service on mobile phones. A further company has a three-tier repair service for honouring their commitments under warranties or producer guarantees. Level 1 repair shops in Nordic countries, check and correct functioning of software. If component repairs are needed they are typically sent to large authorised repair chains for level 2/3 repairs. Level 2 repairs are carried out in the same country. Level 3 repairs are out-sourced to specialised centres in a handful of countries, such as Hungary.

In another activity area, manufacturers also supply new (and refurbished) components to authorised repair shops to carry out repairs. However, at least until very recently, the same manufacturers have not been designing their phones to allow easy repair or component replacement. Greenpeace in partnership with iFixit, assessed over 40 best selling smartphones, tablets and laptops launched between 2015 and 2017 and found that Apple, Samsung and Microsoft's products in particular, are designed in ways that make it difficult for users to fix (Greenpeace, 2017).

To partially compensate for this Apple announced in June 2017 that it will make its screen-repairing Horizon machine available to 400 authorised repairers in 25 countries.[20] This is not the same as design for ease of repair, however, and is intended to ensure that repairs remain restricted to authorised repairers (more on this later).

Design for repair and upgrade, on the other hand, is the central element of Puzzlephone's business model. Puzzlephone has created a modular phone with focus on distribution of components, so they can easily be replaced and repaired. This also allows for necessary upgrade of specific components without the need to upgrade the

[17] http://www.apple.com/dk/recycling/

[18] http://www.apple.com/recycling/

[19] http://www.patentlyapple.com/patently-apple/2016/11/even-in-the-quickly-growing-refurbished-smartphone-market-apples-pricing-seems-to-be-defying-gravity.html

[20] https://www.cnbc.com/2017/06/07/exclusive-apple-makes-iphone-screen-fixes-easier-as-states-mull-repair-laws.html

whole phone, and allows the development of a wide range of specialist modules that can be added to the phone for specific functions; diagnostics for healthcare specialists, surveyors instruments, even a drone. According to Puzzlephone, hardware will always need to be upgradeable but this shouldn't mean buying a new phones.

Several other newcomers are also focusing on modular design for ease of repair and upgrading including Fairphone, Google and ZTE.[21]

One key challenge with modularity is designing components that one can be sure will fit to, and not constrict, the mainframe of future generations of smartphones. This challenge has been experienced in other technologies characterised by leasing systems and modular designs such as copy machines/printers.

Designing software for easy upgrade and trouble shooting can be as important for ensuring long phone lifetimes as designing the hardware for durability or repair. Microsoft's Windows 10 was designed for continuous upgrades (although this has now been halted with the pulling out of Microsoft from smartphone production). Samsung has developed an app, called Smart Tutor, through which consumers can remotely get support for their smartphones. Almost 8 out of 10 support cases where consumers use the Smart Tutor app can be solved remotely.

Retailers of new phones

One retailer (Expert NO) reported training their sellers in providing information on which phones were most durable or robust, but it is not clear whether this leads to higher purchase of these models.

A further area where retailers can engage is via take-back systems. Some retailers are obliged to act as official WEEE collection points[22] in which case they must to send the discarded waste phones on to WEEE collection organisations and may not gain value from it themselves (see Chapter 3). Other retailers *voluntarily* take back used phones as a business initiative.

Importantly, a retailer can both act as an official WEEE collector for waste mobile phones, and in a parallel separate channel take back/buy back used phones from consumers in the understanding that these are for reuse and therefore are not waste.

Four interviewed retailers have established voluntary take-back systems with incentives for consumers: two offer gift certificates (Elgiganten, Expert NO), one offers trade-in discounts on new goods, and the fourth offers cash-back. The used phones are sorted: some go to the official WEEE system developed to comply with the WEEE Directive, others go to refurbishment partners (e.g. Conmodo NO/SE) which sell them on primarily in other markets.

The initiatives have been successful in attracting customers but have also been put in place in reaction to increasing requests by consumers for retailers to accept hand-in of old phones.

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[21] http://www.modularphonesforum.com/news/modular-phones-2015-project-ara-phonebloks-puzzlephone-56/

[22] Under the revised WEEE Directive (2012/19/EU) retailers with EEE sales areas greater than 400 m2 are obliged to accept small WEEE (smaller than 25cm in any direction) free of charge, regardless of whether the original product was bought in that shop or from that retailer. the purchase of new EEE in the shop.

For some retailers, repairs have also become increasingly important to their business model. For one retailer (MyTrendyPhone) of new phones, repair services have grown to 30–40% of their mobile phone-related turnover and demand for these is continuing to grow faster than they can provide. They also assist consumers in making their own repairs via repair guides/films and selling tailor-made repair packages with necessary parts and tools.

Other "traditional" retailers have begun selling pre-owned phones, though on a rather small scale due to limited supply.

Network service providers

Network service providers reported responding to reduced interest in bundled phones and services, lower tolerance for long binding periods and lower customer loyalty by initiating new approaches to hold on to existing customers, and attracting new ones.

Upgrade programmes are one such approach. Under these upgrade consumers pay a fixed fee for a given type of phone. Typically 12 months later the consumer can replace the phone with a new model. One example is Telenor's SWAP service (see Box 4).

Box 4: Example of an upgrade service

Telenor runs an upgrade service called SWAP. Under this service a new mobile phone is provided which is paid off over the following 24 months. This can be combined with various Telenor network/data subscription services. There is however, no binding period to this service, although the mobile phone purchase will need to continue to be paid off even if the consumer switches operator.

After 12 months of payments the customer can return their phone and obtain an upgrade mobile phone under a new 24-month pay-off agreement. Any outstanding payments on the old phone are cancelled.

This model on the one hand may increase average upgrade rates of mobile phones. On the other hand, the operator regains ownership of the phone and can send it for refurbishment and eventually a new user.

Upgrade models don't directly generate much profit for the operator, but are a new means for ensuring customer loyalty. One operator who offers upgrade programmes says that they currently represent a little over 10% of customers while another estimates that by 2020 it will comprise a quarter of the market.

At first glance, upgrade models can be perceived as directly opposing green business models by countering the decelerating upgrade rates of phones seen over the last few years.

On the other hand, under these schemes service providers retain, or regain, ownership of the phone thus making them similar to leasing models. As with take-back systems (see below) this provides opportunities for raising money by selling the phone to a new user or to a refurbishment company.

One interviewed operator (Telenor) that operates this model sells the used phones on to refurbishment partners (BrightStar, Ingram or Conmodo) who sell them on local or global markets.

A positive action being taken by network service providers is to extend warranty periods. One Finnish operator (DNA) has been offering one additional year of warranty to the legal minimum with the objective differentiating themselves from their competitors. So far the operator has not experienced any challenges in honouring these warranties.

Network service providers have for a relatively long period engaged in take-back and buy-back initiatives both in Nordic countries and elsewhere. A UK operator, O_2, initiated a buy-back scheme in 2009 in partnership with Redeem, one of the most prominent mobile phone recyclers in UK. The two millionth handset was refurbished under the scheme in August 2016, by which time GBP 135 million had been paid back to consumers (Mobile News 2016).

Such schemes are also found in the Nordic countries. According to (Swedwatch, 2016) the four largest network service providers in Sweden all run trade-in schemes. Some of the interviewed service providers (Telia (All) and Telenor) also reported having established take-back initiatives for old phones where consumers are encouraged via a discount on a new phone and/or a donation to charity in return for their phone. Telenor have also engaged in take-back via sport clubs who receive money for each used mobile phone they collect from their members and send to Telenor. Telenor have collected close to 650,000 used mobile phones through this initiative.[23]

Some operators reported passing take-back mobile phones on to partner companies (e.g. Redeem and Brightstar) that refurbish them and sell them on global markets under a clear agreement that they must not be resold in the collection country. To increase their control over the fate of take-back phones, one of the companies (Telia SE) wishes to establish a more localised solution and has bought a refurbishment company as a first step in this.

2.3.5 Trends in the second-hand, refurbish and repair sector

Several interviewed repairers reported explosive growth in business over the past few years. Repair businesses state that the growth in the second-hand market has potential for a factor 5–10 increase, but is being held back by a lack of awareness among consumers. More and more actors are entering the market, which is still some way from saturation.

Due to consumers' increasing dependence on smartphones, a strong demand for rapid repair services (under one hour) has developed in recent years. Fast-repairers are experiencing significant growth and require physical repair shops. The location of shops is key, and a typical good location would be in shopping malls where people can get their phone fixed while they are shopping.

Consumer's dependence on their smartphones may in the future lead to more repairers offering a "borrow" phone to consumers to use during longer repairs. This could be enabled by increasing reliance on "cloud offloading" of a phones data and functionality to allow easy transfer to a temporary borrowed phone. More broadly,

[23] https://www.telenor.no/om/samfunnsansvar/mobilretur.jsp

cloud offloading may be a key enabler of recirculation and leasing models for smart phones in the future (Green Alliance, 2015).

In addition to repair, refurbishment and second-hand sales both to private consumers and to businesses are also growing rapidly often in association with take-back/buy-back schemes operated by producers/retailers/network service providers. An industry news website based in UK[24] revealed that mobile phone repair/refurbishment has become an integral business area for mobile phone retailers, distributors, network providers as well as for repair/recycling companies. Companies engaged in the buy-back schemes either directly carry out refurbishment, or have contracts with designated refurbishers.

A Danish refurbisher of IT and mobile phones (Refurb) experienced a factor nine increase in turnover between 2014 and 2015. The company sources used phones from companies and government institutions, but sells refurbished phones both to organisations and to private consumers. The main barrier to even more rapid growth has not been lack of demand, but rather lack of supply of refurbishable phones. The company is now sourcing abroad to supply Danish demand for used phones.

Fonum, a Finnish service company fixing high-end mobile phones, is another example. They started with Apple devices but have been extending their business to other high-end phones such as those from Samsung, and after 4–5 years have expanded to 15 shops. One of their strategies is the projection of an image of high quality. Compared with Denmark, actors engaged in repair business in Sweden suffer from lack of domestic demand.

Warranty is essential for the repairers to build trust and deliver a good service. Interviewed repairers stated that they give a 6–12 month warranty on second-hand phones that complies with what can be found in literature (Mobile News 2014, Mobile News 2015a). Whether this is in compliance with consumer law is discussed under the second part of this report. The warranty is particularly important to repairers that are not certified by manufactures.

2.3.6 Interactions between the actors

The various business groups connect with each other through a large number of interaction routes. Greening of the service systems for phones will rely upon strengthening and consolidating some of these. All interviewed groups reported having interactions with actors in at least two other groups (Figure 8).

[24] http://www.mobilenewscwp.co.uk/

Figure 8: Reported intragroup co-operations

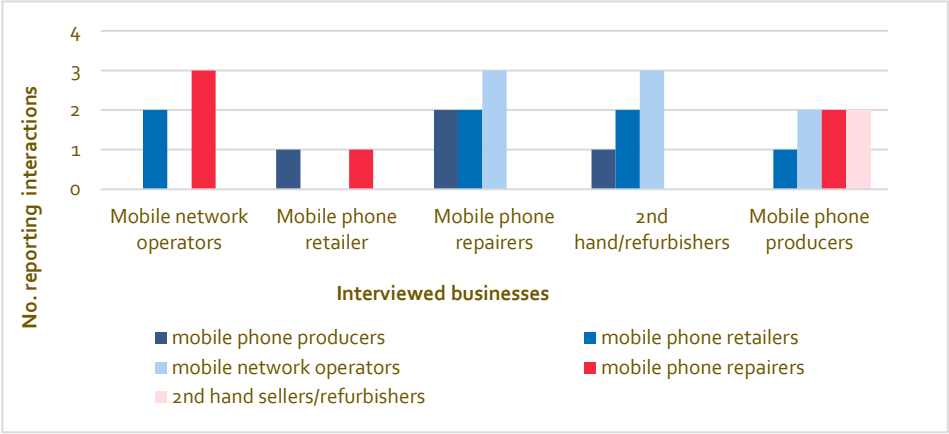
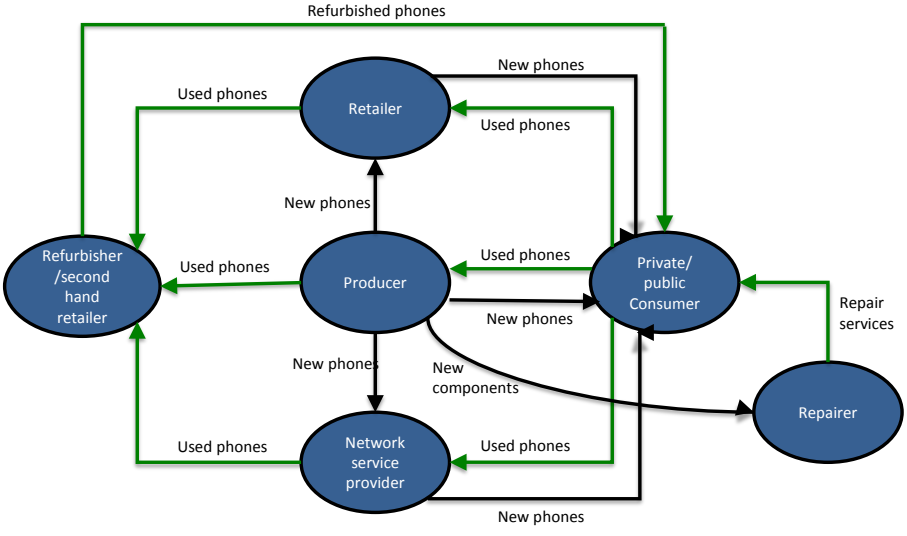


Figure 9 illustrates some of the partnerships named by interviewees and in literature: green lines symbolise a relation that contributes to extending the life of a product and its components; black lines symbolise flows of new products.

One strong interaction type with respect to green initiatives is between *producers/retailers/network service providers* on the one hand and *authorised repairers* on the other. Here the producers/retailers/service providers use repairers to assist them in honouring warranties on the phones they have sold to customers. At the same time *producers* sell spare components to *repairers* to enable them to fulfil their services.

Potential conflicts do arise, however, in these interactions. *Retailers/network service providers* are in some cases obliged by *mobile producers* to use repairers that the producers have authorised. Moreover, some manufacturers only sell replacement components to authorised repairers.

Figure 9: Relationships between actors in the value chain



Source: PlanMiljø, own design.

This presents a challenge for some of the *smaller repair businesses* that can find it hard to gain authorisation. Copy spare parts are available for many mobile models, but use of these may compromise warranties following a repair. Apple's warranty for example is nullified if copy parts have been used in a repair. Moreover, some mobile phone producers may wish to hinder the sale of copy components to reduce competition for their own original parts (this is discussed in detail in Box 5 later).

At the other end of the scale some of the *large authorised repairers* (e.g. Conmodo) have little or no contact with consumers, carrying out all their repairs for network service providers and retailers. However, consumers' increasing dependence on their smartphones has led one operator (TDC) to begin switching to in-house repair services to speed up the process.

A further key interaction is between *network service providers/retailers* and *refurbishment partners that process the used phones* that the network service providers/retailers have collected under take-back initiatives.

While some producers are fully engaged with international refurbishment and resale companies (e.g. Apple have appointed refurbishment company Brightstar to be in charge of its take-back system in the UK) others have held back due to distrust from what they consider to be a rather "grey" market, which they have difficulty in controlling. Their fear is that uncontrolled resell could end up damaging the producer's profile through sale of low quality second hand versions of their phones.

The problem seems to have reduced with the establishment of large, international refurbishing companies. One network operator (Telia SE) is, nevertheless, working towards provide refurbishment in-house to establish full control. One producer (Samsung) refurbishes and resells only those that are on warranty cases, the volume of which is very limited. They have run a pilot to refurbish and resell smartphones via their online shops in UK, however.

At the same time some *refurbishers* (e.g. Inrego) are finding the *supply of take-back phones from network service providers/retailers to be limited in volume* and inconsistent in flow. They wish to work more closely with network service providers/retailers to help them develop better methods for marketing and incentivising consumers to return their phones.

2.3.7 Which consumers are engaging with green initiatives?

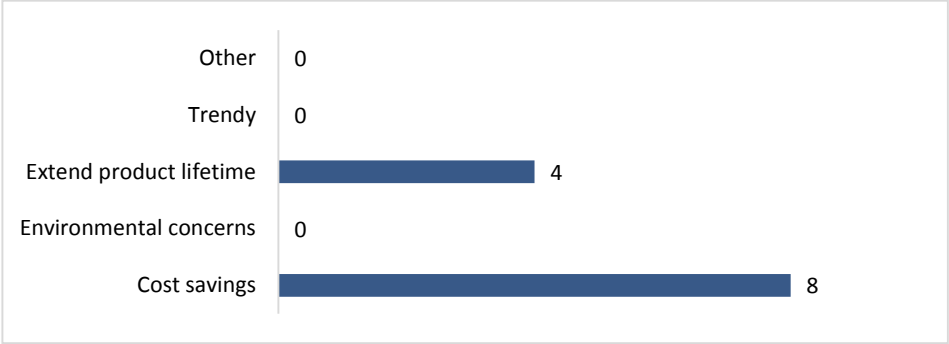
The consumer segment for second-hand handsets and for repair services is in general rather broad. One refurbisher/second-hand retailer (Refurb) identified men age 25–55 with families as being more highly represented in their customer portfolio. They have tight economies and often are the key purchasers of mobiles for other family members. Other interviews found that the consumer segment for used mobile phones is very broad.

The older generation (65+) are often satisfied with simple feature phones that tend to last longer with less need for repair and for which second-hand markets are less prominent in Nordic countries.

Marketing of repair services and second hand handsets is promoted via a very wide range of media and tools e.g. company websites, advertisement on second-hand

platforms (like dba.dk, blocket, finn.no and Tradera), e-mail offers, radio, social media, fliers and advertisement in physical stores. Some reported even using old-fashioned approaches like posting of fliers.

Figure 10: What motivates consumers to get their phones repaired or buy second hand (according to businesses)

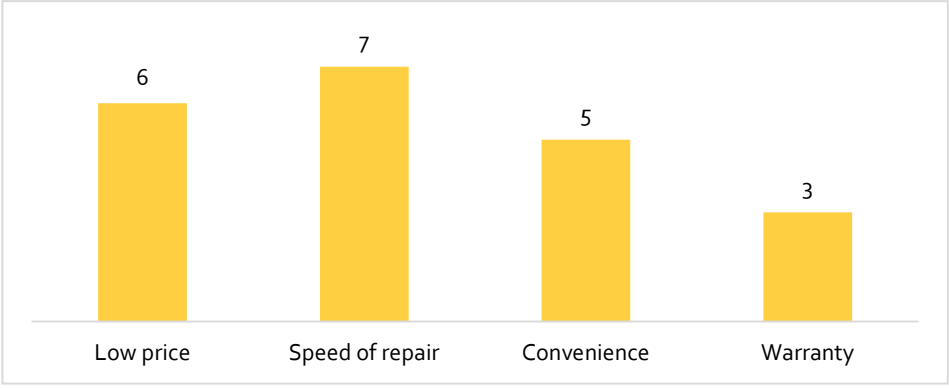


Businesses claim that the drivers for consumers to get their phones repaired or to buy second hand phones are essentially economic (Figure 10). This guides how businesses market repair and second-hand.

Speed of repair and convenience are also key factors for consumers when selecting a repair company (Figure 11). The wish for speed and easy access suggest that physical shops will likely continue as the preferred option for consumers as they become ever more dependent on their smart phones.

Environmental concerns, however, are not currently a driver for consumers to choose greener solutions according to businesses. Retailers did not report any increased interest in "greener" phones i.e. made from materials with lower environmental impacts or phones that are modular to allow easy repair or component upgrading. Manufacturers commented on the lack of consumer pull in greener mobiles (Microsoft, Puzzlephone, Sony). They experience that environmental concerns are less important to consumers than experience of the phone and value for money (Puzzlephone).

Figure 11: The factors that are most important to consumers when choosing repair services and second-hand phones (according to businesses)



Moreover, network service providers and manufacturers (Telia in all countries and Sony) found lack of interest by consumers to be a challenge when they introduce greener initiatives such as take-back systems.

One interviewee speculated that this lack of demand may be a result of lack of availability, or lack of awareness of the availability of greener mobile phones and green initiatives. This is a typical chicken and egg problem. Market actors claim the wait for "signals" from the market, while consumers do not have many ways to show their commitment to sustainability, due to a lack of (viable) alternatives. However, a network operator mentioned that they took away Fairphones from their retail shop due to lack of consumer interest. This case argues against lack of availability being a valid reason for lack of demand.

On the positive side several manufacturers and network service providers noted an increasing demand for greener phones and services from the public sector and other organisation procurers that could serve as a catalyst for further development of greener mobile phones and initiatives. Some manufacturers also stressed the importance of demand for greener mobiles from network service providers.

2.3.8 Obstacles to green models

Businesses were asked to name the key obstacles that hinder engagement in greener initiatives. These are arranged into broader groups in Figure 12.

Figure 12: Reported obstacles to greener initiatives

Waste regulations

Waste regulations were named by several refurbishing/second-hand businesses as a key barrier to green business transitions. This is a common problem for companies engaging in circular economy models through take-back, recycling, refurbishing of products and resources.

According to one of the interviewees, 8–10% of the electrical and electronic products that are brought to civic amenity sites run by municipalities/waste companies can potentially be reused, as long as the equipment is handled correct. The current implementation of the producer responsibility for WEEE, in some countries, does not

allow other stakeholders access to these volumes. This issue could be solved via greater cooperation between the collective schemes, civic amenity cites and refurbishers. This is considered in more detail in Section 3.

VAT rules

Another barrier, identified by various Danish refurbishers and second-hand retailers is the bureaucracy involved in negotiating VAT rebates. Danish VAT rules, allow VAT reductions on used goods, specifying that VAT should only be paid on the value added and not the full sales price. This can potentially be a strong economic incentive for the business model. However, the regulation was originally designed for the antique furniture trade, and the application procedure does not fit well to new types of second-hand businesses and is so bureaucratic that some refurbishers have not made use of it. Stakeholders note a strong need for clearer and more streamlined used-VAT rules. The situation is similar in Norway.

In Sweden, a new rule on VAT exemption came into force from 1 January 2016. Under the new rule, sales of donated second-hand goods by public non-profit organisations and registered religious communities are exempt from VAT if the income from the sales are used to finance non-profit work. A network service provider reported finding the new rule confusing.

Some of the interviewed repairers also claim that small repair shops, are evading VAT and it is very difficult, if not impossible, to track them down. By evading VAT, small repair shops can offer much cheaper services to customers and thereby outcompete law-abiding firms. Illegal activity can damage consumers' picture of the mobile repair sector.

Consumer behaviour and lack of awareness

According to the interviewees, the considerations driving consumers towards lower purchases of new phones and increased purchase of second-hand sales and repairs are mostly economic rather than environmental. Neither are environmental considerations taken into account by consumers when buying new phones, according to Nordic retailers.

Stakeholders argue for incentives e.g. a discount when choosing environmental friendly products or services. However, this is only likely to have an effect if the functionality of these phones is equivalent to that of the less green alternatives. The mobile phone market appears to be something of "a waiting game" where actors are waiting for signals of increased awareness on sustainability amongst consumers. As stressed by several manufacturers interviews, the current lack of consumers' push make it even more important to have demand from institutional buyers, especially network service providers.

Variable quality of used smartphones

Some refurbishers are finding that the quality of smartphones that they receive is variable. Some are worn out from previous use and require significant refurbishment efforts to get into "as good as new" state.

Lack of trust between some actors

As discussed earlier, some producers and network service providers are distrustful of the greyer element of repair and refurbishment services, which could be holding back growth in the repair and refurbishment sectors. This is in part already being solved through the establishment of large high profile repair and refurbishment companies that are easier to form partnerships with.

Interviewees also noted that some consumers may be sceptical about buying a refurbished phone despite the warranty given by businesses. There is also uncertainty among some consumers that their data will be completely removed from phones prior to resell. A recent study in Denmark (Danish EPA, 2015) identified that large volumes of used electrical and electronic equipment, including approx. 8 million mobile phones, is stored in private homes, business and public organisations. This equipment has not been used within the last 12 months, and every day the value of these products reduces, but consumers are distrustful of data security.

These issues could be resolved via utilising a refurbishment standard in Nordic countries such as the British Standard PAS 141,[25] the Belgian Revisie label[26] and a standard currently under development by the European standards organisation, CENELEC. These cover issues such as health and safety, workers' rights, environmental concerns and data removal. Adoption of such a standard would provide assurance for both consumers offering their phones in take-back systems for reuse/ refurbishment and to the consumers buying the phone.

Product design not suited to repair/refurbishment or long life

According to repairers/refurbishers many of the leading smartphones on the market are not designed for easy reparation or designed for durability. Many phones are very sensitive to impact and moisture, and in some cases phones are not easily disassembled to allow replacement of damaged parts. There are no minimum standards for durability or reparability of mobile phones at EU or national level.

Manufactures like Puzzlephone, Google, Fairphone and ZTE are beginning to challenge these barriers by building modular phones to allow easy disassembly, replacement and/or upgrading of components.[27]

Lack of availability of original parts

A clear obstacle for green business models is the issue around original and non-original spare parts described earlier where producers, most notably Apple, only provide authorised repairers with original spare parts. Repairers that are not authorised may be "forced" to use copy parts, which can compromise warranties and commercial guarantees.

An alternative option for small repairers is to buy new mobile phone models to cannibalise as a source of original components – a resource inefficient solution. It can

[25] http://www.wrap.org.uk/sustainable-electricals/esap/re-use-and-recycling/guides/PAS-141-Guide
[26] http://www.qualiprosh.eu/download/Belgium_Second-Hand_sources.pdf
[27] http://www.modularphonesforum.com/news/modular-phones-2015-project-ara-phonebloks-puzzlephone-56/

be argued that there is a need to look more deeply into 3rd party spare parts to ensure that these are accommodated by the mobile phone industry. At the same time it is important that the ability of manufacturers and retailers to live up to warranties is not compromised. The issues are discussed in detail in Box 5.

Box 5: Authorised and non-authorised repairers, spare parts and warranties

One complex and contentious issue that is affecting green business models is that of authorisation of repairers, availability of spare parts, repair equipment and diagnostic tools.

The established mobile phone producers authorise repair companies in key markets that can carry out authorised repairs of their smartphone models during warranty periods and afterwards. These tend to be large chains of shops or online repairers. Authorised repairers are given access to original components, diagnostic tools and in some cases specialised tools/machines for assisting in dissambly and repair.

Non-authorised repairers may have difficulties in gaining access to original components, diagnostics etc. from some, but not all, producers. Apple is one of those companies from whom it is particularly difficult to obtain spare parts. Repairers are either forced to buy additional smart phones to cannibalise for components, or use copy or OEM parts (parts produced in the same facility that produces original parts but outside of contracts). Copy/OEM parts are typically cheaper, but of lower quality materials and workmanship. Apple has previously targetted this practice by causing phones malfunction following installation of an OS update if a smartphone includes non-original components; the so-called Error 53 phenomenon. Apple issued a fix following consumer uproar in February 2016.*

Producers' argument for not supplying original parts and diagnostic tools to non-authorised repairers is that repairs that they have not sanctioned can undermine their warranties. They are concerned that they will be forced to support warranties on phones that contain incorrectly installed components giving high failure rates and incurring high costs to the producer. Moreover, according to Sony, the non-authorised sector includes a wide spectrum of actors. This includes at the bottom end, grey actors that do not follow environmental, health and safety standards and have bad working conditions for their staff. The producers argue that they don't have the means for rapidly distinguishing between professional and above-board actors and grey actors within the non-authorised sector.

According to one medium-sized repairer (PhoneHero), however, not providing non-authorised repairers with original parts and tools will not hinder phone owners from approaching them for repairs, especially under increasing demand for rapid one-hour repairs. By not issuing original components more readily the producers are losing a potential source of income and undermining the quality of repairs. The repairer also argued that many non-authorised repairers run professional and over-board operations.

A number of solutions were discussed at the Helsinki workshop, including 1) producers being more supportive of non-authorised repairs provided that they are "out-of-warranty" 2) producers providing access to blueprints for components to allow higher quality copy components 3) stronger regulation by national governments of the repair sector to outlaw those actors not following regulations. Producers were most open to solutions 1 and 3, while they feel that solution 2 would undermine rules of competition and technological development. Solution 2 is normal in the automobile industry and may soon be forced onto mobile producers by Right to Repair Bills that have been passed in 8 US States.

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*www.dailymail.co.uk/sciencetech/article-3453566/Apple-issues-fix-Error-53-apologises-customers-faces-legal-action-following-warnings-update-renders-iPhones-unusable-breaks-laws.html

Software barriers to refurbishment/resell

Anti-theft and security software installed on smartphones such as Apple's *Find my iPhone* can hinder refurbishment since they can only be removed by the original owner. If this hasn't happened refurbishers may have problems restoring the phone to factory settings ready for a new user. In addition, some software settings hinder complete removal of personal information from the phones. One network service provider mentioned that in these cases, they have no choice but to send the otherwise-reusable phones for recycling.

High salaries and expensive logistics in the Nordic countries

High cost for labour and logistical costs in the Nordic countries can be an obstacle for the second-hand, repair and refurbishment markets since these are effectively competing with the much lower cost of labour in Asia where most new smartphones are manufactured. One repairer also expects to scale down their Nordic operations and move the activity to Eastern Europe. This cost gap could be assisted by more preferential VAT rules for second-hand, repair and refurbishment services.

On the other hand, one company (Puzzlephone) noted that the cost savings from moving production out of the Nordic countries to Asia can be offset by the benefits of keeping technical development close to production. This was one of the lessons that came out of the Nokia experience.

3. Consumer Law and other Regulations

3.1 Approach

Some regulations can potentially represent obstacles and/or opportunities on circular economy and other green initiatives and business models described under the previous section.

We investigated these issues via desktop study supplemented by interviews with a variety of stakeholders in the four largest Nordic countries (see Table 2).

Table 2: Interviewed organisations

Organisation	Country
Consumer Complaints Board	DK
Danish Consumer Ombudsman	DK
Danish Industry	DK
Danish Environmental Protection Agency	DK
Finish Environmental Protection Agency (SYKE)	FI
Finnish Competition and Consumer Authority	FI
Confederation of Finnish Industries	FI
Norwegian Environmental Agency	NO
Norwegian Consumer Ombudsman	NO
Forbrukerrådet	NO
Business Association for Electronics	NO
National Board for Consumer Disputes (ARN)	SE
Swedish Consumer Agency	SE
IT & Telekomföretagen	SE
Swedish Environmental Protection Agency	SE

3.2 Consumer Law, Guarantees and Warranties

Regulations concerning consumer rights, guarantees and warranties can have an influence on the actual lifetime of mobile phones, producers' interest in designing for durability and consumer confidence in repair and second-hand sales.

On the other hand if minimum warranty periods for new or used mobiles or repair services are long and requirements stringent, businesses may not feel that they can live up to these and at the same time run a viable business.

We examine these issues in this section, first looking at the application of consumer law to new mobile phones and then as how it applies to used mobile phones.

3.2.1 *New mobile phones*

European regulation of guarantees

Consumers who purchase goods are legally protected under a number of different EU Directives. Central is the Consumer Sales Directive , which is a contract law instrument meaning that only final sellers to the consumer are liable. Persons or entities higher in the distribution chain, such as producers, are usually not party to contracts with consumers (European Commission, 2015a). The Directive allows the Member states to introduce more strict rules to protect consumers.

In addition to the Consumer Sales Directive, three other Directives have relevance to protection provided for consumers in the mobile phone market. They are the Consumer Rights Directive, the Unfair Commercial Practices Directive and the Unfair Contract Terms Directive (European Commission, 2015a).

Under the Consumer Rights Directive, the seller must inform consumers of the existence of legal guarantee requirements, after-sales service and other crucial information (Article 5.1 (e), Article 6.1 (l)).

The Unfair Commercial Practices Directive lists information on elements to be taken note of when judging if a commercial practice is regarded as misleading (Article 6. 1(g)). The Annex of the Unfair Contract Terms Directive includes in its list of "unfair terms", terms that reduces the possibility of consumers to exercise its rights related to guarantee.

The most important of the Directives, the Consumer Sales Directive states in Article 2 that: "The seller must deliver goods to the consumer, which are in conformity with the contract of sale, and then further specifies presumption of conformity of a number of conditions."

If a lack of conformity – i.e. a defect in the product – becomes apparent within 6 months of purchase, it is presumed to have existed at the time of delivery, unless the seller can prove otherwise. After six months the burden of proof shifts to the consumer (Article 5.3).

Although the legal guarantee covers the contract between the seller and the buyer, the Consumer Sales Directive gives the seller a possibility to pursue remedies against the producer or any other intermediary in the sales chain (Article 4).

Article 3 of the Consumer Sales Directive specifies a list of remedies that should be provided to the consumer in the case of a defect: Repair, Replacement, Reduction in price and Rescission of contract. The consumer is offered a two-tier system. First the consumer is entitled to repair or a replacement free of charge, within reasonable time and without significant inconvenience. Only if this is not met, may the consumer ask for a reduced price or rescission of the contract. There are some exceptions to this in implementation in Nordic countries (see Table 3).

Implementation at national level

The Consumer Sales Directive is transposed into national laws in Nordic countries mainly via revisions to existing national laws. An overview of is given in Table 3. The implementation differs markedly from country to country.

Danish law maintains the two-year minimum guarantee period of the Directive, while the Swedish implementation extends this to three years. Under Finnish implementation the minimum legal guarantee is more pragmatic, linking directly to the expected lifetime of the product in question. The expected lifespan is not set specifically for mobile phones but provides a basis for case-by-case decisions in court and by the consumer complaint board.

The minimum warranty period supported in Norway is also related to the expected lifetime of the product. However, unlike Finnish law, the Norwegian law sets the deadline for a claim for non-conformity to 5 years (though this does not infer that a claim within this period will be successful). The Norwegian Supreme court upheld the 5-year claim period in 2007 (see Box 6).

When asked about whether the current minimum warranty periods strike the correct balance between protecting consumers on the one hand and protecting businesses from unreasonable claims on the other, opinions of the organisations we interviewed differed, but not as much as might be expected. There seemed to be general acceptance of the current circumstances in each country. This may be because, despite the differences in allowances, consumers tend to use their rights during shorter periods (see also under "Burden of Proof").

Table 3: Transposition of Consumer Sales Directive (EC 2015 c; d; e: f), (EC 2015a) and (ECC-Net 2014)

	Sweden	Denmark	Norway	Finland
Name of main National Laws affected	The Consumer Sales Act ("Konsumentköps-lagen"),The Consumer Services Act and The Marketing Act ("Marknadsföringslagen")	The Sales of Goods Act ("Bekendtgjørelse af lov om Køb – or Købeloven"), The Marketing Practices Act ("Bekendtgørelse af lov om Markedsføring")	The Consumer Sales Act ("Lov om forbrukerkjøp"), Marketing Control Act ("Markedsføringsloven")	Consumer Protection Act ("Kuluttajansuojalaki – Konsumentskyddslag")
Additional remedies exceeding the Directive	Withholding payment	No	Withholding payment Compensation	Withholding payment
Legal guarantee which exceeds the minimum established by the Directive (2 yrs)	Yes, 3 years	No, 2 years	Yes. Explicit linkage to the expected lifespan of the product	Yes, expected life span
Hierarchy of remedies	Replacement, reduction in price or compensation, termination of the contract, withhold payment, The consumer may claim damages and request a refund if they consider the defect significant	Repair or replacement followed by Reduction of price or refund	Repair, reduction in price, replacement or refund	Repair or replacement followed by Reduction of price or refund
In case of repair or replacement	The law is not explicit on this point	Once the replacement item is delivered to the consumer, a new 2-year legal guarantee period starts. In the event of a repair, the consumer can make a claim within 3 years if the same defect occurs again	The 2-year duration of the legal guarantee is suspended and resumes as soon as the consumer receives the repaired or replacement item	The law is not explicit on this point
Right to pursue a claim against an intermediary	Partial: The consumer can pursue if the seller Is insolvent, has ceased trading or cannot be located	No	Partial: an option to pursue an importer. National producer or previous seller in the supply chain	Partial: The consumer can claim against intermediaries who supplied the goods for resale

The Danish Consumer Complaints Board felt that two years was reasonable while the Swedish Consumer Agency felt that three years sufficiently reflects life expectancy. The Norwegian Consumer Ombudsman (Forbrukerombudet) was supportive of the 5-year period which, though potentially longer than necessary, it considers better reflects the reasonable expectations for the lifetime of a mobile phone than a two year warranty.

Box 6: Supreme court upholds 5 year claim period

In 2003 a Norwegian consumer bought a Nokia 6100 mobile phone from Memonor AS. After around two years a problem with the phone's keyboard arose. At this point Memonor AS was bankrupt. The consumer contacted the firm's earlier sales distributor, who notified the consumer that the claim was too late, as the two-year legal guarantee had expired. In addition, Nokia claimed that the problem was due to normal wear and tear.

The Supreme Court in 2007 upheld that the fault was not caused by the consumer and that the claim had been made in due time. The court also determined that the normal life time and therefore expected durability of a mobile phone is 3 to 4 years. Further that for goods intended to last 3 to 4 years, the 5-year deadline should apply (Høyesterett, 2007).

While not entirely supportive of the principles behind the 5 year period, the Norwegian electronics branch organisation, has not experienced it as a problem simply because consumers tend not to make much use of it.

There was a general sympathy towards the pragmatism of the Finnish approach, especially from electronics trade organisations. However, consumer representatives were wary of the potential for confusion that such as an approach could cause (e.g. DK Consumer Complaints Board). The Swedish Consumer Agency representative proposed the possible benefits of a supplementary approach in which producers are required to provided expected lifetime of the smartphones they produce which could then be linked to minimum warranty periods.

The EU Commission has proposed harmonisation of minimum warranty periods in response to the increase in internet purchases from non-domestic suppliers and which warranty period should apply in such cases. The proposed EU Directive COM (2015) 634 attempts to address this, but is finding some opposition during negotiations.

Commercial Guarantee

A commercial or manufacturer's guarantee is something a producer, retailer or a third party may choose to offer to buyers. This is a voluntary service that (should) offer more than can be claimed according to the legal guarantee.

Table 4: Mapping of concepts between legal guarantee and different types of commercial guarantees (Adapted from European Commission, 2015a)

	Definition	Characteristics	Price to consumer	Also known as
Legal guarantee	Legally established obligation for consumer goods to comply with conformity of product for 2 years*	Resulting in a set of consumer remedies in cases of lack of conformity	Free: it is a consumer right	"statutory guarantee"
Integral Commercial guarantee	Undertaking by a seller or producer to the consumer which is in addition to the basic legal guarantee	An obligation to reimburse the price paid or to replace, repair or handle consumer goods in any way if they do not meet the specifications set out in the guarantee statement or in the relevant advertising	Free: offered by manufacturer/seller as part of product sales price	"guarantee", "manufacturer's guarantee", "warranty"
Paid-for commercial guarantee	Undertaking by a seller or producer to the consumer which is in addition to the basic legal guarantee	It can resemble commercial guarantees in terms of repair, replace or refund services in case of quality or service lapse. It can either be insurance or non-insurance based	Paid-for: offered separately to underlying product being covered	"extended warranty", "service contract", "care plan", "service plan", "extended service contracts"

Note: *Some countries have more than 2 years, including Norway, Finland and Sweden.

Commercial guarantees upgrade consumers' rights by, for example, offering longer time periods than the legal warranty or expanding the scope of events or failures covered. While under the legal warranty only the seller is directly responsible, it is typically the producer that offers commercial guarantees. When a commercial guarantee is provided by the producer, quick and efficient complaint mechanisms are usually in place to honour these. However, commercial guarantees typically include long lists of exclusions, and the remedies the guarantor is ready to provide, may be limited (ECC-NET 2014).

If a commercial guarantee is provided to the consumer then the seller is bound by the Consumer Sales Directive to the provisions they have made in the commercial guarantee.

Moreover, of key importance, the provisions of the commercial guarantee cannot undermine the provisions of the legal warranty; the provisions which give strongest protection to the consumer are the ones which are prioritised by law. The seller is obliged to inform the buyer of this priority.

However, it seems that the average consumer is not aware of the provisions of the legal guarantee. At EU level self-reported awareness of commercial guarantees lies at 67% while only 35% were also aware of the legal guarantee period in their country; the majority of consumers in half of EU Member States thought that the legal guarantee

period was a single year (European Commission, 2015b). Sellers have in some cases exacerbated this by misinforming buyers. Apple was fined EUR 900,000 in Italy in 2011 when selling extended add-on warranties to its "one year warranty", because the company did not inform buyers that they are entitled to two years of free warranty under Italian law (Reuters, 2011).

Additional insurance

Additional coverage is increasingly being offered to consumers as a complimentary service in a sales campaign or in return for additional payment. They typically cover a wider range of cases (accidental damage, water damage etc.). The need for such extra insurances is something that is hotly debated (Smarte Penger, 2016). Nevertheless, in the mobile phone sector insurance is sold quite easily since it often covers occurrences – e.g. accidental damage or theft – that are not covered by commercial guarantees (ECC-Net 2014).

One interviewee pointed out that the increasing sales of additional insurance might also be a reflection of the lack of awareness amongst consumers of the extent of their rights under minimum legal warranties (Finnish Competition and Consumer Agency).

Honouring warranties and commercial guarantees

As noted earlier the Consumer Sales Directive specifies a list of remedies that should be provided to the consumer in the case of a defect. First the consumer is entitled to repair or a replacement free of charge. If this is not met, the consumer can ask for a refund. This is implemented in a similar way in national law, although in Sweden the buyer may ask for a refund if the defect is significant and in Norway repair is prioritised followed by reduction in price and then replacement or refund.

An interviewee (Finnish Competition and Consumer Agency) noted that in general the seller will prefer to make a repair rather than provide a replacement or refund. This is also the optimal option with respect to greener business models. If the consumer were free to choose they would probably opt for a replacement or refund, which would count against greener models of repair. Consumer complaints boards occasionally get complaints from consumers who have been through several consecutive repair attempts before a problem has been solved.

Box 7: Apple versus David

David Lysegaard bought an iPhone via Apple's webshop in 2011. The phone broke down after a year, and was sent for repair under the service contract. A repair was not possible and he was instead provided with a replacement phone that Apple claimed to be new. David Lysegaard subsequently found that it included refurbished parts. He demanded a new phone or the successful repair of his original phone, but Apple refused.

David Lysegaard made a complaint to the Danish Consumer Complaints Board (Forbruger-klagenævnet) who upheld his right to a new replacement or to a full refund of his original purchase under the Danish Sales of Goods Act. The decision was based on the fact that although a phone containing refurbished parts can have the same appearance, function and life expectancy of an entirely new phone, its economic value may be lower and that under the Act the buyer has the right to a reclamation of the same value.

Apple rejected this demand and took David Lysegaard to the district court in Glostrup. The court found in favour of David. The court did not allow for consideration of environmental benefits in the decision (Danmarks Domstole, 2016). This raises the question of whether the Sales of Good Act and similar should be adjusted to allow for environmental considerations.

With respect to honouring commercial guarantees, EC (2015b) found that in most cases these provides for repair or replacement of an item, whereas additional insurance generally provides monetary compensation in case of loss/damage.

Burden of Proof

The actual impact of legal warranties and commercial guarantees may, in reality, be more defined by the division of the "burden of proof" between the seller and buyer than the minimum warranty period. In Sweden, Denmark and Norway a defect is assumed to be the fault of the seller within the first six months after purchase unless he can prove otherwise, and after six months the burden of proof lies with the consumer.

In Finland, the burden of proof again follows the life expectancy of the given product; only after the end of the reasonably expected lifetime, does the burden of proof transfer over to the consumer.

An extension of the period over which the onus of proof lies with the seller is also being considered as part of Norway's negotiations with the EU on harmonisation (see earlier). One proposal is that, if the Norwegian minimum legal warranty period were to be reduced to two years, then the seller's onus of proof would be extended to fill the full period (Norwegian Consumer Council).

According to interviewees, evidence used to settle claims normally comprises the existence or not of signs of misuse, for example marks on the phone coincident with a physical blow, or evidence of faults in construction and materials (Finnish Competition and Consumer Agency; Danish Consumer Ombudsman; National Board for Consumer Disputes). From the consumer's side, typical evidence consists of photographs of the damage and service documents from the company that has examined and/or repaired the product (National Board for Consumer Disputes).

While evidence of consumer misuse might be relatively easy to identify, evidence of a technical failure might be more difficult (Swedish Consumer Agency). Moreover, while producers typically test mobiles for faults before leaving the factory,

maltreatment of phones by consumers caused in part by lack of knowledge is widespread (Finnish Competition and Consumer Agency). This may be the reason why the majority of claims by consumers are not upheld. In Denmark, only 33 out of 248 claims in 2014 and 2015 handled by the Consumer Complaints Board ended in award of compensation to the buyer.

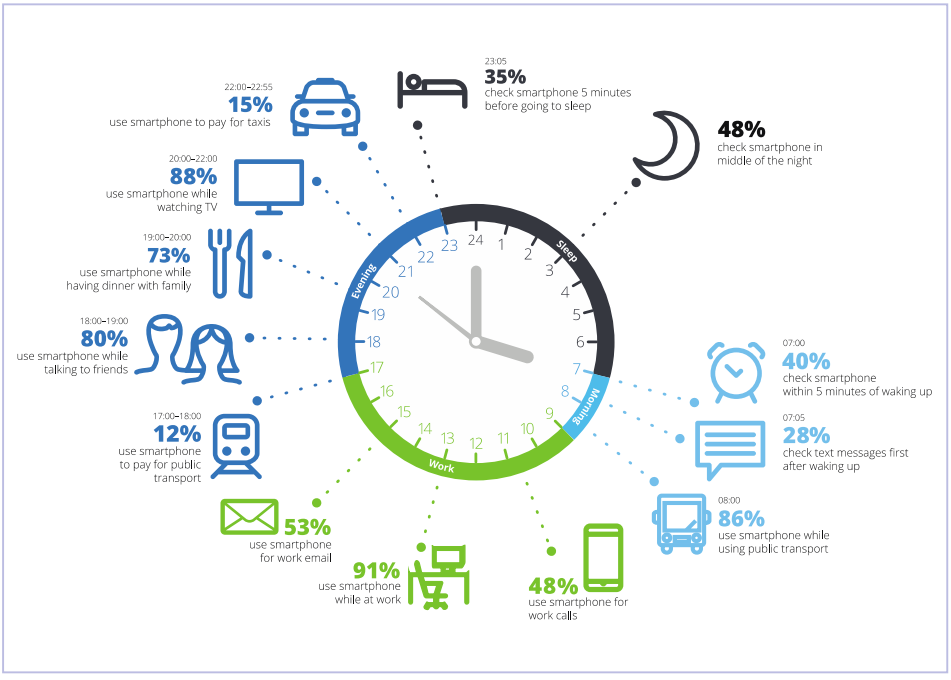
This highlights the importance of providing purchasers with information on how to handle mobile phones, particularly as their usage has become much more intensive with the emergence of smartphones (Finnish Competition and Complaints Agency). According to the Danish Consumer Complaints Board, consumers lack product information about purchased phone's sensitivity to changes in temperature, resistance to water and humidity and other potential causes of damage.

What is normal usage and what is misuse?

Decisions on whether to uphold consumer claims of faults in a phone within a warranty period is highly dependent on producer', consumer' and arbitration bodies' expectations of "normal" usage of a smart phone and what they should be able to withstand.

Smart phones are used much more intensively than their "non-smart" predecessors (see Figure 13).

Figure 13: A day in the life of a smart phone



Source: Deloitte (2016b) Mobile Consumer Survey 2016.

As a result of the intensive use, dropping a phone has become a common occurrence. A 2013 UK study found that the average iPhone was damaged within 10 weeks of purchase. The figure was just 6 weeks for newer (at that time) iPhone models 4 and 5.

The most common causes of breakage were dropping on a hard surface (43%) and dropping into water (35%) .

Under current interpretation by consumer complaints boards/ om-budsmen of what is to be expected from a smart phone, such damage would normally be considered to be the responsibility of the consumer and would not be covered by legal guarantees.

At least two interviewees (Swedish Consumer Agency; Finnish Competition and Consumer Agency) felt strongly that 1) mobile phones should be designed to withstand expected usage profiles and in view of this 2) that the instructions on how to use them should reflect expected usage profiles; for example that they should be able to withstand being dropped. One striking example of where instructions on use are unreasonable is the note by Apple accompanying iPhones that these should not be used in temperatures under 0 degree C. This allowed Apple to reject non-conformity claims in Finland, since outdoor temperatures can lie under this for much of the winter.

On the other hand, phone producers at the Helsinki workshop claimed that consumers do not appear to prioritise durability, increasingly demanding slimness and elegance rather than the robustness that comes with durable phones. This may, however, be a lack of knowledge of consumers on the relative robustness of different phone models. A requirement for labelling of phones with their expected lifetime and resilience to impact and submergence might be a solution, allowing consumers to choose resilient phones.

3.2.2 Second-hand/refurbished products

Application of guarantee laws to second-hand products (EU)

Similarly to new goods, the legislation that most directly addresses guarantees provided to consumers at the EU level for second hand products is the Consumer Sales Directive.[28] The Directive includes provisions allowing Member States to treat second-hand products differently in implementations of the Directive.

None of the other three Directives that have relevance to guarantee provided for consumers – Consumer Rights Directive, the Unfair Commercial Practices Directive and the Unfair Contract Terms Directive – treat second-hand products differently from new products.

National implementation

Article 7.1 of the Consumer Sales Directive allows Member States to *shorten the liability period* of the seller, giving one year as the lower limit. Article 5.1 and 6.1 oblige sellers to inform buyers of their legal guarantee period.

According to the interviewed organisations none of the four largest Nordic countries have made use of this allowance. In Denmark, Sweden and Norway the

[28] Directive 1999/44/EC of the European Parliament and of Council of 25 May 1999 on certain aspects of the sale of consumer goods and associated guarantees.

guarantee is, as for new products, 2 years, 3 years and 5 years respectively. In Finland, as for new products, it is decided case by case on basis of life expectancy.

However, it is worth mentioning again, that the minimum period under law is a period within which the buyer can make a claim, but this doesn't mean that the claim will be honoured, nor upheld if it is passed on to the national consumer complaints board or equivalent. The complaints board will judge the case based on the life expectancy as well as the consumer's handling of the product. According to the Danish Consumer Complaints Board, the life expectancy of a second hand product will be considered lower than for a new.

It seemed from the interviews under the first phase of this project, that second-hand electronics businesses typically offer six months guarantees in their sales contracts, although some offer more. Moreover, they seemed unaware of the legal guarantee period and certainly did not inform their buyers about these. National responsible organisations (for instance Norwegian Consumer Ombudsman) admitted not carrying out visits to second-hand sellers to ensure that they follow the law on this although one (Finnish Consumer Ombudsman) had disseminated guidelines to raise awareness.

Box 8: Technical non-conformity for online sales

The Finnish Competition and Consumer Agency recently handled a case where a consumer had bought a second hand Samsung galaxy phone online from abroad. The phone could not find the 3G network.

The Board found out that the phone was not suitable for the Finnish market but configured to the American market. There had been a label on the phone saying that it was not for national sale in Finland but the sticker had been removed. The claim in the consumer's favour and he received a full refund (Finnish Competition and Consumer Authority, pers. comm.).

The six months guarantees typically provided by the second-hand seller will often not be challenged by the consumer, who again may not even be aware that they can make a claim after this period. None of the interviewees identified any court cases concerning claims over faulty second-hand products after the sellers' shortened six-month contract has expired. Moreover, the complaints boards have limited experience in dealing with such claims.

According to the Danish Consumer Complaints Board less than 10% of claims they deal with concern second hand goods. With respect to second-hand mobile phones, the only complaints they have received related to sale of used phones under a claim that they were new and a case concerning technical non-conformity (see Box 8 for a similar example in Finland).

There are precedencies set for other products. There are several cases where consumers have complained about the poor conditions of purchased used cars and sought to nullify the contract or demand full compensation for the cost of repair. All three court cases reviewed – from Norway, Finland and Denmark respectively – upheld the right of consumers to conformity of the sold goods (European Commission 2015c; European Commission 2015d and European Commission 2015e).

3.2.3 Impacts on green business models

The minimum legal guarantee periods established by consumer law can have the potential to support and strengthen green business models by firstly, financially supporting repair services for mobile phones in the case of a technical failure, and secondly, by encouraging producers to design for reparability and durability. However, there are several weak links that undermine these potentials. These are described below.

Do legal guarantees support repair services?

In theory the legal guarantee opens the door to a minimum two-year window of opportunity for repair services paid for by the seller in the case of a fault. Extending the length of minimum guarantee, as has been done in Sweden and Norway, can potentially support repair services for longer. *Weak links*:

- *Low consumer awareness of minimum guarantee period* is highlighted both in European studies and by interviewed Nordic consumer associations. This emphasises the need for governments and consumer associations to educate consumers in their legal rights and to take more effort in enforcing sellers to inform buyers of their rights.
- *Reduced likelihood of winning a claim after first six months* since after that period the consumer has to prove that there was a fault in the phone. Interviewees stated that most claims outside this period are not successful. If the onus of proof on the supplier was increased this may increase confidence in making a claim and active lifetimes of phones.
- *Phones not built, or expected to withstand normal usage* for example, a break resulting from a dropped phone would normally be the buyer's responsibility even though this could be an expected regular event given today's intensive use of smartphones. This can undermine any effect of extended warranties, since the types of failures covered by them may already reveal themselves in the first 6 months. Caveats on what is covered by purchased additional warranties can also be unreasonable. For example, not exposing to temperatures below zero.

Do legal guarantees support design for repair and durability?

By designing for easy repair and durability, producers can reduce their costs of support during minimum guarantee periods. Phones could be expected to be designed to last at least the length of this minimum period. At least one producer explicitly mentioned this as a reason to improve design of their products, and another indicated that the observation of water damage as the cause of repair encouraged them to work on this particular design feature. If the period was extended this could add further pressures on producers to design for greater reparability and durability. However, we observe the same *Weak links* as under support for repair services but with addition of:

- *Problems passing on costs to producers* although the EU Sales Directive should allow retailers to pass on costs of non-conformity claims during the legal guarantee period, some reported that they had to "top-up" a single-year guarantee provided by the producer. This potentially removes any direct leverage on the producer from extending legal guarantee periods.
- *Nordic markets are potentially too small* to have marked leverage on how global mobile phone producers design their mobiles where minimum legal guarantees have been extended.

Use of refurbished parts challenged by law

The EU Directives and their national implementation can also threaten green business models in certain cases.

Apple has for some time been providing refurbished telephones to customers as replacement for faulty phones. This possibility is also written in their conditions of service contracts. These components can be recovered from used phones gathered under take-back schemes or recovered from other faulty phones replaced under guarantees. It is an example of a green economy model.

However, as described in Box 7 earlier, a Danish court case has determined this to be illegal under the Sales of Goods Act. Of key interest to this report, the court was not able to take environmental considerations into account in the case. According to the Consumer Complaints Board (pers. comm.) if progressed to the regional court such societal effects would potentially have been considered. Although the case only directly affects producers' approaches in Denmark, it may act to change their approaches in other countries.

Pressure on second-hand retailers

If enforced by government organisations, the equal guarantee requirements for on second-hand products could in theory force actors in the second-hand market, most notably refurbishers and second-hand sellers, to change their practices.

As a minimum this would require that they should begin informing buyers of the legal guarantee period. They would perhaps also take more efforts to properly test the used phones that they are selling, to better ensure that they will last for the minimum guarantee period. According to Danish Industry a more effective option would be to have a refurbishing standard for electronics that sellers would need to follow (more on this later).

These actions could have both positive and negative effects. They could push out the smaller second-hand retailers but increase consumer confidence in second-hand in general.

3.3 Definition and ownership of waste

Regulation concerning when a product becomes waste and who then owns that waste can potentially challenge circular economy business models that aim to gain value from unwanted used phones. These definitions are complex and are worth explaining in some detail.

3.3.1 Waste regulations

Waste management in the Nordic countries is largely influenced by European regulations. The basis of EU waste legislation is the Waste Framework Directive 2008/98/EC (WFD)[29] which sets out basic concepts and definitions related to waste management including the "waste hierarchy" (Article 4).

The legally binding waste hierarchy ranks waste management options according to what is best for the environment giving priority to waste prevention (which can include reuse) followed by preparation for re-use, then recycling, energy recovery, and finally landfill.

Box 9: Criteria for waste definition

In the cases C-418/97 and C419/97 ARCO the EU Court established some criteria which can be included in determining when an owner/holder must be assumed to "dispose of" a given material/object, and whether the material is thus to be considered as waste.

From paragraph 51 in the judgement it appears that it cannot automatically be assumed that "disposal of" a given substance in terms of the WFD can solely be based on the fact that the substance is subject to treatment in WFD Annex II.

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69590/pb13813-waste-legal-def-guide.pdf

According to Article 3.1 of the WFD "waste" means "*…any substance or object which the holder discards or intends or is required to discard…*" Courts have been asked to interpret the definition on a number of occasions and a body of case law now exists at both EU level and national level.[30]

The waste definition is dependent on what should be understood by "*discards*". Discarding includes not only the disposal of a substance or object but also its recovery or recycling. Whether a substance or object is being discarded has to be decided on a case-by-case basis (see Box 9), and taking account of all the circumstances, to ensure the aims of the WFD are not undermined (Defra, 2012).

Another related concept introduced in the 2008 WFD Directive is the concept of "End-of-waste" status (Article 6). As the application of the concept so far primarily concerns industrial waste, however, we do not discuss this further in this report.

[29] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.

[30] http://mst.dk/virksomhed-myndighed/affald/vejledende-udtalelser-og-afgoerelser-om-affald/vejledende-udtalelser-om-affald/affaldsdefinitionen-i-forhold-til-genanvendelse-af-bygge-og-anlaegsaffald-paa-landbrugsejendomme/

3.3.2 When do electronics become WEEE and who owns it?

As described above, in practice it can be hard to define, when a given electrical or electronic product becomes waste (see earlier). In addition, who owns WEEE and who should be allowed to collect it differs between countries.

In *Denmark*, (Statutory Order no. 306)[31] the final holder of a product is a "waste producer" or "final user" defined as "the private household, business or private or public institution, which is the last user of the equipment before it becomes waste." Electronic waste from private households generally must be delivered to the municipal collection schemes, to manufacturers or to distributors.[32] When electronic waste is delivered to municipal collection schemes, these are obliged to pass it on to producers or other actors that the producers appoint to carry out the practical activities e.g. collective schemes.[33] It is the responsibility of the municipality to decide whether EEE brought to a recycling centre should be regarded as WEEE (Brandt, 2014). This decision is based on whether the article is functioning and whether there is a market for it.

Under the *Finnish* Waste Act 646/2011 (updated by 528/2014) producers are responsible for organising waste management, including collection and transport, except where collection is legally given to distributors. Producers have the right of precedence to organise WEEE management system, although other actors are permitted to run other systems *in parallel* under agreement with the producer.[34] Importantly, and unlike other Nordic countries, the legislation allows other actors to offer services related to product reuse or preparation for reuse.[35]

Swedish legislation[36] puts the responsibility for collecting household WEEE on producers who must ensure the existence of a permitted organisation to collect WEEE. The Ordinance exempts municipal waste collection systems and distributors from the need to apply for a permit. Also if a consumer intends for a phone to be reused when handing it to an actor, then the actor is considered as a second-hand retailer and does not need a WEEE collection permit. If a consumer intends to discard the phone then the collector requires a permit.

The *Norwegian* legislation defines waste as "movable objects or substances that someone has discarded, intends to discard or is required to discard."[37] WEEE may be delivered free of charge to municipal waste treatment facilities or to distributors who sell similar products. Distributors are required to take-back WEEE.

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[31] WEEE Statutory Order no. 130 of 6 February 2014 Part 3, § 1, no. 31 on placing on the market of electrical and electronic equipment and management of waste electrical and electronic equipment.

[32] http://eng.mst.dk/media/mst/8917328/Engelsk%20overs%C3%A6ttelse%20af%20elektronikaffaldsbekendtg%C3%B8relsen_FINAL.pdf

[33] According to WEEE Statutory Order Part 27.

[34] Section 47(1) of legislation 646/2011.

[35] Section 47(2) of legislation 646/2011.

[36] Ordance 2014: 1075 on Producer Responsibility for electronic equipment , Förordning om prducentansvar för elutrustning. SFS 2014: 1075.

[37] "Lov om vern mot forurensninger og om avfall" (forurensningsloven) § 27.

3.3.3 *When do electronics stop being WEEE again?*

Once an object has been discarded as waste, it usually needs to undergo an operation for it to cease to be waste again. This can range from something relatively minor to quite extensive processing, comprising one or more recovery operations.[38]

A distinction should be made between re-use as a waste prevention operation on the one hand, and re-use following a recovery operation on the other.

Box 10: Preparation for reuse

The meaning of "prepration for reuse" of WEEE is not sharply defined in the WEEE Directive but has been set out by various national and EU documents and standards including:

- PAS141 – Reuse of used and waste electrical and electronic equipment (UEEE and WEEE). Process management (BSI, 2011).
- WRAP – product protocols with the test criteria for 15 product types (WRAP, 2014b).
- "EU Correspondents' guideline no. 1 on shipments of waste electrical and electronic equipment (WEEE)" (EU, 2007).
- UNEP and BASEL, Guideline on environmentally sound testing, refurbishment & repair of used computing equipment (PACE, 2011).
- E-Steward standard®
- "Code of good practice for the re-use of (W)EEE" (OVAM, 2012).

In the former, the article never becomes waste; for example, C2C second hand sale of a functioning mobile phone. In the latter, the article becomes waste but is then recovered in some way so that it can once again be used. An example here would be a mobile phone which is discarded by its holder at a civic amenity site (at which point it becomes waste) following which it is refurbished/prepared for reuse.

The WFD defines these terms as follows: "re-use" means "…any operation by which products or components that are not waste are used again for the same purpose for which they were conceived…" (Article 3.11) and "preparing for re-use" means "…checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing…" (Article 3.16).

Processes of "preparation for reuse" are not defined in the Recast WEEE Directive. However, several countries have developed guidelines and definitions (see Box 10). The standardisation of these requirements for re-use has mainly been aimed at preventing the illegal export of (non-functional) used electronics and to promote confidence in the trade of used electronics.[39]

Refurbishers dealing with preparation for re-use are subject to both waste regulation and product regulation such as warranty and product safety. This contributes to the regulative complexity of this area and also makes it very complex for

[38] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69590/pb13813-waste-legal-def-guide.pdf

[39] http://www2.mst.dk/Udgiv/publikationer/2015/08/978-87-93352-58-2.pdf

participants involved in preparation for re-use processes to ensure compliance with the various regulations.

3.3.4 Implications for green business models

Businesses refurbishing and reselling products that might be considered as waste are facing uncertain conditions. Preparation for reuse activities are not yet fully supported or regulated which can create loopholes in the waste value chain and create difficulties in implementation and enforcement processes.[40]

One example is of waste companies in Denmark who have established shops in recycling centres to sell items that have been donated to the shop or discarded items, including electronics. The Danish Confederation of Industries raised objections as to the legality of these operations[41] but their complaint has recently been rejected by the state's advocates.

Take-back and refurbish/resell schemes by network service providers can also be affected by waste regulations, if the take-back products can be defined as waste. In Denmark, according to Statutory Order Annex 9, it is the producers (or their representative – the collective WEEE operator) who can decide, if preparation for reuse, recycling or other recovery, should be performed. According to the Danish EPA (pers. comm.) it can be challenging for a retailer/mobile service company to obtain permission from producers to carry out preparation for reuse.

In Sweden, the distinction between second-hand products and waste is made based on the intention of the person who discards it (see Section 3.3.2). This means that a network service provider offering collection services needs to either check the intention of their customers explicitly, or obtain a collection permit.

This issue has been resolved to a certain extent in Finland, under the revised Waste Act (646/2011) which notes that an operator other than a producer may offer services related to the reuse of products or preparation for reuse (Section 47(2)). This resulted from a wish to encourage greater reuse.

While all EPAs in principle wish to encourage reuse, they are cautious about allowing collection of discarded WEEE outside of producer responsibility systems due to the risk of the collected electronics finding their way to countries – for example in west Africa – where primitive salvaging operations give significant health and environmental impacts (SYKE pers. comm.; Danish EPA pers. comm.).

Development of standards for refurbishment (see Box 10) have been argued for earlier in this report, as a means for increasing consumer confidence in delivering mobile phones to take-back systems, and in buying refurbished phones. Allowing certified refurbishment companies to receive WEEE for preparation for reuse operations could also address national EPA's concerns over illegal exports.

[40] http://www.rreuse.org/wp-content/uploads/P00283_accredited_reuse_centres_Full_Version.pdf
[41] https://www.dr.dk/nyheder/regionale/sjaelland/genbrugsbutikker-i-klammeri-med-dansk-industri

European standards organisation, CENELEC, is currently developing a refurbishing standard that the Danish government and potentially others will consider implementing (Danish EPA, pers comm.).

It should be noted that stakeholders at the Helsinki workshop were relatively unconcerned over waste regulations' potential impacts on green business models. They felt it to be unlikely that used mobile phones gathered by take-back systems run by phone manufacturers, retailers and network service providers, would be considered to be waste and therefore be affected. They also felt that the regulations were necessary to guard against risks of pollution by hazardous WEEE in countries without strong waste regulations.

3.4 Other relevant regulations/policy

The Consumer Rights Directive includes an extensive list of information the traders are required to provide (Article 5 and 6). The most relevant requirement for the extension of the useful life of smart phones is on the existence and the conditions of after-sale customer assistance, after-sales services and commercial guarantees (Article 5. 1(e) and Article 6. 1(m)). The Unfair Commercial Practices Directive (2005/93/EC) also refers to access by consumers to after-sale services (Annex I 8 and 23).

Moreover, although it isn't specified directly in national consumer law, national agencies consider that software updates should be provided for the full expected lifetime of the product (Finnish Competition and Consumer Agency) or for at least the duration of the minimum guarantee period (Danish Consumer Complaints Board).

Access to software updates are just as important as servicing of the physical elements of a mobile phone in ensuring a longer phone life and reducing phone replacement rates. A lack of updates might render the mobile phones obsolete while its components are still fully functioning.

Yet some companies have not been living up to these various requirements. The Dutch Consumer Council prepared a case against Samsung on lack of support for their devices and not informing consumers as to when they can expect Android updates of the mobile phones. In a report issued by the Dutch Consumer Council, 82% of Samsung phones did not update the previous year (Sammobile, Curry, 2016).

Another relevant piece of legislation is the French decree published in December 2014[42] put new requirements on retailers to inform consumers about the availability of spare parts. Manufacturers, in turn, are required to deliver the parts needed for repairs within two months (ENDS Europe 2015). The French decree also extends the burden of proof on the seller in the case of a fault to 24 months (Swedish Consumer Agency). This legislation should increase longevity of phones and could be inspire similar legislation in the Nordic countries.

[42] Décret n° 2014-1482 du 9 décembre 2014 relatif aux obligations d'information et de fourniture concernant les pièces détachées indispensables à l'utilisation d'un bien
https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000029881868&dateTexte=&categorieLien=id

4. Conclusions and recommendations

4.1 Summary of findings

4.1.1 *Overall trends*

Under Phase 1, literature studies identified that the emergence and subsequent penetration of smartphones in European and Nordic markets have begun to change the behaviour of both consumers and businesses.

Smartphones created unprecedented high replacement rates immediately after their introduction: However, more recently the high purchase price of new smartphones, and the lack of further disruptive, game-changing new features, has slowed down handset replacement rates, and at the same time has increased demand for repair services and second-hand phones. Consumers are increasingly aware of the high commodity value of their used phones and global used smartphone sales are expected to rise from 53 million to 257 million between 2013 and 2018.

As a result of slowing upgrade rates, the bundling of new phones with mobile data and network subscriptions is less dominant than it was ten years ago and consumer demand for SIM-only subscriptions is growing rapidly. This has decreased consumer loyalty to network service providers.

4.1.2 *Engagement in green business models*

Some businesses are exploiting the new opportunities represented by these changing conditions by developing circular business models and services that gain value from extending the lifetime of smartphones and their components.

The most widely reported response amongst "traditional" actors (producers, retailers and mobile service providers) was engagement in take-back and buy-back of used phones and refurbishing these for resale and/or cannibalising them for their components most often in partnership with a refurbishment specialist.

Prior to the emergence of smartphones, phones taken back in developed countries were mostly shipped to developing countries for refurbishment and resell, or discarded in a environmentally hazardous manner. Refurbished smart phones are now at least partly being resold in the collection country or elsewhere in Europe, offsetting purchase of new phones here.

Refurbishment and resell businesses and repair services are reporting rapid growth in demand. As people become ever more dependent on their smart phones, the demand for rapid repair has grown with emphasis on physical repair shops offering

repairs within an hour. Some producers reported beginning to design for greater durability and reparability to reduce warranty costs.

4.1.3 *There is money in greener models*

The majority of businesses are engaging in circular economy models because they can directly earn or save money via offering repair, take-back, refurbishment and resale. Some are also engaging as part of CSR strategies to reduce environmental impacts of their activities and gain a greener profile at the same time.

With respect to the latter they reported, however, that current consumer engagement is also more motivated by economic considerations than environmental concerns. As a result consumers show limited interest in smartphones containing more sustainable materials, especially if functionality and price is influenced negatively as a consequence. Businesses reported "a lack of sustainability signals" coming from the market. In spite of this some producers are engaging in efforts to reduce the environmental footprint of new phones.

4.1.4 *Increasing cooperation between some actors*

The growth in take-back, buy back, refurbishment and resell and repair is leading to a wealth of partnerships and interactions between different businesses in the value chain. Sellers of phones (producers, network service providers and retailers) are developing partnerships with repairers to assist them in meeting warranty obligations. Producers also sell components to authorised repairers and for some producers this may represent a significant share of sales.

There is also increasing cooperation between network service providers, retailers and producers who are operating take-back services on one side and refurbishers on the other, who subsequently process and resell the take-back phones. Some producers have been sceptical about making such partnerships but this scepticism has been reduced following a professionalisation of the larger refurbishment companies some of which are now international concerns.

At the same time, some network service providers are developing in-house refurbishment and repair services rather than working with partners, in part due to the growing demand for rapid repairs.

4.1.5 *Unauthorised repairers and access to spare parts*

In addition to the large businesses there is a dense undergrowth in Nordic cities of small single shop businesses selling repair services, used smart phones and accessories. There is little cooperation between these and established mobile phone producers. This is due to concerns of producers that they cannot control the quality of repairs by non-authorised repairers and that this will affect their cost of supporting warranties. Some large producers thus limit access to original components and diagnostic tools for non-authorised actors. These in turn make use of copy components, which has led one

producer to hold back software support to the owners of the repaired phones that include copy components.

On the one hand, such actions by producers aim at ensuring a greater professionalization of the repair and refurbishment sector and at reducing operations by grey actors who may provide unreliable repairs with lower quality components thus challenging manufacture warranties. Moreover the grey actors may not be living up to environmental and social responsibilities.

On the other hand, these actions also reduce the income that producers can gain from the repair industry and hinder the more professional segment of unauthorised repairers who wish to carry out reliable, high quality repairs. According to some stakeholders, growth in repair and second-hand although rapid is far lower than its potential. Acceptable solutions might be for producers to provide original parts to professional unauthorised repairers for "out-of warranty" repairs, combined with stronger efforts by national governments to regulate and police the repair industry to weed out grey actors.

4.1.6 Lack of design for repair/upgrade and longer life

One strong element inhibiting growth in circular models is that many smartphones are not designed to fully optimise repair or allow upgrade of individual components. Moreover, most smartphones are sensitive to impact and moisture. There are no minimum standards for durability or reparability of mobile phones at EU or national level.

Design for disassembly and upgradeability may increase in the future as companies like Puzzlephone, Fairphone, Google and ZTE push forward with modular phone concepts that might influence the larger players to follow suit. It may also be influenced by Right to Repair Bills that have been passed in eight US states in the past two years.

It isn't only hardware design that can inhibit refurbishment. Anti-theft and security software installed on smartphones can be problematic as they can only be removed by the original owner.

4.1.7 Need for economic incentives to support repair and resell

Although the high price of new smart phones has made repair and refurbishment/resell viable alternatives to replacement with new for consumers, some companies argued that the business case in Nordic countries remains marginal. This is due to the labour intensive nature of the work in combination with high Nordic salaries.

Lower VAT or tax breaks for repair and refurbishment/resell could partially redress the economic misbalance and accelerate growth. Current VAT rules for used goods already potentially provide an economic incentive to refurbishment. However, in Denmark and Norway the application process was designed for antique furniture sellers and almost unusable for second-hand sellers of electronics.

4.1.8 *Leasing and upgrade subscriptions*

Network service providers are countering slowing upgrade rates by introducing leasing-type subscriptions that offer mobile phone upgrades every 12 months. These have been developed in response to the falling customer loyalty associated with the rise of SIM-only subscriptions.

These upgrade subscriptions may not be as directly in conflict with increasing active lifetimes of phones as it might seem. They are catering for that segment of the population who may under any circumstances purchase latest phone models; but by retaining or regaining ownership of the phones, the mobile operator can better ensure that they are redistributed to a new user.

Leasing systems in general are seen as a central element in future mass redistribution systems of smart phones where smart phones are cascaded from one user to the next. Each consecutive user has a reducing need for the latest model and functionality, and pays a lower price in return. Leasing can be kick-started via public procurement contracts.

4.1.9 *Additional obstacles named by businesses*

The following additional obstacles to circular business models were reported by interviewed businesses:

- *Consumer behaviour and lack of awareness*: Mobile producers claim limited environmental awareness amongst consumers with respect to mobile phones. Where circular business models, like repair services and second-hand save money for consumers these are relatively well-used, but there is limited demand for new mobile phones with greener profiles.
- *Variable quality of used smartphones*: Some refurbishers are finding that the quality of smartphones that they receive is variable. Some are worn out from previous use and require significant refurbishment efforts to get into "as good as new" state.
- *Consumer scepticism*: consumers can be sceptical about buying refurbished phones or delivering phones to take-back initiatives due to lack of trust that their data will be completely removed.

4.1.10 The Regulatory Framework

Both consumer law and waste regulations in Nordic countries are largely framed by EU Directives, but there is some room for manoeuvre. It is within these margins that Nordic countries have the possibility to make adjustments to encourage longer product lifetimes.

4.1.11 Consumer law and minimum legal guarantees

The minimum legal guarantee set by the Consumer Sales Directive is two years with allowance for Member States to increase this. In Sweden the minimum guarantee for mobile phones is set at three years, in Norway five years and in Finland it is linked to the expected lifetime of the particular mobile phone model.

Extending minimum legal guarantees can theoretically support green business models in two ways. Firstly, it can extend the period over which retailers support repair services financially. In most cases it is cheaper for the seller to repair the phone rather than supply a replacement. Secondly, it can encourage producers to engage in design for re-pair and longer lifetimes to reduce costs of guarantee support.

However, the potential of extended minimum guarantees to support greener mobile phones and business models is undermined by a number of weaknesses:

- *Low consumer awareness of minimum guarantee period* has been highlighted both in European studies and by interviewed Nordic consumer associations. If consumers don't know their rights then they won't make use of them.
- *Reduced likelihood of winning a claim after the first six months* since after that period, in all countries except Finland, the consumer has to prove that there was a fault in the phone. Claims after this period are normally not successful.
- *Mobile phones are not built, or expected to withstand normal usage*. As a result of the intensive use, dropping a phone has become a common occurrence. A UK study found that the average smart phone was damaged by dropping or otherwise, within 10 weeks of purchase with the most common causes of breakage being dropping on a hard surface and dropping into water. Nevertheless this damage is normally considered as misuse.
- *Problems passing on costs to producers* although the EU Consumer Sales Directive allows retailers to pass on costs of non-conformity claims, some reported that they had to "top-up" a single-year guarantee provided by the producer. This removes direct leverage of extended legal guarantees on the producer.
- *Nordic markets are potentially too small* to have any marked leverage on how global mobile phone producers design their mobiles.

4.1.12 *Use of refurbished parts challenged*

A Danish case (Apple versus David) has challenged the legality of providing refurbished telephones, or telephones with refurbished components, to customers as replacement for faulty phones. The court was not able to take environmental considerations into account in making its decision.

There may be a need for adjusting national implementation of the Consumer Sales Directive to legalise the use of refurbished phones as replacements for used faulty phones provided that they have the same value as the replaced mobile phone.

4.1.13 *Pressure on second-hand retailers*

The Consumer Sales Directive can also affect second-hand and refurbishment businesses. Under its implementation in Nordic countries, sellers of second-hand phones have the same minimum guarantee obligations as sellers of new phones. In practice, however, only a six-month guarantee period is effectively applied due to lower expectations of how long a used phone can last and lack of buyer and seller knowledge on minimum guarantee periods.

Should the full guarantee period be enforced this could have both positive and negative effects: negative by increasing costs for the businesses in requiring more thorough checks; positive by increasing consumer confidence in second-hand. This can be implemented instead by adopting refurbishment standards in Nordic countries.

4.1.14 *Waste regulations and refurbishment*

Waste regulations only affect business models where the mobile phone is (or risks being) classified as waste. What is considered waste depends partly on the intention of the last owner and not the receiver. This makes it difficult for refurbishers or those running take-back schemes.

Moreover, a business carrying out refurbishment of "waste" smartphones for resale, can risk legal uncertainty due to lack of clear legal interpretation on what "preparation for reuse" as defined in the WEEE Directive comprises and who may perform this.

A number of EU countries have tackled this by defining preparation for reuse through establishing a standard or otherwise. This has yet to happen in Nordic countries, although EPAs are following with interest the development of a refurbishment standard by the European standards organisation.

There can also arise problems from the difficulty of establishing alternative collection pathways parallel to WEEE collection systems. Finland has tackled this by allowing organisations to engage in activities related to reuse without having to cooperate with the producers. While all national EPAs in principle wish to encourage reuse, they are also concerned about the risk of WEEE finding its way to countries where it will not be safely treated. Adoption of refurbishment standards and certification of collection organisations could address this concern.

4.1.15 Exports to developing countries remains problematic

Even if WEEE is regulated properly to prevent exports of WEEE to developing countries, used Nordic phones still end up in unsafe dumps in Ghana and elsewhere. This is because despite the growth of second-hand markets in Nordic countries, exports of used phones for *resale* in developing countries is likely to remain significant. When these phones eventually become waste they typically end in open dumps where they may undergo basic salvage operations with human and environmental health impacts.

Refurbishment and export companies could take greater responsibility by collecting and transporting waste phones from developing countries to modern e-waste recycling facilities, a model already implemented by Dutch Closing the Loop.

Regulation could potentially be brought to bear to ensure this. A precursor would need to be a detailed mapping study of the share of collected used phones in Nordic countries that are re-circulated on domestic markets, and the share that are exported for resale elsewhere, with focus on developing countries.

4.2 Potential Measures for Promoting Green Business Models

The following recommendations for measures to overcome regulative, economic and organisational barriers to green business models were identified during the study and discussed an adjusted at the Helsinki workshop.

Table 5: Summary or obstacles to circular models and measures that can overcome these

Obstacle	Proposed Measure	Rationale and comment
Waste regulations concerning ownership and treatment of WEEE make life difficult for refurbishers, preparing discarded phones for reuse	Adopt refurbishment certification standards	Would address concerns of EPAs over improper treatment of WEEE collected outside producer responsibility schemes. It could also allow recognition of certified refurbishers as legal collectors of WEEE where necessary (see next point). Ideally the standard should be harmonised at EU level.
	Allow bypassing of WEEE collection systems by responsible refurbishers	An approach for this is already found in the Finnish Waste Act. Responsibility could be ensured for example, by a certification standard proposed above.
High salaries and expensive logistics in Nordics can present a problem for economic viability of repair/ take back and refurbishment	Lower VAT or Tax breaks for repair and refurbishment of electronics	Would enhance price competitiveness of repair and provide employment for disadvantaged groups. In Sweden VAT reductions for repair of shoes, textiles and bicycles could be extended Where such rules already exist (i.e. DK) these should be modernised.
Mobile phones are not designed for easy repair, durability or resilience	Mandatory declaration of expected lifespans and resilience on new mobile phones	Could ensure that durability became selling point for consumers. Declaration requirements at EU or Nordic level would maximise leverage.
	Requirement that legal guarantee followed declared expected lifespans	This would set up direct economic incentives for producers to live up to declared lifespans. Would be most effective at Nordic or EU level.
	Shift onus of proof more towards the seller in case of a fault	After 6-month cut-off there are fewer successful claims. The onus of proof on seller could follow declared life expectancy as in Finland or extended to 24 months as in France.
	Strengthen rights of retailer to pass on costs of honouring legal guarantees to the producer	Some producers only offer single year legal guarantees that retailers have to top up to meet national minimum legal guarantee period. This removes incentives for producers to design for durability/reparability.
	Slacken interpretations of "misuse" by users when assessing non-conformity claims	Normal wear and tear could be widened to include dropping of a phone on to a hard surface and immersion in water. Allowing retailers to replace like with like would remove the risk of consumers purposefully dropping phones to gain an upgrade.
	Disallow unreasonable exclusions in sales contracts	In judging claims against guarantee exclusions in sales contracts, unreasonable exclusions such as not using in sub-zero temperatures would be discounted.
	Ecodesign – criteria on resource efficiency	These would need to be an EU level process but Nordic governments/stakeholders can provide input in the form of proposed minimum criteria.

Obstacle	Proposed Measure	Rationale and comment
Lack of consumer awareness of the length of guarantee periods	Enforcement of the requirement for sellers to inform consumers of their rights	Low consumer awareness of minimum warranties can undermine the strength of these in supporting repair services.
	Mandatory labelling of warranty rights in the sales country on new phones	Would make consumers aware of their warranty rights at the time of a failure. To allow updating the information could be provided online via a QR-code provided on the phone.
Low consumer confidence in delivering used phones to refurbishers and buying second-hand phones	Adopt refurbishment certification standards	Would increase consumer confidence in the second-hand market.
Lack of availability of original replacement components to non-authorised repairers	Requirement on producers to make original parts available to all parties for repair, for expected lifetime of mobile phone	Some producers only provide original components to authorised repairers. This can inhibit professional elements of the repair sector and lead to the use of low quality copy parts. The requirement may only be acceptable to producers for "out-of-warranty" repairs.
	Regulation and better policing of the repair sector	Some producers are unwilling to give unrestricted access to original components due to risks that repair work will be carried out by grey actors, that do not obey environmental and H&S regulations.
Variable quality of phones delivered to take-back systems	Information campaigns on the value of used electronics	May encourage consumers to take better care of their phones if they know that there are potential second users domestically or abroad.
	Measures to encourage leasing models – beginning with the public sector	Under leasing models the leasing company retains ownership meaning a near 100% return rate. Public sector leasing could be encouraged by requiring government agencies to lease mobile phones in procurement contracts.
Lack of software support during full lifetime	Adjust implementation of Consumer Sales Directive such that software support is required for the full legal guarantee period	Consumer complaints boards tend to uphold claims relating to lack of support during this period but it isn't directly written in to law.

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Sammenfatning

Projektformål

Formålet med projektet er at kortlægge i hvilken udstrækning cirkulære forretningsmodeller anvendes i mobiltelefonindustrien og på den baggrund identificere, hvordan regulering kan understøtte og fremme den cirkulære udvikling.

Kortlægningen er baseret på 22 interviews med virksomheder fordelt på fem grupper; *mobiltelefonsproducenter*, *elektroniske detailhandlere*, *netværksleverandører*, *reparationsservices* og *oparbejdningsvirksomheder/second-hand* sælgere og 15 interviews med forbrugerorganisationer, klagenævn/ombudsmænd, miljøbeskyttelsesorganisationer og relevante brancheorganisationer. Projektet blev afrundet med en workshop, hvor nøgleinteressenter kom med inputs og kommentarer til problemstillingen og de foreslåede løsninger.

Det cirkulære indtog

I flere år efter deres introduktion gav smartphones anledning til en høj udskiftningsfrekvens og erstattede samtidig både den tidligere generation af mobiler såvel som en bred vifte af andre små elektroniske apparater. Senere har høje købspris og manglende nye radikale funktionsudviklinger bremset udskiftningsfrekvensen igen. Det har ført til en øget efterspørgsel efter reparationer og brugte telefoner. Reparationsvirksomheder rapporterer en kraftig vækst i efterspørgslen på særligt "en-times" reparationer. *Bundling* af nye telefonsalg med dataabonnementer har mistet dens dominans, og loyalitet over for netværksudbydere er faldet.

Hvordan, virksomhederne tilpasser sig de nye markedsforhold, varierer. Nogle virksomheder forsøger at styrke salget af smartphones, mens andre virksomheder omlægger til cirkulære forretningsmodeller, der får værdi ved at forlænge telefonernes levetid.

De mest udbredte cirkulære modeller i den traditionelle mobiltelefonindustri er såkaldte *take-back* og *buy-back* modeller. De afleverede telefoner er typisk forberedt til videresalg eller kannibaliseret for deres komponenter. Inden fremkomsten af smartphones blev take-back mobiltelefoner næsten udelukkende eksporteret til salg i udviklingslandene, men brugte smartphones i højere grad bliver solgt i industrilandene.

Cirkulær økonomi kræver mere samarbejde

Væksten i cirkulære virksomheder fører til et væld af partnerskaber og interaktioner på tværs af værdikæden. Producenter og sælgere udvikler partnerskaber med reparatører, der kan hjælpe dem med at opfylde garantier. Producenter sælger også komponenter til autoriserede reparatører.

Der er også et stigende samarbejde mellem netværkstjenesteudbydere, detailhandlere og producenter, der tilbyder take-back systemer på den ene side og oparbejdningsvirksomheder på den anden, der efterfølgende behandler og videresælger de brugte mobiler. Indledende skepsis blandt producenterne er blevet reduceret efter en professionalisering af oparbejdningssektoren.

Samtidigt er der flere enkeltbutikker, der sælger reparationstjenester og brugte smartphones. Nogle store producenter begrænser adgangen til originale komponenter og diagnostiske værktøjer til disse og andre ikke-autoriserede aktører, som derfor er tvunget til at bruge lavere kvalitets kopikomponenter. Formålet med den begrænsende adgang er at sikre en større professionalisering af reparationssektoren og at reducere aktiviteter af aktører, der ikke lever op til deres miljø- og skattemæssige forpligtelser. Det udelukker dog samtidig det mere professionelle segment af uautoriserede reparatører, der ønsker at udføre reparationer af høj kvalitet.

Udfordringer og mulige løsninger

Virksomheder, interessenter og litteraturen beretter om, at den cirkulære økonomi står over for en række udfordringer, som vil blive opridset nedenfor. For hver udfordring er der et antal af mulige løsninger. Disse er angivet i *kursiv.*

Reparation- og oparbejdning kræver meget arbejdskraft, som er dyrt i Norden. Det kan give økonomiske udfordringer for disse virksomheder. *Et lavere moms eller skattefradrag på reparation, oparbejde og gensalg kan bidrage til at gøre cirkulær indsats mere rentabelt.*

De fleste smartphones er ikke designet med henblik på at gøre telefonen modstandsdygtig og nem at reparere. Teoretisk set kan en forlængelse af mobilers minimumsgaranti give producenterne et incitament til at producere mere robuste og reparationsbare mobiltelefoner. EU's Salgsforbrug Direktiv har fastlagt minimumsgarantien til to år, men med mulighed for at medlemsstaterne kan forlænge denne.

Den mulighed er udnyttet i Norge og Sverige, men er svækket af, at bevisbyrden efter de første seks måneder ligger på køberen, og at forbrugere ikke er opmærksomme på deres rettigheder. *Disse svagheder kan delvis løses ved a) en obligatorisk erklæring om mobilens forventede levetid b) en vurdering af, hvor modstandsdygtig mobilen er, c) en forlængelse af perioden hvor bevisbyrden ligger på sælgeren og d) obligatorisk information om forbrugernes rettigheder på nye telefoner.*

Som systemet er indrettet nu, er det sælgeren, der hæfter for garantien. *Ved i højere grad at lade producenterne hæfte for garantien, vil man give dem et større incitament til at designe modstandsdygtige telefoner.*

Hvis forbrugeren taber sin mobiltelefon eller udsætter den for fugt, fortolkes det i dag som misbrug, selvom det udbredte og intensive forbrug af telefoner gør disse uheld mere eller mindre uundgåelige. *Ved at udvide reklamationsretten til også at indbefatte fugtskader og mindre slag, vil det give producenterne yderligere incitamenter til at designe mobiler med længere holdbarhed. Det er dog samtidig nødvendigt med en tilføjelse, der sikrer, at forbrugerne ikke taber deres telefon med vilje for at få en bedre telefon.*

Elektronisk affald

Hensigten med den gældende regulering af ejerskab og håndtering af *affald* af *elektrisk* og *elektronisk* udstyr (WEEE) er at sørge for, at farligt affald ikke ender i udviklingslandene, hvor det håndteres på en uhensigtsmæssig måde ift. menneskesundhed og miljøet. Loven har dog den utilsigtede effekt, at den forhindrer forberedelse med henblik på genbrug. *En certificeringsstandard for oparbejdningsvirksomheder kan give myndighederne mere tillid til at give de certificerede virksomheder adgang til kasserede mobiler.*

En oparbejdningscertificering vil muligvis også give forbrugerene mere tillid til at aflevere deres telefoner til og købe brugte telefoner af disse virksomheder. Den Europæiske Standard Organisation, CENELEC, er netop i gang med at udvikle en sådan certificering.

Til trods for WEEE-reguleringen og et større marked for brugte telefoner i Europa, eksporteres mange brugte mobiltelefoner forsat til udviklingslandene. *Oparbejdnings- og eksportvirksomheder i Europa og de Nordiske lande bør tage større ansvar for at indsamle og transportere kasserede telefoner fra udviklingslande til moderne WEEE-genanvendelsesanlæg.* Lovgivning kunne potentielt blive brugt til at sikre det. Men vi anbefaler at først udarbejde en omfattende kortlægning af skæbnen af brugte telefoner, der indsamles i de nordiske lande.

Annex: List of participants at Helsinki workshop

Table 6: List of Participants at Helsinki workshop'

Organisation name	Contact name
Aalto University	Siru Sihvonen
Afeka institute of Circular Engineering	Avi Blau
Aion Sigma Oy	Jari Ala-Ruona
Bioregional	Sue Riddlestone
Closing the Loop	Joost Dekluijver
Finnish Environment Institute (SYKE)	Camilla Sederholm
Forbrukerrådet	Gunstein Instefjord
German Umweltbundesamt	Janka Steinert
HMD Global	Dean Pattrick
IIIEE	Naoko Tojo
Jolla Oy	Sammy Loitto
Microsoft	Helena Castren
Naturvårdsverket (Swedish EPA)	Annica Carlsson
Paris Institite for Circular Economy	Emmanuelle Moesch
PhoneHero	Erik Lindstedt
PlanMiljø	Anja Charlotte Gylling
PlanMiljø	Bjørn Bauer
PlanMiljø	David Watson
Puzzlephone	Juan Diaz Diaz
Puzzlephone	Tapani Jokinen
Samsung	Annachiara Torciano
Sony Mobile	Johan K. Holmqvist
Sony Mobile	Johan Larsson
Spinverse Innovation	Maria Papina
Swedish Agency for Economic and Regional Growth	Johanna Giorgi
Technical University Dortmund	Michael Kohlgrüber
Uusiouutiset	Elina Saarinen
Zero Waste Scotland	Lynn Wilson

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Circular Business Models in the Mobile Phone Industry

The circular economy offer opportunities to reduce resource use and waste whilst providing business opportunities. This is also true in the mobile phone industry that has been characterised by high rates of product obsolescence. The emergence of the smart phone has changed the landscape, making repair, refurbishment and resell attractive to businesses and consumers. Moreover, emerging modular phone design should allow functional upgrades with low resource wastage.

This report investigates the adoption of circular business models within Nordic markets. Producers, retailers, refurbishers, recyclers and resellers tell of their motivation, experiences and the challenges that they face. A special look is taken at consumer and waste law and the challenges and opportunities they represent. The report ends with 17 policy proposals that can accelerate the adoption of circularity in the sector.

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