

EPR systems and new business models

Reuse and recycling of textiles in the Nordic region



THE NORDIC REGION
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David Watson, Nikola Kiørboe, David Palm, Haben Tekie, Steve Harris, Tomas Ekvall, Thomas Lindqvist and Kari-Ann Lyng



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An EPR system and new business models to increase reuse and recycling of textiles in the Nordic region

Summary of 2013 reports

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1. Key Messages

- Only one functioning mandatory EPR system for textiles currently exists globally (France) with another in the pipeline (Canada). When run *collectively*, mandatory EPR has the potential for capturing large quantities of used textiles cost effectively.
- Overall environmental gains can be increased through promoting so-called *upstream effects*: designing products to last longer, to be easily recycled at end of life, and with lower use of hazardous chemicals during production. Collective EPR schemes can encourage these effects but only if designed carefully.
- There is a diverse and rapidly developing landscape of innovative business models for textiles. However, many models encounter marketing, financial, human resource, and regulatory obstacles.
- Traditional perceptions of selling, buying and owning textiles are a common barrier to all of the models identified. Raising awareness of alternatives amongst both consumers and producers is crucial to their spread and acceptance.
- Design for durability is an important supporting element of lease, repair, clothing libraries, luxury second hand and resell of own brand models. Policies are needed which encourage design for durability and higher quality.
- Some brands/retailers encourage customers to return used textiles by giving rebate coupons on new products in return. Such incentives can risk offsetting the environmental gains of these schemes. Producer/retailers should consider alternative types of incentives.
- Models which are based on reuse and longer lifetimes give higher environmental benefits than models which are based on recycling.
- Several of the business models will create new collection, sorting, service and repair jobs in the Nordic countries, at the expense of production jobs in Asia.
- A qualitative evaluation of the costs and benefits of 4 models was carried out: Mandatory EPR, Voluntary collective EPR, In-store collection with a partner and Resell of own brand. The systems should not be viewed as mutually exclusive.

- The potential magnitude of collection is the most crucial characteristic with respect to overall environmental gains. Mandatory or widely adopted voluntary collective EPR systems can collect much larger volumes than in-store collection and resell of used own brand models.
- All models appear to be break even, but the resell of own brand model enjoys the highest profit margin. The mandatory EPR system would create most green jobs while the in-store collection with partner would create fewest.
- The reuse element gives by far the largest environmental gain per collected tonne for all four models. The low value of non-reusable textiles means these contribute a minor amount to revenues. A technological breakthrough in cost efficient high grade recycling combined and design of textiles for recycling would work in favour of all models.

The key messages and findings presented in this report are part of the Nordic Prime Ministers' green growth initiative, *The Nordic Region – leading in green growth*.

2. Overview

This report is the primary outcome from Part I of the project “An extended producer responsibility (EPR) system and new business models to increase reuse and recycling of textiles in the Nordic region” initiated by the Nordic Waste Group (NAG). The report for Part 2 will be published in December 2014.

The production and use of textiles cause significant global environmental impacts. These impacts can be partly reduced through a greater reuse, and where reuse is not possible, recycling of used textiles.

The aim of the project – *An EPR system and new business models to increase reuse and recycling of textiles in the Nordic region* – is to propose policy packages in Nordic countries which would support extended producer responsibility (EPR) systems and innovative business models which promote greater reuse and recycling of used textiles. In addition to reducing environmental impacts such policy packages would also increase the competitiveness of the Nordic region.

The project is part of the Nordic Prime Ministers’ green growth initiative, *The Nordic Region – leading in green growth*. The initiative identifies eight priorities aimed at greening the Nordic economies, one of which is to develop innovative technologies and methods for waste treatment.

To realise the Prime Ministers’ vision, the Nordic Waste Group (NWG) launched an initiative titled *Resource Efficient Recycling of Plastic and Textile Waste*, comprising of six projects aimed at identifying ways in which the reuse and recycling of plastic and textile waste can be increased. Three of them, including the subject of this report, concern textile waste.

This project for the Nordic Council of Ministers, is a joint cooperation between Copenhagen Resource Institute (Denmark), IVL (Sweden), Ostfold Research (Norway), SYKE (Finland), IIIIEE at Lund University (Sweden) and Environice (Iceland).

The project began in June 2013 and will be completed end 2014. The aims of the work carried out in 2013 were to identify, describe and evaluate existing EPR systems and other innovative business models for clothing and other textiles, both in the Nordic countries and further afield.

The work has been carried out through a combination of literature studies and consultation with key stakeholders. Stakeholder involvement has been ensured, through the establishment and consultation of a

Reference Group comprising a broad spectrum of experts and industry representatives. Further stakeholder input was obtained via a workshop held in November 2013 coordinated by the Sustainable Fashion Academy in cooperation with the Nordic Council of Ministers.

The work carried out in 2013 is presented in 3 reports:

- *Report 1: Survey of existing EPR-systems and business models* – this represented the output from the first stage of the project (Task 2). Relevant types of EPR models and business models which have potential for increasing recycling and reuse of textiles were identified and briefly described and a typology developed for structuring them. Some existing examples of companies/organisations engaging in each model were identified. These included companies/organisations in Nordic countries, wider Europe and the rest of the world. A draft report was sent to the Reference Group for consultation.
- *Report 2: Evaluation of eight EPR-systems and business models* – this represented the output from the second stage of the project (Task 3). Eight of the models identified in Report 1 were described in more detail. A first qualitative evaluation of the 8 models was also carried out. This considered aspects like challenges to the viability and spread of the model, potential for green job generation, potential environmental benefits and so on. The results are presented in a Fact Sheet for each model. A summary one page Fact Sheet was also developed for each.
- *Report 3: Costs and benefits of EPR-systems and two business models* – this represented the output from the third stage of the project (Task 4) and made use of input provided at the Nordic Workshop on textiles held in November. Four of the 8 models described and qualitatively evaluated in Report 2 were selected for a more quantitative evaluation of costs and benefits. Selection was carried out in consultation with participants at the Nordic workshop. The evaluations made use, as far as possible, of data gathered from businesses/organisations engaged in each model, supplemented with qualified assumptions where necessary.

The findings of the three reports are summarised below.

The three reports are then presented in their full form following the summaries.

Under the second part of the project in 2014, the consortium will develop and evaluate policy packages which can promote the more promising EPR systems and business models emerging from the first evaluations.

The reports are part of the Nordic Prime Ministers' overall green growth initiative: *The Nordic Region – leading in green growth*. Read more in the web magazine *Green Growth the Nordic Way* at www.nordicway.org or at www.norden.org/greengrowth

3. Summary of 1st Report

Survey of existing EPR-systems and business models which can increase reuse and recycling of textiles

This report was developed under Task 2 of the Nordic Council of Ministers' project "An extended producer responsibility (EPR) system and new business models to increase reuse and recycling of textiles." The project is one of six projects that constitute *Resource Efficient Recycling of Plastic and Textile Waste*, which was launched by the Nordic Waste Group (NWG) as part of the Nordic Prime Ministers' green growth initiative, *The Nordic Region – leading in green growth*.

The aim of Task 2 was to identify and gather available information about current practices and experiences in Europe and further afield on the use of EPR systems and business models to increase reuse and recycling of textiles.

The report first develops a more detailed description of the scope of EPR-type systems and other business models to be considered, and arranges these into different types. Each type is then described with use of existing examples from the Nordic countries and/or farther afield.

Relevant models are those that have the effect of reducing life-cycle impacts from the production and use of textiles via extending the active lifetime of textile products as far as possible and once this lifetime is over, ensuring that the materials in the products are recycled. In other words, models which maximise the value that can be drawn from a textile product. An element or result of such models may also be that producers are encouraged to make textile products that are more suitable for repair, reuse and recycling and free from hazardous substances (so-called upstream effects).

The review does not attempt to present an exhaustive catalogue of examples, but focuses instead on giving an overview of the various types of models/activities which currently exist and illustrating these with some examples.

The information presented in this report has been collected through desktop survey by referring to relevant reports, articles and studies.

This information was gathered by the project team via previous projects together with web searches. Further, several members of the project team have attended a wide range of relevant workshops and seminars throughout the Nordic region, from which information and inspiration have been gathered. Finally a reference group of relevant stakeholders contributed with inputs and comments for the project.

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Findings

EPR systems have been divided into four different types, differentiating between mandatory and voluntary schemes and between schemes based on individual and collective responsibility. Mandatory EPR-systems for other types of products tend to be implemented via collective responsibility. Collective EPR schemes can inhibit incentives towards implementing upstream effects i.e. improving design of products for longer lifetimes and ease of recycling. However, via careful system design and specification incentives can be included even in collective systems to encourage upstream effects. For example, by giving rebates on producer participation fees for producers who engage in upstream activities. Upstream actions include reductions in the use of certain chemicals during the production of textiles, designing for a longer life, and avoiding fibre mixes to allow easier recycling at end of life.

Only one functioning mandatory EPR system for textiles currently exists globally (France) with one additional example in the pipeline (Canada). A number of EPR-like voluntary initiatives have been adopted by individual producers, however, which include take-back of used products combined with up-stream changes such as designing textile products to be more suited to recycling or reuse. Puma's Incycle initiative is an example of this.

With respect to business models this report has focussed on individual activities/initiatives which can be included as part of a business model but which can also comprise the core of a business model. An individual company may engage in a number of different activities/initiatives related to reuse and recycling of textiles which together form part of its overall business model.

Relevant activities/initiatives were divided into five main categories which are further differentiated into 21 different types of activity, which can be implemented either by producers of textile products or other actors including non-profit organisations.

Product take-back schemes are already well known in the Nordic countries and further afield, but vary somewhat in terms of how used textile products are handled following collection. The category of reuse, resell and de-brand includes the largest range of models. These include both well-known and mature business models and newer less common concepts. The hire, leasing and borrowing models are mostly well-known when performed by actors outside the textile industry. It is less common and widespread when offered by producers but has begun to emerge in recent years. In general, hire, leasing and borrowing appears to be a flourishing and growing business area. Models for longer life are less common from the producer's side. Finally, business models for re-design seem to be an emerging field with many creative ways to increase reuse of textiles.

The majority of EPR and business models/activities considered focus on downstream effects i.e. increasing the collection and recycling/reuse of textiles than on upstream actions. However, most of the models have potential to include upstream actions which would enhance and support the model. For instance, the hiring and leasing models when carried out by the brands themselves would benefit from design for durability and this is already occurring in some of the examples identified. Design for durability is also an important supporting element of lease, reuse, resell and de-brand models again when they are run by the brands/producers themselves. Where third party actors carry out these activities the direct upstream links are lost. Product take-back schemes can also lead to upstream effects where the producers take back their own brand products only. In this context, designing for reuse or easier recycling can potentially increase the economic benefits of take-back schemes to the companies.

The study has revealed a diverse landscape of business models for textiles. The field appears to be developing rapidly with many businesses re-thinking and developing their current activities and many new initiatives appearing. There is thus already a broad spectrum of experiences to draw from in forming new business models/activities in the Nordic region, though fewer examples of functioning EPR-schemes for textiles.

4. Summary of 2nd Report

Evaluation of eight EPR-systems and business models which can increase reuse and recycling of textiles

This report presents the results of Task 3 of the Nordic Project “An EPR system and new business models to increase reuse and recycling of textiles in the Nordic region.” The project is one of six projects that constitute Resource Efficient Recycling of Plastic and Textile Waste, which was launched by the Nordic Waste Group (NWG) as part of the Nordic Prime Ministers’ green growth initiative, The Nordic Region – leading in green growth.

Under this task, eight of the 24 EPR systems and business models that had been described in Report 1 were selected for a more detailed information gathering and qualitative assessment.

In selecting eight models for this qualitative assessment there was a focus on models that were felt to have potential for spreading given the right framework conditions. The models should also represent elements from the full spectrum of models identified in Report 1. The following eight models were selected for qualitative assessment:

- Mandatory EPR schemes
- Voluntary individual EPR (own brand)
- In-store collection with partner
- Leasing of own brand
- Resell of used own brand (either in-store or online)
- Clothing libraries
- Repair and fitting
- Luxury second hand shops

Each model is presented in a Fact Sheet which gives a short overview of the system or business model followed by a description in terms of challenges, assisting instruments, key economic costs and income factors, winners and losers and environmental benefits.

The Fact Sheets provide a wealth of information. Some common elements of interest are as follows. A mandatory EPR-scheme is likely to give the most significant increases in the collection of used textiles. Individual voluntary EPR schemes, however, include strong incentives for upstream effects i.e. improvements in design to benefit reuse or allow effective recycling depending on the focus of the EPR system.

Mandatory collective EPR schemes can potentially provide incentives for upstream effects but this requires very careful design.

There is a wide range of business models which have been tested out in both small and larger settings. Some have been and are still successful whilst others have had to close down, in many cases due to financial obstacles or lack of human resources. There is thus a demand for financial assistance to cover start up, marketing and even running costs.

Traditional concepts of how textile products are marketed and offered to consumers are a common barrier. This concerns both how producers view their role in the market place and how consumers view their options for obtaining and disposing of products. Challenging the current linear models and raising awareness of alternatives amongst both consumers and producers is crucial for the successful spread and nurturing of innovative models. For a number of models citizens have a dual role as both the supplier of materials (i.e. used textile products) and demanders of the products or services (i.e. second hand or leased products). Both roles can be essential for the business model to flourish.

There is therefore wide agreement that more communication about these new business models is needed in order to secure a wider and more stable demand and supply. A number of models offer economic incentives to citizens to return used textile products once they have finished with them. For models involving take-back of used textiles some brands/retailers try to encourage customers to return used textiles by offering rebate coupons on new products in return. Such incentives can risk offsetting the environmental gains of the scheme by encouraging increasing consumption of new products. Producer/retailers should perhaps consider other types of incentives which don't have this effect.

Many of the business models rely on textile items being used by several users and having their active lifetimes prolonged. For these business models increased quality of clothing and design with reuse and repair in mind are essential. There is thus also need for focus on the design phase via e.g. educating designers in long-lasting designs.

In relation to the environmental effects, models which are based on reuse (longer active lifetime for the garments), are expected to give higher environmental benefits than models which are based on recy-

cling. There is, however, uncertainty about the so-called displacement rate. The displacement rate indicates the level to which the purchase (or share/hire) of a used item will replace the purchase of a new one. This is important when evaluating the magnitude of environmental gains offered by some models.

Finally, it is expected that several of the business models will create new collection, sorting, service and repair jobs in the Nordic countries, at the expense of production jobs in Asia.

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5. Summary of 3rd Report

Costs and benefits of EPR-systems and two business models for reuse and recycling of textiles

This report presents the results of Task 4 of the Nordic Project “An EPR system and new business models to increase reuse and recycling of textiles in the Nordic region.”

The project is one of six projects that constitute *Resource Efficient Recycling of Plastic and Textile Waste*, which was launched by the Nordic Waste Group (NWG) as part of the Nordic Prime Ministers’ green growth initiative, *The Nordic Region – leading in green growth*.

The objectives of this task was to select four of the 8 models assessed in the 2nd Project Report and provide a more detailed and, where possible, qualitative evaluation of their costs and benefits. This evaluation, along with the results of the 2nd Report, should provide guidance to Nordic countries in identifying which of the models are worthy of further promotion. They will also together provide a starting point for the development of tailor-made packages of assisting policy instruments in 2014.

Selection of models for evaluation

Key criteria for selection of models for further evaluation was 1) size of impact on the textile flows and environmental gain 2) ease of implementation, 3) availability of relatively robust data and information for enabling an evaluation and 4) representation of a spread of different model types. The Nordic Council of Ministers Waste Group had already in the project description required that one of the models evaluated should be a mandatory EPR.

A first assessment of these criteria was made for all eight models emerging from Task 3 (2nd Report) and the results were presented at a Nordic workshop in Stockholm in November 2013. After discussions and interaction with the participants, the following four models were chosen for evaluation:

- Mandatory EPR.
- Voluntary collective EPR.
- In-store collection with a partner.
- Resell of own brand.

The evaluation should generate knowledge that is relevant for a discussion and decision on what model(s) could be implemented in the Nordic countries. Representatives for the Swedish EPA indicated that the creation of green jobs is a relevant aspect to investigate. Hence, the evaluation focused on the following aspects:

- Net environmental gain.
- Net economic costs.
- Number of green jobs created.

The results from Task 3 are mainly qualitative and the project does not allow for any substantial data collection or complex calculations and only simple indicative calculations are made. The data collection is limited to data gathered under Task 3 of the project, other recently completed projects and other easily available sources. Estimates of the order of magnitude can be done based on previous experience. Where qualitative data is not available, assumptions have been made supported by qualitative discussions.

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Summary of evaluation and assumptions

It has been necessary to make a large number of assumptions during the evaluation, some of which can be significant sources of uncertainty. The assessments of Nordic-wide environmental gains, green jobs etc. are particularly uncertain since they include non-robust assumptions of the spread of each model within the region. In the light of the significance of some of these assumptions, this evaluation should not be viewed as grounds for selecting one system over another. It should rather be considered as a first evaluation of the potential of each system for bringing environmental and economic benefits as a basis for further study. Moreover, the systems should not be viewed as mutually exclusive. Both the in-store collection with partner and the resell of own brand systems can potentially be operated in parallel with or as a part of mandatory or voluntary collective EPR systems.

It is the reuse element which gives by far the largest environmental gain per collected tonne. The reuse level of collected used textiles has been estimated as lying in the range between 40% and 60% for all models. The displacement rate for reuse – i.e. the degree to which a resold article offsets the purchase of a new article – has been assumed to be similar for all models but could in reality differ widely. For example, the resell of used own brand could be expected to have a higher displacement effect due to the higher quality of resold items and their high price compared to average resold products under a mandatory EPR system.

It is the potential magnitude of collection that is, however, the most crucial characteristic of each system with respect to overall environmental gains. According to the evaluation, mandatory or widely adopted voluntary collective EPR systems have the potential for collecting much larger volumes of textiles than in-store collection and resell of used own brand models. The potential scale of the latter two models may have been underestimated in this evaluation with respect to the amount of used textiles collected per store, since they are still under development and consumer awareness of them is not high. However, it is the more all-encompassing nature of the EPR systems which ensures their dominance in terms of collected volumes.

Environmental gains resulting from changes in design or production of textiles have not been considered in this evaluation. If such gains were to be considered the in-store collection gives the least incentive for producers to engage in these design and production changes while the resell of own brand gives the strongest incentives. In particular companies engaging in resell of used own brand would have a clear incentive to produce high quality clothing to be able to sell the same product several times.

If collective mandatory or voluntary EPR systems are carefully designed they can also include elements which encourage such upstream effects. For example, contribution fees could be reduced for producers that avoid the use of certain hazardous chemicals during production, produce higher quality longer lasting articles or design for easier recycling i.e. by avoiding fibre mixes.

The economic evaluation identifies some clear winners though all models appear to be break even. The mandatory EPR system would create most green jobs while the in-store collection with partner would create fewest. A key issue for all models (although less for Resell of used own brand) is the low value of recyclable textiles. A technological breakthrough in cost efficient high grade recycling combined with appropriate design for recycling would work in favour of all models.

The table below gives an overview of the evaluation of the different models for the main evaluation criteria. The green jobs for the EPR systems may not necessarily be in the Nordic region since it may be hard to compete on sorting with sorting facilities with cheaper labour in other parts of Europe.

Table 1: Summary of the evaluation of the four models (Nordic region)

Model	Net Environmental gain	Net Economic gain	Possible green jobs
Mandatory EPR	High	Positive	2,000
Voluntary collective EPR	Medium-High	Positive	900
In-store collection	Low	Negative (for brands) Positive (for sorters)	0
Resell of own brand	Low	Positive	350

Table 2: Summary of key assumptions and their influence on results

Model	Assumption	Level of uncertainty	Impact on result
All models	Textiles that are currently not collected separately, are stored in the household	<i>High (much of it is likely to end in mixed waste)</i>	<i>Low impact on environmental gain calculations. Incineration of mixed waste would give a similar result under average conditions.</i>
	A resold item will displace the purchase of 0.6 new items	<i>High (UK results from regions ranged between 0.11 and 0.52)</i>	<i>High impact on environmental gain calculations. Reuse dominates environmental gains</i>
	All recycled textiles are downcycled into insulation	<i>Low/Medium (there is also considerable downcycling into industrial rags but very little recycling back into textiles in Europe)</i>	<i>Low impact on environmental gain calculations. There is a large variation in environmental gains from different types of recycling but in general downcycling which dominates in Europe has low gains. This could change in future if new recycling back to textiles is developed and expands.</i>
	Only water and greenhouse gas emissions included	<i>n/a</i>	<i>Low impact on ranking of models according to environmental gain. Since all models have similar effects i.e. increasing reuse and recycling the ranking would remain unchanged by the inclusion of impact categories such as ecotoxicity.</i>
	Mixed collected textiles can be sold to sorters for €500 per tonne	<i>High (the figure is based on existing prices but the prices are known to fluctuate significantly with time)</i>	<i>High impact on net economic benefits calculations. This is the most important income for all models apart from the resell of used own brand model.</i>
Mandatory EPR	Increase from current 32% collection rates to 75% collection rates	<i>Medium (both figures are uncertain but are of the right order of magnitude)</i>	<i>High impact on all results. The collection rate is the single most important factor for environmental, economic and green jobs assessments.</i>

	50% reuse, 40% recycling and 10% incineration	<i>Medium (different sorters report quite different values. The higher quantities are collected the lower the likely rate of reuse)</i>	<i>High impact on environmental gain calculations. Reuse dominates environmental gains</i>
	Cost elements based on French EPR	<i>Medium (cost might be higher in Nordic countries due to higher labour costs etc.)</i>	<i>Medium impact on net benefits calculations. Benefits elements are likely to be the same as French due to international market for reused and recycled while costs are likely to be higher. Can reduce viability of all models.</i>
Voluntary collective EPR	Increase from current 32% collection rates to 57-75% collection rates	<i>Medium (as for mandatory)</i>	<i>High impact on all results. (as for mandatory)</i>
	50% reuse, 40% recycling and 10% incineration	<i>Medium (as for mandatory)</i>	<i>High impact on environmental gain calculations. (as for mandatory)</i>
	Cost elements based on French EPR	<i>Medium (as for mandatory)</i>	<i>Medium impact on net benefits calculations (as for mandatory).</i>
In-store collection with partner	2000 stores would be involved	<i>High (this is based on rough calculation of numbers of large stores)</i>	<i>High impact on environmental gain calculations under total Nordic perspective. Number of stores involved is crucial element of total collected textiles.</i>
	Each store collects 1.13 tonnes per year	<i>Medium (based on average M&S levels but highly dependent on size and turnover of store. Did not have this info)</i>	<i>Medium impact on environmental gain calculations under Nordic region perspective. This will be an important element of total collected textiles but uncertainty is medium.</i>
	2.5 minute processing time for each bag of returned textiles	<i>High (nothing to base this assumption on)</i>	<i>Medium impact on net economic benefit calculations. If doubled it would not be the most significant cost element.</i>
	Half of customers would not use rebate voucher	<i>High (based on assumptions in another study)</i>	<i>High impact on net economic benefit calculations. Is the most important cost element for the model.</i>
Resell of used own brand	2,900 stores would be involved	<i>High (this is based on rough calculation of numbers of stores selling high quality clothes)</i>	<i>High impact on environmental gain calculations under Nordic region perspective. Number of stores involved is crucial element of total collected textiles.</i>
	Each store collects 1.13 tonnes per year	<i>Medium (based on average Boomerang levels but highly dependent on size and turnover of store. Did not have this info)</i>	<i>Medium impact on environmental gain calculations under total Nordic perspective. This will be an important element of total collected textiles but uncertainty is medium.</i>
	30 minute processing time per returned garment	<i>High (no available data)</i>	<i>High impact on net economic benefit calculations. Is the most important cost element for the model.</i>

Half of customers would not use rebate voucher	<i>High (based on assumptions in another study)</i>	<i>Low/medium impact on net economic benefit calculations. Even if quadrupled it would not be the most significant cost element.</i>
50% reused (including re-styled), 30% recycled and 20% given to charity	<i>Medium (based on one study)</i>	<i>High impact on environmental gain and net economic benefit calculations. Resell dominates both environmental gains and economic benefits</i>
Resell at €17 per garment	<i>Medium (based on a single company using the model)</i>	<i>High impact on net economic benefit calculations. Is the most important income element for the model. Halving this would remove all the profit.</i>

1st Report:

Survey of existing EPR-systems and business models which can increase reuse and recycling of textiles

Task 2

By Nikola Kiørboe & David Watson (CRI)

Useful comment and input has been provided by the following members of the Reference Group for the project: Kerli Kant Hvass (CBS and KEA Design), Tina Hjort(KEA Design), Kirsi Niinimäki (Alto University for Art & Design), Marja Pitkämä (VTT Finland), Cecilia Brännsten (H&M), Scott McIver & Tom Nilsson (Malmö Högskola), Anne-Marie Johansson (Swedish Chemical Agency), Bror Stende (Virke, Norway) and Bryndís Skúladóttir (Iceland Federation of Industries).

Kari-Anne Lyng (Østfoldforskning) has managed and collated input from the Reference Group

1. Key Messages

- The aim of this task was to catalogue and describe global examples of different forms of extended producer responsibility (EPR) and innovative business models to increase reuse and recycling of textiles.
- One functioning mandatory EPR system for textiles currently exists globally (France) with another in the pipeline (Canada). Mandatory EPR-systems for textiles and other products tend to be implemented via collective responsibility.
- There is a diverse and rapidly developing landscape of innovative business models for textiles. 21 different types of activities were identified. Producers/brands are increasingly adopting models which earlier had been run by other actors.
- The category of reuse and resell includes the largest range of models. These include innovative new models such as resell of used own brand. Hire, leasing and borrowing models run by producers are also beginning to emerge. Re-design is a further new field with many creative ways to increase reuse of textiles.
- Environmental gains of schemes can be increased through promoting *upstream effects*: designing products to last longer and to be more easily recycled at end-of-life. This includes low use of hazardous chemicals during production.
- Current EPR and business models mostly focus on downstream effects: collection, recycling and reuse. With careful design, most models have potential to include upstream actions which would enhance and support the model.
- Design for durability is a particularly important upstream action which supports lease, repair, clothing libraries, luxury second hand and resell of own brand models. Where third party actors carry out these activities the direct upstream incentives are lost.

2. Executive Summary

This document reports on the findings of Task 2 of the Nordic Council of Ministers' project '*An extended producer responsibility (EPR) system and new business models to increase reuse and recycling of textiles*'. The project is one of six projects that constitute *Resource Efficient Recycling of Plastic and Textile Waste*, which was launched by the Nordic Waste Group (NWG) as part of the Nordic Prime Ministers' green growth initiative, *The Nordic Region – leading in green growth*.

The aim of this first task of the project is to identify and gather available information about current practices and experiences in Europe and further afield on the use of EPR systems and business models to increase reuse and recycling of textiles.

The report first develops a more detailed description of the scope of EPR-type systems and other business models to be considered, and arranges these into different types. Each type is then described with use of existing examples from the Nordic countries and/or farther afield.

Relevant models are those that have the effect of reducing life-cycle impacts from the production and use of textiles via extending the active lifetime of textile products as far as possible and once this lifetime is over, ensuring that the materials in the products are recycled. In other words, models which maximise the value that can be drawn from a textile product. An element or result of such models may also be that producers are encouraged to make textile products that are more suitable for repair, reuse and recycling and free from hazardous substances (so-called upstream effects).

The review does not attempt to present an exhaustive catalogue of examples, but focuses instead on giving an overview of the various types of models/activities which currently exist and illustrating these with some examples.

The information presented in this report has been collected through desktop survey by referring to relevant reports, articles and studies. This information was gathered by the project team via previous projects together with web searches. Further, several members of the project team have attended a wide range of relevant workshops and seminars throughout the Nordic region, from which information and inspiration

have been gathered. Finally a reference group of relevant stakeholders contributed with inputs and comments for the project.

The findings presented in this report are part of the Nordic Prime Ministers' overall green growth initiative: *The Nordic Region – leading in green growth*. Read more in the web magazine *Green Growth the Nordic Way* at www.nordicway.org or at www.norden.org/greengrowth

Findings

EPR systems have been divided into four different types, differentiating between mandatory and voluntary schemes and between schemes based on individual and collective responsibility. Mandatory EPR-systems for other types of products tend to be implemented via collective responsibility. Collective EPR schemes can inhibit incentives towards implementing upstream effects i.e. improving design of products for longer lifetimes and ease of recycling. However, via careful system design and specification incentives can be included even in collective systems to encourage upstream effects. For example, by giving rebates on producer participation fees for producers who engage in upstream activities. Upstream actions include reductions in the use of certain chemicals during the production of textiles, designing for a longer life, and avoiding fibre mixes to allow easier recycling at end of life.

Only one functioning mandatory EPR system for textiles currently exists globally (France) with one additional example in the pipeline (Canada). A number of EPR-like voluntary initiatives have been adopted by individual producers, however, which include take-back of used products combined with up-stream changes such as designing textile products to be more suited to recycling or reuse. Puma's Incycle initiative is an example of this.

With respect to business models this report has focussed on individual activities/initiatives which can be included as part of a business model but which can also comprise the core of a business model. An individual company may engage in a number of different activities/initiatives related to reuse and recycling of textiles which together form part of its overall business model.

Relevant activities/initiatives were divided into five main categories which are further differentiated into 21 different types of activity, which can be implemented either by producers of textile products or other actors including non-profit organisations.

Product take-back schemes are already well known in the Nordic countries and further afield, but vary somewhat in terms of how used textile products are handled following collection. The category of reuse, resell and de-brand includes the largest range of models. These include

both well-known and mature business models and newer less common concepts. The hire, leasing and borrowing models are mostly well-known when performed by actors outside the textile industry. It is less common and widespread when offered by producers but has begun to emerge in recent years. In general, hire, leasing and borrowing appears to be a flourishing and growing business area. Models for longer life are less common from the producer's side. Finally, business models for re-design seem to be an emerging field with many creative ways to increase reuse of textiles.

The majority of EPR and business models/activities considered focus on downstream effects i.e. increasing the collection and recycling/reuse of textiles than on upstream actions. However, most of the models have potential to include upstream actions which would enhance and support the model.

Design for durability is a particularly important supporting upstream element of lease, reuse, resell and de-brand models again when they are run by the brands/producers themselves. Where third party actors carry out these activities the direct upstream links are lost. Product take-back schemes can also lead to upstream effects where the producers take back their own brand products only. In this context, designing for reuse or easier recycling can potentially increase the economic benefits of take-back schemes to the companies.

The study has revealed a diverse landscape of business models for textiles. The field appears to be developing rapidly with many businesses re-thinking and developing their current activities and many new initiatives appearing. There is thus already a broad spectrum of experiences to draw from in forming new business models/activities in the Nordic region, though fewer examples of functioning EPR-schemes for textiles.

3. Introduction and aim

This paper was developed as a sub-task under the Nordic Council of Ministers' project '*An extended producer responsibility (EPR) system and new business models to increase reuse and recycling of textiles*'. The project is one of six projects that constitute *Resource Efficient Recycling of Plastic and Textile Waste*, which was launched by the Nordic Waste Group (NWG) as part of the Nordic Prime Ministers' green growth initiative, *The Nordic Region – leading in green growth*.

The paper gathers information about current international experiences with EPR systems for textiles plus other relevant business models.

Relevant models are those that have the effect of reducing life-cycle impacts from the production and use of textiles via extending the active lifetime of textile products as far as possible and once this lifetime is over, ensuring that the materials in the products are recycled. In other words models which maximise the value that can be drawn from a textile product. An element or result of such models may also be that producers are encouraged to make textile products that are more suitable for repair, reuse and recycling and free from hazardous substances. The EPR models will include both voluntary market driven EPR models and models based on a legal framework for EPR plus other types of business models.

The paper first develops a more detailed description of the scope of EPR-type systems and other business models to be considered, and arranges these into different types. Each type is then described with use of existing examples from the Nordic countries and/or farther afield.

In Report 2, a number of these EPR systems and business models are selected and described and assessed in more detail.

4. Scope of models to be considered in review

In the following chapters business models in general and EPR-systems in particular will be described in detail. It should be noted that at least some EPR-models can also be considered as business models, however, as a result of definitions in the tender, they are described in separate sections below.

4.1 Extended Producer Responsibility

The term “Extended Producer Responsibility” (EPR) was firstly introduced by Thomas Lindhqvist in 1990. EPR is based on the “polluter pays” principle, in the sense that it makes manufacturers responsible for the entire life-cycle of their products.

OECD defines EPR as an environmental policy approach in which a producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle. An EPR policy is characterised by: (1) the shifting of responsibility (physically and/or economically; fully or partially) upstream toward the producer and away from municipalities; and (2) the provision of incentives to producers to take into account environmental considerations when designing their products. While other policy instruments tend to target a single point in the chain, EPR seeks to integrate signals related to the environmental characteristics of products and production processes throughout the product chain (OECD 2013).

Lindhqvist (2000) describes the term more simply, in that he sees the EPR-scheme as a policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various parts of the product’s life cycle, and especially to the take-back, recovery and final disposal of the product.

Part of the rationale for the EPR approach has thus been that giving responsibility for the end-of-life management of products to the manufacturer and/or importer of that product will lead to improvements along the product's entire life cycle. More specifically, it is expected that the EPR will provide incentives to producers and importers to manage the products more efficiently, with less environmental risk by taking measures both up-stream and down-stream from sale. For the fashion and textile industry the up-stream activities are those activities which are closest to the production (i.e. from design to point of sale) whereas the down-stream activities are closest to the customer (i.e. from sale to end-of-life).

Figure 1: The value chain for the fashion and textile industry



Source: Guidelines II (2012)

The up-stream measures could include design of products to be more suitable for reuse including increasing product quality reducing the use of toxic and hazardous substances during production processes, and designing products to be disassembled and recycled more efficiently. Downstream measures include the design of systems to increase collection rates, enhance reuse and recycling, and more environmentally sound treatment of end-of-use products.

What distinguishes EPR from other systems which involve take-back schemes is the intended creation of a feedback mechanism between the downstream and the upstream phases of products (Tojo et al. 2012). So far in Europe little evidence can be found of large upstream effects having resulted from current EPR-schemes for textiles or other products. Most activity has focussed on down-stream activities, i.e. point (1) in the OECD definition. Linkages to the up-stream activities (2) remain relatively weak.

4.2 Types of EPR-schemes

Tojo et al. (2012) describe EPR-schemes with respect to two different criteria: EPR-schemes can be either mandatory or voluntary and each of these two types of EPR-schemes can be introduced either individually or collectively. In the following the characteristics of the types of EPR-schemes will be presented in short.

Mandatory vs. voluntary responsibility

EPR-systems which are introduced by Member States either in response to European Union (EU) Directives or otherwise tend to be *mandatory* for the producers and importers included in the scope of the legal framework. At present there is only a single mandatory EPR-system for textiles in Europe. Mandatory EPR systems for other products such as packaging, batteries, end-of-life vehicles and electronics and electrical equipment have been the subject of EU Directives and implemented by Member States for a number of years. More detail is given on these in Chapter 6.

There are several *voluntary* take-back initiatives in the textile business, some of which include EPR-like characteristics. Voluntary initiatives are generally introduced by the producers or via voluntary agreements between industry and government and can be driven by e.g. ambitious CSR-departments in-house, pressure from the market i.e. customers, competition with other producers, a wider stakeholder group, increasing prices on raw materials etc. Businesses tend to include these initiatives as part of their marketing strategy in branding themselves as being environmentally conscious, as a way to differentiate themselves from competitors in the market. However in other cases the initiatives reflect a more fundamental adoption of sustainability concepts in the central values of the company as expressed by their CSR strategy.

Individual vs. collective responsibility

The difference between individual and collective responsibility refers to the way the responsibility is carried out in practice. Under individual responsibility the producers take back and manage their own products. Under collective systems producers and importers join up to pay a separate organisation to take back all products within the specific category. How the cost of collection and management is split between producers/importers can be allocated according to the volume or value of relevant products they have put on the market in the given year. Most man-

datory systems allow producers/importers to choose between engaging in individual or collective systems.

In relation to encouraging upstream changes and waste prevention – that is, the reduction of environmental impacts downstream by changing the design of products/systems surrounding the products, the distinction between individual and collective responsibility becomes important. In the case of textiles, for example, upstream actions could include avoiding fibre mixtures to ease recycling, easy removable seams, zips etc., and reducing the use of hazardous chemicals (see Box 1).

It has been argued that the implementation of *individual* responsibility is crucial in order to induce these upstream changes. If producers pay the same fee per output for collection and management of end-of-life products regardless of the level of design-for-end-of-life, producers have little incentive to take upstream initiatives. This is the case for many collective responsibility systems. Having said this, if the fee is paid per item instead of per kg this could theoretically provide an incentive towards the production or import of higher quality textile products. Under all circumstances upstream effects are only likely to occur if the fee represents a non-negligible cost per item. This is not considered likely for textiles due to low collection costs per item and the fact that most used textiles will have some economic value after they have been collected. Instead, it is likely that consumers end up paying the costs for the collection and treatment, whilst those who introduce products with better characteristics with respect to reuse and recycling end up subsidising the producers that do not.

Under individual responsibility where each producer manages their own waste, there is a greater direct incentive to improve on design for reuse and/or end-of-life since it will reduce the company's costs. In practice individual responsibility can prove a challenge, since each producer must introduce their own collection infrastructure. A possible solution would be to design collective systems which provide incentives for upstream effects via for example distinguishing the costs of involved in managing each individual producer's products.

Box 1: Chemicals and textiles

Many chemicals are used during the production of textile products both during the production of yarns and particularly during the production and preparation of fabrics (pre-treatment, dyeing, printing and finishing). The finishing step aims at improving the functionality and facilitating easy care of textile products and includes the use of chemical agents for increasing crease resistance, softening and filling and stiffening plus water and oil repellents, flame retardants and anti-static agents depending on the intended function of the product. Over 1900 chemicals used in textile production were identified in a non-exhaustive mapping exercise by the Swedish Chemical Agency of which 165 are classified as hazardous with respect to health or the environment under the EU's Classification, Labelling and Packaging Regulations from 2008 (Swedish Chemical Agency, 2013). Of these, 105 substances used in production of textiles were identified as being Carcinogenic, Mutagenic or toxic to Reproduction which are the three classes of most concern to the Swedish Chemical Agency with respect to textiles. These are collectively referred to as CMR substances. In addition to the 165 substances 24 further substances from the REACH Candidate List were identified as being used in textile production.

Most chemicals are completely removed from the final product prior to putting them on the market. However, some chemical traces can remain in textiles at the point of sale (Swedish Chemical Agency, 1997). In some cases these traces are unintended, in others such as brominated flame retardants in e.g. some uniforms etc. or chemicals for easy care these are designed to remain in the article during the lifetime of the product. These chemicals in particular are likely to remain in the product during its functional life, but there is also a potential for other traces to remain at the point where a textile product is donated for reuse or recycling. Long living chemicals classed as persistent, bioaccumulative and toxic (PBT) including perfluorated carbon substances and heavy metals can be problematic in the context of systems for increased recycling in a circular economy since they can potentially accumulate in new products with recycled fibre content. This could be particularly problematic where the new product is intended for chemically-sensitive groups such as children. Some of these are also classed as CMRs.

The Swedish Chemical Agency (2011) identified the need to carefully consider chemical use in manufacturing in the emerging context of circular economies being promoted by the EU Commission. This was followed by specific recommendations for textiles to ensure the restricted use of problematic chemicals in textile production and/or finished products. This included extending fibre labelling regulations, better use of the REACH Regulation, and creating new textile-specific legislation similar to the RoHS regulation for electrical equipment (Swedish Chemical Agency, 2013). There already exist several voluntary labels that include criteria that to varying degrees limit the use of chemicals in textile production and/or in finished textiles: Bra Miljöval, Nordic Swan; EU Flower; Global Organic Textile Standard (GOTS); Bluesign; and Oeko-Tex 100.

4.3 Types of Business Models

One of the more simple definitions of the term 'business model' was developed by Osterwalder and Pigneur (2009) as describing *the rationale of how an organization creates, delivers and captures value (economic, social, cultural, or other forms of value)*. This definition relates to how a business creates competitive advantage. Similarly, Teece (2010) notes that the essence of a business model is that it *defines the manner by which the business enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit: it thus reflects management's hypothesis about what customers want, how they want it, and how an enterprise can organize to best meet those needs, get paid for doing so, and make a profit*. A business model is thus a conceptual, rather than financial, model of a business. Both definitions relate to how a business creates competitive advantage, which is why Teece (2010) underlines that a good business model is non-imitable.

There has been a significant focus on new and innovative types of business models in recent years. The interest has grown concurrently with increased competition and pressure on revenues, which many businesses have experienced over the past decade. These intensified market pressures result from increasing globalization, deregulation of markets, faster innovation cycles and/or a high degree of economic integration which have made markets more dynamic, more competitive and above all, more complex (Wirtz 2011).

For the purposes of this project a simplified classification or typology is necessary which distinguishes between different types of business activities which are specifically relevant to extending the lifetime of textile products, and increasing reuse and recycling rates including via upstream initiatives. This includes activities developed by fashion companies and textile producers, but also those created by other types of actors including non-for profit social innovators.

Various ideas and frameworks for classifications have been presented in the literature. Wirtz (2011) presents a useful overview of classification systems. These classifications tend to focus on rather specific elements of business models to be used for more operational approaches, rather than how various models can be defined / classified in a more descriptive way as is our need. Another conceptualisation presented by Bisgaard et al (2012) divides business models into two groups: incentive-based models and life-cycle based models. This classification is interesting but is not nuanced enough for our purposes.

Due to the lack of useful classification options a new skeleton has been created for this project. Inspiration has been drawn from a simplified landscape of post-retail initiatives presented by Hvass (2013). The skeleton doesn't present an overview of different business models per se, but rather how different business models can innovate with respect to post-retail initiatives.

Following this approach, it is very important to note that the classification developed for this project distinguishes between types of *activities* and not necessarily different *business models*.

An individual company may engage in a number of different activities related to reuse and recycling of textiles which together form part of its overall business model. For example, it may design better quality products for longer life, establish an in-store repair service and also operate a take-back system for its own products which it then sells second hand in an online platform. Particularly in the area of textiles many companies are currently experimenting with multiple ideas (personal comment, Hvass, K. K.) and different combinations of activities can create a vast range of unique business model as advocated by Teece (2010). Therefore, to allow a useful classification of different types the focus is on types of individual *activities/initiatives* which can be included as part of a business model but which can also comprise the core of a business model.

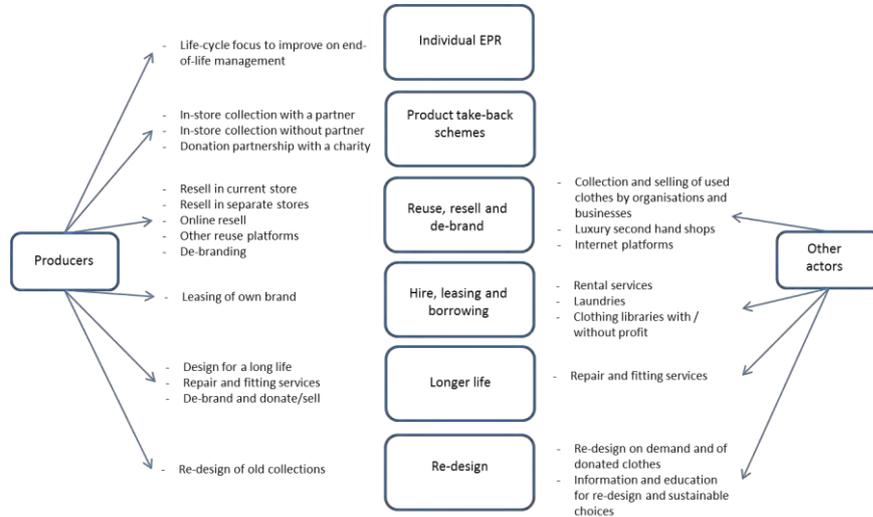
The structure we have developed for these activities differentiates between *producers* and *other actors*, and includes six different main types of activities which the businesses can choose to focus on or combine.

All activities which are included:

- Extend the lifetime of textile products, and/or
- Increase collection-, reuse- or recycling rates, and/or
- Increase demand for recycled fibres.

The skeleton is presented in Figure 2 and will serve as base for the description of the business models in Chapter 7.

Figure 2 Structure of business models



Source: own making

The activities presented under the first two categories (*Individual EPR* and *take-back schemes*) are not necessarily activities, which *creates, delivers and captures value to customers*. In particular the *Individual EPR* model might merely serve as an internal strategy for optimising (parts of) the business.

The Nordic Council of Ministers wished for a specific focus on EPR and this is therefore subject to its own chapter: Chapter 4 which includes both collective and individual EPR systems. Chapter 5 covers activities other than EPR. Some of the examples of the activity types which are presented in Chapter 4 and 5 can be described as core elements of business models which have been developed from a more traditional model (i.e. produce and sell textile products). Others are examples of businesses which have been started from scratch with the specific activity in mind. Finally there are initiatives which are merely add-ons to a traditional business model (like e.g. resell of own brand next to selling of new products).

5. Method for collection of information

The information presented in this report has been collected through desktop survey by referring to relevant reports, articles and studies. This information was gathered by the project team via previous projects together with web searches. Further, several members of the project team have attended a wide range of relevant workshops and seminars throughout the Nordic region, from which information and inspiration have been gathered. Finally a reference group of relevant stakeholders contributed with inputs and comments for the project.

The reference group members who have contributed with comments and input are Kerli Kant Hvass (CBS and KEA Design), Tina Hjort(KEA Design), Kirsi Niinimäki (Alto University for Art & Design), Marja Pitkänen (VTT Finland), Cecilia Brännsten (H&M), Scott McIver & Tom Nilsson (Malmö Högskola), Anne-Marie Johansson (Swedish Chemical Agency), Bror Stende (Virke, Norway) and Bryndís Skúladóttir (Iceland Federation of Industries).

6. Existing EPR-models for textiles

6.1 Mandatory EPR-scheme

There is currently only one established mandatory EPR-system globally which includes textiles in the scope. It was established in France in 2006 and came into force January 1 2007. A further mandatory EPR for textiles is planned for implementation in Canada by 2017.

When EPR-schemes are introduced by law, producers are usually given the opportunity to choose whether they want to undertake their responsibility individually or through participation in a collective agreement. Collective systems are usually chosen by companies due to the higher costs for logistics and administration for individual systems.

EcoTLC system in France

France is one of the most active countries in the world when it comes to the use of EPR systems. The country has more than 20 different EPR systems that cover products like packaging, tyres, furniture and household chemicals and since 2006 also clothing, linen and footwear.

The respective legislation which was introduced at the end of 2006 (Article L-541-10-3 of the Code de l'Environnement), made French companies which produce and import clothing, linen and footwear (Textile, Linge, Chaussure - TLC) responsible by law for ensuring reuse and recycling of their products at the end of their usage. These companies can either organise their own reuse and recycling program that must be approved the French authorities (individual system) or contribute financially to an organisation accredited by the authorities to provide for them (collective system).

At present Eco TLC is the only organisation accredited by the French public authorities to provide a collective system for the sector. Eco TLC is a non-for-profit private company directed by a board of industry representatives. Currently, Eco TLC represents more than 93 % of the industry. The remaining 7 % are currently free riders (Tiard, L. 2013).

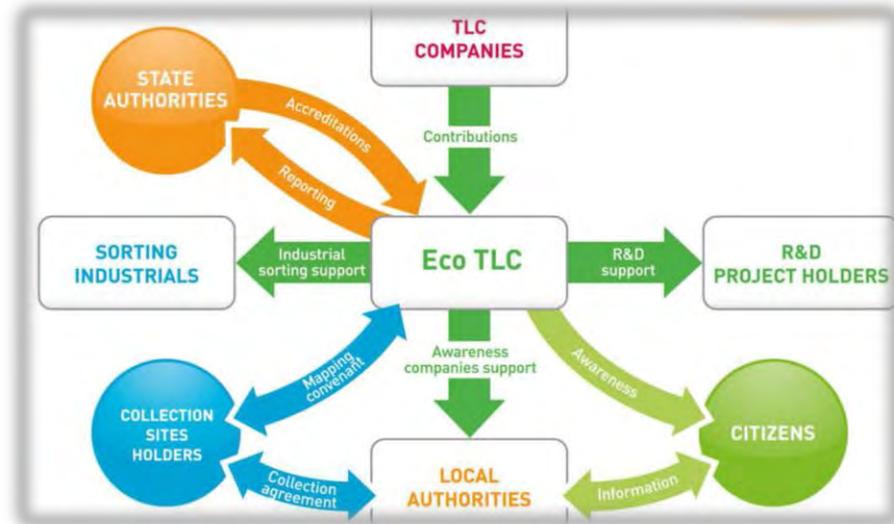
The members of Eco TLC pay an annual contribution to the organisation based on last year's volume put on the market, and in accordance with the size of each item. There are four different categories for clothing and linen and two sizes of footwear.

As already mentioned collective EPR systems don't tend to provide strong incentives for encouraging upstream improvements. However, Eco TLC encourages one type of upstream effect by including an economic incentive to use recycled fibres in their new textiles products. Members who use a minimum of 15% recycled fibres or other recovered materials in their new textile products pay a significantly reduced contribution per item to Eco TLC (Lauriane Tiard pers. comm.).

Eco TLC claims that member contributions do not change the price for the end consumer (Tiard, L. 2013). Member fees for the system are used for supporting the following activities (see also Figure 3):

- Sorting by organisations that are approved as meeting Eco TLC requirements.
- R&D projects that are selected by a scientific committee to find new outlet and solutions to recycle used textiles, linen and shoes.
- Communication campaigns organised by local authorities to motivate end used to change consumers waste sorting habits.
- Communication kits to all stakeholders of the sector.
- Measuring tools to analyse and develop reliable statistics about the industry.
- Real time mapping of all French collecting sites to inform local citizens and communities for free.

Figure 3 The organisation of the French EPR system



Source: Eco TLC 2013

Future activities that will be financed from membership fees will include projects aimed at educating and assisting designers of products to design with reuse and recycling in mind (Lauriane Tiard pers. comm.).

Interestingly the system does not provide financial support directly to collectors although some sorters will also be collectors. Collectors are rather indirectly supported through sorting companies having a stronger financial foundation. This creates a stronger market for the used items that the collectors can supply them with thus creating improved financial conditions for collectors (Scott McIver pers. comm.)

Eco TLC collected around 154,000 tonnes of textiles at 26,000 collection sites across France in 2012. This corresponds to around 25 % of clothing, linen and footwear put on the French market. The collection quantity has increased by on average 8 % a year since the scheme was introduced. The legislation does not stipulate minimum levels of reuse and / or recycling, but Eco TLC's declared objective is to treat 50 % of the volume put on the market, which they aim to sell, reuse or recycle at least 70 %. A 90% target is currently under discussion.

All collection sites (includes charities, collection banks and protected booths) are marked with the EcoTLC logo for recognition, and the Eco TLC has now started to advertise the system with a map of collection sites on their website, in local radio and in newspapers in order to increase the collection rates (Tiard, L. 2013). Companies that have regis-

tered with and paid fees to Eco TLC are free to choose whether they communicate concerning their contribution.

Of the sorted clothes, linen and shoes around 60-65 % goes to reuse (mainly in Africa due to historical ties), 25-30 % goes to recycling (unravelling or rags) and 5-10 % goes to waste (landfill or incineration) (ibid).

In 2012 the Eco TLC collected 14 M € from their members. The division between implementing actors was as follows:

- 65 % to support sorting companies
- 25 % to local authorities covering services
- 8 % for taxes, staff, office and outsourced services
- 2 % for R&D (selected by a scientific committee to find new outlets and solutions to recycle TLC) (ibid).

EPR on textiles in Canada

In 2009 the Canadian Council of Ministers for the Environment released the Canada-wide Action Plan for Extended Producer Responsibility (the CAP for EPR). The CAP for EPR is a plan for how Canada can achieve substantial reductions in the amount of waste generated and sent for landfill. This is the national strategy which was initiated since Canada's performance on MSW lags behind other G8 countries with respect to recycling. The CAP for EPR contains common coordinated policies and commitments for government action and common key elements for building producer responsibility through the adoption of EPR approaches on a range of product categories (CCME 2009).

The CAP for EPR is separated in two phases of which the first must be implemented within six years of the adoption of the CAP and the second must be implemented within eight years of the adoption. The CAP for EPR covers product categories like packaging, electronics and electrical products, household hazardous and special wastes, automotive products, furniture and textiles and carpets (ibid).

The CAP for EPR aims at facilitating the creation of consistent and harmonious EPR regulations and programs in Canada. The plan outlines a number of common elements that set out recommendations and guidance for all EPR programs in order to ensure common interpretation and application. These elements include the responsibilities of designated producers and producer responsibility organizations, the relationship to stewardship plans, the establishment of targets and reporting mechanisms, the raising of funds and design for environment considerations (ibid).

Textiles and carpets are part of the “Phase 2” of the plan, and will thus not be implemented before 2017.

6.2 Voluntary and individual EPR-schemes

For the voluntary individual EPR-schemes it becomes rather important to be precise in terms of the definition of the EPR. As will be clear in chapter 7, many textile producers have taken various initiatives which in some cases resemble an EPR-scheme. To be classified as an EPR-scheme, however, producers should not only collect their products at the post-consumer stage, but should also take physical and/or economical responsibility for treatment of textiles after collection. Further the responsibility should ideally have an effect on the design phase of products i.e. design for more sustainable end-of-life management.

Puma

In March 2013 PUMA launched an entire line of gear that is either biodegradable or recyclable and 100% Cradle-to-Cradle Basic certified^{CM}. The PUMA InCycle collection includes among others a lifestyle sneaker Basket (biodegradable), a PUMA Track Jacket (recyclable), shirts (biodegradable) and a backpack (recyclable). The PUMA InCycle collection uses biodegradable polymers, recycled polyester and organic cotton among others in order to eliminate pesticides, chemical fertilizers and other hazardous chemicals, in order to, amongst other things, ease the end-of-life management of their products (PUMA 2012).

The recyclable PUMA Track Jacket, is 98% made of recycled polyester deriving from used PET bottles while the conventional PUMA Track Jacket contains additional materials, such as elastane. To fully ensure the homogeneity of materials, the recyclable jacket’s zipper was made of recycled polyester as well. Once the InCycle PUMA Track jacket has been returned by the consumer and collected in the PUMA Bring Me Back Bin (in collaboration with I:CO, see Box 2), the jacket can be turned back into polyester granulate which then serves as a secondary raw material for new products (ibid).

The PUMA Backpack is made of polypropylene and will be returned to the original manufacturer in China after collection, who will then produce new backpacks from the recycled polypropylene (ibid).

There are thus some elements of EPR-like mechanisms, since PUMA 1) collects its own products and sends them to recycling facilities and to 2) designs some products for easier end-of-life management.

Figure 4 The PUMA bring back bin



Source: PUMA

Boomerang

Boomerang is a Swedish clothing brand which opened its first shop at the end of the 80's. They now distribute their collections in six different countries, with 32 privately owned shops and more than 200 specially selected retailers. As the name suggests, the philosophy of the company is that "whatever you give you get back". This means that the customer in return for their old Boomerang clothes (they do not accept other brands) will receive a 10% discount on a new garment in the store. The used garments are then either sold as Boomerang Vintage (more on this in chapter 7.2.1) or cut up and used to make Boomerang Home products. Fabric cut-offs from the factory are recycled in the Effect Collection (Boomerang 2013). It is underlined that the Boomerang designers choose materials, colours and models that will be suitable for reuse i.e. a longer life (Boomerang 2013a).

Marks & Spencer

Marks & Spencer have produced the *Shwop Coat* which is made from wool extracted from woollen clothing donated by customers in M&S stores or via their charity partner Oxfam under the Shwop initiative (read more about this in chapter 7.1.3). This is the first item of clothing to be produced using recycled materials from textiles collected under the scheme. According to M&S it is sold at half the price it would be if made from virgin wool (Morgan 2013), which thus underlines that recycled materials can be less expensive than virgin material.

Figure 5 The "Shwop coat"



Source: Marks & Spencer

Klättermusen

Swedish out-door gear producer Klättermusen launched a deposit-refund system in 2009 which rewards their customers with up to € 20 for returning used Klättermusen gear. The company donates the returned item to charity, re-designs it or sends it off for recycling. Klättermusen have the long term aim of refining their products and making them more suitable for end-of-life treatment (Klättermusen 2009).

ECO CIRCLE

Teijin's ECO CIRCLE is a recycling technology which is based on chemical recycling. This technology can refine old polyester into new polyester raw material equivalent to that made from petroleum, and is the first of its kind in the world. The system now encompasses a global network of more than 150 companies, including apparel, sportswear and uniform manufacturers. These companies collect their post-consumer products ship them back to Teijin for chemical recycling into new fibres, which are then manufactured into new products again to be sold at the retailers again (Teijin 2013).

Global producers like Nike and Patagonia are amongst the Teijin partners (Ulasewicz and Baugh 2013). Swedish manufacturers Houdini and Fjällräven have also joined the initiative, but by 2012 had still not accumulated sufficient material to justify shipment to Japan (Tojo et al 2012). This shows that the infrastructure of a take-back scheme is only a part of the solution. If the system is to work, there has to be sufficient communication and/or benefits for consumers to encourage them to deliver input to the system. In the meantime to ensure a more constant flow of polyester material to Teijin from Nordic countries, it may be relevant for the Nordic members of ECO CIRCLE to cooperate in central collection and transport.

6.3 Voluntary and collective EPR-schemes

There are no known voluntary collective EPR-schemes for textiles or for any other product groups globally. The ECO CIRCLE system described above is not considered to be a collective EPR system since the individual companies collect their own brand clothing. Teijin provides for the back-end of the system, in other words they take no part in the collection of textiles from end users. However, if Teijin is considered here to be a manufacturer then this system could be considered to be a collective EPR.

6.4 Existing EPR-schemes in the Nordic countries

EPR is already known and used in the Nordic region. Sweden, Denmark and Finland are all covered by EU legislation, and are therefore obliged to abide by the Waste Framework Directive, which introduces both the "polluter-pays" principle and the "extended producer responsibility"

principle. Although Norway and Iceland are not members of the EU, the two countries are EFTA members and have signed the agreement on the European Economic Area. Norway and Iceland are thus required through this agreement to implement the directives in the environment area, including the Waste Framework Directive.

The Waste Framework Directive states that the costs of disposing of waste *must* be borne by the holders of waste, by previous holders or by the producers of the product from which the waste came, and that member states *may* take measures to ensure that the producer has extended producer responsibility (European Commission 2008). EU Directives have been adopted for end-of-life vehicles, batteries, waste from electrical and electronic equipment (WEEE) and packaging. Under the first three it has been obligatory for EU states to adopt legal mandatory EPR systems. For packaging it is up to the individual states whether or not they develop a mandatory EPR system to meet collection and recycling targets. A number of Member States have chosen to implement the directive via an EPR system for packaging. A few MS have also developed EPR for additional products such as tires. The Directives and implementing laws, in theory, allow companies to meet their responsibilities individually or as part of a collective system. In practice, due to the cost of developing systems which comply with the law, almost all companies have elected to be part of *collective* systems.

EPR on textiles in the Nordic countries

To date no formal EPR scheme on textiles has been introduced in any of the Nordic countries. However, there has been some public debate in several of the Nordic countries with regard to the handling of textiles after their first use.

In Denmark the debate on a deposit-refund system was opened in the media in January 2013. A Danish politician proposed the idea, but it was quickly abandoned after heavy criticism by fellow politicians and other interested parties in that it was expected to be a too bureaucratic and expensive model for handling textiles. In February the Danish EPA held a seminar for 60 stakeholders in the textile industry, where they were to discuss possible models for preventing and recycling textile waste in Denmark. The idea of a deposit-refund system was popular amongst the attendees as a potential concept for waste prevention/recycling (Danish EPA, forthcoming).

The latest development in Denmark is that the Danish Fashion Institute (DAFI) in cooperation with other stakeholders is developing a business model based on a take-back system for clothing. The aim of this project is to increase the collection of used clothing, improving their

subsequent use according to the waste hierarchy, and contributing to green growth and jobs in Denmark. A longer term objective would be to establish a sorting facility in the Nordic region. The project has so far been supported by the Business Innovation Fund (Fornyelsesfonden) and DAFI is currently seeking further funding sources.

In Sweden the textile industry is encouraged to introduce a voluntary EPR in the most recent waste management plan “Affaldsplanen” (Naturvårdsverket 2013).

7. Business Models to increase reuse and recycling

The following chapter will present an overview of different types of activities/business models which, as mentioned in chapter 4.3, are expected to:

- Extend the lifetime of textile products, and/or
- Increase collection-, reuse- or recycling rates and/or
- Increase demand for recycled fibres.

The list is presented to give an overview of the types of activities/ business models which are currently in place with examples of specific companies and other actors to illustrate each model. The overview is not exhaustive in terms of examples and specific details for each of the models. Several of the producers which are mentioned have implemented more initiatives, and they might not all be described here. The list is aimed to be a first step in identifying those activities/business models which have most potential for increasing reuse and recycling of textiles in the Nordic region.

7.1 Product take-back schemes – producers

7.1.1 *In-store collection with partner*

In-store take-back schemes seem to be gaining momentum. The examples provided here are not considered to be EPR systems under the more formal definition since they do not include upstream elements i.e. changes to product design.¹ The distinction between product take-back schemes and individual EPR-schemes is however not so sharp and initia-

¹ It could be argued that this mechanism is not even present under current accepted EPR-schemes, such as the one for WEEE, but for this study we will use the formal definition.

tives could easily move between the two categories as small changes in the activities are made. The examples which are mentioned cover high street retailers that encourage customers via incentives or otherwise to donate used garments (bought from that retailer or any other retailer depending on the scope) to stores. The garments are then sent to a central facility for sorting, for reuse, recycling and other waste management.

H&M

Since February 2013 the global clothing chain H&M has partnered up with global textile collector I:CO (see Box 2) by taking back all types of used clothes from all brands independent of the state which the clothes are in. The initiative has been rolled out in all 48 countries where H&M are present. The collected clothes are then sent to the nearest I:CO sorting centre using existing logistics. At the I:CO plant the clothes are graded and hand-sorted, in accordance with the waste hierarchy, i.e. prioritising reuse rather than recycling and recycling rather than landfill or incineration. In return for their efforts, the customer receives some kind of rebate on their next purchase in the store (the incentives vary from country to country) for each bag of clothes which is handed in. This incentive raises the question of whether or not the scheme gives net environmental benefits. This depends on whether the scheme increases net purchase of new textile products or whether it only increases H&M's market share. The same question can be raised for all take back schemes which includes refunds for buying new products.

Box 2: Private collection companies

Many larger European producers have decided to team up with the Swiss textile collectors and handlers I:Collect (I:CO) which is a part of the SOEX Group. The company currently processes around 500 tons of used items every day which has been collected at collection points in 74 countries all over the world. I:CO arranges the pick-up, the sorting, the re-use and the re-cycling. When large producers collect used textile in-store the textiles are brought back to main storages by the existing logistics, from where I:CO picks it up and transports it to a central sorting plant. The contract I:CO makes with individual companies and organisation varies in terms of payment for the textiles, donations etc. Most companies incentivize their customers to hand in their used textiles by offering a discount voucher for the store in which the textiles are handed in.

KICI is a Dutch collection company which has also started to team up with private businesses. In the Nordic region they are currently present in Sweden.

A small donation is given per bag to local charity organisations. The textile collection scheme has been initiated under H&M's own initiative as an implementing activity of their CSR-policy (H&M 2013). By September 2013 H&M had collected approximately 1,800 tons of textiles worldwide which resulted in donations to various charitable projects of around €37,000 (H&M 2013a).

Stormberg

The Norwegian producer of sportswear, Stormberg, has introduced a take-back policy where customers returning clothes to stores get a refund on their next purchase. The refund depends on the type of product. The system is carried out in collaboration with the Red Cross and returned clothes are sent to Latvia and donated to people that have reduced financial capacity to buy clothing (Stormberg 2013).

Similar initiatives

Jack & Jones has launched a similar scheme in collaboration with I:CO, where they also take back used textiles in-store of all brands. In return the customers get a refund on their sustainable jeans-collection "Low Impact Denim" (I:CO 2013). As such, the scheme is potentially more environmentally sustainable than the H&M/Stormberg type systems where the refund applies to all types of products. The in-store collection systems run by children's clothes brand Name It goes even further and doesn't offer refunds for returns.

In Sweden, Cheap Monday and I:CO has also set up the same type of initiative (Weekday 2013) while an American branch of I:CO has entered into agreement with the North Face for taking care of their collected textiles (Ecouterre, 2013). As mentioned in chapter 6.2 PUMA is also collaborating with I:CO and it seems as if more companies are moving in this direction.

7.1.2 *In-store collection without partner*

Patagonia

As identified in Box 3, as part of their comprehensive business model and strategy for more sustainable products, Patagonia operate a take back scheme in all of their shops for all Patagonia products. Depending on the type of product some of these are subsequently sent to Teijin for polyester recycling under the Ecocircle scheme (see under Chapter 4). Alternative recycling options are found for the other returned products.

Box 3: Patagonia

Patagonia is an example of a company that has developed a business model which includes many different types of activities included under different elements of the categorisation presented in chapter 5, as part of their sustainability strategy.

Patagonia's "common threads initiative" invites their customers to take a pledge that obliges them to live up to the mantra "Reduce, Repair, Reuse and Recycle", underlining that "there's a reason that recycling comes last", thus emphasising the waste hierarchy.

In return for the customer's effort, Patagonia promise to do their part by designing products that last longer and are more easily recycled, offering repair services for damaged goods, offering an on-line marketplace for used Patagonia products to be sold for re-use (in collaboration with e-Bay) and finally to take back all of their products for recycling at the end of their life (Patagonia 2013).

On their website Patagonia presents the "footprint chronicles"; an interactive map showing producers and textile mills with which Patagonia collaborates. They have high standards for their material input and process PET bottles, unusable second quality fabrics and worn out garments into polyester fibres to produce many of their clothes (ibid).



One way of communicating their unique business model has been via their "don't buy this jacket"-campaign. The campaign was launched in the US on Black Friday, which is the first day of the Christmas spending. The message was intended to encourage people to consider the effect of consumerism on the environment and purchase only what they need (ibid).

7.1.3 Donation partnership with a charity

Marks & Spencer

Marks & Spencer sells clothing, food and articles for the home and has 766 UK stores and 418 international stores. The company has a significant focus on its environmental impact, including the impact of their sales of textiles. In their effort to collect and bring down the amounts of textile waste sent to landfill, Marks & Spencer have amongst other things initiated a partnership with the charity organisation Oxfam. Together they have introduced the concept of “shwopping” and two annual one day wardrobe clear-out, where customers who hand in clothes for reuse (in either Marks & Spencer or in an Oxfam store) receive bonus points which can be exchanged for new purchases in Marks & Spencer.

All collected textiles are handed over to Oxfam who sorts them and either sells them in one of their stores, or recycles them at their recycling plant in UK which sorts around 80 tonnes of textiles per week (Morgan 2013). Oxfam has estimated that it earns around one million British pounds on each of the one day wardrobe clear-outs alone (Marks & Spencer 2013), and that they received around 3 million garments in 2011 (Morgan 2013).

Levi’s and Jackpot have initiated similar initiatives where take back is carried out in collaboration with a charity.

All three named examples include refunds off future purchased new clothes which, as discussed earlier, raises the question of whether or not they lead to a net reduction in environmental impacts caused by textile products.

G-star

G-star has run an initiative with KICI (who has strong collaborations with various charity organisations) where they developed a collection out of G-Star post-consumer denim. KICI collected and developed the fibre and supplied the recycled material to G-Star, who created a new collection from it.

Filippa K

In addition to the second hand shop as described under 5.4 below, Filippa K has entered into a partnership with the charity organisation, Stadsmissionen, who is involved with the resell of lower quality Filippa K garments that do not have resell value in the Filippa K second hand store and which the customers are not interested in getting back. Stadsmissionen provides employment for people in need, by creating an opportunity for redesign of used Filippa K garments (Hvass 2013a).

7.2 Reuse and resell – producers

In this model retailers only take back their own brand used products and these are only accepted if suitable for reuse. It is not common for producers to engage in the life of their garments after their first use, but there are a few examples of how this can take place.

7.2.1 *Resell in current stores*

Boomerang

In six of their Swedish Boomerang stores customer can find both new and Vintage Boomerang clothes. As already mentioned in chapter, customers will receive a 10% discount on a new garment in the store in return for an old Boomerang garment. If the used garments can be awarded with the Swedish Society for Nature Conservation's Bra Miljöval (good environmental choice) label they are re-sold in-store as Boomerang Vintage. Since the *Boomerang Vintage* idea was launched, more than 7,000 garments have been handed in for reuse in the stores (Boomerang 2013a).

In a slightly different model Branting, Sweden, sell items from earlier collections which were never sold. Instead of discarding the items, they are sold in their shops as vintage clothing (Sanna Due pers. comm.).

7.2.2 *Resell in separate stores*

Filippa K

Swedish Filippa K has created a business model where they, in addition to their "regular" stores, have established a second hand store for used items of their own brand. Here customers can hand in Filippa K clothes which they no longer use. The second hand store is decorated in the same way as the "ordinary" shops, but with a more "vintage"-like look so that the customer experience is as close to the "normal" experience when shopping. When the clothes are sold on to a new owner, the customer receives a commission. Returned clothing which can't be resold is donated to charity (see under 5.2).

Eileen Fisher

A slightly different model is presented by the U.S. women's clothing brand Eileen Fisher. Used Eileen Fischer clothes which are suitable for re-use can thus be handed in at one of four Green Eileen stores in the U.S. or sent in by mail if this is more convenient. In return the donor

receives a tax receipt and a \$5 Reward Card for each item which can be used in Eileen Fischer stores or online (Green Eileen 2013). In addition to the Green Eileen shops, the brand also supports a wide range of organisations. The Green Eileen stores further offer workshops for everyone on e.g. sewing-lessons, knitting courses and repair techniques (Green Eileen 2013a).

7.2.3 Online resell

Patagonia

As part of their “common threads initiative” (see Box 3) Patagonia has engaged in a partnership with e-Bay where used Patagonia clothes can be sold from one customer to another. The used clothes are thus sold on eBay through their “ordinary” sales platform, but are also linked to the Patagonia website in order to make the connection to the producer itself (Patagonia 2013). eBay in return gets an increased activity on their website.

Swedish producer of children’s clothing Polarn O. Pyret has provided a special section on their website for parents to buy and sell used Polarn O. Pyret clothes (Polarn O. Pyret 2013).

7.2.4 Other reuse platforms

Swap parties

Katvig is a Danish producer of children’s clothes with a very strong focus on sustainability throughout their business model. The company has taken a wide range of initiatives to improve on their environmental impact including focusing on their production inputs, improving logistics, educating their consumers and more.

Due to the nature of children’s’ clothes, many Katvig garments are only used a few times before the wearer outgrows them. Katvig designs long-lasting and durable products which can live many lives on many children. Katvig therefore arranges *swap parties* for their customers, where the customers can bring their used Katvig garments and swap them for a similar amount of garments in a larger size or a more suitable selection for a different season (Katvig 2013).

Figure 5 Katvig Swap Party



Source: Katvig

7.3 Reuse and resell – other actors

A more common model for reuse and resell is where other actors take over the handling of textile products after their first use, in order to profit on (or simply facilitate) their resale. This is a mature model where markets for used clothes are well established both locally and globally and the buyers are both individuals and professional actors.

7.3.1 Collection and selling of used clothing by organisations and businesses

In the Nordic countries (and globally) a large group of charitable organisations and private businesses base their business on collecting and selling used clothes, shoes and household textiles. There are large differences in the way they operate in terms of, for example, *what* they collect, *how* they collect it, *how* and *to whom* they decide to sell it, *what* they do with the leftovers etc.

Tojo et al (2012) provides a good overview of the current situation in parts of the Nordic region (Denmark, Finland and Sweden), as will the coming report from the project “The Nordic textile reuse and recycling commitment” prepared for the Nordic Council of Ministers, which is expected to be available at the end of 2013.

7.3.2 Luxury second-hand shops

Quite similar to the model presented in chapter 7.2.2, the re-selling of used clothes can also be undertaken by an actor separate from the producer. These types of shops are usually rather selective in terms of styles and brands (as opposed to the charity-driven second hand shops) but the scope varies significantly from shop to shop and company to company.

In Copenhagen the so-called “luxury second hand shops” sell used clothes of various brands which are handed in by private persons. In return the shop gives a set commission (usually 50 % of the sales value). These types of shops have experienced increasing interest over the past years in terms of both customers who want to hand in their used clothes as well as customers who want to buy these clothes. This increased demand for used clothes seems to be a result of amongst other things a tendency towards a greater acceptance of mixing with previous collections and also a larger use of vintage clothes in fashion styles (Skov, Larsen & Netter 2011).

There are also privately run vintage stores that source their products from different suppliers abroad like e.g. *Genbrug* and *PRAG*, which are both located in central Copenhagen. Both stores have a large variety of clothes which is divided by style and time (50’s, 60’s, 70’s, 80’s etc.). The items are sources from abroad (like e.g. Holland, USA, UK or France), bought in bulk in big quantities and then vintage pieces are selected out. There is thus no commission policy.

7.3.3 Internet platforms

The internet provides numerous sites where private citizens can buy, sell, swap and borrow clothes and other used goods from one other. Citizens can trade on such sites for free or with relatively low charges compared to the luxury second-hand shops described in 7.3.2 which typically charge up to 50 % of the sales value.

The possibilities seem endless and sellers, buyers and borrowers all over the world are making increasing use of the concept. eBay is the world's largest on-line marketplace for private persons and in 2009 had more than 2 million garments registered for sale. Not all of these are used however; some may be new. Big Wardrobe is a counterpart to the Scandinavian Trendsales, and had 32,000 registered garments in 2009. It is currently estimated to be growing by 20 % per month (Danish EPA, forthcoming).

A short set of examples from the long list of on-line marketplaces includes Trendsales.dk, erento.se, finn.no, bazar.no, bloppis.no, eBay.com, preloved.co.uk, ecoModo.com and swapstyle.com. These are all flourishing examples of this relatively new type of business model.

7.4 Hire, leasing and borrowing – producers

The rental and leasing business models are not yet as common as some of the models presented above. They are, however, often mentioned as an important element of a less resource intensive economy (see e.g. WRAP 2013). Many see great potentials within the clothing industry since it is already common to buy and sell used clothing. This model can also be combined with design of quality long-life clothing whose price might otherwise be prohibitive for households.

7.4.1 Leasing of own brand

Beibamboo

Baby clothes is an evident place to start testing leasing models, since babies usually outgrow their clothes faster than they wear them out. A Finnish producer of baby clothes specifically designed for babies who are hospitalised offers their customers to rent the clothes. This seems to be a very convenient solution in that the clothes are only suitable for a very specific (and hopefully short) period of a child's life. The clothes are professionally cleaned using gentle detergents, disinfected and treated for stains (Beibamboo 2013).

Katvig

Katvig with support from the Danish Business Innovation Fund (Fornlyelsesfonden) is developing a green business model based on a leasing system, where the customer leases baby clothes from the company. Customers receive a package of baby clothes in the appropriate size, and then simply exchange the package for a package of larger clothes as their baby grows. The clothes are thus used but in good condition according to Katvig's standards.

MUD

Dutch MUD has offered a leasing service since 2013 for their own brand jeans. Customers pay a one-off 20 euro fee, covering shipment and administration costs, and then 5 euros a month for a year. At the end of the contract, the customer can either return the jeans, get a new pair or they can choose to keep hold of the jeans, paying another four months at 5 euro plus a further 20 euro deposit. The deposit goes towards another pair, when the customer eventually needs one. The jeans will thus remain property of Mud Jeans. The jeans, which are made of high-end organic cotton, are either washed, repaired and reused when the customer sends them back, or they are shredded and returned to the factory for recycling (MUD Jeans 2013; PSFK 2013).

7.5 Hire, leasing and borrowing – other actors

7.5.1 Rental service

Providing hiring services for formal clothes and eveningwear is one of the more common and widespread business models within the textiles industry. For a long time it has been common to hire formal clothes and eveningwear for gala parties, weddings, classic concerts etc. It makes sense to hire these types of clothes, which individuals have only very irregular need for. With the arrival of fast fashion it makes sense to expand this concept to more “regular” clothes since an increasing number of people view clothes as products which should only be used a few times before they are replaced with something new.

7.5.2 Laundries

It is quite common that laundries buy and own the textiles which are used in many businesses and public institutions such as in hotels, hospitals, nursery homes and the like. The laundries thus offer a service of renting out the textiles, cleaning them whenever necessary and, since they are the actual owner of the textiles, also taking care of them once the textiles are either worn out or once the customer decides to replace either the textiles or the laundry company. However, this service is regularly sent out for public procurement which can have an unintended side-effect in that well-functioning textiles are discarded due to changing suppliers and/or renewed design.

7.5.3 Clothing libraries

A clothing library is a business model which has become quite popular in Sweden in recent years. As the word indicates, the business model is similar to a library where you can borrow clothes rather than books. There are various models, but common for them are that you can take home clothes which has been donated/given to the library for a certain lending period e.g. 30 days.

At Lånegarderoben it costs SEK600 per six months to become a member and members can then borrow up to three items for four weeks (Lånegarderoben 2013). The clothes are donations from producers, designers and other actors. A clothing library has also recently opened in Denmark where dresses are available at an unlimited rate for DKK 600 for six months (Resecnd 2013). In Resecnd the members bring in one or several dresses when they sign up, and can hereafter borrow dresses for four weeks at a time accordingly to the number of dresses they have handed in.

Figure 6 Snapshot from Lånegarderoben



Source: Lånegarderoben, Photo: Petter Cohen

Clothing libraries are mainly driven by voluntary efforts but often with some local/governmental funding to support the start-up. Klädoteket is an example of a volunteer driven project, where it is free to become a member and to borrow clothes. Members pay a relatively small fine for returning clothes too late and to cover damages to borrowed clothing (Klädoteket 2013). A clothing library in Helsinki is mainly provided with garments from young local designers (Nopsatravels 2013).

A similar model from Australia, with a twist, is also worth mentioning. Belmont Clothes is a charity project which lends out suits for people who are in need of one, e.g. when going to a job interview. The service is free for people who are unemployed and the suits are donations from households, famous Australians and an Australian clothing chain which takes back used but dry cleaned suits in return for a \$50 payment (Belmont 2013; Treehugger 2008).

7.6 Long life – producers

The design for a long life and high quality garments together with repair and fitting services are both tools which increase the foundation for reuse of textiles. They can also be necessary elements of hire, lease and borrowing models described above.

7.6.1 *Design for a long life*

It is difficult to judge or develop criteria for whether a producer actually designs for a longer life, which in reality means that more or less any producer can claim to be doing so. There are no tests to pass for a producer who claims to design long-lasting products or high-quality clothes, and the consumer experience thus ends up being the test.

It is more common that out-door gear is designed for a long life, and often the target group for these types of clothes are somewhat different from the target group for fast fashion brands. Many of the producers mentioned in this overview do claim to design longer-lasting products, timeless classic garments and/or products of high quality (Patagonia 2013; Green Eileen 2013; Boomerang 2013; Katvig 2013; Houdini 2013; Hvass 2013a). This can only be proved through detailed studies: For example brand-specific customer surveys on the length of time they have actively used garments and what characteristics have influenced this lifetime.

The Slow Fashion movement (Gardetti and Torres 2013) can be said to fit into this category. The term “slow fashion” was first coined by Kate Fletcher and shares many characteristics with the Slow Food movement (Fletcher 2007 in Gardetti and Torres 2103). “Slow fashion often includes many diverse business models that maintain profits, while conserving and enhancing our ecological and social systems” (ibid). Examples of companies and organisations that are associated with slow fashion can be: Slowear in Paris (brand names Incotex, Zanone, Glanshirt and Montedoro commonly marketing and advertising timeless style that’s made to last); With and Wessel which donates carpets made from all the offcuts in production to humanitarian causes; Pact; Remade in Leeds; Our Social Fabric; FromSomewhere; Oliberté and Permacouture Institute.

7.6.2 *Repair and fitting*

Few producers advertise that they provide tailoring services as part of their business model, and those that do are most often producers of outdoor gear like Patagonia (Patagonia 2013) and Bergans (Bergans 2013). Green Eileen offers workshops for their customers designed to equip, educate and inspire their customers to take care of their clothes through e.g. repair (Green Eileen 2013a). In Denmark these types of workshops are offered at some public libraries.

A different variant of this business model is to ensure that the garment will fit perfectly even before it is created. According to NOMO Jeans, stud-

ies have indicated that the average jeans buyer needs to try at least 10 pairs before finding something that fits. In order to make up for this challenge Finnish NOMO Jeans therefore makes computer-assisted made-to-measure jeans. When ordering a pair of jeans, the customer will be assisted by a 'denimologist' and scanned using a 3D body scanner. The customer can hereafter 'tune' the jeans almost endlessly. Automated pattern creation is based on the customer measurements and selected features. All jeans are then individually hand-made with a guaranteed satisfaction. Measurements will in addition be kept for future purchases, in case the customer wants a different style or feature (e.g. flared legs instead of slim or high waist instead of low) (NOMO 2013). This fitting service does not increase reuse or recycling, but could in theory create jeans which will be replaced less often than "ordinary" jeans, and thus extend the active lifetime of the textile product. The model does however not "protect" against rapid changes in fashion and changes in body shape.

A further variant which can potentially also extend the lifetime of clothing is the 'Design your own' model. In this model the customer is invited to participate in the final stage of design. Through an interactive web-based platform, the customer is given the possibility to choose among a set of predefined alternatives in terms of colour, model, size and more. By combining various options, the customer can create a unique product based on personal preference (Brismar, 2013). By tailor-making the article to be more in line with personal wishes the model may have some potential to extend the active lifetime of the garment. Some companies, such as Boomerang, use participatory design as an additional service for their customers, while others have created a business model solely based on this model.

7.6.3 De-brand and donate/sell

Under this model, clothing which otherwise would have no life at all receives a useful life rather than immediate disposal. This concerns faulty products which do not pass a brand or manufacturers quality control. Instead of being disposed of these can be donated or sold via other actors for active use. Prior to this the article is typically de-branded i.e. any labelling which identifies the brand is removed.

An example is Topshop's agreement with I:CO to increase the reuse and recycling of garments that have been rejected. In 2012 Topshop sent 30 tonnes of rejected garments to I:CO with 80% of that de-branded for second-hand markets outside the UK and the remainder recycled into fibres and reused. Other clothing that is rejected by Topshop or returned

to stores by customers due to faults are otherwise returned to the supplier or given to charity (Arcadia Group, 2013).

7.7 Long life – other actors

7.7.1 *Repair and fitting services*

Here we focus on a specific element of tailoring that of the repair and fitting service for clothing, both of which can extend the life of a specific garment. Once widespread, these types of services are generally rare and relatively expensive in today's Nordic countries, due to fast fashion, low prices on garments and high wages. Unless any of these conditions change it is difficult to see such services returning to any great extent. Repair is, however, often offered in combination with dry cleaning services since they deal with more expensive garments for which small repairs can be cost-effective.

7.8 Re-design – producers

7.8.1 *Re-design of old collections*

In terms of increased reuse and recycling it is also evident to focus on the inputs in the production of clothes and other textile products. Used garments can be turned into new (and hip) pieces or items from previous collections can be used as inputs to new clothes.

The British high-street chain Topshop launched a "Reclaim to Wear" collection in the spring of 2012, which contained clothes that were solely produced from leftovers from earlier collections. The designers thus had to create new products which could be sold from leftovers of Topshop's surplus stocks and cut-offs from the production phase. The collection was launched in a website which also contained tips and ideas for how customers can redesign and upgrade their own clothes which they no longer are using (Topshop 2013).

7.9 Re-design – other actors

7.9.1 *Re-design on demand and of donated clothes*

Another initiative which is similar to the above, only undertaken by an external actor, is “Wardrobe Surgery”. This is a combined tailor-, repair- and customisation service. Alongside the “ordinary” tailoring and repair services, the “Wardrobe Surgery” also creates new garments from used garments which have been donated by both customers and producers (Wardrobe Surgery 2013). Similar Norwegian initiatives are Barnigjen which a company that produces handmade children’s clothing from new and vintage materials (Barnigjen 2013); Barneboden (Barneboden 2013) and Rundt & Rundt (Rundtgrundt 2013).

Figure 7 Hooded waistcoat (made from old suit)



Source: Wardrobe Surgery

Worn Again is a UK business that works directly with large companies in order to realize the value of their existing textile waste. Projects relate to upcycling, downcycling and reuse, and the aim is to develop and integrate closed-loop solutions. Worn Again have worked with Terra Plana, Virgin Atlantic, McDonald's and Marks & Spencer, in order to create new products from prison blankets, ex-military parachutes and old fashioned suit jackets from Oxfam, airline seat covers and old staff uniforms (Worn Again 2013).

Further, small initiatives have sprung up in Norway for redesign for sale and for own use (rather than buying new garments). Some examples are the Østfold regional branch of Norway's Rural Women's Network (Bygdekvinnelaget 2012) and Jenny Skavlan (Skavlan 2012).

7.9.2 *Information and education for re-design and sustainable choices*

Another rather different type of actor is [re]design, an organisation whose purpose is to support and promote design for sustainability through creative and effective engagement with all stakeholder groups in the design sector. They do this by inspiring designers, motivating consumers, helping the industry and equipping learners all into making more sustainable choices, including extending the lifetime of textile products and increasing the demand for recycled fibres. [re]design achieves these objectives by working in partnership with private companies and public, third sector, educational and cultural organizations. Their range of outputs includes exhibitions, workshops, talks, seminars and show-and-tells, publications and online content ([re]design 2013)

8. Conclusion

This study has focused on Extended Producer Responsibility (EPR) systems and business models/activities which reduce life-cycle impacts from the production and use of textiles via extending the active lifetime of textile products and once this lifetime is over, ensuring that the materials in the products are recycled. The review does not attempt to present an exhaustive catalogue of examples, but focuses instead on giving an overview of the various types of models/activities which currently exist and illustrating these with some examples.

EPR systems have been divided into four different types, differentiating between mandatory and voluntary schemes and between schemes based on individual or collective responsibility. As a rule mandatory EPR-systems for other types of products tend to be implemented via collective responsibility which inhibits incentives towards implementing upstream effects i.e. improving design of products for longer lifetimes and ease of recycling. Special care should be taken when designing EPR systems to encourage these upstream effects. Upstream actions include reductions in the use of certain chemicals during the production of textiles which can potentially accumulate in recycled fibres leading to exposure risks for users of new products including recycled fibres.

Only one functioning mandatory EPR system for textiles currently exists in Europe or anywhere else (France) with one additional example in the pipeline (Canada). A number of EPR-like voluntary initiatives have been adopted by various producers, however, which include take-back of used products combined with up-stream changes such as designing textile products to be more suited to recycling or reuse. Puma's Incycle initiative is an example of this.

With respect to business models this report has focussed on individual *activities/initiatives* which can be included as part of a business model but which can also comprise the core of a business model. An individual company may engage in a number of different *activities/initiatives* related to reuse and recycling of textiles which together form part of its overall business model.

Relevant *activities/initiatives* were divided into five main categories which are further differentiated into 21 different types of activity, which can be implemented either by producers of textile products or other

actors including non-profit organisations. The selected activities either extend the active lifetime of textile products, increase collection-, reuse- or recycling rates, or increase the demand for recycled fibres.

Product take-back schemes are already well known in the Nordic countries and further afield, but vary somewhat in terms of how used textile products are handled following collection. The category of *reuse, resell and de-brand* includes the largest range of models. These include both well-known and mature business models and newer less common concepts. The *hire, leasing and borrowing* models are mostly well-known when performed by actors outside the textile industry. It is less common and widespread when offered by producers but has begun to emerge in recent years. In general, hire, leasing and borrowing appears to be a flourishing and growing business area. Models for *longer life* are less common from the producer's side. Finally, business models for *re-design* seem to be an emerging field with many creative ways to increase reuse of textiles.

The majority of EPR and business models/activities considered focus on downstream effects i.e. increasing the collection and recycling/reuse of textiles than on upstream actions. However, most of the models have potential to include upstream actions which would enhance and support the model. For instance, the hiring and leasing models when carried out by the brands themselves would benefit from design for durability and this is already occurring in some of the examples identified. Design for durability is also an important supporting element of lease, reuse, resell and de-brand models again when they are run by the brands/producers themselves. When third party actors are carrying out these activities the direct upstream link is lost. Product take-back schemes can also lead to upstream effects where the producers take back their own brand products only. In this context, designing for reuse or easier recycling can potentially increase the economic benefits of take-back schemes to the companies.

The study has revealed a diverse landscape of business models for textiles. The field appears to be developing rapidly with many businesses re-thinking and developing their current activities and many new initiatives appearing. There is thus already a broad spectrum of experiences to draw from in forming new business models/activities in the Nordic region, though fewer examples of functioning EPR-schemes for textiles. Under the next stage of this project some of the models will be examined in more detail and some initial evaluation of costs and benefits carried out.

9. References

- Arcadia Group (2013): "*Environmental Impacts of Products: Clothing Waste*".
<http://www.arcadiagroup.co.uk/fashionfootprint/our-products/Environmental-Impacts-of-Products>
- Barneboden (2013): <http://www.barneboden.no/Websted/Barneboden.html>
(accessed 24/6/2013).
- Barnigjen (2013): <http://www.barnigjen.no/> (accessed 24/6/2013).
- Beibamboo (2013): "*Rent your preemies clothes!*" <http://www.beibamboo-shop.com/rent-clothes-for-preemie-c-48.html?language=en>
- Belmont BEC (2013): "*Belmont Clothes Library*".
http://www.belmontbec.com/project.php?id_project=11
- Bergans (2013): "*Reservedeler og reparasjoner*"
<http://nettbutikk.bergans.no/bekledning/service/reservedeler>
- Bisgaard, T., Henriksen, K. and Bjerre, M. (2012): "*Green Business Model Innovation – Conceptualisation, Next Practice and Policy*". Nordic innovation Report 2012:12, October 2012, http://www.nordicinnovation.org/Global/_Publications/Reports/2012/2012_12%20Green%20Business%20Model%20Innovation_Conceptualisation%20next%20practice%20and%20policy_web.pdf
- Bluesign (2013): "*About us*". <http://www.bluesign.com/index.php?id=57>
- Boomerang (2013): "*Boomerang Effect – a sustainable philosophy*".
<http://www.boomerangstore.com/eu/boomerang-effect->
- Boomerang (2013a): "*Boomerang Vintage*".
<http://www.boomerangstore.com/eu/boomerang-effect-vintage>
- Brismar, A. (2013) "Design your own...." Article in online magazine Green Strategy. Uploaded 31/12/2013. (accessed 22/01/2014).
- Bygdekvinnelaget (2012): "Redesign - gamle tekstiler i ny drakt".
<http://bygdekvinnelaget.no/redesign-gamle-tekstiler-i-ny-drakt> (Accessed 24/6/2013).
- CCME (2009): "*Canada-wide Action Plan for Extended Producer Responsibility*". Canadian Council of Ministers of the Environment, http://www.ccme.ca/assets/pdf/epr_cap.pdf
- Chemical Inspection & Regulation Service (2013): "*REACH Restricted Substances List (RSL)*". http://www.cirs-reach.com/Testing/REACH_Restricted_Substances_List.html
- Eco TLC (2013): "*French ERP for Clothing, Linen and Footwear*". http://www.ecotlc.fr/ressources/Documents_site/plaquette_anglais_Eco_TLC_pour_web.pdf
- Ecouterre (2013): "*The North Face launches "Clothes the Loop" Garment-Recycling Program*". February 21, 2013 <http://www.ecouterre.com/the-north-face-launches-clothes-the-loop-garment-recycling-program/>
- European Commission (2008): "*Directive 2008/98/EC of the European Parliament and the Council of 19 November 2008 on waste and repealing certain Directives*". <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:EN:PDF>

- FORA (2010): "Green Business Models in the Nordic Region – A key to promote sustainable growth". http://www.motiva.fi/files/4878/Greenpaper_Green_Business_Models_in_the_Nordic_Region_A_Key_to_Promote_Sustainable_Growth.pdf
- Gardetti and Torres (Eds.) (2013): "Sustainability in Fashion and Textiles, Values, Design, Production and Consumption". Greenleaf Publishing, UK.
- George, G and Bock A.J. (2011): "The business model in practice and its implications for entrepreneurship research". *Entrepreneurship Theory and Practice*, 35(1): 83-111.
- Green Eileen (2013): "Our Story". <http://www.greeneileen.org/our-story/>
- Green Eileen (2013a): "Workshops". <http://www.greeneileen.org/workshops/>
- Guidelines II (2012): "Guidelines II – A handbook on sustainable fashion", Krüger, H., Planthrin, D., Dahl, E. H. and Hjort, T. <http://fashionguidelines.dk/>
- H&M (2013): "Don't let fashion go to waste". <http://about.hm.com/AboutSection/en/About/Sustainability/Commitments/Reduce-Reuse-Recycle/Garment-Collecting.html>
- H&M (2013a): "Daily efforts for a better world". H&M CharityStar <http://www.hm.charitystar.com/en/home/>
- Houdini (2013): "Our Philosophy". <http://www.houdinisportswear.com/en/our-philosophy>
- Hvass, K. K. (2013): "Business model innovation for post-retail responsibility of fashion". Presentation at the Mistra Future Fashion Symposium – Sustainability & Producer's Responsibility in Textiles, May 29, 2013, Malmö.
- Hvass, K. K. (2013a): "Business model innovation through second hand retailing: Learning from Filippa K case study". Working paper. CBS Center for Corporate Social Responsibility, Copenhagen Business School (CBS) and Copenhagen School of Design and Technology (KEA).
- I:CO (2013): "Jack & Jones joins new recycling concept with customer rewards". <http://www.ico-spirit.com/en/press/jack-jones-joins-new-recycling-concept-with-customer-rewards,7.html>
- Katvig (2013): "Katvig Swap Party". <http://www.katvig.dk/pocket/swapping/>
- Katvig (2013a): "Five reasons to choose Katvig". <http://www.katvig.dk/about-katvig/>
- Klädoteket (2013): "Så funkar det". <http://kladoteket.se/sa-funkar-det/>
- Klättermusen (2009): "Returned deposits on outdoor clothes and equipment! Klättermusen launches a unique recycling programme". http://www.klattermusen.se/img/nyheter/pdf/KM_pressrelease_rEcover_EN.pdf
- Lindhqvist, T. (1992): "Extended Producer Responsibility, in T. Lindhqvist, *Extended Producer Responsibility as a Strategy to Promote Cleaner Products*". (1-5), IIIIEE, Lund University
- Lånegarderoben (2013): <http://www.lanegarderoben.se/>
- Marks & Spencer (2013): "Plan A – doing the right thing, Partnerships – Oxfam". <http://plana.marksandspencer.com/about/partnerships/oxfam>
- Danish EPA (forthcoming): "Fremme af affaldsforebyggelse og øget genanvendelse i tekstilbranchen". Unpublished report by the Danish EPA.
- Morgan, E. (2013): "Learning from Marks and Spencer "Plan A", Presentation at the *International*". Researcher Workshop on Sustainable Fashion, May 30, 2013, Copenhagen
- MUD Jeans (2013): "MUD Jeans lanceert lease a jeans!" <http://www.mudjeans.nl/en/>
- Naturvårdsverket (2013): "Från avfallshantering till resurshushållning – Sveriges avfallsplan 2012-2017". Rapport 6502, maj 2012 <http://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6502-7.pdf>

- NOMO (2013): "Info about us". http://www.nomojeans.com/nomo/how_nomo_works
- Nopsatravels (2013): Nopsa launched a fashion library, <https://www.facebook.com/pages/Vaatelainaamo/222567064441869>
- OECD (2013): "Environmental policy tools and evaluation – Extended producer Responsibility". <http://www.oecd.org/env/tools-evaluation/extendedproducerresponsibility.htm> (Accessed 6 June 2013).
- Osterwalder, A. and Pigneur, Y. (2009): "Business Model Generation". Self Published
- Patagonia (2013): "Join us. In The Common Threads Partnership". <http://www.patagonia.com/us/common-threads/>
- Polarn O. Pyret (2013): "Köp och sälj". <http://www.polarnopyret.se/Top-Menu/Kop-och-Salj/Sok/>
- PSFK (2013): "Mud Jeans has launched a new service that enables people to lease a pair for a year". Hutchings, E., 20 February, 2013, <http://www.psfk.com/2013/02/rent-designer-jeans.html>
- PUMA (2012): "Puma introduces biodegradable and recyclable products". Press release, October 2012, http://about.puma.com/wp-content/themes/aboutPUMA_theme/media/pdf/2012/incycleen.pdf
- [re]design (2103): "About us". http://www.redesigndesign.org/index.php?option=com_content&view=category&layout=blog&id=18&Itemid=32
- Resecnd (2013): "Om kjolebutikken". <http://resecnd.com/>
- Rundtøgrundt (2013): www.rundtøgrundt.no (accessed 24/6/2013)
- Skavlan, J. (2012): "SYO – 31 enkle grep for ny garderobe". Aschehoug
- Skov, L., Larsen, F. & Netter, S. (2011): "Kommissionsgenbrug: imellem nyt og gammelt". Creative Commons, http://openarchive.cbs.dk/bitstream/handle/10398/8280/59-LS-FLSN-Kommissionsgenbrug_imellem%20nyt%20og%20gammeltx.pdf?sequence=1
- Stormberg (2013): "Panteordning". <http://www.stormberg.com/no/om-stormberg/samfunnsansvar/panteordning>
- Sustainable Apparel Coalition (2013): "The Higg Index". <http://www.apparelcoalition.org/higgindex>
- Swedish Chemical Agency (1997): "Report from a commission - chemicals in textiles". Sundbyberg. (Report: 5/1997).
- Swedish Chemical Agency (2012): "Bättre EU-regler för en giftfri miljö: rapport från ett regeringsuppdrag". (Report: 1/12)
- Swedish Chemical Agency (2013) "Hazardous Chemicals in Textiles: report of a government assignment". (Report: 3/13)
- Teece, D. (2010): "Business Models, Business Strategy and Innovation", Long Range Planning 43 (2010) 172-194, <http://www.bmcommunity.sitew.com/fs/Root/8jig8-businessmodelsbusinessstrategy.pdf>
- Teijin (2013): "Closed-loop Recycling System ECO CIRCLE". <http://www.teijin.com/solutions/ecocircle/>
- Textile Exchange (2013): "Global Recycle Standard". <http://textileexchange.org/content/global-recycle-standard>
- Tiard, L. (2013): "The French EPR". Presentation at the Mistra Future Fashion Symposium – Sustainability & Producer's Responsibility in Textiles, May 29, 2013, Malmö.
- Tojo, N. (2004): "Extended Producer Responsibility as a Driver for Design Change – Utopia or Reality?". Doctoral dissertation, September 2004, IIIIEE, Lund University.

- Tojo, N., Kogg, B., Kiørboe, N., Kjær, B. and Aalto, K. (2012): "Prevention of textile waste – material flows of textiles in three Nordic countries and suggestions on policy instruments". TemaNord 2012:545, Nordic Council of Ministers, <http://www.norden.org/da/publikationer/publikationer/2012-545>
- Topshop (2013): "Reclaim to wear". <http://www.topshop.com/webapp/wcs/stores/servlet/CatalogNavigationSearchResultCmd?catalogId=33057&storeId=12556&langId=-1&viewAllFlag=false&categoryId=572491&interstitial=true&geoip=noredirect>
- Treehugger (2008): "Clothing Libraries: Another Product Service System". McLaren, W., 31 March, 2008 <http://www.treehugger.com/clean-technology/clothing-libraries-another-product-service-system.html>
- Ulasewicz, C. and Baugh, G. (2013): "Creating new from that which is discarded. The collaborative San Francisco Tablecloth Repurposing Project, in Sustainability in Fashion and Textiles. Values, Design, Production and Consumption". Edited by Gardetti, M. A. and Torres, A. L. Greenleaf Publishing Limited
- Wardrobe Surgery (2013): "Operation Wardrobe – Upcycled clothing in London's Hackney". website: <http://www.junkstyling.co.uk/index.html>, video: <http://faircompanies.com/videos/view/operation-wardrobe-upcycled-clothing-in-londons-hackney/>
- Weekday (2013): "Recycle or re-use your used clothes at Weekday in Sweden". http://shop.weekday.com/Recycle_clothes_at_Weekday
- Wirtz, B. W. (2011): "Business Model management – Design – Instruments – Success Factors". 1st ed. 2011, Gabler Verlag | Springer Fachmedien Wiesbaden GmbH 2011.
- Worn Again (2013): "Our Story". <http://www.wornagain.co.uk/pages/our-story-2>

10. Sammenfatning

Dokumentet er den første rapport i Nordisk Ministerråds projekt "En EPR-ordning og nye forretningsmodeller til øget genbrug og genanvendelse af tekstiler i Norden". Dette materiale er resultatet af Del 1 i projektet "An extended producer responsibility (EPR) system and new business models to increase reuse and recycling of textiles in the Nordic region". Rapport for Del 2 vil blive publiceret når projektet er klart I december 2014. Projektet er et af seks projekter under initiativet Resourceeffektiv genbrug af plast- og tekstilaffald, der blev lanceret af Nordisk Affaldsgruppe (NAG) som del af de nordiske statsministres grøn vækst initiativ, Norden – ledende i grøn vækst.

Målet med opgaven var at indsamle information om erfaringer i Europa og nabolande om anvendelsen af EPR-ordninger og forretningsmodeller, til øget genbrug og genanvendelse af tekstiler.

Rapporten starter med en detaljeret beskrivelse af omfanget af EPR-ordninger og andre forretningsmodeller, der skal undersøges, og opstiller dem i forskellige typer. Hver type bliver derefter beskrevet ved brug af eksisterende eksempler fra de nordiske lande og/eller andre nabolande.

De relevante modeller er dem, der reducerer livscykluspåvirkninger fra produktion og anvendelse af tekstiler ved at øge den aktive levetid for tekstilprodukter så vidt som muligt, og så snart denne levetid er omme sikre, at produktmaterialerne genanvendes. Altså modeller, der forhøjer den værdi, der kan udtrækkes af et tekstilprodukt. Et element eller resultat af sådanne modeller kan også være, at producenter opfordres til at udvikle tekstilprodukter, der er bedre egnet til reparation, genbrug og genanvendelse, samt er fri for farlige stoffer (såkaldte *upstream effects*).

Informationen i denne rapport er blevet indsamlet ved hjælp af desktop-undersøgelser ved at referere til relevante rapporter, artikler og studier. Informationen er indsamlet af projektteamet via tidligere projekter og søgninger på internettet. En referencegruppe, bestående af relevante aktører, har bidraget med input og kommentarer til projektet.

Rapportens resultater er en del af de nordiske statsministres overordnede grøn vækst initiativ, *Norden – ledende i grøn vækst*. Læs mere i webmagasinet *Green Growth the Nordic Way* på www.nordicway.org eller på www.norden.org/greengrowth

Resultater

EPR-ordninger er inddelt i fire forskellige typer, der skelner mellem frivillige og obligatoriske ordninger og individuelt og kollektivt ansvar. Obligatoriske EPR-ordninger for andre typer produkter er ofte implementeret via kollektivt ansvar. Kollektive EPR-ordninger kan forhindre tilskyndelse til implementering af *upstream effects*, det vil sige forbedring af produkters design med henblik på længere levetid, samt lettere genanvendelse. Det er dog muligt, ved hjælp af omhyggeligt systemdesign og specifikationer at inkludere motivation til tilskyndelse af opstrøms-effekter, selv i kollektive ordninger - for eksempel ved at give rabat på deltagelse for producenter, der deltager i opstrøms-aktiviteter. Opstrøms-aktiviteter inkluderer også reduktion af anvendelse af visse kemikalier i tekstilproduktion, design der giver produktet længere levetid samt undgåelse af blandede tekstilfibre for at muliggøre lettere genanvendelse, når produktet er udtjent.

Der eksisterer på globalt plan kun en obligatorisk EPR-ordning for tekstiler (i Frankrig), og der er et lignende under opbygning (i Canada). En række EPR-lignende initiativer er igangsat af individuelle producenter. De inkluderer returnering af udtjente produkter kombineret med opstrøms-ændringer: design af produkter så de er bedre egnede til genanvendelse eller genbrug (f.eks. Puma's 'Incycle' initiativ).

Med hensyn til forretningsmodeller, fokuserer denne rapport på individuelle aktiviteter/initiativer, der kan blive inkluderet som en del af en forretningsmodel, men som også kan udgøre kernen af en forretningsmodel. Et individuelt firma kan være engageret i flere forskellige aktiviteter/initiativer, der relaterer til genbrug og genanvendelse af tekstiler, som til sammen udgør en del af dets overordnede forretningsmodel.

Relevante aktiviteter/initiativer er i rapporten inddelt i fem hovedkategorier, som igen er opdelt i 21 forskellige aktivitetstyper, der kan implementeres enten af producenter af tekstilprodukter eller andre aktører, inklusive almennyttige organisationer.

Produktreturneringsordninger er allerede velkendte i Norden og nabolande. Kategorien 'genbrug, gensalg og ny markedsføring' udgør den største andel af modellerne. Denne kategori indeholder både velkendte og modne forretningsmodeller og nyere, mindre kendte koncepter. Modeller, der indeholder leje, leasing og lån er mest anvendt af aktører udenfor tekstilindustrien. Disse modeller er mindre kendte og mindre udbredte, når de udbydes af producenter, men er begyndt at dukke op indenfor de senere år. Forretningsmodeller for re-design lader til at være et voksende område, med mange kreative måder at øge genbrug af tekstiler.

Hovedparten af EPR- og forretningsmodeller/aktiviteter har mere fokus på nedstrøms-effekter, det vil sige stigende indsamling og genanvendelse/genbrug af tekstiler, end på opstrøms-aktiviteter. De fleste modeller har dog potentiale til at inkludere opstrøms-aktiviteter, som vil kunne forbedre og støtte modellen.

Design til lang levetid er et vigtigt element i modellerne for leasing, genbrug og gensalg samt ny markedsføring, når de udføres af varemærket/producenterne selv. Når disse aktiviteter udføres af tredjepart, mister man de direkte opstrøms-forbindelser. Returneringsordninger kan også føre til opstrøms-effekter, hvor producenterne udelukkende tager deres egne produkter retur. I denne sammenhæng kan design til genbrug eller lettere genanvendelse, potentielt øge de økonomiske fordele af returneringsordningerne.

Analysen viser, at der findes flere forskellige forretningsmodeller for tekstiler. Tekstilområdet lader til at være inde i en rivende udvikling, hvor flere producenter er i gang med at gen-overveje og udvikle deres nuværende aktiviteter, og der opstår mange nye initiativer. Der er derfor allerede en stor portion erfaring at trække på, når der skal udformes nye forretningsmodeller/aktiviteter i Norden, selvom der er færre eksempler på igangsatte EPR-ordninger for tekstiler.

**2nd Report:
Evaluation of eight EPR-systems
and business models which can
increase reuse and recycling of
textiles**

Task 3

*By David Watson & Nikola Kiørboe (CRI), Thomas Lindqvist
(Lund University), Haben Tekie, Steve Harris & Tomas Ekvall (IVL)*

1. Key Messages

- The aim of this task was to describe and carry out a first qualitative evaluation of eight of the more promising EPR systems and business models identified in the first report.
- Mandatory EPR-schemes are likely to give the most significantly increases in the collection of used textiles. Individual voluntary EPR schemes include stronger incentives for upstream effects i.e. improvements in design to benefit reuse and effective recycling.
- Many new business models encounter marketing, financial, human resource, and regulatory challenges.
- Traditional perceptions of selling, buying and owning textiles are a common barrier to all of the models identified. Raising awareness of alternatives amongst both consumers and producers is crucial to their spread and acceptance.
- A number of models would benefit from state financial assistance to cover start up, marketing and even running costs.
- Design for durability is an important supporting element of lease, repair, clothing libraries, luxury second hand and resell of own brand models. Policies are needed which encourage design for durability and higher quality.
- Some brands/retailers encourage customers to return used textiles by giving rebate coupons on new products in return. Such incentives can risk offsetting the environmental gains of these schemes.
- Models which are based on reuse and longer lifetimes give higher environmental benefits than models which are based on recycling.
- Several of the business models will create new collection, sorting, service and repair jobs in the Nordic countries, at the expense of production jobs in Asia.
- The key messages and findings presented in this report are part of the Nordic Prime Ministers' green growth initiative, *The Nordic Region – leading in green growth*.

2. Executive Summary

This report presents the results of Task 3 of the Nordic Project “An EPR system and new business models to increase reuse and recycling of textiles in the Nordic region.” The project is one of six projects that constitute *Resource Efficient Recycling of Plastic and Textile Waste*, which was launched by the Nordic Waste Group (NWG) as part of the Nordic Prime Ministers’ green growth initiative, *The Nordic Region – leading in green growth*.

Under Task 2 (1st Report) a literature review was carried out identifying different types of EPR systems and other relevant actions which constitute key elements of business models. Under Task 3 eight of these systems and business models were selected for a more detailed information gathering and qualitative assessment.

In selecting eight models for this qualitative assessment there was a focus on models that were felt to have potential for spreading given the right framework conditions. The models should also represent elements from the full spectrum of models identified in Task 2. The following eight models were selected for qualitative assessment:

- Mandatory EPR schemes.
- Voluntary individual EPR (own brand).
- In-store collection with partner.
- Leasing of own brand.
- Resell of used own brand (either in-store or online).
- Clothing libraries.
- Repair and fitting.
- Luxury second hand shops.

Each model is presented in a Fact Sheet which gives a short overview of the system or business model followed by a description in terms of challenges, assisting instruments, key economic costs and income factors, winners and losers and environmental benefits.

The Fact Sheets provide a wealth of information. Some common elements of interest are as follows. A mandatory EPR-scheme is likely to give the most significantly increases in the collection of used textiles. Individual voluntary EPR schemes, however, include strong incentives

for upstream effects i.e. improvements in design to benefit reuse or allow effective recycling depending on the focus of the EPR system.

Mandatory collective EPR schemes can potentially provide incentives for upstream effects but this requires very careful design.

There is a wide range of business models which have been tested out in both small and larger settings. Some have been and are still successful whilst others have had to close down, in many cases due to financial obstacles or lack of human resources. There is thus a demand for financial assistance to cover start up, marketing and even running costs.

Traditional concepts of how textile products are marketed and offered to consumers are a common barrier. This concerns both how producers view their role in the market place and how consumers view their options for obtaining and disposing of products. Challenging the current linear models and raising awareness of alternatives amongst both consumers and producers is crucial for the successful spread and nurturing of innovative models. For a number of models citizens have a dual role as both the supplier of materials (i.e. used textile products) and demanders of the products or services (i.e. second hand or leased products). Both roles can be essential for the business model to flourish.

A number of models offer economic incentives to citizens to return used textile products once they have finished with them. For models involving take-back of used textiles some brands/retailers try to encourage customers to return used textiles by offering rebate coupons on new products in return. Such incentives can risk offsetting the environmental gains of the scheme by encouraging increasing consumption of new products. Producer/retailers should consider other types of incentives.

Many of the business models rely on textile items being used by several users and having their active lifetimes prolonged. For these business models increased quality of clothing and design with reuse and repair in mind are essential. There is thus also need for focus on the design phase via e.g. educating designers in long-lasting designs.

In relation to the environmental effects, models which are based on reuse (longer active lifetime for the garments), are expected to give higher environmental benefits than models which are based on recycling. There is, however, uncertainty about the so-called displacement rate. The displacement rate indicates the level to which the purchase (or share/hire) of a used item will replace the purchase of a new one. This is important when evaluating the magnitude of environmental gains offered by some models.

It is expected that several of the business models will create new collection, sorting, service and repair jobs in the Nordic countries, at the expense of production jobs in Asia.

The findings presented in this report are part of the Nordic Prime Ministers' overall green growth initiative: *The Nordic Region – leading in green growth*. Read more in the web magazine *Green Growth the Nordic Way* at www.nordicway.org or at www.norden.org/greengrowth

3. Introduction and approach

This report presents the results of Task 3 of the Nordic Project “An EPR system and new business models to increase reuse and recycling of textiles in the Nordic region.” The project is one of six projects that constitute *Resource Efficient Recycling of Plastic and Textile Waste*, which was launched by the Nordic Waste Group (NWG) as part of the Nordic Prime Ministers’ green growth initiative, *The Nordic Region – leading in green growth*.

Under Task 2 (1st Report) a literature review was carried out identifying different types of EPR systems and other relevant actions which constitute key elements of business models. 24 different types of systems and business models were identified under seven main groups:

- Mandatory EPR-schemes.
 - a) Mandatory EPR schemes.
- Voluntary EPR schemes.
 - a) Voluntary and individual EPR.
 - b) Voluntary and collective EPR.
- Product take-back schemes – producers.
 - a) In-store collection with a partner.
 - b) In-store collection without partners.
 - c) Donation partnership with a charity.
- Reuse and resell.
 - a) Resell in current stores.
 - b) Resell in separate stores.
 - c) Online resell.
 - d) Other reuse platforms.
 - e) Collection and selling of used clothing by organisations and businesses.
 - f) Luxury second-hand shops.
 - g) Internet platforms.
- Hire, leasing and borrowing.
 - a) Leasing of own brand.
 - b) Rental service.
 - c) Laundries.
 - d) Clothing libraries.

- Extending lifetimes.
 - a) Design for a long life.
 - b) Repair and fitting.
 - c) De-brand and donate/sell.
 - d) Long life – other actors.
- Re-design.
 - a) Re-design of old collections.
 - b) Re-design on demand and of donated clothes.
 - c) Information and education for re-design and sustainable choices.

Under Task 3 a number of these systems and business models were selected for a more detailed information gathering and evaluation exercise.

The first objective of Task 3 is to present a catalogue of ideas for businesses and government, and identify current obstacles and assisting factors in the spreading of these ideas. The second objective is to provide information that will aid in the further selection of up to 4 systems/models for further evaluation and development of tailor-made packages of assisting policy instruments.

3.1 Selection of models

Models were selected for information gathering according to the following considerations:

- The wish of the Nordic Council of Ministers to include at least one EPR system in the final group of 2–4 systems/models for development of policy packages.
- Cover a spread of models representing elements of the full spectrum identified.
- Focus on models that were felt to have potential for spreading given the right framework conditions.
- Limit the number of models evaluated to that which can be reasonably covered within the project budget.

The following eight models were selected on this basis:

- Mandatory EPR schemes.
- Voluntary individual EPR (own brand).
- In-store collection with partner.
- Leasing of own brand.
- Resell of used own brand (either in-store or online).
- Clothing libraries.
- Repair and fitting.
- Luxury second hand shops.

3.2 Evaluation approach

Each model is presented in a Fact Sheet. The Fact Sheet template is presented below:

Model	Name of model
Description	
Overview	Short description of the main principles of the model. The description should include what the aim of the model is and how it functions
Existing examples	A few non-exhaustive examples of businesses and individual initiatives that have used this particular model. Nordic examples should be prioritised followed by EU and then ROW. Name of initiative/business and main actor(s) Website
Scope	Which broad product types the model has been used for so far and (where relevant) within which sectors (i.e. households, government, private business)
Key actors	Who are the key actors in the model, what are their roles and how should they interact. Brief description only.
Opportunities and obstacles	
Challenges	Key challenges to the adoption/spreading of the model in bullet point form. They can include legal, organisational, economic, behavioural etc. Where possible country differences should be named where these are of a critical nature which would strongly affect the relative potential of the model between countries.
Documentation	Present the documentation and reporting requirements, if such exist in this model. State also if there are targets for re-use, for recycling and/or for the treatment of textile materials not suitable for recycling.
Assisting instruments	A few examples of future voluntary or legal instruments that could aid the spread of this model and/or break down barriers, if any. This should take its starting point in the "Challenges" section above.

Evaluation	
Material flows	What quantities of textiles are reused through this model, in total, in a specific country, or at a specific site? What is the composition of the reused textiles (cotton, wool polyester, etc.)? What quantities of textiles are recycled through this model, in total, in a specific country, or at a specific site? What is the composition of the recycled textiles (cotton, wool polyester, etc.)? What do the recycled textiles displace (new clothing, insulation materials, etc.)?
Key economic costs and income factors for model	What types of costs and revenues does the model generate for the business engaging in it?
Winners and losers	Which actors benefit economically from the model and which actors might see a loss as a result of the model? What is the potential of the model for creating new jobs and what types of jobs would they be and where would they be created i.e. in Nordic region or elsewhere? What types of jobs might be lost and where?
Environmental benefits	Taking a starting point in the above, what environmental benefits (or impacts) can the model give per item or per customer compared to a traditional business model? Where would the environmental benefits/impacts occur – i.e. in what part of the lifecycle and where?

In general the evaluations given in the third section of the Fact Sheets are qualitative based on well-considered assumptions rather than thorough quantitative LCA-assessments or econometric modelling methods.

The environmental benefits element is a complicated issue and requires some explanation. The overall objectives of the project are to evaluate models which lead to extended functioning lifetimes of products including but not limited to reuse, and recycling of products when they are no longer fit for reuse.

Extending lifetimes: Environmental benefits resulting from extended functional lifetimes will result from offsetting of resource use and impacts caused by the production of new products which may *otherwise* have been purchased. For example, repairing a shirt so that it lasts twice as long has the potential to offset the purchase of an additional new shirt. Similarly ensuring that a shirt which has been discarded by its original owner is reused by a new owner has also the potential to offset the purchase of a new shirt.

Here the “usage time” of the individual products has been used as the functional unit for comparing a new system with current mainstream models. If the “usage time” is doubled then one might expect a halving in the number of shirts that need to be produced and a resulting halving in production cycle environmental impacts.

However, this direct displacement of new purchases does not always occur in reality. Even if the functioning lifetime of the shirt is increased the user may have saved money which they may anyway use on purchasing a new shirt and increasing their total wardrobe size or on some other purchase which causes environmental impacts (secondary effects).

A study from Britaint has however indicated that the re-use displacement effect from buying a used item rather than a new one is only 28% for textiles (WRAP 2013a). A 100% displacement effect can presumably only be expected where the original or new user in fact saves no money through the increased functional lifetime. These issues have been mentioned but without detailed study actual displacement effects can only be guessed at.

Increased recycling: if the model includes an element where the product which is no longer fit for (re)use is materially recycled then this would be expected to offset the environmental impacts caused during the production of virgin materials. These savings depend on what type of material the recovered material offsets. If it is used in the production of new textile products this will offset the production of virgin cotton, polyester etc. If it is however downcycled as industrial rags or insulation, this may replace other materials such as paper, rock wool etc. Danish EPA (in press) found that the greater benefits will be gained from recycling compared to downcycling but in both cases the benefits will be lower than if the textile product is reused.

User phase environmental gains: In general no significant change in the environmental impacts caused by the care of textiles (washing, drying etc.) are expected if one uses the functional unit of a given usage time of a product. For example, a single shirt that is actively used for two years will need the same number of washes as two consecutive shirts with a usage time of one year. The more durable shirts may be made from a different set of fibres than the less durable ones and may therefore require different washing regimes. This, however, has not been taken into account in the evaluations presented here.

Information for the Fact Sheets has been gathered from a range of sources including websites and documents released by organisations who have engaged in the relevant model, plus third party publications from researchers who have already assessed a specific model e.g. UK WRAP reports. Where necessary direct contact was made with individual organisations who have adopted a given business model.

4. Fact Sheets on systems and models

In the following tables the eight fact sheets will be presented. In the description it has been found that many of the models are challenged by the current conditions in the political and economic structures in the Nordic countries, and many thus experience difficulties in setting up and/or growing their business model. Suggestions to how these challenges can be addressed are presented in the fact sheets. In addition, there are also indications that most of the business models are expected to contribute positively to the Nordic (or wider European) job markets, but also that this might be at the expense of jobs outside the region in e.g. Asia.

In relation to the environmental effects, models which are based on reuse (longer active lifetime for the garments), are expected to give higher environmental benefits than models which are based on recycling. It is however uncertain to which degree purchases of used items will replace purchases of new items. This is particularly important in relation to the environmental effects. Finally, models with so-called *feedback loops* (i.e. upstream effects) have potential for greater effects per item (i.e. push towards better quality) but may remain more limited in size, than systems and models which do not.

4.1 Fact Sheet 1: Mandatory EPR schemes

4.1.1 *Description*

Overview

Mandatory Extended Producer Responsibility (EPR) is a product policy requiring manufacturers and importers to take responsibility for additional elements of products' life cycles. Most EPR systems focus on take-back, and management of post-consumer products. This fact sheet identifies the characteristics of mandatory EPR schemes for textiles based on the experiences of existing systems for textiles (France), as well as, systems for other products.

A fundamental definition is who is considered to be the “producer.” The standard approach is to include manufacturers within a country plus importers or distributors (retailer) where products are manufactured outside the country jurisdiction.

EPR schemes can be individual or collective (Tojo *et al.*, 2012). Many of the incentives for up-stream design improvements are more prominent for individual systems. Mandatory EPR legislation generally allows for both individual and collective systems. Requirements for companies opting for individual systems may be onerous: hence a clear majority of companies currently choose to join collective systems. For less complex products, in particular for packaging, a fee system based on product properties (mass and material) provides economic incentives to optimise these product properties. For products where these properties are of key importance, fee systems produce similar effects to individual systems.

We assume here that the mandatory EPR scheme will by and large be implemented through a collective system, or systems. To be in line with EU law, it may allow the option of several parallel collective systems. However, Nordic experiences tend to point to a more monopoly-like approach.

The level of responsibility accorded to the producer is of importance. No EPR scheme exists that allocates all responsibilities to producers. Certain responsibilities connected to collection will always remain with the consumers/citizens. Producer-established collection systems interact with existing waste collection systems established and maintained by municipalities, for instance, establishment of collection points in municipal recycling points or on municipality-owned ground.

When it comes to the level of responsibility, there are two main dimensions to consider: the part of the take-back chain that the producer is responsible for; and the types of responsibilities the producer needs to assume: physical, financial and informative (Lindhqvist, 2000). We will here assume that a mandatory EPR system for textiles will make the producers physically and financially responsible for the collection of the textiles from the containers that they or their sub-contractors are providing. Producers or sub-contractors will also be responsible for the costs of containers, but will be able to free-of-charge use land that is owned by municipalities and retailers for placing the containers. To the extent municipalities decide to collect textiles separately in some areas, these wastes will be handed over to the EPR scheme free-of-charge. These assumptions are in line with existing EPR schemes for comparable products in the Nordic countries. This is also in line with the French system.

The producers will also have the main responsibility for providing information to the citizens concerning the need for collection and the prac-

ticalities surrounding the collection, in particular, the availability of collection sites. Municipalities should include such information in the general information about recycling and waste management without getting any financial compensation from the producers.

A mandatory EPR scheme may also include specified targets for separate collection of textiles and for re-use and recycling of the separately collected materials. Collection targets can be expressed as convenience levels (number and location of containers for collection) or as a percentage of the estimated amount being discarded. We assume here that the legislation will lead to an increase in the number of collection points available for citizens. The mandatory EPR scheme will also have higher ambitions for recycling material from those textiles that cannot be re-used.

It is expected that a mandatory EPR scheme will build on existing schemes in the Nordic countries (i.e. collections by charity etc.), but there will be more frequent collection points and improved awareness activities. Producers will be responsible for collection from collection points/actors, sorting, and re-use and recycling of the collected materials. More material will be recycled and less material will be disposed in landfills and incinerators. The scheme will allow for individual collection activities by manufacturers or retailers that may be deducted from collection and recycling obligations of the collective, but these activities are not assumed to affect the main amount of textile waste. This design also means that charity organisations will remain as important collectors of used textiles, but will act as sub-contractors to the collective EPR scheme when it comes to marking of containers and treatment of non-reusable textiles.

Existing examples

The French scheme, Eco TLC, is the result of the legislation which was adopted by the Article L541-10-3 of the Law No 2006-1666 of 21 December 2006. This article introduces mandatory EPR for those who professionally introduce textile clothes, footwear and linen for domestic use. The responsibility was introduced from 1 January 2007, but the more detailed requirements are only decided by the Decree No 2008-602 of 25 June 2008. The Eco TLC was consequently created by the producers in December 2008 and approved by the authorities in March 2009. The Eco TLC brings together some 2,000 producers.

Eco TLC has contracts with several dozens of organisation who place containers in places easily accessible to citizens. Information about the location of containers in the French scheme is found on a common website and the organisations cooperating with Eco TLC, collectors and sorters, have to agree to collect textiles not only for re-use, but also for recy-

cling, and to supply Eco TLC with accurate data on collection and treatment of the textiles.

Scope

The scope of the French system is clothing, linen and footwear. The precise scope in terms of which articles are and aren't included under the legislation is specified in considerable detail within an annex to the legislation.

Key actors

- Producers (manufacturers and importers) who have to assume the responsibilities prescribed in the legislation, in particular finance the scheme.
- Producer Responsibility Organisation(s) (PRO) that will be commissioned by the producers to fulfil the physical and informative responsibilities of the producers.
- Collection organisations/companies engaged by the PRO to carry out the collection and sorting.
- Consumers who will keep their used clothing separate and deposit it in the containers provided by the EPR scheme or to other designated collection points.
- Authorities, who need to monitor the actions of the producers and whether targets are reached.
- Municipalities that needs to coordinate their collection activities with the PROs and the collection organisations/companies, so that consumers are provided reasonable convenience and understandable systems.

4.1.2 Opportunities and obstacles

Challenges

Producers: The challenges for producers will be to meet the collection, reuse and recycling targets set by the legislation. The requirements for more convenient collection and better recycling will likely lead to costs for the producers, who today are mostly not involved in these activities.

Challenges for collectors and recyclers: The main difference for these actors will be that they will need to interact with the PRO(s) and provide accurate data for collection, sorting and treatment. These tasks do not seem to be very demanding compared to present practices. There may also be a challenge to develop efficient recycling technologies to better make use of collected non-reusable textiles.

Challenges for municipalities: Municipalities will have to coordinate location of containers and information activities with PRO(s) and their collectors. This task is similar to what is happening today with EPR systems for other products, and existing textile collection activities, and is not likely to demand much extra resources. Municipalities will also have to hand over textiles collected separately, but such separation will likely not be very frequent in municipal systems and co-location at recycling stations will facilitate such interactions.

Challenges for authorities: Any mandatory scheme will demand a certain level of control and actions to impose sanctions. The main problem for the authorities will likely be free-riders – producers who have not joined a collective scheme or set up an individual scheme. To keep track of free-riders, authorities may have to introduce a system where producers are registered and monitored. Such systems can be quite cumbersome and expensive, and the design of the mandatory EPR scheme should be such that this task is minimised.

Documentation

A mandatory EPR scheme will rely on a dedicated piece of regulation that specifies reporting by the various actors on progress towards targets that the system is required to achieve. This also means that producers will have to secure relevant and accurate data from the collectors, sorters and recyclers.

Assisting instruments

EPR Regulation: This will be central to the mandatory EPR system rather than an assisting instrument. The regulation would assign responsibilities, set targets, set criteria for PROs and individual systems, define reporting protocols etc.

Information: Information-provision and awareness-raising activities will, as mentioned several times, be crucial for the success of a mandatory EPR scheme. These activities can also extend to producers advertisements in media and in shops, and common producer-initiated awareness campaigns.

Support for research into recycling of textiles: There will be a need for technology development of sorting and recycling technologies for textiles that will benefit from national and European research funding.

Subsidies: A mandatory EPR scheme can be supported by various levels of subsidies for activities, such as lowered or no VAT for charities reselling clothes.

Instruments requiring/encouraging design for recycling: This could be included as part of the EPR regulations i.e. a reduced fee for producers

who design for easier disassemble, no fibre mixes, use of synthetic polymers etc. Otherwise could be included as a separate instrument perhaps as part of an existing Eco-label such as Nordic Swan.

4.1.3 Evaluation

Material flows

Due to increased convenience for the consumers and more effective information campaigns, the amount of textiles that will be collected will increase. It is today estimated that the half of the textile products used today in the three countries Denmark, Finland and Sweden are discarded as waste, amounting to close to 145,000 tonnes per year (Tojo *et al.*, 2012). A rough estimate, assuming Iceland and Norway have similar figures, gives that without any changes of the systems and habits, the discarded amounts in the Nordic countries are today in the order of 183,000 tonnes per year.

It seems likely that a more convenient and better known scheme will manage to substantially increase the collection rates, but it will depend on the requirements set in the law. We find it reasonable to assume that a target will be in the order of 75% collection rate that is a decrease of the amount of textile waste being disposed in landfills and incinerators by 50%.

It is more difficult to determine what goals could be set for recycling of non-reusable textiles.

Key economic costs and income factors for model

The mandatory EPR systems will most likely resemble the present systems in the Nordic countries for collection of textiles. The number of collection containers will increase, the information efforts will be enhanced and there will be stronger efforts to recycle more of the textiles that cannot be re-used.

The cost for consumers, municipalities and authorities are judged to be rather limited. The main costs will fall on the producers who will have to support a more dense collection network and, potentially, support expanded sorting and recycling activities. It is difficult to estimate the costs of these activities. The French scheme cannot provide useful information here as collection rates under the French EPR are lower than current collection rates in Denmark (though have increased significantly since the scheme began).

An EOR scheme can potentially bring benefits to producers by decreasing producer's material costs if recycled material can be used for

new products. This is dependent on necessary technology for recycling being developed.

- Summary: The costs of the system very much depend on targets set in regulations but these costs are likely to be limited in comparison to product prices.

Winners and losers

Winners: A clear winner of a mandatory EPR scheme for textiles is the consumer who will have a more convenient and transparent system. Municipalities and society at large will also benefit from the better collection and treatment of textiles.

Existing collection organisations, for instance charities, will have the opportunity to join the new scheme and expand their activities. The extra efforts needed will be compensated by the producers through their fees to a collective scheme.

Recyclers of textiles will also win from a bigger volumes and new developments of technologies.

Losers: The costs of the system will be borne by the producers who are responsible for achieving the targets set by the EPR legislation. However, it is likely that these costs will in the foreseeable first steps be rather limited.

If the scheme does not allow opt out of individual producers who want to establish their own systems as part of business concepts, then these producers can become substantial losers.

Environmental benefits

Production phase effects: It is not expected that the mandatory EPR scheme in itself will give significant upstream effects – however, this depends on the way the fee system in collective systems is designed. Most environmental benefits will arise from improved collection, reuse and recycling of these items.

More collection points will increase transports for the collecting organisations, but these environmental impacts are likely to be compensated by gains in re-use and recycling. For the consumers, it is not likely to change the transport distances as most of the citizens will combine the handing in of discarded textiles with other recyclables.

Use phase effects: The model is not expected to have any notable effect on use-phase environmental pressures.

- Summary: Potentially high environmental gains per article though upstream effects might be limited.

4.2 Fact Sheet 2: Voluntary individual EP

4.2.1 Description

Overview

Under “Extended Producer Responsibility” (EPR) models manufacturers take responsibility for the entire life-cycle of their products. EPR-schemes can be either mandatory or voluntary and either individual or collective (Tojo *et al.*, 2012). This fact sheet considers voluntary individual EPR (own brand) systems.

There are several voluntary initiatives with EPR characteristics. Voluntary initiatives are generally introduced by the producers or retailers themselves. Alternatively systems can be set up via voluntary agreements with government.

In this business model consumers are encouraged to return own brand used textile products to the brand (via post or retailers). In some cases this encouragement is given via some kind of economic benefit (discount or voucher) on the consumer’s next purchase from the brand/store.

Brands can then make use of the returned textile products in various ways. For instance Boomerang used garments are either sold as Boomerang Vintage or cut up and used to make Boomerang Home products. Klättermusen donates the returned item to charity, re-designs it or sends it off for recycling. PUMA has EPR systems for individual products such as the PUMA Track Jacket which is made entirely of polyester. Once returned in Puma’s in-store return system it is sent for recycling to polyester granulate (PUMA 2012). Similarly, companies such as Nike and Patagonia and Swedish manufacturers Houdini and Fjällräven who have signed up with Teijin’s ECO CIRCLE system collect their own brand polyester garments and send them to Teijin’s recycling centre for production of polyester granulate.

EPR models are differentiated from ordinary take-back schemes in that the producers engaging in them carry out supporting upstream actions which make the reuse or recycling of the returned textiles more effective. This can include design of products to be more durable and therefore be more suitable for reuse following return. It can also include design for more simple redesign including avoiding fibre mixes, making use of fibres such as polyester which can be recycled into new fibres with no loss of quality, and designing for easy disassembly of seams, removal of zips, buttons etc.

The motivation for the brand to engage in this model can arise from several considerations: 1) from a CSR policy within the company to reduce resource use 2) through a wish to create a stronger linkage with the customer, effectively building a more long term relationship and greater brand loyalty.

Existing examples

- Boomerang, www.boomerang.se
- Members of ECO CIRCLE (e.g. Nike, Patagonia, Houdin, Fjällräven), www.teijin.com
- Klättermusen, www.klattermusen.se
- PUMA, www.puma.com

Scope

The model has so far been implemented by producers of clothing (and in particular outdoor clothing) and footwear. However, it is applicable to any kind of textile product including home textiles, hospital linen, uniforms etc.

Key actors

- Brands that take initiatives and provide collection.
- Consumers who submit their used clothing.
- Charities who in some models receive donations from the brand.
- Recycling companies like Teijin who work closely with the brands to recycle returned products.

4.2.2 Opportunities and obstacles

Challenges

Only collection of own brand: Total collection will be limited, because these brands only collect their own brand clothes. For smaller brands there may be an issue gathering sufficient stocks of returned garments to support an own brand reuse or recycling model.

Challenges for the shop: This business model may require additional floor space and storage, which could be difficult or make it too expensive for some to participate. There are also practical challenges, such as stores having enough of a size range to make it worthwhile for consumers to look for clothing. It could also be expensive for stores to sort through clothes.

Consumer challenges: This business model could be time consuming for the consumer as they have to visit each brand store to return clothing that is no longer wanted or send by post. This makes demands on the consumer many of whom may find the model too inconvenient.

Involving customers in the business model: Currently the textile flows in an own brand EPR system is low. Sjöström (2013) argues that a big challenge is to get customers involved in this business model. Customers are not aware that textiles can be reused or recycled, and therefore do not return clothes. It is hence crucial that customers are made aware of possibilities to return garments they no longer want.

Documentation

There are no documentation and reporting requirements or targets set for this type of business model.

Assisting instruments

Information for consumers: The uptake of this business model is dependent on increasing the population's knowledge of the benefits of depositing textiles. This could be provided via information campaigns (preferably supported by the fashion industry) or by use of behavioural change tools such as nudging.

Other accessible collection systems: In order for large flows of textiles to be collected other alternatives than in-store collection are needed. Brännsten, (2013) and Sjöström (2013) argue that other means of accessible collection systems such as recycling centres, voluntary organisations other brands are needed as a complement to this business model. However, this might create logistics problems for the brand.

Financial incentives: Perhaps extra incentives (e.g. higher discount or other incentives) to consumers are needed in order to engage customers to return their used clothing back to the brand Sjöström (2013).

Reduced VAT or labour tax: Removing or reducing VAT on used clothing/textiles, and/or reducing labour taxes (e.g. as in Swedish house renovations where labour receives a 50% rebate), could increase the economic viability of voluntary EPR models based on reuse or redesign.

4.2.3 Evaluation

Material flows

Individual EPR (own brand) is a relatively new business model and there are no official recordings of the quantities of textile which are reused or recycled through voluntary. However, since the start (2011) Boomerang

has collected between 7–8,000 garments, approximately 3 ton/year (Boomerang, 2013). It is difficult to know how effective this business model is i.e. if it will lead to significant increases in collected textiles.

Key economic costs and income factors for model

As this business model is fairly new, the business viability has not been extensively tested. Where vouchers are provided, brands may see an increase in revenue as customers will have higher incentives to purchase more clothes. This increase is most likely offset by the loss of income due to the discount provided.

On the other hand, brands will see increased costs in terms of implementation costs for the collection of textiles as well as higher administrative costs and costs for sorting and handling.

- Summary: Unclear without further study.

Winners and losers

Winners: The collected clothing will lead to brands being able to resell their clothes as second hand goods. This could allow consumers who usually cannot afford their brands to buy their clothes. It may also therefore create additional markets and revenue for the manufacturer. The brands that utilise collected clothes for remanufacturing (e.g. Boomerang use collected fabric to produce home products) could also benefit from lower raw material costs. The model also benefits in terms of convenience for customers, since the different brands are often located in the city centre in comparison to most charity organisations.

The amount of reused clothing will increase and the amount of new clothing produced could decrease, although these effects could be minor. Further companies could choose to “repair” items, which are not quite in a sellable state, which could further create jobs in the Nordic region. For instance for Boomerang the reuse of textiles has meant an increase in external partnership with those that weave their carpets, sew the seats and carve the furniture. In the long run this business model could lead to a small increase in personnel staff and jobs created, but in the short term it is not expected that this business model should create a significant increase of jobs in the Nordic countries.

Losers: The clothes which are collected are exclusively of the retailer’s own brand meaning that it will increase the sorting efforts for the consumer.

This business model may lead to an increase in reused clothing, which in theory means that the amount of new clothing produced should

decrease. In that case jobs could be lost in Asia, however in the short term this is unlikely.

Environmental benefits

Production phase effects: It is expected that the voluntary EPR model will provide incentives to producers to incorporate a life cycle approach into the design of their products with reuse, remanufacture and recycle in mind (i.e. upstream effects). Environmental benefits will be gained at the production phase as reused and recycled textiles should reduce the production of new textile products and/or reduce the production of virgin fibre inputs.

In general the models that focus on reuse rather than recycling of returned products are likely to have higher environmental benefits per item provided that the sale of reused products offsets the purchase of new products. Brands could choose to sort clothes and treat in the most environmental beneficial way. Hence clothes that cannot be directly reused could be remanufactured or recycled, depending on quality.

However, if the model is accompanied by vouchers giving rebates on sales of new clothes the environmental benefits may be reduced. A more environmentally beneficial model would be to give vouchers for rebates on used collections.

Additionally, there is a possibility of reductions in transport via distribution. If the returned good is sold in the same shop then this would reduce the transport of new products from Asia. However, if as in the Eco Circle model the returned goods are transported to Japan this may not reduce transport impacts at all.

Use phase effects: The model is not expected to have any notable effect on use-phase environmental pressures.

- Summary: Allows for positive upstream and possible transport effects which can give increased environmental benefits. Rebates might however (partially) offset this effect.

4.3 Fact sheet 3: In-store collection with a partner

4.3.1 Description

Overview

In-store collection schemes in cooperation with partners seem to be gaining momentum in Europe. In this fashion retailers encourage customers to bring used textile products of any brand, type and quality to high street stores. The garments are then passed over to a partner (collector) for subsequent processing. This processing includes transport to a central facility for sorting, and subsequent reuse, recycling and where this is not possible other forms of waste management.

In this business model, brands take back all types of used clothes from all brands independent of the state of the clothes i.e. torn or not. As a result this model differs from EPR systems since it does not include upstream elements i.e. product designs to increase durability and ease of recycling. Since the retailers collect textile products designed and produced by many different companies there is no incentive for improved design.

Consumers who bring used clothes back to the brand shop will in return for their efforts receive some kind of economic benefit (e.g. cash or percentage reduction) on their next purchase in the store (the schemes vary somewhat in this regard) for each bag of clothes which is handed in (Tojo *et al.*, 2012).

Many retailers have teamed up with the Swiss textile collectors and handlers I:Collect (I:CO). When large producers collect used textiles in-store the textiles are brought back to main storage points by existing logistics, from where I:CO picks it up and transports it to a central sorting plant.

The collected clothes are then sent to the nearest I:CO sorting centre with the return logistics. At the plant the clothes are then graded and hand-sorted, in accordance with the waste hierarchy, i.e. prioritising reuse rather than recycling and recycling rather than landfill or incineration (I:CO, 2013).

Existing examples

The following examples, are a non-exhaustive list of initiatives in the Nordic countries:

- H&M, www.hm.com
- Jack&Jones, www.jackjones.com
- Stormberg, www.stormberg.com

Scope

The model covers the collection of all types of clothing, regardless of brand and condition. The intention of the business model is to increase the reuse and recycling of textiles.

Key actors

- Stores that provide in-store collection.
- Consumers/households who submit their used textiles.
- Entrepreneurs who arrange the pick-up, the sorting, and reuse and recycling of textiles.

4.3.2 Opportunities and obstacles

Challenges

Identifying suitable partner: It could be a challenge to find a suitable partner and negotiate agreeable terms. This assumes I:CO will not be a viable alternative for all.

Quality of collected clothes: H&M collects clothes of any quality, but this may not be viable for other situations which may have challenges assuring customers hand in clothes of a suitable quality.

Consumer mind-set: It will take time for consumers to regard torn textiles as a resource and have the different brands in mind as an alternative for collecting clothes for reuse and recycling when cleaning out their wardrobes.

Technical challenges with recycling: There are still currently limited recycling opportunities for most textiles that are unfit for reuse. This is concerned with fibre mixes which are difficult to separate, difficulties in removing buttons etc. This means that most non-reusable textiles that are collected are downcycled (i.e. as industrial rags) or incinerated.

Documentation

There are no documentation and reporting requirements or targets set for this type of business model.

Assisting instruments

Increased knowledge and awareness: The uptake of this business model is dependent on increasing the population's knowledge of the benefits of submitting textiles. Most consumers are also not aware of the large impact that textiles have on the environment. This could be achieved via information campaigns (preferably supported by the fashion industry) or by the use of behavioural change tools such as nudging.

Labelling on clothes: labels could be included on clothes which provide information on take back systems. This could come in the form of QR codes for smart phones linking to internet sites providing information on where to deliver clothing.

Incentive for consumers to bring used textiles: Perhaps extra incentives for consumers are needed in order to engage customers to return their used clothing back to the brand Sjöström (2013). This could be higher discounts on new clothing but this would both challenge the economics of the system and also undermine environmental benefits. Discounts on other types of (less-impacting) products or services could be offered.

Other accessible collection systems: In order for large flows of textiles to be collected other alternatives than in-store collection are needed. Brännsten (2013) argues that other means of accessible collection systems such as recycling centres, voluntary organisations other brands are needed as a complement to this business model.

Supporting networks and programs: for smaller businesses the formation of a collaborative business network or assistance by local governments could aid collection. These could help coordinate collection, provide training, negotiate terms with the collector or form a cooperative reuse, sales and recycling facility.

4.3.3 Evaluation

Material flows

There are no official recordings of the quantities of textile which are reused through in-store collection. This business model is relatively new. H&M collected 1,900 tons globally (40 ton in Sweden) from February-October 2013 (H&M, 2013) which is an insignificant sum compared to the totals collected by charities (26,000 tons annually in Sweden alone). According to H&M, I:CO reuse 40–60% of the collected clothing and recycle 30–40%. The composition can be assumed to be a typical mixture of polyester, cotton and wool, etc. as there are no restrictions on clothes that can be deposited.

4.3.4 Key economic costs and income factors for model

Consumers will benefit as they get a financial discount on a future purchase. There is inadequate information available on how this affects business revenues and profits. However, it is expected to be financially viable for H&M, since they sell the clothes to I:CO (I:CO pay H&M per kg) and shoppers have to use the reward in store. This should be tolerable

for H&M whose gross profit margin is regularly over 60% (Bloomberg, 2013). There would however, be additional costs associated with handling and storage of the clothes before collection. However, since collected textiles are sent back to the retailers warehouses there should be no additional transport costs associated with the model for the retailer.

In addition, this business model also brings customers to the store i.e. they maintain a linkage with the customers. There could therefore be an increase in overall sales and revenue as customers who perhaps would not have consumed clothes will now have incentives (the voucher) to do so.

There will be economic benefits to the collecting partners in terms of revenue from reselling the textiles into the international market. For each kilogram of clothes collected H&M donate, 0.02 EUR² to a local charity organisation chosen by H&M. Nordic jobs could be created in relation to the collection. Sorting, reuse and recycling could be either in Nordic countries or abroad.

- Summary: Not clear as yet whether these initiatives bring overall costs or benefits to participating retailers. However there is a potential for increased revenue.

Winners and losers

Winners: Consumers will benefit by receiving a discount on a future purchase. The brands who offer in-store collection may also benefit from a potentially increased sale. They will also benefit since the voucher makes customers come back to the store and can in this way maintain customers. This will also hinder customers from consuming at competing brands. But primarily brands will benefit from selling returned clothing to the collecting partner.

The collecting partner will also benefit as they can resell the clothing bought from retailers into the international market. The business model could lead to more jobs for the entrepreneurs as demand for the collecting partners increases. In addition, stores will possibly require further staff due to the increase of clothing collected in store.

Further, an increased reuse of second hand clothing could have a snowball effect, increasing its acceptability and thereby its further use.

² A small donation to a local charity organization is given (by H&M) in accordance to the collected amounts of textiles but there is no cooperation in the sense that the gathered clothes are handed to the charities for reselling.

Because collection is easily accessible and not time consuming for consumers, there is potential for large collection amounts. Consumers do not have to do any additional sorting, as the brands collect textiles in any condition.

Losers: It is possible that these types of initiatives, where consumers get vouchers, for submitting their used clothes could potentially lead to consumers only giving away clothes to e.g. H&M. In that case charities and second hand stores may see a decrease in donated clothing and hence, reductions in revenue used for charity work or otherwise.

On the other hand it could also be that people who bring textiles to retailers may not be those who otherwise donate them to charities i.e. the model might bring in additional used textiles rather than just shifting the collectors from charities to retailers. This is as yet unclear.

Although two of the above mentioned brands do not cooperate with charities,³ there are examples of charities and brands cooperating (Stromberg and Red cross, and Marks and Spencer and Oxfam in the UK). In order for charities to not be out competed by brands, cooperation is probably necessary. If the charities lose out this may be at the expense of (mostly voluntary) Nordic jobs and in favour of jobs in German where I:CO have their sorting centres.

Environmental benefits

Production phase effects: This business model has the potential to increase the total amount of collected clothing. Since collectors such as I:CO are interested in maximising profit, the preferred hierarchy of reuse, remanufacture and recycle could be encouraged. In theory this will reduce the purchasing of new clothes and thereby reduce the associated higher resource use (including energy, water and natural resources).

However, this depends to a great extent on what kind of incentives retailers offer consumers bringing clothes. If they offer vouchers on new clothes, clothing sales in countries where the system operates may actually increase potentially offsetting environmental benefits. Alternative incentives could be investigated.

It is not thought that this model will encourage improved design of the clothes for reuse and recycling, since there is no direct feedback to the manufacturer. However, some big brands (e.g. H&M) who are in-

volved with the in-store collection today are also looking into how to close the material loop of their products.

- Summary: Level of net benefits is largely dependent on whether vouchers for new clothes are offered. Net benefits are more likely where other types of incentives are offered. Upstream benefits are expected to be moderate/low.

4.4 Fact Sheet 4: Leasing of own brand

4.4.1 *Description*

Overview

Leasing of own brand is similar to the more common lending models of e.g. formal evening wear but where a company leases out its own brand clothing. The agreement with the customer typically comprises a long term subscription-based agreement rather than one-off loans.

The business model aims at keeping the customers closer to the brand (i.e. maintaining customer loyalty) whilst giving them the opportunity to change wardrobes regularly at typically reduced cost compared to buying new articles.

The result of the model is to keep the textiles under the ownership and thereby responsibility of the brand, meaning that the fabrics can be reused and/or recycled at the end of a single consumer's use, depending on how the service is carried through. Repairs can also be carried out during the customers use.

The business model also provides incentives for better design for re-use and/or recycling. This has been the case for children's clothing leased by Beibamboo, where material, colour and design have been chosen to improve on reusability and longer life (Ignatius, N. 2013). Similarly MUD Jeans design for recycling, which means for example that no labels are stitched onto the jeans (Van de Wiel, H. 2013).

Existing examples

- Beibamboo, www.beibamboo.com
- MUD, www.mudjeans.nl
- Houdini, www.houdinisportswear.com

Scope

This model has been applied to clothing for both children and adults as well as for uniforms (MUD jeans for Dutch gardeners) but could also be applied on household textiles and other public textile products such as linen, towels etc.

Key actors

- Brandowners.
- Customers (private as well as municipalities, state run institutions or companies like hotels, private hospitals or security patrols).
- Logistics services.

4.4.2 Opportunities and obstacles

Challenges

Challenge to traditional brand approach This requires a very different approach than current retail models which might pose a challenge for existing companies. Would require a complete restructuring of processes and also new mind-sets of company owners/CEOs. This is less of an issue for start-up companies.

Start up capital: if the leasing business is started from scratch (i.e. is not building on an existing business) it can be very difficult to receive start-up loans from banks. The business model requires that the customer only gives a relatively small pay-out when they receive the product(s), and then pay the leasing fee over a set period of time. This results in a huge challenge for liquidity, and thus makes banks or other loaners reluctant to invest in this type of business model. The challenge is more easily overcome if an existing solid business can invest itself in the leasing model (van Son, B. 2013a).

Marketing costs: to reach potential customers there is a strong need for marketing. For smaller brands, necessary marketing costs can be insurmountable (Ignatius, 2013).

Finding suitable materials: of very high quality that lasts is crucial for the business model to be viable. There can be a lot of “trial-and-error” before finding the suitable material and perhaps also the right design for longevity including preparation for reuse.

High labour costs: Personnel for checking and/or doing small repairs on returned leased textiles can be expensive in Nordic countries, and are a significant cost in the business model (Ignatius, 2013).

Consumer mind-sets: Perhaps the key challenge is in changing mind-sets. Leasing textile products rather than owning them is quite a differ-

ent way of consuming, and will thus demand a significant change in thinking and behaviour. The challenge is probably greatest for the private consumer, since both public organisations and businesses are increasingly used to lease models for other product types such as office furniture and vehicles.

Costs for logistics: this can be a significant cost element.

Documentation

There are no documentation and reporting requirements or targets set for this business model.

Assisting instruments

Increased visibility: The business model could benefit from increasing the level of awareness. Cooperation with hospitals and/or birth clinics, libraries, health visitors and shops with baby clothes could help spread awareness about the business model for children's clothes.

Easy logistics: Good cooperation with other types of logistics services could be important or perhaps even crucial. An alternative is to offer the leasing model with pick-up (where the customer makes the exchange themselves), in which provision of a location for this pick up could benefit the model. Making use of cafés, libraries or other types of locations should be feasible and could benefit both parties (i.e. bringing new customers in and/or bringing in customers more regularly).

Support for start-up costs: Since start-up leasing businesses struggle with getting financing, it seems crucial for the spread of this business model, that there are better opportunities for raising start-up capital. Perhaps via government supported funds.

Support for personnel costs: Wage costs for personnel handling the clothes are a significant entry in the accounts. Leasers could benefit from employing personnel with support and/or receiving guidance to arrangements which already exists (e.g. wage subsidy job arrangements or similar).

Raising knowledge and acceptance: The spread of the business model is dependent on increasing knowledge and acceptance in the population to lease clothes. This could be provided via information campaigns (preferably supported by the fashion industry) or by use of behavioural change tools such as nudging. Adoption by high street brands may also lead to more rapid acceptance.

Knowledge sharing in design for greater durability: An improvement in the quality and reusability of clothing and textile products is an essential element of the leasing model. Knowledge sharing hubs could aid brands in gaining best practice information on design for longer lifetimes.

4.4.3 Evaluation

Material flows

Since this business model is new there is limited data availability. Beibamboo has run the leasing concept for three years. When the business was at its highest there were 25 customers leasing baby clothes. At its lowest there were 4. These customers were all acquired with close to no marketing effort (Ignatius, N. 2013). Each of the customers had chosen either a mini set with 6 pieces of clothes or a basic set with 15 pieces of clothes. The clothes were made from pure cotton with a small amount of polyester (ibid).

MUD Jeans reports to have gained around 1,000 customers since the start in January 2013 (Van Son, B. 2013a)

Key economic costs and income factors for model

Very few companies have tried to carry through this business model in practice, so the economic costs and benefits are difficult to predict. If the business model includes delivery and pick-up services, logistics have mentioned be a significant economic challenge in the case of products being delivered via a delivery service. In the case of Bamboo baby clothes, the return costs for a single parcel were around EUR10 (Ignatius, N. 2013). Marketing costs have also proven to be significant in order to properly spread this model (ibid).

The MUD Jeans and fleece leasing model is “growing rapidly and the numbers are promising” but is still difficult since the model is currently financed by the initiator himself (van Son, B. 2013b). A crowd-funding campaign has been initiated, and about the market is currently being expanded to other countries, amongst others Denmark (Van Son, B. 2013a). The Beibamboo model ran for three years, but closed down mainly due to lack of financial and human resources for making the necessary investments needed for expansion. WRAP (2013b) has evaluated the financial viability of this kind of model, and concludes that it *might be* financially viable after 10 years.

A main advantage for the brand is that they will be able to keep very close track of their textile products. This can result in them getting the opportunity to keep fabrics in a closed loop system, with full control and knowledge of fabric composition, chemical content etc. MUD Jeans have already made arrangements with an Italian recycler, which will recycle leased jeans, once consumers are finished with using them and they are not fit for reuse. If they succeed in efficient reuse and recycling of their materials, they will be able to save money on material inputs for new products. The technology currently only allows the content of recycled

cotton to be around 30% but it is anticipated that this rate will go up to 50% with time (van Son, B. 2013a).

- Summary: Potential economic advantages for those engaging in it but unclear without further study.

Winners and losers

Winners: Consumers are likely to benefit from this business model, since they are likely to be able to change their wardrobe relatively often at a lower cost than had they have to buy the clothes from new. The model has potential for job creation in the Nordic countries since it is relatively labour intensive rather than material intensive. Jobs would be created in personnel for checking clothes and performing small repairs on their return. Jobs in logistics and laundry services would potentially also be created.

If the business model has a positive impact on recycling levels, new jobs could also be created in the recycling industry either in Nordic countries but more likely in other parts of Europe.

Losers: There does not seem to be any evident losers from the model, although businesses with a more “traditional” business model might not be able to compete with leasing businesses over the long term, if the model becomes main-stream. Job losses would mostly occur overseas in countries producing new textiles.

If the business model has a positive impact on recycling levels the recycled material would replace virgin materials and jobs in the industry for producing virgin materials would be lost. These jobs are mainly located outside the Nordic region.

Environmental benefits

Production phase effects: In this model following return, articles are repaired and then sent out for use by new customers extending the lifetime of the articles. This should offset the production of new textile articles. The level of displacement depends on the percentage increase in “usage time”⁴ compared to a purchased article. There is unfortunately no data available on this percentage increase but it can be assumed to be significant particularly for baby and children’s clothes where the user fast outgrows the article.

⁴ Usage time is taken to mean the intensity of use multiplied by the period over which it is used. An article of clothing can last many years in someones wardrobe without being used. In this case the lifetime might be high but the total usage time would be low. It is the usage time of an article of clothing which is key in how much it offsets the purchase of new similar clothing articles

Environmental savings will be gained in the entire production chain of textile products. If the usage time of an article is increased by 100% this will offset production chain environmental pressures by up to 50%. Articles suitable for hiring/leasing are likely to be of higher quality than alternative purchased articles which may mean a greater weight of fibres used in the article and may mean a change in the type of fibre mix used. This may reduce the environmental benefits during the production of the products but information is not available to predict to what extent this might occur.

Use phase effects: Due to increased usage time, it is expected that the article will be laundered a greater number of times during its lifetime than an alternative purchased individual item. However, if the article is compared to its alternative which provides the same functional unit (i.e. one pair of leased jeans compared to two pairs of purchased jeans which last half as long each) then the total number of laundering cycles and associated environmental pressures are not expected to increase.

Return of articles to the company and its allocation to a new user will be associated with some transportation. This may happen a few times during the article's life. However, in the alternative scenario where several of the same articles are purchased this will also involve transportation for each new purchase. Therefore, no significant difference in transport effects is seen.

The model is not expected to have any notable effect on use-phase environmental pressures.

- Summary: Potentially high reductions in textile production impacts per article but dependent on percentage increased usage time which is uncertain.

4.5 Fact Sheet 5: Resell of used own brand

4.5.1 Description

Overview

In this model, retailers take back used clothes of own brand which are suitable for reuse. It is not common for producers to engage in the life of their garments after their first use, but there are a few examples of how this can take place, including resell in own stores, resell in separate stores or re-sell on-line. The clothes for this business model are mainly used clothes handed in by consumers, but it could also be an opportunity for the brand to sell off collection samples and/or collection pieces with

smaller flaws. The aim of the business model is to increase levels of re-use by making use of (high quality) clothes which are hanging unused in wardrobes (WRAP 2012) whilst creating profit and employment.

This model if it also includes upstream effects e.g. design for durability, can also be considered as a specific type of voluntary EPR.

Existing examples

- Filippa K, www.filippaksecondhand.se
- Boomerang, www.boomerangstore.com
- Patagonia, www.patagonia.com

Scope

The business model usually covers men's and women's clothing, but could easily be applied to children's clothes. The business model is only relevant for private consumers.

Key actors

- Brand owners.
- Existing second hand shops (if brands decide to collaborate).
- Consumers.

4.5.2 Opportunities and obstacles

Challenges

Challenge to traditional brand approach: Brand owners / CEOs might have to change their mind-set about how to run their business. Taking in used clothes and selling them again might seem like a threat to the traditional business model, so for some there could be a strong need for changing their mind set. Fillipa K sees the potential instead of the threat and states that they:

“...see it as an opportunity because we know that our clothing can really stand the test of time, so that we can actually get more customers, we don't want each customer to buy more and faster but you can have new customers.”

(Hvass 2013)

Ensuring supply: This business model relies on the supply of used brand clothes from customers. If used clothes just keep hanging unused in the closet (which is the case for around 30% of all clothes in British wardrobes: WRAP 2012) or if used clothes are discarded of as waste, the sup-

ply of clothes for this business model might not be sufficient. Consumer behaviour change is therefore necessary.

Reverse logistics: have also been highlighted as a possible challenge by Hvass (2013). The reverse supply chain for the second-hand retail concept requires thorough planning and coordination of additional services, such as customer service for product returns, sorting, pricing, storing, transportation and end-of-life management of lower quality items. According to Hvass (2013) engaging in partnerships with other businesses might be the way forward for brands who wish to engage in resell of their garments.

Challenge to conventional mind-sets: While second-hand and vintage clothes have increasingly been perceived as trendy since the financial crisis, many consumers may still have negative associations with wearing second-hand clothes with concerns over hygiene or status. Others may just not be aware of this as a viable alternative to new products. A change in people's mind set is thus crucial for this business model to develop. This model, however, might be a significant positive catalyst in the promotion of second hand products into mainstream markets.

Documentation

There are no documentation and reporting requirements or targets set for this type of business model.

Assisting instruments

Easy logistics: Good cooperation with other types of logistics services could be important or perhaps even crucial as underlined in Hvass (2013). Partnerships might serve as a good way forward.

Raising knowledge and acceptance amongst consumers: The spread of the business model is dependent on increasing knowledge and acceptance in the population to buy used clothes. This could be provided via information campaigns (preferably supported by the fashion industry) or by use of behavioural change tools such as nudging. Adoption by high street brands may also lead to more rapid acceptance.

Knowledge sharing in design for greater durability: An improvement in the quality and reusability of clothing and textile products is an essential element of the reuse model. Knowledge sharing hubs could aid brands in gaining best practice information on design for longer lifetimes.

Eco-labelling on durability and on reuse: The Swedish Bra Miljöval for example includes an option for labelling of reused clothes as a good environmental choice. Other more widespread labels such as the Nordic Swan could be developed to do the same. Labels could be developed to also include criteria on durability of products. This could be a positive benefit for resellers of own brand.

4.5.3 Evaluation

Material flows

It has not been possible to retrieve specific data on the material flows for any existing resell business models.

Key economic costs and income factors for model

The key economic costs for this model are related to handling of the clothes which are taken back, including costs for transportation, sorting, laundry, possible costs for repair and new materials, storing and additional staff costs. In addition, depending on how the business model is constructed, there will be costs for discount vouchers or direct financial compensation for the customers who hand in their used items.

The income will be generated from the sale of items which are suitable for reuse and the earnings from items sold off for recycling.

In general, the study by Hvass (2013) show that there is a potential for fashion brands with quality products to integrate resell activities and that they can provide additional financial value through an enlarged customer group, income generated from the resell of clothes and finding a sales channel for collection samples. A recent WRAP study has ranked this business model as the model with the quickest pay-back period and the most commercially viable model over both the short and the long term amongst five different business models for clothes (WRAP 2013). Due to these promising results any fashion brand at the forefront of addressing sustainability issues and driving fashion trends, such as the recent increase in anything vintage, is expected to be an ideal candidate for uptake of this model (ibid).

- Summary: Potential economic advantages but unclear without further study.

Winners and losers

Winners: Consumers will benefit from this business model, since they will be able to receive quality clothes at a cheap(er) price than that of new clothes. This however is under the assumption that the consumers perceive the used clothing of as good value as new clothes.

Secondly, shop-owners will benefit from the profit they make of selling the same garment twice or more. The brand might also experience a general improvement of perceived brand value, which could increase sales, since the business model can serve as some sort of quality stamp. In Hvass (2013), a source has stated that:

“...to make a second-hand store with one brand is not easy. But if we can do that, it shows that we are really serious about it. It’s really a quality stamp.”

WRAP has suggested that there is a positive net-job effect for re-use of different types of clothing (WRAP 2011). This result might be transferable to a Nordic context, creating local jobs for personnel for handling and checking clothes and possibly also performing small repairs on their return. Jobs in logistics and laundry services would potentially also be created. If the business model has a positive impact on recycling levels, new jobs could also be created in the recycling industry either in Nordic countries but more likely in other parts of Europe.

Losers: Losers from this model could potentially be the factories producing new clothes for the brand. If the business model has a positive impact on recycling levels the recycled material would replace virgin materials and jobs in the industry for producing virgin materials would be lost. These jobs are mainly located outside the Nordic region.

If the model becomes widespread it could potentially reduce the supply of quality used clothing to charity second hand shops. However, this is not seen as a significant risk.

Environmental benefits

Production phase effects: In this model, following return, articles are repaired and then sold to new customers extending the lifetime of the articles. This should offset the production of new textile articles. The level of displacement depends on the percentage increase in “usage time”⁵ compared to a purchased article. There is unfortunately no data available on this percentage increase but it can be assumed to be significant particularly for baby and children’s clothes where the user fast outgrows the article.

Environmental savings will be gained in the entire production chain of textile products. If the usage time of an article is increased by 100% (i.e. reused once) this will offset production chain environmental pressures by up to 50% but dependent on the degree to which purchase of the used item displaces the purchase of a new one. In addition, articles suitable for reuse are likely to be of higher quality than average articles which may mean a greater weight of fibres used in the article and may

⁵ Usage time is taken to mean the intensity of use multiplied by the period over which it is used. An article of clothing can last many years in someone’s wardrobe without being used. In this case the lifetime might be high but the total usage time would be low. It is the usage time of an article of clothing which is key in how much it offsets the purchase of new similar clothing articles.

mean a change in the type of fibre mix used. This may reduce the environmental benefits during the production of the products but information is not available to predict to what extent this might occur.

A British study has revealed that one tonne of jumpers sent for direct reuse can result in a net GHG saving of 9 tonnes CO₂-eq or just over 4.5 kg CO₂-eq per jumper. Similarly 1 tonne of T-shirts for direct reuse can result in a net GHG saving of 13 tonnes CO₂-eq, which is approximately 3kg CO₂-eq per T-shirt. In addition to the carbon benefits, there are parallel resource and energy savings as a result of the reuse activity (WRAP 2011).

Use phase effects: Due to increased usage time, it is expected that the article will be laundered a greater number of times during its lifetime than item which is not reused. However, if the article is compared to its alternative which provides the same functional unit (i.e. one pair of reused jeans compared to two pairs of purchased jeans which last half as long each) then the total number of laundering cycles and associated environmental pressures are not expected to increase.

Return of articles to the company and resell to a new user will be associated with some transportation. This may happen a few times during the article's life. However, in the alternative scenario where several of the same articles are purchased this will also involve transportation for each new purchase. Therefore, no significant difference in transport effects is seen.

The model is not expected to have any notable effect on use-phase environmental pressures.

- Summary: Potentially high reductions in textile production impacts per article but dependent on percentage increased usage time which is uncertain.

4.6 Fact Sheet 6: Clothing libraries

4.6.1 Description

Overview

A clothing library is similar to an "ordinary" library, where clothes are lent and borrowed instead of books or music. The business model can be run on a voluntary basis with free rental or as a business with regular membership fees. The library can be either physical or virtual.

In the physical version members borrow from and return clothing to a central location. This location and the staff to run it represent potential

cost elements. However, the staffing may also be provided voluntarily in a rota by members of the library and costs of the room can potentially be supported by municipalities. The clothing in the library is typically donated by producers, designers, members or organisations and is the property of the library. However, models could also be envisaged where the original owner retains ownership. Fines can be charged for late returns.

The virtual alternative is currently seen as an internet site which links lenders and borrowers to one another. Lenders typically gain a credit when they lend an article of clothing which they can then use to borrow another members article. All exchanges are sent by post at the lenders expense or via physical meetings between the lender/borrower. Clothing remains the property of the original lender. An alternative is a virtual version of the physical library, where an initiator owns the clothes and sends them to the borrower either for free or in return for a fee.

The potential sustainability benefit of the model is to make greater use of clothing during its useful lifetime. The model gives users the opportunity to rapidly renew their wardrobe without the need to purchase new textiles.

From the users point of view there can be varying motives for joining a clothing library: access to a variety of clothes at a relatively low cost; unification of interest in fashion and reducing consumption and interest in the concept of collaborative consumption (Pedersen & Netter, 2013).

Existing examples

The following examples, is a non-exhaustive list of initiatives in the Nordic countries:

- Klädoteket, www.kladoteket.se
- Re-second, www.resecond.com
- Lånegarderoben, www.lanegarderoben.se
- Share your closet, www.shareyourcloset.dk

Scope

The model usually covers clothes for adults and most commonly women's clothing rather than men's. Underwear tends not to be commonly exchanged. The model is also applicable for children's and baby clothes. The business model only exists so far for private consumers.

Key actors

- Library owners and/or initiators
- Library members

- Brands and/or designers who donate clothes and who may design more durable library friendly clothing.
- Municipalities who may support non-profit initiatives

4.6.2 Opportunities and obstacles

Challenges

Consumer mind-set: Borrowing clothes rather than owning them demands a significant change in perception and behaviour (Hansen 2013).

Security: In the case where ownership is retained by the original owner worries about damage to lent articles may also be a challenge. The inclusion of fines/penalties for damages can perhaps remove this barrier.

Lack of both financial and human resources (Pedersen & Netter 2013). Clothing libraries examined in this study are almost solely run by voluntary labour, and location and limited opening hours are considered to be some of the most significant barriers to growth. None of the libraries currently generate profits (ibid).

Low quality of clothing: clothing of higher quality is best suited to this model which is based on increasing the intensity of use of individual items. The growth in budget fashion is a challenge to this.

Documentation

There are no documentation and reporting requirements or targets set for this type of business model.

Assisting instruments

Financial support: The business model could benefit from receiving state/municipality support in terms of either finances for start-up costs or provision of a location for a library perhaps linked to existing book/music libraries.

Increased knowledge and acceptance: The spread of the business model is dependent on increasing knowledge and acceptance in the population to borrow/lend clothes. This could be provided via information campaigns (preferably supported by the fashion industry) or by use of behavioural change tools such as nudging. Linking to either existing libraries or adoption by highstreet brands may also lead to more rapid acceptance.

Design for greater durability: A general improvement in the average quality of clothing put on the market would increase the potential of clothing libraries to become more widespread and be perceived as a viable means for extending wardrobes. This could be encouraged

through various means: 1. linking particular brands to libraries 2. Quality labelling on clothing 3. Charging per article import duties.

Eco-labelling on durability and on reuse: The Swedish Bra Miljöval for example includes an option for labelling of reused clothes as a good environmental choice. Other more widespread labels such as the Nordic Swan could be developed to do the same. The label criteria would need to make it possible for a clothing library to receive permissions to apply the label to all their clothing. Labels could be developed to also include criteria on durability of products. This would aid clothing libraries in identifying which clothing would be suitable for use in the library.

4.6.3 Evaluation

Material flows

There are no official recordings of the quantities of textile which are reused through physical clothing libraries. This business model is relatively new. Re-Second in Copenhagen estimates that between 40 and 50 dresses change hands every week at its single shop (Hansen 2013). At the end of September 2013 the virtual clothing library Share your closet had facilitated 255 shares between its users since its launch in January 2013. This is an average of 25 shares per month (Pinholt, M. L. 2013). There is no knowledge on the composition of the exchanged textiles but this is likely to be representative of general compositions in clothing on the market though perhaps with a high representation of more durable, higher quality materials.

Key economic costs and income factors for model

The costs and benefits for the business model are relatively easily predicted. Most clothing libraries charge a membership fee, and all models presented in this study are supplied with free clothing from various actors including the members themselves. Benefits are therefore related to numbers of members not numbers of exchanges. Fines for late return may also be included as an income.

For a virtual library most of the cost will involve designing and maintaining an internet site plus marketing. For physical libraries costs will include expenses for premises and personnel. However, marketing may also be an expense. Depending on how the business model is run, the personnel might work voluntarily perhaps via including in the model a duty for members of the library to take turns to staff it. Premises could potentially be provided by municipalities. Support from actors such as donators and municipalities make the business model potentially vulnerable.

In a recent report, an online retail store and an online rental model is compared (Ellen McArthur Foundation 2013). The calculations for the two business models show, that rental model is expected to pay higher profits than that of the conventional retail model. The largest bonus is a decrease in “store operations and SG&A.” The second largest gain is achieved via savings on COGS which is savings on cost of goods sold, driven by decrease in clothing production from 29 garments per year (retail) to 16 garments per year (rental).

It is uncertain whether these results could be directly transferred to clothing libraries but, it should be noted, that the economic benefits for clothing libraries could be larger than for online rental services since libraries would not be required to deliver or launder clothing. On the other hand income is typically raised from membership fees, not per exchange.

- Summary: unclear without further study.

Winners and losers

Winners: Consumers will be able to extend their effective wardrobes at a lower price than by buying new clothes. In Pedersen & Netter (2013) libraries are described as providing a “creative playground” without the costs, risks, and burden of ownership. Library owners will benefit from the profit (if any) they make from membership fees.

Designers and/or brands which donate clothes to libraries, have an opportunity to test and market their collections. A fashion library in Helsinki cooperates with young, local designers, to give them the opportunity to enter the market.

Nordic jobs for people employed at clothing libraries could be created. Possibly, however, at the expense of Nordic jobs in retailing.

Losers: This will mainly comprise producers of new clothes, assuming that making use of a clothing library reduces the consumption of new clothes which are mostly manufactured outside Nordic countries. This could mean loss of jobs in countries located outside the Nordic region. Brands could potentially mitigate their loss by participating in clothing libraries and thus earning money by marketing their collections via this channel. As also discussed later the displacement effect is rather uncertain.

Environmental benefits

Production phase effects: The environmental effect of clothing libraries per user is highly dependent on the displacement effect i.e. to what extent the use of the library displaces the purchase of new clothes. If the membership of a clothing library results in a reduction of consumption of new clothes, the environmental benefits will be related to the reduction in the

resource-, energy-, and chemical use which will be saved in the production phase as a result of the reduction in purchase of new clothes.

There is no direct study on the displacement effect for clothing libraries. A recent UK study found that the re-use displacement effect from buying a used item rather than a new one is only 28% for textiles (WRAP 2013a). This means that less than a third of all purchases of used textiles replace the purchase of a new item. There is thus considerable “risk” that consumption of used clothing might not reduce consumption of new clothing proportionally.

This displacement effect might however not be directly transferred for a clothing library. Membership of a library potentially expands a consumer’s wardrobe several times over which potentially could increase the displacement effect. On the other hand if only people who can’t afford new clothes join the library the displacement effect will be minimal. An added complication is second-order effects i.e. if people save money by using the clothing library rather than buying new clothes, what they use the saved money on is critical for the net environmental benefits. If they use savings for local cultural/recreational experiences or purchase of low impact-intensive services the environmental savings may be high. If they use it on purchase of other material goods or for travel there may be no net gain.

In general, a high overall displacement effect and resulting benefits can only be expected if the cost of library membership is equivalent to what the consumer would have spent on new clothing.

Use phase effects: Use phase impacts are expected to remain unchanged since no increase in laundering cycles per user is expected as a result of this model.

- Summary: Potentially high per user of library but unclear without further study.

4.7 Fact Sheet 7: Repair and fitting

4.7.1 *Description*

Overview

This is not a new business model but rather an old model that has dwindled in the Nordic countries over past decades as new clothes became relatively cheap.

Repair and fitting services can be carried out by either by clothing brands or other actors. If the brands perform repair and fitting services it will often be offered via retailers.

Repair and fitting is performed in order to extend the life of a specific garment by either repairing something which is broken and/or altering it to a different size.

These types of services are seldom used and are often relatively expensive in the Nordic region. Repair is sometimes offered in combination with dry cleaning services since they deal with more expensive garments for which small repairs can be cost-effective.

The service can also be provided as an extra service from retailers mostly as part of retailing of high-quality relatively expensive clothes and clothing types such as suits.

Existing examples

- Skredder John, www.skredderjohn-as.com
- Wahlströms skrädveri & kemptvätt, www.wahlstromsskradveri.se
- Skrædder service, www.skraedderservice.dk

Scope

This business model is relevant for all sectors (i.e. households, government, and private businesses) and in for all types of textile products.

Key actors

- Tailors.
- Customers.
- Dry-cleaners or retailers in the event of them hiring a tailor in as part of their service.

4.7.2 Opportunities and obstacles

Challenges

Low prices of fast fashion versus high labour costs: As long as there is fast fashion with high turnover in collections, low prices on garments and relatively high wages in the Nordic countries, it is challenging for this business model to make a significant return to Nordic markets. Garments are cheap to replace and fashion changes too quickly in order for one to want to maintain a specific piece. This results in low demand for repair and fitting services. Much of the repair services take place in other countries with lower labour costs where possible.

There may be highest potential for home textiles which aren't subject to changing fashion.

Documentation

There are no documentation and reporting requirements or targets set for this business model.

Assisting instruments

Reduced or no VAT on repairs: For everyday clothes and household textiles, repairs are relatively expensive compared to buying a new piece. A reduction or removal of the VAT would reduce the buying price of repair and fitting services, but it is still doubtful whether such a price incentive would be significant enough to be effective.

Design for greater durability: A general improvement in the average quality of clothing put on the market could increase the demand for repairs and alterations. This is based on the assumption that higher quality clothes would result in more expensive textile products which users would want to preserve longer.

Reduced emphasis on changing collections: The high street fashion industry could be encouraged to reduce the number of new collections they develop each year and place emphasis on quality and high prices rather than turnover of individual pieces. This would require a change in mind-set of the industry as a whole.

Support for repair services and workshops in public spaces such as libraries. These could be designed to equip, educate and inspire people to take care of their own clothes through activities such as repair and redesign.

4.7.3 Evaluation

Material flows

There is no knowledge of the quantities which are reused through this model or the composition of the reused textiles. A recent report shows that 16% surveyed cited "need for repairs" as a reason some items of clothing were unworn in the last year, whereas 57% cited "no longer fits me." Nearly one in five people could use over half of their unworn clothes if they were repaired (19%) this equates to around 166 million clothing items in Britain (WRAP 2012a). The same study also shows that it would be "very likely" or "fairly likely" that 27% of the people surveyed would wear more of the clothes which haven't been worn in the past 12 months, if tailoring services were provided in more High Street shops (ibid). Therefore, a displacement effect on purchase of new

clothes would be expected to result from this model though the magnitude cannot be ascertained from the figures above.

Key economic costs and income factors for model

Income for this business model is solely generated by the repair service. Costs are related to the labour which as mentioned, is relatively high in the Nordic region. In addition, there are costs for spare parts and other materials needed for the repair, premises, and marketing.

WRAP (2013b) explores a business model where a national retail store offers repair and upgrading service as well as workshops designed to equip, educate and inspire people to take care of their clothes through activities such as repair, better care and redesign. The model has a relatively high cost base and generates low amounts of revenue. Under a conservative scenario it does not provide any payback over a 10 year period.

In Denmark, statistics show that an average household spends a bit more than EUR 1,600 per year on fabrics and clothes, but less than EUR 18 (approx. 1% of textiles budget) on repair and dry-cleaning (Statistikbanken.dk/FU5).

- Summary: Businesses are challenged by low demand and high labour costs.

Winners and losers

Winners: In the event of repair and fitting services provided by retailers, retailers/brands could benefit from more loyal and/or new customers, since this service is demanded (WRAP 2013b).

If conditions changed such that this service became more attractive to customers due to e.g. increasing emphasis on quality clothes then the model has the potential for creating jobs in Nordic countries.

Losers: Losers could potentially be the producers of fast fashion textile products, but the increased demand for repair and fitting would have to be quite significant before an actual effect in consumption is expected. Any effect would mainly result in lost jobs outside the Nordic region during the production of fibres and manufacture of new textiles. On the other hand producers of high quality clothes could gain from the model if customers knew they could get such items repaired locally. Demand for these clothes could thus be increased.

Environmental benefits

Production phase effects: In this model articles are repaired extending their functional lifetime. This should offset the production of new textile articles. The level of displacement depends on the percentage increase in

“usage time” compared to a purchased article which was not repaired. There is unfortunately no data available on this percentage increase but it can be assumed to be significant.

Environmental savings will be gained in the entire production chain of textile products. If the usage time of an article is increased by 100% this will offset production chain environmental pressures by up to 50%.

Use phase effects: Due to increased usage time, it is expected that the article will be laundered a greater number of times during its lifetime than if the article was not repaired. However, if the article is compared to its alternative which provides the same functional unit (i.e. one shirt which is repaired doubling its lifetime compared to two pairs of purchased shirts which last half as long each) then the total number of laundering cycles and associated environmental pressures are not expected to increase. Therefore the model is not expected to have any effect on use-phase environmental pressures.

- Summary: Potentially high per article but dependent on percentage increased usage time resulting from repair which is unclear.

4.8 Fact Sheet 8: Luxury second hand shops

4.8.1 Description

Overview

The luxury second hand shop business model is a model where an actor separate from the producer re-sells used clothes. Contrary to second-hand shops run by charity organisations, these shops are run for-profit. Luxury second hand shops are usually rather selective in terms of styles and brands which they accept, but the scope varies significantly from shop to shop. Many luxury second hand shops are run as consignment shops where individuals can leave their garments for sale, and then split the profit with the consignment shop. The split of the profit is commonly 50–50. Under this model the original owner retains ownership of the article until it is sold.

Other luxury second hand shops are sourced from vintage clothing and used garments wholesalers often hand-picked by shop managers/buyers. Under this model the shop owner owns all articles in the shop.

The effect of the business model is to increase levels of reuse by making use of the large amounts of clothes which are hanging unused in wardrobes (WRAP 2012b) by giving them a value.

Existing examples

- Affordable Luxury, www.affordable-luxury.se
- O.S.V. (and so on), www.o-s-v.dk
- Tonica Vintage Corner, www.tonicavintage.com
- Beyond Retro, www.beyondretro.com

Scope

The business model usually covers clothes for both children and adults (although most commonly for women's clothing rather than men's clothing). The business model targets private consumers.

Key actors

- Shop owners.
- Consumers who can act as both buyers of the used clothes, and in some cases also as the suppliers of used clothes (in the case of consignment shops).
- Suppliers of high quality used clothes/vintage clothes (quite commonly found abroad), from which the shop managers/buyers supply their shop.

4.8.2 Opportunities and obstacles

Challenges

Payment of VAT on sales: A key challenge for the consignment shop model (at least in Denmark) is that they are eligible for VAT on sales, but cannot claim for input VAT since they are "buying" from ordinary people rather than businesses. This makes this type of business model difficult to run and drives some consignment shop owners into running at least part of their business without reporting to the authorities (Danish EPA, forthcoming).

Lack of supply of suitable clothing: For this business model to be supplied with used clothes it is essential that consumers hand in their used clothes directly to the consignment shops or to charity from where shop managers/buyers can retrieve suitable garments. If used clothes remain unused in wardrobes (which is the case for around 30% of all unwanted clothes in the UK: WRAP, 2012b) or if used clothes are discarded as waste, the supply of clothes for this business model might not be sufficient. Consumer behaviour change might thus be necessary.

Consumer mind-sets: While second-hand and vintage clothes have increasingly been perceived as trendy since the financial crisis, many consumers may still have negative associations with wearing second-hand

clothes with concerns over hygiene or status. Others may just not be aware of this as a viable alternative to new products. A change in people's mind set is thus crucial for this business model to develop.

Low prices of fast fashion: As long as there is fast fashion with high turnover in collections, low prices on garments it is challenging for this business model to make a significant return to Nordic markets

Documentation

There are no documentation and reporting requirements or targets set for this business model.

Assisting instruments

Financial support: Wage costs are a significant entry in the accounts and shop owners could benefit from employing personnel with support and/or receiving guidance to arrangements which already exists (like e.g. wage subsidy job arrangements or the like).

Reduced VAT: Removing or reducing VAT on used clothing/textiles would considerably increase the economic viability of the consignment shop model.

Increased knowledge and acceptance: The spread of the business model is dependent on increasing knowledge of the model as well as increasing acceptance in the population to wear used clothes. One consignment shop owner reports of at least 20 similar shops in Copenhagen and relatively tough competition. Indeed the owner reports that consignment shops are accepted on equal terms with "ordinary shops." It might thus have reached a saturation point in Copenhagen, but for the model to spread to other cities and regions there is a need for increased awareness. This could be done via information campaigns (preferably coming from the fashion industry) or by use of behavioural changing tools such as nudging.

Eco-labelling on durability and on reuse: The Swedish Bra Miljöval for example includes an option for labelling of reused clothes as a good environmental choice. Other more widespread labels such as the Nordic Swan could be developed to do the same. The label criteria would need to make it possible for luxury second-hand to receive permissions to apply the label to all their clothing. Labels could be developed to also include criteria on durability of products. This could increase the supply of good quality clothing for reuse.

4.8.3 Evaluation

Material flows

One consignment shop in Copenhagen reports to sell between 8 and 10 pieces of clothes per day on average (Jørgensen, 2013).

Key economic costs and income factors for model

The income for this business model is based on sales of used items. The costs are related to consignment pay-backs in the event of consignment shops, and costs for buying products in the event of vintage shops. In addition, there are costs for premises, personnel and marketing.

In a recent study by Managers of three consignment shops in Copenhagen were interviewed report turnovers between DKK 100,000 and DKK 1,2 million. All three managers report to at least break even and earn reasonable salaries from the business, although their previous careers were better paid (Skov, Larsen and Netter, 2011).

A further consignment shop owner is currently considering selling the shop since it is difficult to make it grow (Jørgensen, 2013). Despite turnovers of more than DKK 2.4 million, the owner estimates that consignment shops are seldom profitable for *investors*. Salaries for shop personnel VAT and fixed expenses quickly absorb revenues. The wage costs are considerable in Nordic countries and shops where the owner does not at least partly step in behind the counter tend to be difficult to make profitable. This removes human resources that would otherwise be used for expansion, marketing etc. (ibid).

- Summary: Unclear without further study. Businesses break-even but are struggling with making profits and/or expanding the business.

Winners and losers

Winners: Consumers will benefit from this business model, since they will be able to receive quality clothes at a cheap(er) price than that of new clothes. Secondly, shop owners will benefit from the profit they make of their sales. Thirdly, consumers and/or businesses selling their used clothes and/or suppliers of used/vintage clothes benefits from their sales.

WRAP has suggested that there is a positive local net job effect for re-use of different types of clothing (WRAP 2011). This result might be transferrable to a Nordic context.

Losers: Losers from this model could potentially be producers of new clothes, although a recent report states that the re-use displacement effect in Britain from buying a used item rather than a new one is only

28% for textiles (WRAP 2013a). This means that only less than a third of all purchases of used textiles replace the purchase of a new item. Potential job losses would be in the production and manufacture of fibres and clothing which are almost exclusively located outside the Nordic region.

Environmental benefits

Production phase effects: The environmental gains from this model would all be during the production phase of textiles products due to the displacement of the purchase of new clothing. The environmental gains would include reductions in emissions of toxic chemicals including dyes, pesticides etc. reductions in the demand for water and other resources.

The magnitude of these savings per luxury second hand article sold is highly dependent on the level of the displacement effect. A study from Britain indicates that the re-use displacement effect from buying a used item rather than a new one is only 28% for textiles (WRAP 2013a). This means that only less than a third of all purchases of used textiles replace the purchase of a new item. However, this result is for the average article of second hand clothing. Due to the generally rather high prices paid for luxury second-hand compared to second-hand clothes in charity shops, and the high quality of the items the displacement effect is likely to be far higher for this model.

A further UK study estimated that one tonne of sweaters sent for direct re-use can result in a net GHG saving of 9 tonnes CO₂-eq or just over 4.5 kg CO₂-eq per jumper. Similarly 1 tonne of T-shirts for direct reuse can result in a net GHG saving of 13 tonnes CO₂-eq, which is approximately 3kg CO₂-eq per T-shirt. In addition to the carbon benefits, there are parallel resource and energy savings as a result of the reuse activity (WRAP 2011).

Use phase effects: No changes are expected in environmental pressures caused during the use phase: Used clothes will need laundering no more or less than the alternative new purchased clothes would have.

- Summary: Potential in the production phase depending on the displacement effect which is unclear.

5. References

- Article L541-10-3 (inséré par Loi n° 2006-1666 du 21 décembre 2006 art 69 finances pour 2007 Journal Officiel du 27 décembre 2006).
- Beton, A., Dias, D., Farrant, L., Gibon, T., Le Guern, Y., Desaxce, M., Per-wueltz, A., and Boufateh, I. (2011): Environmental Improvement Potential of Textiles (IMPRO), European Commission, BIO Intelligence Services and ENSAIT, http://susproc.jrc.ec.europa.eu/textiles/docs/120423%20IMPRO%20Textiles_Publication%20draft%20v1.pdf
- Bloomberg (2013): Give H&M your old clothes, get a discount, <http://www.businessweek.com/articles/2013-06-27/give-h-and-m-your-old-clothes-get-a-discount>
- Boomerang (2013): Personal communication with Lang Unenge, C, Creative Director Boomerang International AB, 4 October 2013.
- Brännsten, C. (2013). Personal communication with Cecilia Brännsten, Global Project Manager for the H&M Garment Collecting program.
- Danish EPA (forthcoming): Fremme af affaldsforebyggelse og øget genanvendelse i tekstilbranchen, Unpublished report by the Danish EPA
- Décret n° 2008-602 du 25 juin 2008 relatif au recyclage et au traitement des déchets issus des produits textiles d'habillement, des chaussures ou du linge de maison neufs destinés aux ménages.
- Eco TLC. (2013). <http://www.ecotlc.fr>
- Ellen McArthur Foundation (2013): Towards the Circular Economy – opportunities for the consumer goods sector
- H&M (2013): <http://www.hm.charitystar.com/en/home/>
- Hansen, J. L. (2013): Se min kjole, skal vi bytte? Information 21. August 2013
- Hvass, K.K. (2013): Post-retail Responsibility of Garments – A Fashion Industry's Perspective, Journal of Fashion Marketing and Management, forthcoming
- I:CO (2013): Jack & Jones joins new recycling concept with customer rewards, <http://www.ico-spirit.com/en/press/jack--jones-joins-new-recycling-concept-with-customer-rewards,7.html>
- Ignatius, N. (2013): Personal interview, 26. September 2013.
- Jørgensen, N. (2013): Personal correspondence with consignment shop owner in connection with the project, 19 September 2013.
- Klättermusen (2009): Returned deposits on outdoor clothes and equipment! Klättermusen launches a unique recycling programme, http://www.klattermusen.se/img/nyheter/pdf/KM_pressrelease_rECoVer_EN.pdf
- Lindhqvist, T. (2000). *Extended Producer Responsibility in Cleaner Production*. IIIEE Dissertation 2000:2.
- Skov, L., Larsen, F., and Netter, S. (2011): Kommissionsgenbrug: imellem nyt og gammelt, Copenhagen Business School, Creative Encounters.
- Statistikbanken.dk/FU5: Husstandenes årlige forbrug efter forbrugsart, husstandsgrupper og prisenhed.

- Pedersen, E. R. G. & Netter, S. (2013): Collaborative Consumption: Business Model Opportunities and Barriers for Fashion Libraries, CBS Working Paper – DRAFT.
- Pinholt, M. L. (2013): Personal communication with Maria Lindebæk Pinholt, initiator to Share Your Closet, 23 September 2013.
- PUMA (2012): Puma introduces biodegradable and recyclable products, press release, October 2012, http://about.puma.com/wp-content/themes/aboutPUMA_theme/media/pdf/2012/incycleen.pdf
- Sjöström, P. (2013). Personal communication with P. Sjöström, Marketing Manager Boomerang.
- Teijin (2013): Closed-loop Recycling System ECO CIRCLE, <http://www.teijin.com/solutions/ecocircle/>
- Tojo, N., Kogg, B., Kiørboe, N., Kjær, B. and Aalto, K. (2012): Prevention of textile waste – material flows of textiles in three Nordic countries and suggestions on policy instruments, TemaNord 2012:545, Nordic Council of Ministers, <http://www.norden.org/da/publikationer/publikationer/2012-545>
- Van de Wiel, H. (2013): Giving old clothes a second life, DWMA 2013.
- Van Son, B. (2013a): Personal communication, 31. October, 2013.
- Van Son, B. (2013b): Personal communication, 9. September, 2013.
- WRAP (2011): A methodology for quantifying the environmental and economic impacts of reuse, WRAP November 2011, Project Code: SAP 134.
- WRAP (2012a): Valuing our clothes: the evidence base, Project code RRC-001, WRAP
- WRAP (2012b): Valuing our clothes, <http://www.wrap.org.uk/sites/files/wrap/VoC%20FINAL%20online%202012%2007%2011.pdf>
- WRAP (2013a): Study into consumer second-hand shopping behaviour to identify the re-use displacement effect, WRAP March 2013, Project Code MDP007-001.
- WRAP (2013b): Evaluating the financial viability and resource implications for new business models in the clothing sector, Project code RNF100-005, WRAP.

6. Sammenfatning

Dokumentet er den anden rapport under Nordisk Ministerråds projekt "En EPR-ordning og nye forretningsmodeller til øget genbrug og genanvendelse af tekstiler i Norden." Dette materiale er resultatet af Del 1 i projektet "An extended producer responsibility (EPR) system and new business models to increase reuse and recycling of textiles in the Nordic region". Rapport for Del 2 vil blive publiceret når projektet er klart I december 2014. Projektet er et af seks projekter under initiativet Resourceeffektiv genbrug af plast- og tekstilaffald, der blev lanceret af Nordisk Affaldsgruppe (NAG) som del af de nordiske statsministres grøn vækst initiativ, Norden – ledende i grøn vækst.

Otte af de 24 EPR-ordninger og forretningsmodeller, der er beskrevet i rapport 1, blev udvalgt til en mere detaljeret indsamling af informationer og kvalitativ vurdering.

Ved valget af de 8 modeller til denne kvalitative vurdering, var der fokus på modeller, der menes at have potentiale for udbredelse, under de rigtige rammebetingelser. Modellerne skulle også repræsentere elementer fra det fulde spektrum af modeller, som er identificeret i rapport 1. Følgende 8 modeller blev valgt til kvalitativ vurdering:

- Obligatoriske EPR-ordninger.
- Frivillige individuelle ERP-ordninger (eget varemærke).
- In-store indsamling med partner.
- Leasing af eget varemærke.
- Gensalg af brugt eget varemærke (enten in-store eller online).
- Tøjbiblioteker.
- Reparation og tilpasning.
- Kvalitets-second-hand forretninger.

Hver model præsenteres i et fakta-ark, der giver et kort overblik over ordningen eller forretningsmodellen, efterfulgt af en beskrivelse af udfordringer, hjælpeinstrumenter, primære økonomiske udgifter og indtægtsfaktorer, tabere og vindere samt miljømæssige fordele. Hvert fakta-ark giver en stor mængde information

En obligatorisk EPR-ordning er mest tilbøjelig til at give markante stigninger i indsamling af brugte tekstiler. Individuelle, frivillige EPR-

ordninger indeholder dog stærke incitamenter til *upstream effects* det vil sige forbedringer i design, der fremmer genbrug, eller tillader effektiv genanvendelse, afhængig af EPR-ordningens fokus. Obligatoriske, kollektive EPR-ordninger kan potentielt give incitamenter til opstrøms-effekter, men det kræver meget omhyggeligt design.

En lang række forretningsmodeller er blevet afprøvet i både større og mindre skala. Nogle har været, og er stadig, succesfulde, mens andre har været nødt til at lukke ned, ofte på grund af økonomiske vanskeligheder eller mangel på arbejdskraft. I nogle tilfælde er der brug for økonomisk hjælp til at dække udgifter til opstart, marketing og muligvis drift.

Traditionelle koncepter for, hvordan tekstilprodukter markedsføres, og tilbydes til forbrugere, er en barriere for de fleste modeller. Det gælder både den måde, producenter ser deres rolle på markedet, og hvordan forbrugere ser deres muligheder for at opnå og kassere produkter. Det er afgørende at udfordre de nuværende lineære modeller, og skabe opmærksomhed om alternativer blandt både forbrugere og producenter. For en række forretningsmodeller gælder, at forbrugere har en dobbeltrolle, både som leverandør af materialer (brugte tekstilprodukter) og efterspørgere efter produkter eller services (second-hand eller leasede produkter). Begge roller kan være væsentlige for, at forretningsmodellen kan fungere.

En række forretningsmodeller tilbyder økonomiske incitamenter til borgere for at returnere brugte tekstiler, når de er færdige med at bruge dem. For modeller, der involverer returneringsordninger for brugte tekstilprodukter, forsøger nogle detailhandlere at opmuntre forbrugerne til at returnere brugte tekstilprodukter, ved til gengæld at tilbyde rabatkuponer på køb af nye varer. Sådanne incitamenter risikerer at fortrænge ordningens miljømæssige fordele ved at opfordre til øget forbrug af nye produkter. Producenter/detailhandlere bør overveje andre former for incitamenter.

Mange forretningsmodeller afhænger af, at tekstilprodukter anvendes af mange brugere og får deres aktive brugstid forlænget. For disse forretningsmodeller er øget kvalitet af tøjet og design, med henblik på genbrug og genanvendelse væsentligt at inddrage. Der er behov for fokus på designfasen via f.eks. at uddanne designere i langtidsholdbare design.

Med hensyn til de miljømæssige påvirkninger, forventes modeller, der er baseret på genbrug (længere aktiv levetid for tøjet) at give flere miljømæssige fordele end modeller, der er baseret på genanvendelse. Der er dog usikkerhed om den såkaldte "erstatningsgrad". Erstatningsgraden indikerer, i hvilken grad købet (eller andelen/lejen) af et brugt

stykke tøj, erstatter købet af en nyt. Dette er vigtigt, når man evaluerer omfanget af forretningsmodellernes miljømæssige fordele.

Afslutningsvis forventes det at flere af forretningsmodellerne vil skabe nye jobs inden for indsamling, sortering, service og reparation i de nordiske lande, på bekostning af produktionsjob i Asien.

Rapportens resultater er en del af de nordiske statsministres overordnede grøn vækst initiativ, *Norden – ledende i grøn vækst*. Læs mere i webmagasinet *Green Growth the Nordic Way* på www.nordicway.org eller på www.norden.org/greengrowth

**3rd Report:
Costs and benefits of EPR-
systems and two business
models for reuse and recycling
of textiles**

Task 4

*David Watson (CRI), David Palm, Haben Tekie, Steve Harris and
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1. Key Messages

- objectives of the task were to select four of the 8 models assessed under Task 3 of the project and provide a qualitative evaluation of their costs and The objectives of the task were to select four of the 8 models assessed under Task 3 (2nd Report) of the project and provide a qualitative evaluation of their costs and benefits.
- The four models evaluated are: Mandatory EPR, Voluntary collective EPR, In-store collection with a partner and Resell of own brand. The systems should not be viewed as mutually exclusive.
- A large number of assumptions have been made during the evaluation, some of which can be significant sources of uncertainty.
- The potential magnitude of collection is the most crucial characteristic with respect to overall environmental gains. Mandatory or widely adopted voluntary collective EPR systems can collect much larger volumes than in-store collection and resell of used own brand models.
- All models appear to be break even, but the resell of own brand model enjoys the highest profit margin. The mandatory EPR system would create most green jobs while the in-store collection with partner would create fewest.
- For the in-store collection model only direct income and cost elements have been included in the economic evaluation. Retailers may enjoy indirect increases in sales as a result of a greener image and the distribution of rebate coupons. These may result in an overall economic gain to the retailer but risk undermining environmental gains.
- The reuse element gives by far the largest environmental gain per collected tonne for all four models. The low value of non-reusable textiles means these contribute a minor amount to revenues. A technological breakthrough in cost efficient high grade recycling combined and design of textiles for recycling would work in favour of all models.
- The key messages and findings presented in this report are part of the Nordic Prime Ministers' green growth initiative, *The Nordic Region – leading in green growth*.

2. Executive Summary

This report presents the results of Task 4 of the Nordic Project “An EPR system and new business models to increase reuse and recycling of textiles in the Nordic region.” The project is one of six projects that constitute *Resource Efficient Recycling of Plastic and Textile Waste*, which was launched by the Nordic Waste Group (NWG) as part of the Nordic Prime Ministers’ green growth initiative, *The Nordic Region – leading in green growth*.

The objectives of this task were to select four of the 8 models assessed under Task 3 (2nd Report) of the project and provide a more detailed and, where possible, quantitative evaluation of their costs and benefits. This evaluation, along with the results of Task 3, may provide some guidance to Nordic countries in identifying which of the models are worthy of further promotion. They will also together provide a starting point for the development of tailor-made packages of assisting policy instruments in 2014.

Selection of models for evaluation

Key criteria for selection of models for further evaluation was 1) size of impact on the textile flows and environmental gain 2) ease of implementation, 3) availability of relatively robust data and information for enabling an evaluation and 4) representation of a spread of different model types. The Nordic Council of Ministers Waste Group had already in the project description required that one of the models evaluated should be a mandatory EPR.

A first assessment of these criteria was made for all eight models emerging from Task 3 and the results were presented at a Nordic workshop in Stockholm in November 2013. After discussions and interaction with the participants, the following four models were chosen for evaluation:

- Mandatory EPR.
- Voluntary collective EPR.
- In-store collection with a partner.
- Resell of own brand.

The evaluation should generate knowledge that is relevant for a discussion and decision on what model(s) could be implemented in the Nordic

countries. Representatives for the Swedish EPA indicated that the creation of green jobs is a relevant aspect to investigate. Hence, the evaluation focused on the following aspects:

- Net environmental gain.
- Net economic costs.
- Number of green jobs created.

The results from Task 3 are mainly qualitative and the project does not allow for any substantial data collection or complex calculations and only simple indicative calculations are made. The data collection is limited to data gathered under Task 3 of the project, other recently completed projects and other easily available sources. Estimates of the order of magnitude can be done based on previous experience. Where qualitative data is not available, assumptions have been made supported by qualitative discussions.

The findings presented in this report are part of the Nordic Prime Ministers' overall green growth initiative: *The Nordic Region – leading in green growth*. Read more in the web magazine *Green Growth the Nordic Way* at www.nordicway.org or at www.norden.org/greengrowth

Summary of evaluation and assumptions

It has been necessary to make a large number of assumptions during the evaluation, some of which can be significant sources of uncertainty. The assessments of Nordic-wide environmental gains, green jobs etc. are particularly uncertain since they include non-robust assumptions of the spread of each model within the region. In the light of the significance of some of these assumptions, this evaluation should not be viewed as grounds for selecting one system over another. It should rather be considered as a first evaluation of the potential of each system for bringing environmental and economic benefits as a basis for further study. Moreover, the systems should not be viewed as mutually exclusive. Both the in-store collection with partner and the resell of own brand systems can potentially be operated in parallel with or as a part of mandatory or voluntary collective EPR systems.

It is the reuse element which gives by far the largest environmental gain per collected tonne. The reuse level of collected used textiles has been estimated as lying in the range between 40% and 60% for all models. The displacement rate for reuse – i.e. the degree to which a resold article offsets the purchase of a new article – has been assumed to be similar for all models but could in reality differ widely. For example, the resell of used own brand could be expected to have a higher displace-

ment effect due to the higher quality of resold items and their high price compared to average resold products under a mandatory EPR system.

It is the potential magnitude of collection that is, however, the most crucial characteristic of each system with respect to overall environmental gains. According to the evaluation, mandatory or widely adopted voluntary collective EPR systems have the potential for collecting much larger volumes of textiles than in-store collection and resell of used own brand models. The potential scale of the latter two models may have been underestimated in this evaluation with respect to the amount of used textiles collected per store, since they are still under development and consumer awareness of them is not high. However, it is the more all-encompassing nature of the EPR systems which ensures their dominance in terms of collected volumes.

Environmental gains resulting from changes in design or production of textiles have not been considered in this evaluation. If such gains were to be considered the resell of own brand would fair even better. Companies engaging in resell of used own brand have clear incentives to produce high quality clothing to be able to sell the same product several times.

If collective mandatory or voluntary EPR systems are carefully designed they can also include elements which encourage such upstream effects. For example, contribution fees could be reduced for producers that avoid the use of certain hazardous chemicals during production, produce higher quality longer lasting articles or design for easier recycling i.e. by avoiding fibre mixes. Some brands engaging in in-store collection are also considering means for closing material loops.

The economic evaluation identifies some clear winners though all models appear to be break even. The mandatory EPR system would create most green jobs while the in-store collection with partner would create fewest. With respect to the in-store collection model it is important to note that only direct income and cost elements have been included in the economic evaluation resulting in a loss for the stores. However, there are also likely to be indirect increases in sales as a result of an improved green image, and as a result of the distribution of "rebate off next purchase coupons." These may result in an overall economic gain to the retailer. However, rebate coupons also risk undermining environmental gains.

A key issue for all models (although less for Resell of used own brand) is the low value of recyclable textiles. A technological breakthrough in cost efficient high grade recycling combined with appropriate design for recycling would work in favour of all models.

The table below gives an overview of the evaluation of the different models for the main evaluation criteria. The green jobs for the EPR systems may not necessarily be in the Nordic region since it may be hard to compete on sorting with sorting facilities with cheaper labour in other parts of Europe.

Summary of the evaluation of the four models (Nordic region)

Model	Net Environmental gain	Net Economic gain	Possible green jobs
Mandatory EPR	High	Positive	2,000
Voluntary collective EPR	Medium–High	Positive	900
In-store collection	Low	Negative (for brands) Positive (for sorters)	0
Resell of own brand	Low	Positive	350

Summary of key assumptions and their influence on results

Model	Assumption	Level of uncertainty	Impact on result
All models	Textiles that are currently not collected separately, are stored in the household	<i>High</i> (much of it is likely to end in mixed waste)	<i>Low impact on environmental gain calculations.</i> Incineration of mixed waste would give a similar result under average conditions.
z	A resold item will displace the purchase of 0.6 new items	<i>High</i> (UK results from regions ranged between 0.11 and 0.52)	<i>High impact on environmental gain calculations.</i> Reuse dominates environmental gains
	All recycled textiles are downcycled into insulation	<i>Low/Medium</i> (there is also considerable downcycling into industrial rags but very little recycling back into textiles in Europe)	<i>Low impact on environmental gain calculations.</i> There is a large variation in environmental gains from different types of recycling but in general downcycling which dominates in Europe has low gains. This could change in future if new recycling back to textiles is developed and expands.
	Only water and greenhouse gas emissions included	n/a	<i>Low impact on ranking of models according to environmental gain.</i> Since all models have similar effects i.e. increasing reuse and recycling the ranking would remain unchanged by the inclusion of impact categories such as eco-toxicity.
	Mixed collected textiles can be sold to sorters for EUR 500 per tonne	<i>High</i> (the figure is based on existing prices but the prices are known to fluctuate significantly with time)	<i>High impact on net economic benefits calculations.</i> This is the most important income for all models apart from the resell of used own brand model.
Mandatory EPR	Increase from current 32% collection rates to 75% collection rates	<i>Medium</i> (both figures are uncertain but are of the right order of magnitude)	<i>High impact on all results.</i> The collection rate is the single most important factor for environmental, economic and green jobs assessments.
	50% reuse, 40%	<i>Medium</i> (different	<i>High impact on environmental gain</i>

Model	Assumption	Level of uncertainty	Impact on result
	recycling and 10% incineration	sorters report quite different values. The higher quantities are collected the lower the likely rate of reuse)	<i>calculations.</i> Reuse dominates environmental gains
	Cost elements based on French EPR	<i>Medium</i> (cost might be higher in Nordic countries due to higher labour costs etc.)	<i>Medium impact on net benefits calculations.</i> Benefits elements are likely to be the same as French due to international market for reused and recycled while costs are likely to be higher. Can reduce viability of all models.
Voluntary collective EPR	Increase from current 32% collection rates to 57–75% collection rates	<i>Medium</i> (as for mandatory)	<i>High impact on all results.</i> (as for mandatory)
	50% reuse, 40% recycling and 10% incineration	<i>Medium</i> (as for mandatory)	<i>High impact on environmental gain calculations.</i> (as for mandatory)
	Cost elements based on French EPR	<i>Medium</i> (as for mandatory)	<i>Medium impact on net benefits calculations</i> (as for mandatory).
In-store collection with partner	2,000 stores would be involved	<i>High</i> (this is based on rough calculation of numbers of large stores)	<i>High impact on environmental gain calculations under total Nordic perspective.</i> Number of stores involved is crucial element of total collected textiles.
	Each store collects 1.13 tonnes per year	<i>Medium</i> (based on average M&S levels but highly dependent on size and turnover of store. Did not have this info)	<i>Medium impact on environmental gain calculations under Nordic region perspective.</i> This will be an important element of total collected textiles but uncertainty is medium.
	2.5 minute processing time for each bag of returned textiles	<i>High</i> (nothing to base this assumption on)	<i>Medium impact on net economic benefit calculations.</i> If doubled it would not be the most significant cost element.
	Half of customers would not use rebate voucher	<i>High</i> (based on assumptions in another study)	<i>High impact on net economic benefit calculations.</i> Is the most important cost element for the model.
Resell of used own brand	2,900 stores would be involved	<i>High</i> (this is based on rough calculation of numbers of stores selling high quality clothes)	<i>High impact on environmental gain calculations under Nordic region perspective.</i> Number of stores involved is crucial element of total collected textiles.
	Each store collects 1.13 tonnes per year	<i>Medium</i> (based on average Boomerang levels but highly dependent on size and turnover of store. Did not have this info)	<i>Medium impact on environmental gain calculations under total Nordic perspective.</i> This will be an important element of total collected textiles but uncertainty is medium.
	30 minute processing time per returned garment	<i>High</i> (no available data)	<i>High impact on net economic benefit calculations.</i> Is the most important cost element for the model.
	Half of customers	<i>High</i> (based on as-	<i>Low/medium impact on net economic</i>

Model	Assumption	Level of uncertainty	Impact on result
	would not use rebate voucher	assumptions in another study)	<i>benefit calculations</i> . Even if quadrupled it would not be the most significant cost element.
	50% reused (including restyled), 30% recycled and 20% given to charity	<i>Medium</i> (based on one study)	<i>High impact on environmental gain and net economic benefit calculations</i> . Resell dominates both environmental gains and economic benefits
	Resell at EUR 17 per garment	<i>Medium</i> (based on a single company using the model)	<i>High impact on net economic benefit calculations</i> . Is the most important income element for the model. Halving this would remove all the profit.

3. Introduction and approach

3.1 Background

This report presents the results of Task 4 of the Nordic Project “An EPR system and new business models to increase reuse and recycling of textiles in the Nordic region.” The project is one of six projects that constitute *Resource Efficient Recycling of Plastic and Textile Waste*, which was launched by the Nordic Waste Group (NWG) as part of the Nordic Prime Ministers’ green growth initiative, *The Nordic Region – leading in green growth*.

Under Task 2 (1st Report) a literature review was carried out identifying different types of EPR systems and other relevant actions which constitute key elements of business models which have the effect of increasing the reuse and recycling of textiles. A report was produced summarising the results of the study.

Under Task 3 (2nd Report) of the project, eight of these systems and business models were selected for a more detailed information gathering exercise and a first *qualitative* assessment. This assessment comprised development of a Fact Sheet for each of the eight models. The Fact Sheets:

- provided a short description of the model
- described obstacles to the current viability/spread of the model and potential instruments that could mitigate these obstacles
- identified economic winners and losers if the model became more widespread
- identified key economic cost elements and income elements for the business adopting the model
- potential magnitude of environmental benefits per textiles article or per user of the model.

The 2nd Report provided a catalogue of ideas for businesses and government, and identified some key obstacles to and potential assisting factors in the spreading of these ideas.

The objectives of Task 4 are to further filter down and select four of these models for a more detailed and, where possible, qualitative evalua-

tion. This evaluation, along with the results of Task 3, should provide some guidance to Nordic countries in identifying which of the models are worthy of further promotion. They will also together provide a starting point for the development of tailor-made packages of assisting policy instruments in 2014.

3.2 Selection of models for evaluation

The following criteria were developed for selection of the four models described under Task 3 of the project for further evaluation:

- The model has a potentially large impact on the textile flows and environmental gain.
- The model is easy to implement.
- Relevant and robust input data and information for the evaluation is available.
- The model is distinctively different from the models already chosen.
- The NAG have already required in the project description that one of the models considered must be a mandatory EPR.

Criteria 1 and 2 were proposed by representatives from the Swedish EPA. They are important because they focus the evaluation on the most promising models. Criterion 3 is necessary to make the evaluation possible and accurate – the preliminary results from Task 3 indicate that the input data are in fact scarce and mainly qualitative. Criterion 4 means that the evaluation will give insights that are complementary to the evaluation of the first two models. This increases the knowledge gained from Task 4 as a whole.

The following procedure was applied for selecting the final model(s):

1. A qualitative assessment of the relative potential impact on the textile flows and environmental gain. This is presented in Figure 8.
2. An assessment of Criterion 2 with Good, Medium and Bad on these issues allocated for each model. This is presented in Table 1.
3. At the Nordic workshop:
 - a) the project presented its views on the impact on textile flows and asked for feedback and comments. The participants were in general agreement with the ranking.

- b) participants were asked to rank models according to Criterion 2
- c) the assessment of data availability and robustness was presented
- d) the situation was discussed with participants and agreement on a final choice taking into account Criterion 4 & 5.

Figure 8 ranking of potential environmental gain

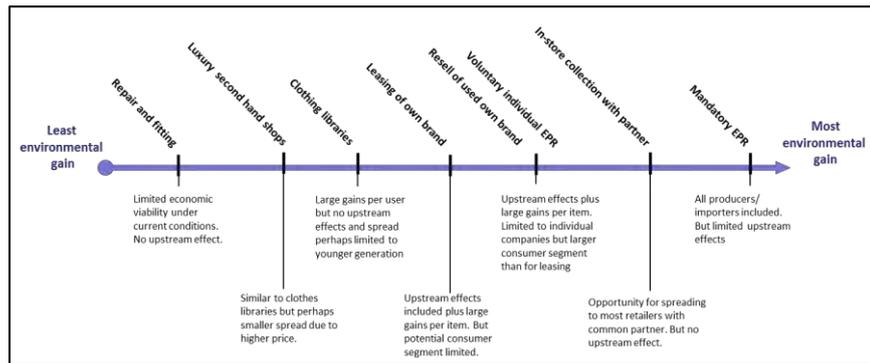
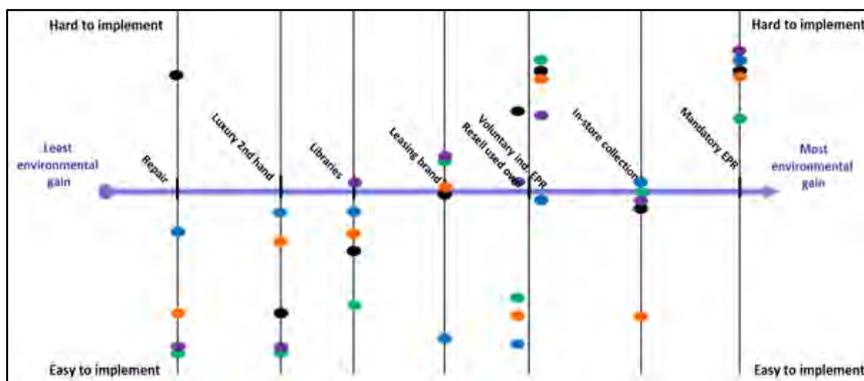


Table 1 assessment of availability of robust data for evaluation

Business model	Availability of robust data			Overall ranking (Medium 1 to Bad 3)
	Net environmental benefits	Net economic costs	Number of green jobs created	
Mandatory EPR schemes	Medium	Bad	Medium	2
Voluntary individual EPR (own brand)	Medium	Bad	Bad	3
In-store collection with a partner	Medium	Bad	Medium	2
Leasing of own brand	Medium	Bad	Bad	3
Resell of used own brand (either in-store or online)	Medium	Bad	Bad	3
Clothing libraries	Medium	Bad	Medium	2
Repair and fitting	Medium	Medium	Medium	1
Luxury second hand shops	Medium	Medium	Medium	1

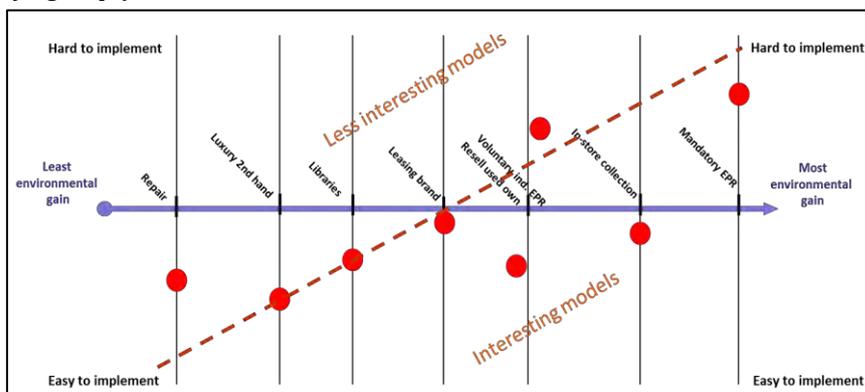
The results of step 3b were as follows. The participants were divided into 5 groups and each agreed on the ranking of each model with respect to ease of implementation. The ranking was rather spread for each model – for some more than others. The results of the ranking of the 5 groups for each models is shown in Figure 9.

Figure 9 Ranking of environmental gain and ease of implementation (all 5 groups - distinguished by colour)



The average ranking for each model is shown in Figure 10. The diagonal line is a rough division between interesting and uninteresting models for further evaluation taking Criteria 1 and 2 into account. Those under the diagonal are seen as low hanging fruit i.e. relatively high impacts compared to the difficulties of implementation.

Figure 10 Ranking of environmental gain and ease of implementation (average of 5 groups)



The results would suggest that the four models: *Mandatory EPR*, *In-store collection with a partner*, *Resell of own brand* and to a lesser extent *Leasing of own brand* come out as interesting models.

A direct vote was also taken on which three models each group felt most interesting to evaluate other than Mandatory EPR which was preselected. However, the participants demanded that voluntary individual EPR was changed to voluntary collective EPR. The results are presented in Table 2.

Table 2 Results from workshop vote

	No. of votes
Voluntary <i>collective</i> EPR	5
In-store collection with partner	3
Leasing of own brand	2
Resell of used own brand (either in-store or online)	3
Clothing libraries	1
Repair and fitting	0
Luxury second hand shops	1

Thus, the results of the two processes were similar. However, a new model was introduced that has not been covered by Fact Sheets. This is for voluntary collective EPR. This is potentially problematic as this model has not been described so far in the project. It is potentially identical to the mandatory EPR in that the structures of the system might be very similar. The main differences are likely to be:

- The ambition of the targets set for collection and reuse/recycling.
- The proportion of producers/importers who would be part of the scheme.

In the mandatory scheme, given a certain % of free-riders at least 90% of the market is likely to be included.⁶ In a voluntary scheme it could be significantly lower. An assumption of this would need to be made, perhaps based on the share of the market represented by national federations of clothing and textiles producers/retailers.

Following subsequent discussions with the Nordic Council of Ministers it was agreed to carry out evaluations for the following models:

- Mandatory EPR.
- Voluntary collective EPR.
- In-store collection with a partner.
- Resell of own brand.

Unfortunately, the list includes one model with bad data availability (resell of own brand). Lack of data for this model was partially compensated for using data gathered on such a model in the UK (Buttle *et al.*, 2013).

⁶ Estimate.

3.3 Evaluation method

The evaluation should generate knowledge that is relevant for a discussion and decision on what model(s) could be implemented in the Nordic countries. Representatives for the Swedish EPA indicated that the creation of green jobs is a relevant aspect to investigate. Hence, the evaluation focused on the following aspects:

- Net environmental gain.
- Net economic costs.
- Number of green jobs created.

The results from Task 3 are mainly qualitative and the project does not allow for any substantial data collection or complex calculations and only simple indicative calculations are made. The data collection is limited to data gathered under Task 3 of the project, other recently completed projects and other easily available sources. Estimates of the order of magnitude can be done based on previous experience. Where qualitative data is not available, assumptions have been made supported by qualitative discussions.

3.3.1 *Functional unit*

The functional unit is the calculation basis in a quantitative evaluation, where environmental impacts, net costs etc. are calculated and presented per functional unit. However, a functional unit can also be the basis for a qualitative discussion on, for example, what model has the greatest environmental gain per functional unit.

In this study, the environmental gain, net economic costs and number of green jobs are discussed in the context of two different functional units:

- 1 additional tonne of textiles collected and subsequently processed by the model compared to being stored in the household or disposed of in mixed waste.
- 1 year with the model implemented in the Nordic region i.e. taking into account total material flows of textiles in the region as a whole (not split by country) compared to the baseline norm for post-consumer textiles in the Nordic region as a whole.

The first functional unit allows presentation of more reliable results and conclusions. The second functional unit is needed to understand if the model is effective or not. For the environmental assessment, the different reuse models are expected to give very similar results if for Functional unit A. With Functional unit B, the evaluation will be much more uncertain, but the results will indicate the environmental significance of choosing a model that has large impacts on the textile flows.

3.3.2 Net environmental benefits

All of the models that have been selected for this evaluation involve collection of used textiles and subsequent processing, reuse, resale and/or recycling depending on the model. Environmental gains have been calculated for the two functional units:

- Environmental gains *per additional tonne of textiles that are collected* by the system and subsequently handled, compared to being stored in the household or disposed of in mixed waste.
- Environmental gains *per year across the Nordic region as a whole* given assumptions about the spread of the model and the total number of additional tonnes collected and handled by it compared to the baseline.

The baseline conditions are presented in Section 2.1.

Most of the environmental benefits are likely to be connected to the reduced production of materials that are displaced by reused and recycled textiles. For this reason, it is important to estimate the environmental benefits and impacts from a life-cycle perspective. However, environmental pressures considered have been limited to greenhouse gas emissions and water use.

Relevant environmental data and knowledge that are easily available were identified and estimations of impacts and benefits are based on this information. Where such data is lacking assumptions have been made to make the evaluation possible. Assumptions of total flows of textiles handled by each model have also been made. An overview of the key assumptions is provided in the summary at the end of this report along with their potential influence on the results.

Although environmental impacts have been quantified, due to the high number of assumptions these should not be considered to be accurate. They rather provide an indication of the magnitude of environmental pressures. As already mentioned, in general the results will be more

accurate for the first functional unit than for the second since the second includes a greater number of assumptions.

3.3.3 *Net economic costs/benefits*

Estimates of economic costs and benefits strongly depend on the perspective. From a societal perspective, taxes, salaries etc. are not costs but transfers within the system. The economic cost or benefit appears as a change in gross domestic product. Estimating such effects is beyond the scope of our economic evaluation because it requires data from general equilibrium models that are not available in this project.

Instead, we estimate the economic costs and benefits from a life-cycle business perspective. This means that the costs include investments, salaries, taxes, etc. that companies pay.

Again costs and benefits are calculated for the two function units i.e. per tonne of collected post-consumer textiles and per year for the Nordic region as whole given assumptions concerning the spread of the model within the market.

When quantitative data are available from the easily available sources, net economic costs have been calculated by deducting revenues from sale of reused and recycled textiles. A few data gaps can be filled through assumptions. An overview of the most important of these is again provided in the summary at the end of this report. Similarly as for the environmental assessment, where a large share of the quantitative data is missing, we can only make a qualitative or semi-quantitative estimate of the net costs.

3.3.4 *Green jobs*

To estimate the number of green jobs created, the concept of green jobs need to be defined. In the context of this project, green jobs are tentatively defined as jobs in the reuse and recycling system. Then the number of greens jobs could in principle be calculated as the salary cost divided by an average salary. If such information is not easily available, the number of green jobs could be roughly or qualitatively estimated by discussing what share of the total cost can reasonably be salaries. Since this estimate will be related to the available information on economic cost, it cannot be more accurate than the economic estimate.

Some of the models may involve or affect charity second-hand shops. Most of the people involved in such shops today are volunteers. Their input should probably not be counted as green jobs, but they still need to

be accounted for in the discussion, because of the reciprocal social value of being a volunteer. The inclusion of social aspects was also a widespread wish from many of the participants at the Stockholm workshop in November. One must also account for the work-training provided by the charity second-hand business. These aspects have only been discussed qualitatively.

4. Evaluation of models

4.1 Baseline information

Baseline information on consumption, collection and subsequent handling of textiles is specified in Table 3 based on Watson *et al.* (2013). A total of 368.8 ktonnes of textiles are consumed per year in the Nordic region which amounts to 14.2 kg per capita.

Table 3 Baseline information on consumption, collection and subsequent handling of textiles across the Nordic region

	Amount (kg per capita)	Percentage
Consumption	14.2	100%
Collection	4.5	32%
Reuse*	2.2	16%
Recycling**	1.4	10%
Incinerated and landfilled***	6.6	46%
Unknown end of life****	3.2	23%
Storage*****	0.8	5%

* Including 50% of exported textiles (Tekie *et al.* 2013).

** Including 40% of exported textiles (Tekie *et al.* 2013).

*** Including 10% of exported textiles (Tekie *et al.* 2013).

**** Assumed as incinerated or landfilled.

***** By calculation.

For the environmental gains of *additional reuse* compared to the baseline, we consider a reuse displacement effect of 60% based on Farant (2008), i.e. one reused item offsets the purchase and thereby the production of 0.6 new items. This level of displacement can be disputed and a more recent study by WRAP (2012) showed a displacement level of only 29% in the UK. The WRAP study, however, only looked at reuse within the UK and not export to e.g. Africa or Eastern Europe. It also identified a very large range in displacement rates of between 11% and 52% in the different regions of the UK. Since no study has been made for the Nordic region including exports other than Farrant (2008), this was chosen as the general assumption.

The environmental pressures of new production are based on Palm *et al.* (2013), Engelhardt (2010), Mekonnen and Hoekstra (2011) and Kalliala and Nousiainen (1999) and simplified to only include greenhouse gas emissions and water use.

4.1.1 Greenhouse gas emissions

Production of 1kg of cotton leads to emissions of 16kg CO₂eq (Palm *et al.* 2013) and production of 1kg of polyester leads to emissions of 14kg CO₂eq (Palm *et al.* 2013). World production of fibres is 41% cellulose based of which 36% cotton and 57% synthetic fibres of which 45% is polyester. This is simplified to 60% polyester and 40% cotton (Engelhardt, 2010 and Palm *et al.* 2013).

With a displacement factor of 0.6, *additional reuse* of 1 kg of textile products (60% polyester and 40% cotton) displaces production of 360 g of new polyester and 240 g of new cotton, giving a total saving of 8.9kg CO₂eq per kg of reused textiles.

For *additional recycling* of textiles, a model is assumed where textiles are down-cycled into insulation products that replace glass wool. According to Watson *et al.* (2013) most recycling of textile waste in Europe entails downcycling rather than recycling into new textiles. According to Palm *et al.* (2013) downcycling as insulation material offsets 1.2kg CO₂eq per kg of waste textiles.

Net greenhouse gas emissions benefits of additional reuse and recycling should ideally also take into account the environmental pressures resulting from the current waste treatment from which the textiles have been diverted. These can be positive or negative depending on the treatment method. However, this would require developing a model which would include life cycle processes for all waste treatment options across the Nordic countries and the fuels offset by incineration for heat and power. Development of such a model is beyond the scope of this project.

Instead, for the purposes of this project it is assumed that the textiles would otherwise have been stored unused in the original owner's cupboard i.e. with no end-of-life stage and associated pressures. The actual end result of this are not too dissimilar to another baseline scenario which assumed 100% incineration for all post-consumer textiles, with the heat offsetting natural gas and the electricity offsetting the average European fuel mix. This scenario would have resulted in a very small environmental gain of 0.06 kg CO₂ per kg of textiles waste which would need to be subtracted from benefits of additional reuse or recycling.

Another key assumption is that all recycling comprises downcycling to insulation. Other options such as downcycling into industrial rags could have been considered but again the time available for the assessment did not allow for these nuances. I:CO (2013) lists insulation as the most usual recycling option in Europe which supports the assumption made.

4.1.2 Water use

Water used for production of 1kg of cotton fabric is 8,600 litres including green and blue water⁷ following the water footprint methodology (Mekonnen and Hoekstra, 2011). Water used for production of 1 kg of polyester fabric is 10 litres, based on Kalliala and Nousiainen (1999).

Reuse then saves 5,160 litres per kg of cotton and 6 litres per kg of polyester with a total saving of 2,100 litres per kg textile mix.

Recycling into insulation that replaces glass wool saves about 6 litres of water per kg textile (Ecoinvent centre, 2007).

Transport related impacts are not included in the environmental evaluation, but are not considered to be significant compared to the impacts of other processes.

There are several other important environmental impacts related to textiles such as toxic effects related to pesticides, insecticides and chemical. It is, however, difficult to quantify these aspects in an easy way. This and the fact that the impact related to the analysed models would be rather similar these impacts are not included in the evaluation.

4.2 Mandatory EPR

For the mandatory EPR we include the collection system and information but no effects on the design of textile products to make them more appropriate for reuse or recycling.

It is assumed that the system builds on current collection by charities but supplemented by increased kerbside-and container collection to make collection more easily accessible to consumers and improve collection rates. It is assumed that the EPR system achieves a target of 75% collection of used clothing and home textiles (See 2nd Report).

Reported shares of subsequent reuse and recycling of collected textiles differ between sorters. KICI states an average of 50% reuse, 40% recycling and 10% incineration (See 2nd Report) while Humana report that of the textiles sorted at their sorting facility in Vilnius, Lithuania approximately 75% are reused, 20% are recycled and 5% landfilled (Kaj Pihl pers. comm.).

⁷ Blue water is water abstracted from freshwater resources i.e. surface water or groundwater during the production of goods. This includes irrigation of crops. Green water is rainwater absorbed by crops which are later used to make the products for which the water footprint is calculated. Blue water and green water is typically added together to give a water footprint.

As the collection increases from the current 32% to 75%, the average quality of the collected textiles is likely to decrease. This is because households are currently mostly donating items which they think can be reused. Under a mandatory EPR they would increasingly be delivering textiles unsuitable for reuse. Therefore, the figures quoted by KICI instead of the higher reuse share reported by Humana have been used.

There is also an issue that there may be a limit to quantities that can be recycled in Europe but for this report the recycling market is assumed to be elastic and capable of managing the additional supply.

See Table 4 for key figures for effects of the model on the flow of post-consumer textiles in the Nordic region as a whole and Table 5 for the effects per collected tonne of textiles compared to baseline conditions.

Table 4. Handling of Nordic textiles under a mandatory EPR system compared to baseline conditions

	Baseline	Mandatory EPR
Collection	32%	75%
Reuse	16%	40%
Recycling	10%	25%
Incineration & Landfill	69%	30%
Storage	5%	5%

Table 5. Handling of each additional tonne of collected used textiles with a mandatory EPR compared to handling under baseline (stored in home)

	Baseline	Mandatory EPR
Reuse	-----	54%
Recycling	-----	33%
Incineration & Landfill	-----	13%
Stored in home	100%	-----

The effects on the collected textiles are assumed to be largely unchanged by the introduction of a mandatory EPR.

4.2.1 Net environmental benefit

The net environmental benefit is roughly considered to be carbon dioxide equivalents and water saved from reuse and recycling. The net environmental benefit from a mandatory EPR can be seen in Table 6 per tonne additional used textiles collected and in Table 7 per year of operation.

Table 6 Net environmental benefits from a mandatory EPR per tonne of *additional* post-consumer textiles collected

	Carbon dioxide eq. avoided (tonnes)	Water use avoided (tonnes)
Reuse	4.7	1,100
Recycling	0.4	2.0
Total	5.1	1,100

Table 7 Net environmental benefits resulting from *increased* reuse and recycling caused by adoption of a mandatory EPR per year of operation in the Nordic region as a whole

	Carbon dioxide eq. avoided (tonnes)	Water use avoided (tonnes)
Reuse	750,000	180,000,000
Recycling	63,000	320,000
Total	810,000	180,320,000

4.2.2 Net economic cost

The costs for the mandatory EPR include operation cost i.e. ongoing costs of running and maintaining the business model for different actors. These consist of:

- collection costs and transport costs for collectors
- operational costs and costs for purchasing of textiles from collectors for sorters
- information costs (to get people to recycle textiles) administrative costs and R&D costs for the producers. In addition, the producers also pay a subsidy to the sorters.

Benefits from the business model are also quantified; these include benefits for collectors from selling the collected textiles to sorters and sorters benefits from selling the sorted textiles. Since the operating costs are based on compensation levels, the investments costs are included in the operation costs.

The collection costs are based on a combination of recycling centre and curb-side collection, where the cost is SEK 1,046/tonne (EUR 118 per tonne) based on current average compensation for a fraction of the collection system for packages and newspaper (Stenmarck *et al.*, 2010). These costs include costs to collect in existing systems.

Transport costs of SEK 560/tonne (or EUR 63 per tonne) are based on KICIs figures for textiles on the Stockholm trial (Avfall Sverige, 2013, Personne 2013), which are the transportation costs to KICIs sorting partner.

In the French mandatory EPR, the textiles collected (by e.g. charities) are bought by the sorters for EUR 500 per tonne (Avfall Sverige, 2013,

Personne 2013). In addition, sorters have sorting costs, which are EUR 450/tonne, based on KICIs figures in the Stockholm trial (Avfall Sverige, 2013, Personne 2013).

From the assumptions given in the baseline information, we know that 368,800 tonne of textiles are consumed every year out of which 32% or 118,000 tonne is already collected. With a mandatory EPR it is assumed that 75% will be collected, thus if a mandatory EPR is implemented i.e. 158,600 tonne of textiles will be collected additionally each year.

Based on these facts, the costs for collectors across the Nordic region as a whole can be estimated. The collection costs are (Stenmarck *et al.*, 2010). 158,600 tonne is collected yearly, at a cost of EUR 118 per tonne giving a total cost of EUR 19,000,000 per year. The collectors will also handle the transportation of the collected textiles and with a cost of EUR 63 per tonne (Avfall Sverige, 2013, Personne 2013), transport costs will amount to about EUR 10,000,000 per year.

The collected textiles are later sold by the collectors to the sorter. The total price given by sorters for 158,600 tonne at EUR 500 per tonne comes to EUR 80 million per year. In addition, the sorters total operational costs at EUR 450 per tonne amounts to about EUR 70 million per year. Thus, the total cost for the sorters is EUR 150 million per year.

Information costs in the French mandatory EPR are paid by the local authorities, which in turn are paid by the producers. This means that costs in reality are paid by the producers. The information costs are based on a study conducted by Tekie *et al.* (2013), where the information costs for introducing recycling centres and curb-side collection amounted to SEK 9.6 million/year i.e. SEK 1 per person per year in Sweden. Since there are about 25.9 million people living in the Nordic countries, we assume that the information costs are SEK 25.9 million/year or EUR 2.93 million per year. This is similar to the French EPR where information costs are EUR 0.1 per capita (Tiard, 2013).

Based on the French EPR system (Tiard 2013), the producers also pay for administration, R&D and support to sorters. The subsidy to sorters (EUR 11per year) is 65% of the total budget and information costs (EUR 2.93 per year) is 25% of total budget. Administration is 8% and R&D is 2% of total budget. This means that administration costs amount to about EUR 2.5 million per year (16 EUR/tonne) and R&D amount to EUR 0.31 million per year (EUR 2per tonne).

Collectors will also make an economic benefit. Since the collected clothing are sold to the sorters for EUR 500 per tonne, the collectors make a benefit of EUR 80 million per year. Giving a revenue of EUR 70 million per year.

Besides the collectors the sorters also benefit from this business model. The sorters sell the sorted textiles for EUR 1,000 per tonne and receive an additional EUR 69 per tonne from producers via the EPR scheme for sorting the textiles (Tiard 2013). This gives an income of about EUR 170 million per year and total revenue of EUR 20 million per year for sorters.

Table 8 Costs and benefits of Mandatory EPR for different actors

Actors	Costs		Benefits		Total revenue EUR/year
	EUR/tonne -	Million EUR/year	EUR/tonne	Million EUR/year	
Investment*					
Operation					
Collectors					
Collection	118	20			
Transport	63	10			
Sold textiles to sorters			500	80	
<i>Total costs brands</i>	<i>181</i>	<i>30</i>	<i>500</i>	<i>80</i>	<i>50</i>
		<i>Total benefits</i>			
Sorters					
Bought textiles	500	80			
Sorting	450	70			
Sold textiles			1,000	159	
Subsidy from producers			69	11	
<i>Total costs sorters</i>	<i>950</i>	<i>150</i>	<i>1,069</i>	<i>170</i>	<i>20</i>
		<i>Total benefits</i>			
Producers					
Information	18.5	2.9			
Administration	16	2.5	1,000	2.3	
R&D	2	0.31	1,000	2.3	
Subsidy to sorters	69	11			0.1
<i>Total costs producers</i>		<i>17</i>			

*investment costs are included in the operation costs.

4.2.3 Green jobs

The main part of the added work due to a mandatory EPR is in the sorting industry although there will also be an increase in collection and transportation of used textiles.

If sorting is located in the Nordic region, which might be possible with the extra income provided by the EPR system there can be the possibility of increased low paying jobs.

A very rough estimate with 75% of sorting cost (75% of EUR 70 million) related to employees and a salary of EUR 10 per hour would give about 2,000 jobs in a Nordic sorting industry.

4.3 Voluntary collective EPR

The distinction between mandatory and voluntary responsibility, relates to whether the EPR is introduced by law. Legal EPR-systems which are introduced by e.g. the national state or the European Union (EU) are *mandatory* for the producers that are included by the legal framework. Voluntary initiatives are generally introduced by the producers themselves or via voluntary agreements with government driven by, pressure from the market i.e. customers, other producers, a wider stakeholder group, increasing prices on raw materials etc. This model covers a voluntary system which would be likely to be driven by voluntary agreements between branch organisations and government.

It is assumed here that the resulting system is largely similar to that of a mandatory EPR in structure. The main differences are likely to be:

- the ambition of the targets set for collection and reuse/recycling
- the proportion of producers/importers who would be part of the scheme.

The effects of a voluntary collective EPR are difficult to estimate since this is not performed in large scale anywhere. Therefore two scenarios are proposed where one is conservative and one is more optimistic. The conservative scenarios consider improvement of the current collection and sorting systems with varied assumptions of what could be diverted from incineration and landfill and capturing of used textile where the end fate is unknown.

The *conservative scenario* includes:

- 50% of used textiles are diverted from mixed municipal waste streams to additional separate collection.
- In addition 25% of used textiles with currently unknown fate is separately collected (this might be textiles stored in private households).
- 75% of currently separately collected textiles that is currently incinerated is diverted to reuse and recycling.

The *optimistic scenario* is assumed to give identical changes to textile flows as the mandatory EPR described in the previous section i.e. 75% of textiles put on the market is eventually collected separately (see Table 2).

The relation of reuse and recycling of collected textiles are considered equal to that of the mandatory EPR with an equal share of added amounts from avoided incineration in the conservative scenario.

Table 9 shows the effects on the Nordic textiles with a voluntary collective EPR for both the conservative and the optimistic estimate compared to the baseline. Table 10 shows the effects per *additional* collected tonne of used textiles compared to the baseline assumption. The large difference between the conservative and optimistic scenarios lies in the amount of textiles collected and there is only a small difference in treatment of collected textile.

Table 9 Handling of Nordic textiles under a voluntary collective EPR compared to baseline conditions

	Baseline	Conservative	Optimistic
Collection	32%	57%	75%
Reuse	16%	31%	40%
Recycling	10%	20%	25%
Incineration & Landfill	69%	44%	30%
Storage	5%	5%	5%

Table 10 Handling of each additional tonne of collected used textiles with a voluntary EPR compared to handling under baseline (stored in home)

	Baseline	Conservative	Optimistic
Reuse	----	57%	54%
Recycling	----	38%	33%
Incineration & Landfill	----	5%	13%
Stored in home	100%	----	----

4.3.1 Net environmental benefit

The net environmental benefits are roughly considered to be greenhouse gas emissions and water saved from additional reuse and recycling caused by the adoption of the model.

The net environmental benefit from a voluntary collective EPR can be seen in Table 11 per tonne of additional collected used textiles and in Table 12 per year of operation. Each result in Table 12 is presented as the range in value from the conservative to the optimistic scenario. The environmental benefit per tonne is higher for the conservative scenario than for the optimistic but the increase in collected amounts for the optimistic scenario makes this the environmentally better scenario for one year of operation.

Table 11 Net environmental benefits from a voluntary EPR per tonne of *additional* post-consumer textiles collected

	Carbon dioxide eq. saved (tonnes)	Water use saved (tonnes)
Reuse	5.1–4.7	1,200–1,100
Recycling	0.46–0.40	2.3–2.0
Total	5.6–5.1	1,200–1,100

Table 12 Net environmental benefits resulting from increased reuse and recycling caused by adoption of a voluntary EPR per year of operation in the Nordic region as a whole

	Carbon dioxide eq. saved (tonnes)	Water use saved (tonnes)
Reuse	490,000–750,000	120,000,000–180,000,000
Recycling	44,000–63,000	220,000–320,000
Total	530,000–610,000	120,000,000–180,000,000

4.3.2 Net economic cost

The voluntary collective EPR is included as a variant of mandatory but with different assumptions. Therefore we have used the same type of operation cost as in the mandatory EPR i.e. collection costs, transport costs, sorting costs, information costs and administrative costs:

- Collection costs – EUR 118 per tonne.
- Transport costs – EUR 63 per tonne.
- Information costs – EUR 93million per year.
- Administration costs – EUR 2.5million per year.

Administration and information costs are assumed to be independent of the number of tonnes collected i.e. are a fixed cost.

The benefits are also the same as in the mandatory EPR, charities, commercial collectors and the profits from selling the textiles per tonne. Thus the costs are:

From the assumptions given in the baseline information, we know that 368,800 tonne of textiles are consumed each year out which 118,000 tonne (32%) are already collected. If we assume that a total of between 57% and 75% is collected in the voluntary system, this gives *an additional* 92,200 to 158,600 tonne per year collected under the voluntary EPR.

Based on these facts the costs for collectors can be quantified. Collection costs EUR 118 per tonne and assuming 92,200 tonne/year additionally collected, gives about EUR 11 million per year. The collectors will also handle the transportation of the collected textiles and with a cost of EUR 63 per tonne, transport costs will amount to about EUR 6 million per year.

The collected textiles are bought by the sorters for EUR 500 per tonne and with 92,200 tonne per year collected, the costs amount to EUR 46 million per year. In addition, the sorters also have costs to sort the collected textiles, EUR 450 per tonne, which amounts to about EUR 42 million per year. Thus, the total cost for the sorters is EUR 88 million per year.

The subsidy to sorters (EUR 6.5 million per year) is 65% of the total budget and information costs (EUR 2.93 million per year) is 25% of total budget. Administration is 8% and R&D is 2% of total budget. This means that administration costs amount to about EUR 850,000 per year and R&D amount to EUR 200,000 per year.

Collectors will also have an economic benefit. Since the collected clothing are sold to the sorters for EUR 500 per tonne, the collectors make a benefit of EUR 46 million per year, giving a total revenue of EUR 29 million per year.

The sorters will also benefit from this business model. The sorters sell the sorted textiles for EUR 1,000 per tonne and receive an additional EUR 69 per tonne from producers for sorting the textiles (Tiard, 2013). This gives an income of about EUR 99 million per year and total revenue of EUR 11 million per year for sorters.

Table 13 Costs and benefits of Voluntary EPR under conservative collection rate assumptions

Actors	Costs		Benefits		Total revenue EUR/year
	Investment*	EUR/tonne	Million EUR/year	EUR/tonne	
Operation					
<i>Collectors</i>					
Collection		118	11		
Transport		63	6		
Sold textiles to sorters				500	46
<i>Total costs brands</i>		181	17	500	80
			<i>Total benefits</i>		29
Sorters					
Bought textiles		500	46		
Sorting		450	42		
Sold textiles				1,000	92
Subsidy from producers				69	7
<i>Total costs sorters</i>		950	88	1,069	99
			<i>Total benefits</i>		11
Producers					
Information	32.5		2.93		
Administration	9		0.85		
R&D	2		0.2		
R&D	69		7		
<i>Total costs producers</i>			11		

*investment costs are included in the operation costs.

If instead 75% is collected then the same costs and benefits as the mandatory EPR apply, these are summarized in table 14 below.

Table 14 Costs and benefits of Voluntary EPR under optimistic collection rates assumptions

Actors	Costs		Benefits		Total revenue EUR/year
	EUR/tonne	Million EUR/year	EUR/tonne	Million EUR/year	
Investment*	-				
Operation					
Collectors					
Collection	118	20			
Transport	63	10			
Sold textiles to sorters			500	80	
<i>Total costs brands</i>	<i>181</i>	<i>30</i>	<i>500</i>	<i>80</i>	<i>50</i>
		<i>Total benefits</i>			
Sorters					
Bought textiles	500	80			
Sorting	450	70			
Sold textiles			1,000	159	
Subsidy from producers			69	11	
<i>Total costs sorters</i>	<i>950</i>	<i>150</i>	<i>1,069</i>	<i>170</i>	<i>20</i>
		<i>Total benefits</i>			
Producers					
Information	18.5	2.9			
Administration	16	2.5			
R&D	2	0.31			
Subsidy to sorters	69	11			
<i>Total costs producers</i>		<i>17</i>			

*investment costs are included in the operation costs.

4.3.3 Green jobs

The main part of the added work due to a voluntary EPR is, as for the mandatory EPR, in the sorting industry although there will also in this case be an increase in collection and transportation of used textiles.

Under the conservative collection estimate the amounts sorted will be lower and the number of jobs will be fewer. With less material there might also be less of an incentive to start up sorting businesses which reduce the probability of sorting in the Nordic region.

With 75% of sorting cost (75% of EUR 30 million) related to employees and a salary of EUR 10 per hour, this would give about 870 jobs in a Nordic sorting industry under a voluntary EPR with conservative assumptions.

4.4 In-store collection with partner

In-store collection schemes in cooperation with partners encourage customers to bring used textile products of any brand, type and quality to high street stores. The garments are then passed over to a partner (collector) for subsequent processing. This processing includes transport to a central facility for sorting, and subsequent reuse, recycling and where this is not possible other forms of waste management. In this business model, brands take back all types of used clothes and home textiles from all brands independent of their state. Consumers who bring used textiles back to the brand shop may in return for their efforts receive some kind of economic benefit e.g. a voucher off the next purchase. In addition, brands may benefit from customers who use the voucher in their store.

One retailer that runs such an operation in Nordic countries is H&M in partnership with the international collecting, sorting and recycling company I:Collect. Marks and Spencer in the UK run a similar scheme with the charity Oxfam. The evaluation of in-store collection with partner model is mainly based on these two partnerships.

In this business model operational costs include treatment i.e. handling of collected textiles, staff and costs for handling vouchers and the cost of providing the voucher.

It is further assumed that half of the brands donate money to charitable or social causes, at the same rates as H&M in their current model, which is 0.02 EUR for each kilogram of textiles collected. For reasons of scale it is also assumed that only the big brands stores will implement this model.

There are approximately 2,000 of these big brand stores (H&M, KapAhl, Lindex, Dressman, Cubus and Jack&Jones) in the Nordic countries that have the potential to adopt this business model.

H&M collects about 112 tonnes in Sweden in their 177 stores annually (by linear extrapolation, since the collection has not been performed for a full year) (H&M 2013). However, since the collection is relatively new, the collection levels for M&S, which has collected for several years, are instead used as the basis adjusted in relation to revenue.⁸ This gives 1.13 tonnes collected annually per store or a total collection volume of

⁸ M&S collects 1100 tonnes per year with a revenue of 4.88bn€ which gives a collection of 225 tonnes per bn€. H&M has a yearly revenue in Sweden of 0.9bn€ which gives approximately 200 tonnes per year.

2,300 tonnes per year for the business model. This equals 0.62% of total textile consumption in the Nordic region.

According to H&M (Brännsten, 2013) the clothing sent to I:CO is 40–60% reused and 30–40% recycled. No information is given on how much is incinerated or landfilled but two scenarios can be created with a maximum reuse and recycling and a minimum reuse and recycling as stated in Table 15.

It is possible to argue that in-store collection may potentially compete with current collection systems i.e. that some of the collection is actually diverted from charity donations. To show the possible effects of competition two assumptions are shown in Table 16:

- No competition, where collection complements one other
- Competition, where half of the in-store collection is diverted from charity collection.

These are combined with the minimum and maximum reuse and recycling levels.

Table 15 Handling of each additional tonne of collected used textiles by an in-store collection with partner system compared to handling under baseline(stored in home)

	Baseline	Minimum	Maximum
Reuse	---	40%	60%
Recycling	---	30%	40%
Incineration & Landfill	---	30%	00%
Stored in home	100%	----	----

Table 16 Handling of Nordic textiles with an in-store collection with partner systems in place in all large stores compared to baseline conditions

	Baseline	No competi- on minimum	No competition maximum	Competition minimum	Competition maximum
Collection	32%	33%	33%	32%	32%
Reuse	16%	16%*	16%*	16%	16%*
Recycling	10%	10%*	10%*	10%	10%*
Incineration & Landfill	69%	68%*	68%*	69%	68%*
Storage in the home	5%	5%*	5%*	5%	5%*

*rounding error.

4.4.1 Net environmental benefit

The net environmental benefit is roughly considered as carbon dioxide equivalents and water saved from additional reuse and recycling caused by the scheme. Table 17 shows the benefits per additional tonne of textiles collected, while Table 18 shows the total impact per year of operation where 2,000 large stores across the Nordic regions has adopted the scheme.

The environmental benefits are to range from the minimum under the scenario of competition with charities combined with minimum reuse and recycling, to a maximum under a scenario with no competition and maximum reuse and recycling of collected textiles.

Table 17 Net environmental benefits from an In-store collection with partner per tonne of collected textiles in stores

[tonnes]	Carbon dioxide eq.	Water
Reuse	1.3–5.3	320–1,300
Recycling	0.17–0.48	0.87–2.4
Total	1.5–5.8	320–1,300

Table 18 Net environmental benefits from In-store collection with partner per year of operation across the Nordic region

[tonnes]	Carbon dioxide eq.	Water
Reuse	3,100–12,000	730,000–2,900,000
Recycling	400–1,100	2,000–5,500
Total	3,500–13,000	730,000–2,900,000

The net environmental benefits are likely to be somewhat reduced under systems where vouchers are given for the purchase of new clothing since this may further decrease the displacement effect of the collected textiles. This has not been quantified but should be considered as a potentially significant negative characteristic of this model.

This would be removed if other types of incentives were offered to customers i.e. rebate coupons for experiences such as going to the cinema, or a higher donation to charity. With respect to the latter, studies have shown that economic incentives based on self-interest can actually undermine pro-environmental behaviour (Berglund & Matti, 2006; Mont *et al.*, 2013). Moreover, people can gain more satisfaction from altruistic-based incentives (i.e. donations) than from incentives from which they themselves gain financially (Dunn *et al.*, 2008).

4.4.2 Net economic cost

The costs for In-store collection with partner are mainly related to handling costs and voucher costs for the producer. Main benefits are from selling of the collected textiles.

It is assumed that handling collected clothes does not consume much time for the staff since brands take back all types of used clothes independent of the state of the clothes and no sorting, restyling or repairing is needed (H&M 2013b). It is, therefore, assumed that it takes on average 2.5 minutes per bag handed in.

With 1.13 tonnes per year collected per store and assumed that each bag weighs 3kg, 370 bags are handed in per store and year. Then each store needs 15 hours to handle the collected bags. If it is further assumed that an employee earns EUR 12 per hour, which gives a cost of about EUR 180 per store per year for handling the collected clothing. This gives about EUR 350,000 per year for all stores and EUR 150 per tonne.

There is also additional time for handling vouchers, first when the textiles are brought back to the store and when the customers intend to use the voucher. This cost is assumed to be negligible.

The voucher cost for the company is related to the price of clothing and a mean of EUR 30 per clothing item has been used. The "Face Value" of the discounted amount with 15% discount (Buttle *et al.* 2013 and H&M 2013) results in a face value of EUR 4.5 as a saving for the customer and cost for the retailer. However, it can be expected that not all customers will use their vouchers, thus, we assume similarly to Buttle *et al.* (2013) that only 50% will use their vouchers. The true cost for the retailer i.e. internal costs, of supplying the voucher is then EUR 2.25 (50% of EUR 4.5). We assume that each bag that is returned back to the store contains 3 kg of clothing. The voucher cost per collected tonne is then EUR 750 and per year. With 2,300 tonnes collected the cost amounts to EUR 1.7 million.

The voucher also means that there will be increased sales and thereby revenues to the brand, since customers have to purchase for EUR 30 in order to get the EUR 4.5 discount (H&M, 2013c). This revenue is very difficult to estimate and could be both negative and positive depending on the profit margin for the retailer. They have not been included in the overall accounts in Table 19 but could potentially turn the model into a net profit generator rather than loss maker for brands.

The retailer sells the used textiles to a collection and sorting organisation, which pay per tonne clothing. The selling price is based on KICIs figures for textiles in the Stockholm trial (Avfall Sverige, 2013, Personne 2013) and is EUR 500 per tonne or EUR 1.2 million per year.

Charities receive EUR 0.02/kg which amounts to EUR 46,000 per year.

Table 19 Costs and benefits of In-store collection with a partner

Actors	Costs		Benefits		Total revenue EUR/year
	EUR/tonne -	Million EUR/year	EUR/tonne	Million EUR/year	
Investment					
Operation Brands					
Treatment cost (staff)	150	0.35			
Voucher "face value"	750	1.7			
Donation to charity	20	0.046			
Sold textiles to sorters			500	1.2	
<i>Total costs brands</i>	<i>1,120</i>	<i>2.1</i>	<i>500</i>	<i>1,2</i>	<i>-0.9</i>
			<i>Total benefits</i>		
Sorters					
Bought textiles	500	1.2			
Sorting	450	1			
Sold textiles			1,000	2.3	
<i>Total costs sorters</i>	<i>950</i>	<i>2.2</i>	<i>1,000</i>	<i>2.3</i>	<i>0.1</i>
			<i>Total benefits</i>		
Charities			20	0.046	<i>0.046</i>

4.4.3 Green jobs

With the very limited effect on collection, even with collection estimates based on M&S the business model will have little effect on jobs in the Nordic region. The partners of current schemes tend to export the collected textiles for sorting and subsequent handling in other parts of Europe. Moreover, the reception of used textiles in stores are managed by current store employees as part of their daily work and according to Brännsten (2013) there has not been an increase in employees due to H&M's collection.

4.5 Resell of used own brand (in-store or online)

In this model, retailers take back used clothes of own brand which are suitable for reuse. It is not common for producers to engage in the life of their garments after their first use, but there are a few examples of how this can take place, including resell in own stores, resell in separate stores or re-sell on-line.

The clothes for this business model are mainly used clothes handed in by consumers, but it could also be an opportunity for the brand to sell off collection samples and/or collection pieces with smaller flaws. Consumers who bring used clothes back to the brand shop may in return for their efforts receive a discount voucher which can be used to purchase second-hand garments. The retailer will take back all clothes brought

back by customers but will only buy back garments of a sufficient quality for restyle or resale. Returned clothes which are not of good enough quality to be resold are sent to a sorter for further treatment.

The garments that customers bring back are divided into three categories: Recycle, resale and restyle.

Recycle of garments that are not of sufficient quality to re-use. They are assumed to be sold to a sorting partner, who pays a small amount per garment.

Resale of garments of the highest quality, in Buttle *et al.* (2013) it is assumed that the garments only require to be cleaned via an outsourced laundry provider, before being returned to stores for sale (Buttle *et al.*, 2013).

Restyle of garments that need minor repairs or restyle and laundry in order to be able to be sold in the store (Buttle *et al.*, 2013).

Boomerang and Filippa K are two brands that have adopted this business model in the Nordic region. Boomerang has seven stores that sell own brand of which 4 are located in Stockholm, Filippa K has one resell store. This means that 8 stores in total that have adopted this business model. Boomerang has since the start in 2011 collected 7,000 garments (1,000 garments per store) annually or about 3 tonne per year. It is assumed in Buttle *et al.* (2013) that this model is suited for retailers that sell higher quality garments with a median price of GBP 50 which are therefore suitable for reuse and have a vintage value (e.g. Boomerang and Filippa K) as opposed to cheaper fast fashion retailers.

In order to estimate the number of potential brands that may adopt this business model, we estimate that about half of the clothing stores are in the medium price range of GBP 50 and half of these would adopt such a model.⁹ This gives that 2,900 stores could potentially adopt this business model in the Nordic region. If it is assumed that all stores collect as much as Boomerang which is 0.43 tonnes per store, then about 1,230 tonne per year is collected using this business model. This equals 0.33% of total textile consumption in the Nordic region. In terms of garments this amounts to 1,000 garments per store and year or 2,900,000 garments collected altogether annually in the Nordic countries.

Since the collection for resell of used own brand is only for high value items and does not represent a significant share of total textile flows, it is not considered to compete with charity collections.

⁹ This is a very rough estimate based on that half of the 30 clothing stores in the shopping center Nordstan is in this price range and various discussions with retailers show there are both those in favour of the model (although not using it) and those that are not interested in such a model as seen in Figure 9.

The split of the collected textiles between the three handling categories are based on Lang Unenge (2013): 50% reused (including restyled), 30% recycled (including textile recycling research) and 20% given to charity. These figures are high compared to WRAP estimates with 15% reused, 2.5% restyled and 82.5% send for industrial sorting (Buttle *et al.*, 2013) but are used since they are operational figures for the Nordic region. The amount given to charity is considered to be reused, recycled and incinerated in similar shares as for other textiles collected by charities. The effect on the Nordic textiles is minimal as seen in Table 21 due to the very low level of collection.

Table 20 Handling of each additional tonne of collected used textiles under a resell of own brand system compared to handling under baseline (stored in home)

	Baseline	Resell
Reuse	----	60%
Recycling	----	36%
Incineration & Landfill	----	04%
Storage in the home	100%	----

Table 21 Handling of Nordic textiles with resell of own brand system in place across Nordic region compared to baseline conditions

	Baseline	Resell
Collection	32%	32%
Reuse	16%	16%
Recycling	10%	10%
Incineration & Landfill	69%	69%
Storage	5%	5%

4.5.1 Net environmental benefit

The displacement effect for this model is likely to be considerably higher than for the average reusable textiles donated to charity, both due to the higher quality and also likely higher resell price. Therefore, a purchase of a reused item in a high street store is very likely to replace the purchase of a new item in the same store. The environmental benefit would then increase.

However, there could be a negative effect on informal and semiformal reuse (Palm, 2011, Buttle 2013) which would reduce the environmental benefits since the displacement factor would then be reduced. The total of these effects is difficult to estimate and the displacement factor has been kept at 0.6 for the calculations.

The net environmental benefit is roughly considered to be carbon dioxide equivalents and water saved from reuse and recycling. Table 22

shows the impact per affected tonne of textile and Table 23 show the impact of one year of business model operation in the Nordic region.

Table 22 Net environmental benefits from Resell of used own brand per additional tonne collected textiles compared to baseline (stored at home)

[tonnes]	Carbon dioxide eq.	Water
Reuse	5.3	1,300
Recycling	0.43	2.2
Total	5.7	1,300

Table 23 Net environmental benefits from Resell of used own brand per year of operation in relevant shops across Nordic region

[tonnes]	Carbon dioxide eq.	Water
Reuse	6,600	1,600,000
Recycling	530	2,700
Total	7,100	1,600,000

4.5.2 Net economic cost

Operation costs are the same as those used by Buttle *et al.* 2013 and include:

- *Laundry Costs*: at a cost of EUR 0.25 per garment and is only applicable to “resale” and “restyle” garments. Boomerang has collected about 7,000 garments from seven different store points since the start in 2011, out of which 50% is reused. This gives EUR 125 per year in laundry costs for each store. With 2,900 stores this gives EUR 400,000 per year for all stores and EUR 300 per tonne.
- *Direct Staff Costs*:
 - *Picking& Packing staff*- costs to handle the received textiles and distribute them to and from the laundry and then make the textiles prepared for restyling or resale.
 - *Store staff*- In Buttle *et al.* (2013) it is assumed that store staff will be trained to sort and process the garments received back.
 - *Restyling staff*- costs to do repairs/restyling of each relevant garment.

Due to the low number of collected garments, it is assumed that an employee spends 30 minutes per garment¹⁰ for picking & packing, training for sorting and processing garments received back and restyling. Boomerang has to restyle or repair about 20% of the collected garments, which means that 200 garments will need restyling or repairing per store. Assuming that an employee on average earns EUR 12/hour this amounts to EUR 1,200 per year per store and EUR 2,800 per tonne. For all 2,900 relevant stores in Nordic countries this gives a total of EUR 3,500,000 per year.

For the voucher "Face Value", similarly to Buttle *et al.*, (2013) an average retail price of SEK 150 (or EUR 17) is assumed per garment for resale and restyled garments (Boomerang, 2013). The "Face Value" of the discounted amount – using an average sales price of a pre-owned garment of EUR 17 with a 10% discount, results in a face value of EUR 1.7 as a saving to the customer and cost to the retailer. However, it can be expected that not all customers will use their vouchers, thus, we assume similarly to Buttle *et al.* (2013) that 50% of the vouchers and that 50% of purchases made will be by consumers that don't have discount vouchers. In Boomerang's case the voucher can also be used on new clothing, but it is here assumed that it only applies to second-hand clothing.

The true cost for the retailer i.e. internal costs, of supplying the voucher is EUR 0.85 (50% of EUR 1.7). EUR 0.85/garment and 2.8 million garments per year are collected out of which half can be re-sold i.e. 1.4 million garments per year. This gives a cost of EUR 1.2 million per year.

Since 615 tonne per year can be resold i.e. half of what is collected (1,230 tonnes) the cost per tonne is EUR 2,000.

In Buttle *et al.* (2013) it is assumed that garments are transported from collection points to central processing warehouse, where they are sorted and processed before being shipped back to the store. However, in this report transport costs are not included as they will be very small and most likely included in the regular logistics of the company.

Benefits

Benefits from selling the second hand clothes are EUR 17 minus the voucher cost of EUR 1.7 which gives EUR 15.3 multiplied by the garments sold and with 1.4 million sold garments over the Nordic region gives 21 million EUR per year.

¹⁰ In Buttle *et al.* (2013), one hour per restyled item was assumed, but with only a small percentage restyled.

Boomerang recycles 30% of the materials. If the same scenario is applied for the Nordic countries, 369 tonne per year is recycled. Revenues from selling to a system operator with a cost of EUR 500 per tonne gives EUR 180,000 per year.

Table 24 Costs and benefits of Resell of used own brand system

Actors	Costs		Benefits		Total revenue EUR/year
	EUR/tonne -	Million EUR/year	EUR/tonne	Million EUR/year	
Investment					
Operation Brands					
Collection staff	2,800	3.5			
Laundry costs	300	0.4			
Costs from providing voucher	2,000	1.2			
Sold textiles to sorters			500	0.185	
Sold textiles in own store			35,000	21	
<i>Total costs brands</i>	<i>5,100</i>	<i>5.1</i>	<i>35,500</i>	<i>21.2</i>	<i>16.1</i>
		<i>Total benefits</i>			
Sorters					
Bought textiles	500	0.185			
Sorting	450	0.165			
Sold textiles			1,000	0.37	
<i>Total costs sorters</i>	<i>950</i>	<i>0.35</i>	<i>1,000</i>		<i>0.2</i>
		<i>Total benefits</i>			

4.5.3 Green jobs

The main source for new jobs with a resell business is in the restyling of garments. With 250 hours per store and 2,900 stores this could amount to 350 new jobs in Nordic countries.

4.6 Summary of evaluation and assumptions

One must be careful when drawing conclusions based on such a rough evaluation. It has been necessary to make a large number of assumptions during the evaluation, some of which can be significant sources of uncertainty. The assessments of Nordic-wide environmental gains, green jobs etc. are particularly uncertain since they include non-robust assumptions of the spread of each model within the region. An overview of the key assumption is given in Table 26 below.

In the light of the significance of some of these assumptions, this evaluation should not be viewed as grounds for selecting one system

over another. It should rather be considered as a first evaluation of the potential of each system for bringing environmental and economic benefits as a basis for further study. Moreover, the systems should not be viewed as mutually exclusive. Both the in-store collection with partner and the resell of own brand systems can potentially be operated in parallel with or as a part of mandatory or voluntary collective EPR systems,

With respect to environmental gains, most gains connected to the four evaluated systems are considered to arise from offset production of new textile products, or other new materials and products as a result of reuse and/or recycling of collected used textiles.

It is the reuse element which gives by far the largest environmental gain per collected tonne. The reuse level of collected used textiles has been estimated as lying in the range between 40% and 60% for all models. The displacement factor for reuse – i.e. the degree to which a resold article offsets the purchase of a new article – has been assumed to be similar for all models but could in reality differ widely. For example, the resell of used own brand could be expected to have a higher displacement effect due to the higher quality of resold items and their high price compared to average resold products under a mandatory EPR system.

It is the potential magnitude of collection that is however the most crucial characteristic of each system with respect to overall environmental gains. According to the evaluation, mandatory or widely adopted voluntary collective EPR systems have the potential for collecting much larger volumes of textiles than in-store collection and resell of used own brand models. The potential scale of the latter two models may have been underestimated in this evaluation with respect to the amount of used textiles collected per store, since they are still under development and consumer awareness of them is not high. However, it is the more all-encompassing nature of the EPR systems which ensures their dominance in terms of collected volumes.

Environmental gains resulting from changes in design or production of textiles have not been considered in this evaluation. If such gains were to be considered the resell of own brand would fair even better. Companies engaging in resell of used own brand have clear incentives to produce high quality clothing to be able to sell the same product several times.

If collective mandatory or voluntary EPR systems are carefully designed they can also include elements which encourage such upstream effects. For example, contribution fees could be reduced for producers that avoid the use of certain hazardous chemicals during production, produce higher quality longer lasting articles or design for easier recy-

cling i.e. by avoiding fibre mixes. Some brands engaging in in-store collection are also considering means for closing material loops.

The economic evaluation identifies some clear winners though all models appear to be break even. The mandatory EPR system would create most green jobs while the in-store collection with partner would create fewest.

With respect to the in-store collection model it is important to note that only direct income and cost elements have been included in the economic evaluation resulting in a loss for the stores. However, there are also likely to be indirect increases in sales as a result of an improved green image, and as a result of the distribution of “rebate off next purchase coupons.” These may result in an overall economic gain to the retailer. However, rebate coupons also risk undermining environmental gains.

A key issue for all models (although less for Resell of used own brand) is the low value of recyclable textiles. A technological breakthrough in cost-efficient high-grade recycling combined with appropriate design for recycling would work in favour of all models.

Table 25 gives an overview of the evaluation of the different models for the main evaluation criteria. The green jobs for the EPR systems may not necessarily be in the Nordic region since it may be hard to compete on sorting with sorting facilities with cheaper labour in other parts of Europe.

Table 25 Summary of the evaluation of the four models (Nordic region)

Model	Net Environmental gain	Net Economic gain	Possible green jobs
Mandatory EPR	High	Positive	2,000
Voluntary collective EPR	Medium–High	Positive	900
In-store collection	Low	Negative (for brands) Positive (for sorters)	0
Resell of own brand	Low	Positive	350

Table 26 Summary of key assumptions and their influence on results

Model	Assumption	Level of uncertainty	Impact on result
All models	Textiles that are currently not collected separately, are stored in the household	<i>High</i> (much of it is likely to end in mixed waste)	<i>Low impact on environmental gain calculations.</i> Incineration of mixed waste would give a similar result under average conditions.
	A resold item will displace the purchase of 0.6 new items	<i>High</i> (UK results from regions ranged between 0.11 and 0.52)	<i>High impact on environmental gain calculations.</i> Reuse dominates environmental gains
	All recycled textiles are downcycled into insulation	<i>Low/Medium</i> (there is also considerable downcycling into industrial rags but very little recycling back into textiles in Europe)	<i>Low impact on environmental gain calculations.</i> There is a large variation in environmental gains from different types of recycling but in general downcycling which dominates in Europe has low gains. This could change in future if new recycling back to textiles is developed and expands.
	Only water and greenhouse gas emissions included	n/a	<i>Low impact on ranking of models according to environmental gain.</i> Since all models have similar effects i.e. increasing reuse and recycling the ranking would remain unchanged by the inclusion of impact categories such as eco-toxicity.
	Mixed collected textiles can be sold to sorters for EUR 500 per tonne	<i>High</i> (the figure is based on existing prices but the prices are known to fluctuate significantly with time)	<i>High impact on net economic benefits calculations.</i> This is the most important income for all models apart from the resell of used own brand model.
Mandatory EPR	Increase from current 32% collection rates to 75% collection rates	<i>Medium</i> (both figures are uncertain but are of the right order of magnitude)	<i>High impact on all results.</i> The collection rate is the single most important factor for environmental, economic and green jobs assessments.
	50% reuse, 40% recycling and 10% incineration	<i>Medium</i> (different sorters report quite different values. The higher quantities are collected the lower the likely rate of reuse)	<i>High impact on environmental gain calculations.</i> Reuse dominates environmental gains.
	Cost elements based on French EPR	<i>Medium</i> (cost might be higher in Nordic countries due to higher labour costs etc.)	<i>Medium impact on net benefits calculations.</i> Benefits elements are likely to be the same as French due to international market for reused and recycled while costs are likely to be higher. Can reduce viability of all models.
Voluntary collective EPR	Increase from current 32% collection rates to 57–75% collection rates	<i>Medium</i> (as for mandatory)	<i>High impact on all results.</i> (as for mandatory).
	50% reuse, 40% recycling and 10% incineration	<i>Medium</i> (as for mandatory)	<i>High impact on environmental gain calculations.</i> (as for mandatory).

Model	Assumption	Level of uncertainty	Impact on result
	Cost elements based on French EPR	<i>Medium</i> (as for mandatory)	<i>Medium impact on net benefits calculations</i> (as for mandatory).
In-store collection with partner	2,000 stores would be involved	<i>High</i> (this is based on rough calculation of numbers of large stores)	<i>High impact on environmental gain calculations under total Nordic perspective.</i> Number of stores involved is crucial element of total collected textiles.
	Each store collects 1.13 tonnes per year	<i>Medium</i> (based on average M&S levels but highly dependent on size and turnover of store. Did not have this info)	<i>Medium impact on environmental gain calculations under Nordic region perspective.</i> This will be an important element of total collected textiles but uncertainty is medium.
	2.5 minute processing time for each bag of returned textiles	<i>High</i> (nothing to base this assumption on)	<i>Medium impact on net economic benefit calculations.</i> If doubled it would not be the most significant cost element.
	Half of customers would not use rebate voucher	<i>High</i> (based on assumptions in another study)	<i>High impact on net economic benefit calculations.</i> Is the most important cost element for the model.
Resell of used own brand	2,900 stores would be involved	<i>High</i> (this is based on rough calculation of numbers of stores selling high quality clothes)	<i>High impact on environmental gain calculations under Nordic region perspective.</i> Number of stores involved is crucial element of total collected textiles.
	Each store collects 0.43 tonnes per year	<i>Medium</i> (based on average Boomerangs levels but highly dependent on size and turnover of store. Did not have this info)	<i>Medium impact on environmental gain calculations under total Nordic perspective.</i> This will be an important element of total collected textiles but uncertainty is medium.
	30 minute processing time per returned garment	<i>High</i> (no available data)	<i>High impact on net economic benefit calculations.</i> Is the most important cost element for the model.
	Half of customers would not use rebate voucher	<i>High</i> (based on assumptions in another study)	<i>Low/medium impact on net economic benefit calculations.</i> Even if quadrupled it would not be the most significant cost element.
	50% reused (including restyled), 30% recycled and 20% given to charity	<i>Medium</i> (based on one study)	<i>High impact on environmental gain and net economic benefit calculations.</i> Resell dominates both environmental gains and economic benefits
	Resell at EUR 17 per garment	<i>Medium</i> (based on a single company using the model)	<i>High impact on net economic benefit calculations.</i> Is the most important income element for the model. Halving this would remove all the profit.

5. References

- Avfall Sverige 2013. Textilt avfall – En framtida resurs – Pilotprojekt i Stockholm. Avfall Sverige report U2013:15.
- Berglund, C. & Matti, S. (2006): Citizen and consumer: the dual role of individuals in environmental policy, *Environmental Politics*, 15:4, 550–571.
- Brännsten, C, (2013). Personal communication with Cecilia Brännsten Global Project Manager for the H&M Garment Collecting program.
- Buttle, M. 2013. Personal communication with Martin Buttle, Senior supply chain consultant, MADE-BY. 2013-12-13.
- Buttle, M., Vyas, D., Spinks, C. 2013. Evaluating the financial viability and resource implications for new business models in the clothing sector. WRAP-report.
- Dunn, E. W., Aknin, L. B., & Norton, M. I. (2008). Spending money on others promotes happiness. *Science*, 319(5870), 1687–1688.
- Ecoinvent centre. Ecoinvent data v2.0 Ecoinvent reports No. 1–25, 2007. . Swiss centre for Life Cycle Inventories.
- Engelhardt, A., 2010. The Fibre year 2009/10 – A world survey on Textile and Nonwovens Industry. Oerlikon corporation.
- Farrant, L. 2008. *Environmental benefit from reusing clothes*. Master thesis. Technical University of Denmark.
- H&M 2013. Charity star H&M countries activities. <http://www.hm.charitystar.com/en/home/> accessed 2013-12-14.
- H&M 2013b. Personal interviews with H&M-stores in Gothenburg. Autumn 2013.
- H&M 2013c. <http://www.hm.se/se> accessed 2013-12-16.
- I:CO 2013. I:CO FAQ <http://www.ico-spirit.com/en/faq/> accessed 2013-12-16.
- Kalliala, E.M., and Nousiainen, P. (1999) Life Cycle Assessment: Environmental profile of cotton and polyester-cotton fabrics. *AUTEX Research Journal*, 1 (1), 8–21.
- Lang Unenge 2013. Personal communication with Catti Lang Unenge, Creative Director Boomerang International AB.
- Mekonnen, M.M., Hoekstra, A. Y., 2011. The green, blue and grey water footprint of crops and derived crop products. *Hydrology and Earth System Sciences*. Twente Water Centre, University of Twente, The Netherlands.
- Mont, O., Heiskanen, E., Power, K., & Kuusi, H. (2013). Improving Nordic policymaking by dispelling myths on sustainable consumption. Stockholm: Nordic Council of Ministers.
- Palm, D. 2011. Improved waste management of textiles. IVL Report B1976. IVL Swedish Environmental Research Institute.
- Palm, D., Harris, S., Ekvall, T., 2013 Livscykelanalys av svensk textilkonsumtion – Underlagsrapport till naturvårdsverkets regeringsuppdrag om nya etappmål – deluppdrag textil och textilavfall. IVL report B2133. IVL Svenska Miljöinstitutet. Göteborg.
- Personne, H. 2013. Personal communication with Helene Personne, project leader, Municipality of Stockholm.

- Stenmarck, Å., Kock, E., Palm, D. & Sundqvist, J.-O., 2010. Insamling av återvinningsbart material i blandad fraktion – en ekonomisk bedömning. IVL report B1864. IVL Swedish Environmental Research Institute.
- Tekie, H., Palm, D., Ekvall, T., Söderholm, P., 2013 Samhällsekonomisk analys av etappmål textil – Underlagsrapport till naturvårdsverkets regeringsuppdrag om nya etappmål – deluppdrag textil och textilavfall. IVL report B2132. IVL Svenska Miljöinstitutet. Göteborg.
- Tiard, L. 2013 The French EPR. Presentation at Mistra Future Fashion symposium May 2013. Eco TLC.
- Trendhuset Norden 2013. Hitta plagget. <http://www.hittaplagget.se> accessed 2013-12-14.
- Watson, D., Kjørboe, N., Lindqvist, T., Tekie, H., Harris, S., & Ekvall, T. (2013) Evaluation of eight EPR-systems and business models which can increase reuse and recycling of textiles. Temanord report for the Nordic Council of Ministers.
- Watson, D., Kjørboe, N., Elander, M., Salmenperä, H., Lyng, K-A., Gíslason, S. 2013 A Nordic strategy for collection, sorting, reuse and recycling of textiles. International Market Survey. Temanord report for the Nordic Council of Ministers.
- WRAP. 2012. Study into consumer second-hand shopping behavior to identify the reuse displacement effect. WRAP UK.

6. Sammenfatning

Denne rapport er den tredje fra Nordisk Ministerråds projekt "Et EPR-system og nye forretningsmodeller til øget genbrug og genanvendelse af tekstiler i Norden." Dette materiale er resultatet af Del 1 i projektet "An extended producer responsibility (EPR) system and new business models to increase reuse and recycling of textiles in the Nordic region". Rapport for Del 2 vil blive publiceret når projektet er klart i december 2014. Projektet er et af seks projekter under initiativet *Ressourceeffektiv genbrug af plast- og tekstilaffald*, der blev lanceret af Nordisk Affaldsgruppe (NAG) som del af de nordiske statsministres grøn vækst initiativ, *Norden – ledende i grøn vækst*.

Formålet med opgaven var at udvælge fire af de 8 vurderede modeller fra den 2. projektrapport, og give en mere detaljeret og, hvis muligt, kvalitativ evaluering af deres omkostninger og fordele. Evalueringen og projektrapporten vil tilsammen give et udgangspunkt for udvikling af skræddersyede pakker med politiske hjælpeværktøjer i 2014.

Valg af modeller til evaluering

Hovedkriterier for valg af modeller til videre evaluering er, 1) omfanget af effekten på tekstilstrømme og den miljømæssige fordel, 2) gennemførlighed, 3) tilgængelighed af relativt robust data og information for at muliggøre en evaluering, og 4) repræsentation af en vifte af forskellige modeltyper. Det Nordiske Ministerråds affaldsgruppe har i projektbeskrivelsen krævet, at en af de evaluerede modeller skulle være "obligatorisk EPR."

En første vurdering af disse kriterier blev foretaget for alle 8 modeller fra opgave 3, og resultaterne blev præsenteret på en nordisk workshop i november 2013 i Stockholm. Efter diskussioner og interaktion med deltagerne, blev følgende fire modeller udvalgt til evaluering:

- Obligatorisk EPR.
- Frivillig, kollektiv EPR.
- In-store indsamling med partner.
- Gensalg af eget varemærke.

Evalueringen skulle resultere i viden, der er relevant for en diskussion af og beslutning om, hvilke modeller, der kan implementeres i de nordiske lande. Repræsentanter for den svenske Miljøstyrelse indikerede, at skabelse af grønne jobs, er et relevant aspekt at undersøge. Evalueringen fokuserede derfor på følgende aspekter:

- Netto miljømæssig gevinst.
- Netto økonomiske udgifter.
- Antal af skabte grønne jobs.

Resultaterne fra opgave 3 er hovedsageligt kvalitative, og projektet lægger ikke op til indsamling af store mængder data eller komplekse beregninger – der er derfor kun foretaget simple vejledende beregninger. Datainsamlingen er begrænset til data indsamlet under opgave 3, andre nyligt afsluttede projekter, samt andre let tilgængelige kilder. Vurdering af størrelsesordenen kan foretages baseret på tidligere erfaring. I tilfælde hvor der ikke har været tilgængeligt kvalitativt data, er der foretaget vurderinger støttet af kvalitative diskussioner.

Resumé af evaluering

Det har været nødvendigt at foretage et større antal antagelser under evalueringen, hvoraf nogle kan være væsentlige kilder til usikkerhed. Derfor, bør denne evaluering ikke danne grundlag for valg af et system fremfor et andet. I stedet skal den ses som en første evaluering af hvert systems potentiale for miljømæssige og økonomiske gevinster, og som et udgangspunkt for videre analyse. Endvidere bør systemerne ikke ses som indbyrdes udelukkende hinanden. Både systemet for "in-store indsamling med partner" og for "gensalg af eget varemærke" kan potentielt køres parallelt med, eller som en del af, obligatoriske eller frivillige kollektive EPR-ordninger.

Det er genbrugselementet, der giver den miljømæssigt største gevinst pr. indsamlet ton. Det vurderes, at genbrugsniveauet for indsamlede brugte tekstiler ligger mellem 40% og 60% for alle forretningsmodeller. Erstatningsgraden for genbrug – det vil sige i hvilken grad en solgt vare udligner/opvejer købet af en ny vare – vurderes at være ens for alle modeller, men kan i virkeligheden variere meget. For eksempel kunne man formode, at gensalg af eget varemærke har en højere erstatningsgrad, på grund af den højere kvalitet af gensolgte varer og deres højere pris, sammenlignet med andre gennemsnitlige produkter, solgt under en obligatorisk EPR-ordning.

Med hensyn til den overordnede miljømæssige gevinst, er den vigtigste egenskab for hvert system dog indsamlingens potentielle omfang.

Ifølge evalueringen har modeller med obligatoriske eller udbredte frivillige, kollektive EPR-ordninger potentiale for indsamling i meget større mængder end modeller med in-store indsamling, og gensalg af eget varemærke. Det potentielle omfang af de to sidstnævnte modeller kan være undervurderede i denne evaluering, med hensyn til mængden af brugte tekstiler indsamlet pr. forretning, da modellerne stadig er under udvikling, og forbrugernes viden om dem ikke er særlig stor. Det er dog den mere altomfattende karakter af EPR-ordningerne, der sikrer deres førerposition, med hensyn til indsamlet volumen.

Miljømæssige gevinster fra ændringer i design eller produktion af tekstiler, er ikke taget i betragtning i denne evaluering. Hvis disse gevinster skulle tages i betragtning, er det in-store indsamlingen, giver gensalg af eget varemærke nogle større fordel. Virksomheder, der gensælger deres eget varemærke, ville have et klart incitament til at producere tøj af højere kvalitet, for at kunne gensælge det samme produkt flere gange.

Hvis kollektive og obligatoriske eller frivillige EPR-ordninger bliver omhyggeligt udtænkt, kan de også inkludere elementer, som tilskynder til opstrøms-effekter. Som eksempel kunne man reducere producenterne bidrag til ordningen, hvis de undgår brug af visse farlige kemikalier i produktionen, producerer varer af højere kvalitet og længere levetid, eller designer deres produkter til lettere genanvendelse, f.eks. ved at undgå blanding af tekstilfibre. Nogle brands der har indførte in-store indsamling er også engagerede i initiativer omkring hvordan man kan genanvende fibre fra indsamlede tekstiler i deres nye produkter.

Den økonomiske evaluering viser nogle klare vindere, selvom alle modeller lader til at balancere økonomisk. Den obligatoriske EPR-ordning ville skabe flest grønne job, mens in-store indsamling med partner ville skabe færrest. Udfordringen for alle modeller, (dog mindre for gensalg af eget brugt varemærke), er de genanvendelige tekstilers lave værdi. Et teknologisk gennembrud indenfor omkostningseffektiv, første-klasses genanvendelse, kombineret med velvalgt design til genanvendelse, ville være en fordel for samtlige modeller.

Tabellen nedenfor giver en oversigt over evalueringen af de forskellige modeller, i forhold til det overordnede evalueringskriterium. EPR-ordningernes grønne jobs er ikke nødvendigvis i Norden, da det kan være svært at konkurrere med sorteringsfaciliteter med billigere arbejdskraft i andre dele af Europa.

Resumé af evaluering af de fire modeller (Norden)

Model	Netto miljømæssig gevinst	Netto økonomisk gevinst	Mulige grønne job
Obligatorisk EPR	Høj	Positiv	2,000
Frivillig, kollektiv EPR	Mellem-høj	Positiv	900
In-store indsamling	Lav	Negativ (for varemærker) Positiv (for genanvendere)	0
Gensalg af eget varemærke	Lav	Positiv	350



EPR systems and new business models

This report is the primary outcome from Part I of the project “An extended producer responsibility (EPR) system and new business models to increase reuse and recycling of textiles in the Nordic region” initiated by the Nordic Waste Group (NAG). The report for Part 2 will be published in December 2014.

This report summarizes the work carried out in 2013 and is presented in three sub-reports:

- Survey of existing EPR-systems and business models – Relevant types of EPR models and business models with potential for increasing recycling and reuse of textiles are identified and briefly described.
- Evaluation of eight EPR-systems and business models – Eight of the models identified in Report 1 are described in more detail, including a first qualitative evaluation.
- Costs and benefits of EPR-systems and two business models – Four of the eight models described and qualitatively evaluated in Report 2 are selected for a more quantitative evaluation of costs and benefits.

The report is part of the Nordic Prime Ministers’ green growth initiative: “The Nordic Region – leading in green growth.” Read more in the web magazine “Green Growth the Nordic Way” at www.norden.org/greengrowth

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