

**SEPTEMBER 2022**



# **SORTING FOR CIRCULARITY**

## EUROPE

### **SORTERS HANDBOOK: HOW TO CONDUCT A SORTING ANALYSIS USING HAND-HELD NEAR INFRARED SCANNING TECHNOLOGY**

**Sorters Handbook in collaboration and alignment with  
TERRA and Refashion**



**Re\_fashion**

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# How To Use This Document

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## **INTENDED USE**

This document is for textile industry players who aim to kick-start a material composition study, to better understand their post consumer textile feedstock and determine new business opportunities based on sorting for circularity.

The methodology prescribed in this Handbook is intended for:

- Sorters that aim to test or pilot near infrared scanning technology
- Near infrared scanning technology providers that aim to support textile sorters and recyclers
- Research organisations that aim to conduct a study on material composition of post consumer textile feedstocks

## **PURPOSE AND IMPLEMENTATION**

The Sorting for Circularity Europe project presents an established and tested research methodology to sort for circularity, based on fibre composition. Chapter 2 lays out a step-by-step approach to preparing and implementing the methodology, and Chapter 3 outlines reflections and learnings that can inform future replications of the methodology.

This Project aims to create a blueprint for understanding material composition of textiles, in order to accelerate the creation of new business opportunities based on closed loop textile recycling using household textile waste as new feedstock. For further information and collaboration, please refer to the Contact page at the end of this Handbook.

# 1. Sorting For Circularity Europe Project

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## 1.1 INTRODUCTION AND CONTEXT

The Sorting for Circularity Europe project (the Project) aims to increase harmonisation between the sorting and recycling industry and stimulate a recycling market for unwanted textiles that can generate new revenue streams for sorters. Conducting analyses across Europe, in Belgium, Germany, the Netherlands, Poland, Spain, and the United Kingdom, the project provides the most comprehensive and representative snapshot of post-consumer textiles composition generated in Europe to date.

In order to achieve this, the Project has orchestrated the following activities:

1. Textile waste composition analysis across multiple European contexts to understand exactly what (e.g. material composition) and how much (i.e. volumes) textile waste is generated. You can discover the results in the [Sorting For Circularity Europe](#).
2. Mapping the textile recycler's capabilities to understand how aligned current supply (textile waste) is with the demand (recycler's processes) - also illuminating potential gaps whereby greater investment and innovation must occur. You can discover the results in the [Recycler's Database](#).
3. Understanding the future business models required for sorters to commercialise the textile waste that is being generated. You can discover the results in the [Sorting For Circularity Europe](#).
4. Link the supply-side of the industry with the demand-side (textile recyclers) through the support of online platforms such as, [Reverse Resources](#) and [Refashion Recycle](#), which will connect the relevant stakeholders in the end-of-use supply chain for textile waste (i.e. sorted textile waste with material reprocessors and textile recyclers), in a transparent and open-source manner.

The Project was launched in May 2020 by Fashion for Good together with Circle Economy. Catalytic funding was provided by Laudes Foundation and facilitated by brand partners, adidas, BESTSELLER, and Zalando, Inditex and H&M as an external partner. Fashion for Good partners Arvind Limited, Birla Cellulose, Levi Strauss & Co., Otto and PVH Corp. are participating as part of the wider working group. Circle Economy has led the creation and implementation of the methodology, with support from Terra, to assess the characteristics of low value textiles. Both organisations build on their extensive experience from similar projects, such as the [Interreg Fibersort](#) project and previous textile composition analyses. Refashion created the Refashion textile materials library used for the textile composition assessment. Matoha has provided the Near Infrared (NIR) technology, used to assess textiles composition. Finally, the Project brings together the largest industrial textile sorters in the North-West European region; including the Boer Group, I:CO (a part of SOEX Group), JMP Wilcox (a part of Textile Recycling International), Modare-Cáritas, Wtorpol and TEXAID (referred to as the Sorters), placing key industry players firmly at the heart of the Project and driving the industry towards greater circularity.

# Sorting For Circularity Europe Project

## 1.2 CREATION OF METHODOLOGY

The research methodology in the Project is based on the methodological basis provided by Refashion and the research process undertaken by TERRA to map textiles in France (a characterisation study commissioned by Refashion to update their [previous characterisation study](#) published in 2014), and [similar studies](#) previously conducted by Circle Economy. Before launching the on-the-ground research, the methodology was adapted to the timeline and scope of the Project by Circle Economy and TERRA in consultation with Refashion and participating sorting facilities to ensure suitability of all parties involved and comparability of results to previous research, and to Refashion's characterisation study to be released in 2023.

Examples of the main adjustments include, but not limited to, the following:

- Noting the overall sample weight rather than individual garment weight in order to capture more data in a shorter time
- Simplifying the number of product categories to be tracked (i.e. type of item being a heavy jacket, trousers, or home textiles)

Based on in-depth interviews with each of the participating sorting facilities, an operational protocol was established for each facility. To define the operational protocol, the interviews discussed parameters of each sorting facility such as:

- Size, capacity and productivity
- Languages spoken by sorters on-the-ground
- Categorisation of textile fractions
- Flow, operations, and sorting process related to relevant fractions (see Section 1.3 for definition of fraction)
- Current end markets of the rewearable and non-rewearable fractions (see Section 1.3 for definition of fraction). This information was collected to ensure an anonymised and aggregated high-level understanding of the second-hand market and its effects on the sorter's operations, which is reflected in the [Sorting For Circularity Europe](#).

## 1.3 THE FRACTION IN SCOPE FOR ANALYSIS

The composition analysis focused on post-consumer garments that are sorted as non-rewearable items, or considered to be at risk of becoming non-rewearables in the near future. The analysis excludes mattresses, footwear, and accessories arriving at sorting facilities which are not garments.

# Sorting For Circularity Europe Project

## DEFINITION OF FRACTION

For the purpose of the study we have defined the following three fractions:

- **Black fraction:** garments deemed by sorting facilities as non-rewearable items which include the following categories: 1) Materials for recycling/garneting (including for insulation, automotive, mattress filling, yarn, other); 2) Materials for wiping; 3) Materials destined to become refuse-derived fuel; 4) Ultimate waste.
- **Grey fraction:** garments currently deemed rewearable by sorting facilities and sold in the second-hand market at low prices, but where market demand is expected to stop when volumes collected rise. This grey fraction includes grades defined by each participating sorter based on their own market challenges.
- **White fraction:** garments deemed rewearable by sorting facilities and sold in the second-hand market at decent prices with high-demand. These items will be worn again, even if collected volumes rise. This fraction remains out of scope for the composition analysis during the Project, and indications of its characteristics from sorters are used only for the purpose of comparison with black and grey fractions.

The Project analysed samples from the Black and Grey fractions.

## 1.4 DEFINITIONS

To ensure alignment in language used across the various stakeholders involved, the following definitions have been put together:

- **Rewearable:** Garments that can be reused in their original form, for their original purpose. This category is known as "product reuse" among many textile collectors/sorters.<sup>1</sup> In this study, rewearables are represented by the 'White' and 'Grey' fractions.
- **Non-rewearable:** Garments that cannot be reused in their original form and are made from one or multiple types or layers of textiles. This category is known as "material reuse" among many textile collectors/sorters.<sup>2</sup> This category is considered the 'Black fraction' in this study and includes:
  - Materials for downcycling: garment textile products which are meant to be shredded or garnetted (opening up the fabric into a fluffy, fibrous condition for reuse),<sup>3</sup> with a purpose of future use of these fibres for recycling into insulation, automotive, mattress filling, yarn or other.
  - Materials for wiping: various mainly cotton rags used for cleaning machinery as well as used for hand wiping.<sup>4</sup>
  - Materials for fibre-to-fibre recycling: garment textile products which are meant to be shredded or cut into smaller pieces with a purpose of future use of these materials for recycling into outputs used again in this specific sector, in similar applications for which it was first developed.
  - Fibres and materials destined to become refuse-derived fuel: fibres and materials from garment textile products that are used to produce Refuse Derived Fuel (RDF) to ultimately produce energy and heat.<sup>5</sup>
  - Ultimate waste: wet, damp, damaged garment textile products which are not fit to be sold in reuse or recycling markets.

# Sorting For Circularity Europe Project

- **Mono-layer:** Products that are made from one layer or type of textile.<sup>6</sup>
- **Multi-layer:** Products that are made from more than one distinct layer, each of which may be composed of different materials.<sup>7</sup> There are two types of multi material garments:
  - Case 1: True multilayer = "Several main layers". Refers to an article consisting of at least a second layer representing more than 1/3 of the surface of the article (eg. jacket lining)
  - Case 2: Monolayer + others = "1 main layer and 1 or more auxiliary or minority layers": article made up of a main layer with the presence of other minority layers representing less than 1/3 of the surface (eg. pocket bottom, badge, yoke, embroidery, lace)
- **Grade:** quality level by which collected used textiles are sorted, defined as grades, and sold both for reuse and recycling in different fractions (eg. Cream, A, B, C).<sup>8</sup>
- **Fraction:** categories by which collected used textiles are sorted into for different reuse and recycling purposes, which are sold on different local and global markets.<sup>9</sup>
- **Downcycling:** Reprocessing discarded textiles to create new consumer or industrial products, in a process that is usually mechanical (cutting, shredding, bonding). Discarded textiles are no longer in their original form, and new products do not re-enter the textile supply chain, resulting in a subsequent use that is of lower value than the original source of the material.<sup>10</sup>
- **Textile-to-textile recycling:** in the context of this study, this encompasses all textile recycling processes where the output is used again in this specific sector, in similar applications for which it was first developed.
- **Colour:** The colour of an article is considered the solid or dominant colour. If it is not possible to define one and the same dominant colour, the article is to be considered multicoloured. The dominant colour categories for the analysis will be predefined and added to the annex in this Handbook. All shades of one colour (eg. light blue) should be considered within the category of the solid colour (eg. blue).
- **Disruptor:** an element or hard point present on a textile product (eg. fastener, button, zipper, fabric patch etc.) that may be a disruptor to the recycling process and will need to be removed before the product is suitable as feedstock for recycling.
  - Removable disruptors: for the purpose of this study, it is defined that metal and plastic hardware are suitable to be removed prior to recycling activities
  - Non-removable disruptors: for the purpose of this study, all other hardware found in textiles as well as combinations of different types of hardware are considered as non-removable for the purpose of fibre-to-fibre recycling activities.

# Sorting For Circularity Europe Project

## 1.5 VOLUMES ANALYSED IN THE PROJECT

The Project involved eight sorting facilities, which resulted in a total volume of approximately 22 tonnes analysed at two points in time (fall/winter 2021 and spring/summer 2022) to account for seasonal changes in the types of garments entering sorting facilities. The initial goal was to analyse a total of 50 tonnes of post-consumer garments, however, the productivity of the on-the-ground analysis was lower than predicted. The productivity of professional sorters was 41 seconds per scan, which translates to approximately 22 kilos of textiles per person, per hour. The type of feedstock sorted and the functionalities of the software used for inputting garment characteristics were two elements that impacted the productivity of the process. The latter element was significantly improved after the first analysis. In all, depending on feedstock analysed, a productivity of 700 - 900 scans per hour was achieved with 10 professional sorters.

In total, 10 Matoha FabriTell NIR handheld scanners (the NIR scanners) were used throughout the project. The database of the scanners was optimised through the Refashion textile materials library that was completed in August 2021. The on-the-ground analysis took place between September 2021 - July 2022 at the sorting facilities of the largest textile sorters in the North-West European region: Boer Group, I:CO - part of SOEX Group, JMP Wilcox - part of Textile Recycling International, Modare-Cáritas, Wtórpol and TEXAID.

## 1.6 RESULTS

To learn about the Project's results and better understand the fibre composition of potential feedstock available for fibre-to-fibre recycling, please refer to the [Sorting For Circularity Europe](#).



# 2. Methodology For Sorting With NIR Based Technology

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This Handbook outlines a step-by-step research methodology that was developed, tested, and delivered during the composition analysis of the Project. The operational protocol (see Section 1.2) data collection template used throughout the Project was created by Circle Economy and Terra, in consultation with Fashion for Good and participating sorters. Moreover, a copy of the Refashion textile materials library, which was created using chemically analysed materials, was utilised by Matoha as a reference to retune their identification algorithms and improve performance of the scanners. Matoha has also developed an app to be able to track the product categories (see Annex 1, Table 2). This app was translated to languages spoken by professional sorters working in the participating facilities.

## 2.1 PREPARATION

### STEP 1: CAPACITY PLANNING

To ensure the implementation of the predefined operational protocol and methodology, it is important to train, guide, and monitor the data collection process throughout the full duration of the on-the-ground analysis.

To plan for number of sorters or volunteers required, consider the following:

- Estimated productivity based on the Project was 41 seconds per item, which leads to approximately 22 kilos of textiles per person, per hour. This time was spent mostly on manually entering information about each garment - the actual NIR scan time is 1 second per scan.
- Include time in the schedule for training and learning (approximately one to two hours), and breaks. Bear in mind that some time is also lost when changing the type of fraction or bale being sorted. This is why appointing one individual to manage logistics, such as changing and weighing bales (further described in Step 2), is crucial.

# Methodology For Sorting With NIR Based Technology

## STEP 2: WORKPLACE PREPARATION

The workplace must be set up to enable professional sorters and/or volunteers to use the hardware required to conduct the analysis. The hardware provided includes the following:

- The NIR scanners which are used to scan the garments and items.
- Tablets which are used to categorise each scanned item based on characteristics such as type of garment, colour, and disruptors using the Matoha app (link to download app on iOS and Android devices [here](#)).
- To prepare the workplace, following actions are recommended and will take around one hour to complete:
- Connect the tablets and NIR scanners to the internet. Ensure that the internet connection is not disturbed for the entire analysis process as the data must be stored on the cloud.
- Plug the NIR scanners into a power socket to turn them on (they must be plugged throughout the entire time of the analysis).
- Calibrate the NIR scanners using the calibration device (a small white plastic calibrator is provided by Matoha).
- Open the Matoha app on the tablets, and connect each device to the respective scanner (one tablet per scanner).
- Follow health and safety guidelines for the sorters and/or volunteers, for example, by providing orthopaedic mats as they are required to stand for long hours or by ensuring the height of the tables does not cause back pain.

To prepare the relevant fractions, following actions are recommended:

- Prior to the start of analysis, the fractions and volumes per fraction must be determined as part of the operations protocol.
- Appoint one individual to manage the logistics (the logistics varies per facility). This individual must bring in new bales to be sorted, pick up and weigh\* the sorted bales. This avoids the chance of double-counting of certain fractions, and enables an optimised and efficient sorting process.

\*Please note that individual garments were not weighed during the analysis, only the total bales were weighed.

# Methodology For Sorting With NIR Based Technology

## **STEP 3: TRAINING SORTERS/VOLUNTEERS**

After preparing the workplace for on-the-ground analysis, the sorters and/or volunteers must be trained to use the NIR scanners and tracking of product categories within the Matoha app. Some considerations at this stage:

- The training approximately takes one hour to complete, this is based on a training given by two research leads to a maximum of ten sorters and/or volunteers.
- The training includes: run through of data collection steps (see section 2.2 below), tracking of product categories on Matoha app.
- Ensure that sorters and/or volunteers are provided with Annex 2 to understand how to categorise disruptors.
- Allow some time for the sorters and/or volunteers to familiarise with the sorting process as a test round for approximately a half hour to one hour. During this test round, monitor the physical sorting process and the digital data stored in the cloud. Based on this monitoring, adjustments can be made. For instance, in the physical sorting space, examples of adjustments include height of tables, appropriate lighting, and the placement of new and sorted bales. While examples for the digital aspect include understanding productivity rate and checking for any mistakes with product categorisation.

One important consideration to note here was that the productivity was doubled when the sorting analysis was carried out by professional sorters over volunteers (i.e. university or high school students). Although students and other types of volunteers enjoy educational benefits from this process.

# Methodology For Sorting With NIR Based Technology

## 2.2 DATA COLLECTION

### STEP 4: DATA COLLECTION USING NIR SCANNERS

To scan and identify the composition of an item using the NIR scanner, follow the actions below:

1. Select the correct fraction name being scanned. The different fractions must be defined in the operational protocol and must also be added to the Matoha app, find more information [here](#).
2. Bunch the fabric and place over the sensor of the NIR scanner. The screen will display the composition of the item (i.e. 100% cotton or 57% acrylic/43% cotton). See image below.

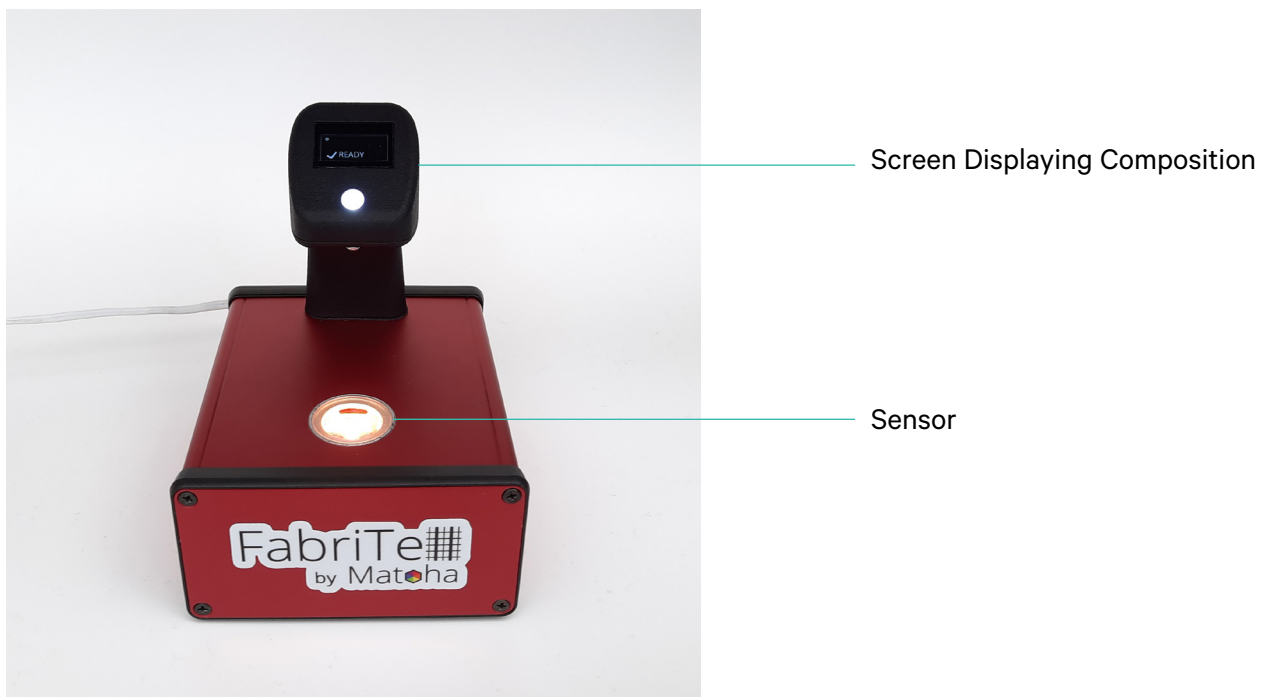


IMAGE: FABRITELL NIR SCANNER DEVELOPED BY MATOHA

3. When the scanner identifies the composition, it automatically appears on the tablet. Here, the product categories must be tracked and saved on the Matoha app. Product characteristics like type of garment or item, colour and presence of disruptors are captured in the app through a predefined multiple choice survey. In case the necessary characteristic is not predefined in the app, the sorter can insert the information in an adaptable field. See Annex 1 for further information.
4. If the item consists of more than one layer, the layers must be scanned and tracked separately. Through the app, the second scanned layer must be added to the categorisation of the first layer (by clicking on the button “Add to previous sample”).

# Methodology For Sorting With NIR Based Technology

5. If the scanned item provides an “unknown” result on the NIR scanner’s display screen, the sorters and/ or volunteers must input the composition claims manually on the Matoha app, as seen on the care label of the item. If the care label is missing or not legible, only the product category information must be tracked on the Matoha app.

Some considerations for data collection and items:

- Wet garments must not be scanned and should not be included in the fraction analysed.
- Items that are heavily broken or stained must be included and scanned, however, if an item is too small to be classified as a specific garment, they must be removed from the sample.
- See Section 3 to understand limitations of the handheld NIR scanners.

## 2.3 QUALITY CONTROL

### **ACTION 1: TRAINING AT THE START OF THE PROCESS**

The process of tracking product categories is a matter of subjective judgement of each individual sorter. Through the initial training and test round, it is recommended to go over exemplar product/garment types, mono- and multi-layer items, and the different types of disruptors to ensure alignment and mutual understanding in the defined product categories. The disruptors, specifically, was a common point of confusion, therefore clear training must cover the various types of disruptors (see Annex 2).

### **ACTION 2: MONITORING DATA REAL-TIME**

As data is being collected, it is important for one to routinely monitor the data in real-time to spot and resolve any mistakes or inconsistencies immediately. This was done using the Matoha API and a dedicated Python script developed by Terra for data monitoring. Some of the recurring mistakes, but not limited to, in the Project were mostly human errors:

- Incorrect categorisation
- Data saved under the wrong fraction name
- Inconsistencies between the two layers of one garment

Data collection could also be disrupted by external factors and in that case support from Matoha or the facility was fundamental to resolve them:

- Internet connection failures
- Cloud uploading issues
- Hardware failures of the tablets or scanners

Resolving such issues immediately was one way of controlling the quality of the data.

# 3. Limitations

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This section discusses some of the observed limitations of the Matoha Fabritell scanners:

- The scanner was unable to distinguish samples that are chemically identical, for instance, wool versus cashmere, or cotton versus linen. NIR can only differentiate samples that are chemically different, for instance different wool or plant fibre types differ in their microscopic shape and structure or simply the plant or animal they originate from. During the study, a wool blend was often identified as silk, or a leather product was identified as wool. All other mammal-derived fibres were recognised as wool, notably cashmere, alpaca, mohair, camel, mink etc. For more information, please refer to the [Matoha website](#) as they continue to update and improve their technology and algorithms.
- With regards to accuracy of the Matoha FabriTell, the scanner is able to detect two main materials used in a textile with typical accuracy  $\pm 5\%$  for pure samples and  $\pm 10\%$  for blends for most samples (see more information [here](#)). Accuracy can be affected by external factors, such as specific coatings (notably polyurethane but not perfluorinated waterproofing coatings), carbon black pigments, thick prints (e.g. PU or PVC iron-ons - the garments should not be scanned in the printed area), and presence of some synthetics, mainly elastane, which is hardly recognised by the scanner.
- In case of blends with three or more materials, the scanner would recognise the closest two-material blend or provide an “unknown” result.
- The scanner also produced an “unknown” result when scanning materials such as: natural leather, synthetic leather, PU coated fabrics, natural and synthetic fur, and occasionally silk, wool or linen. In case of supported materials, the unknown result would often be typically caused by coatings, pigmentation or operator error (i.e. not following the measurement guidelines [here](#)).
- Matoha scanner is optimally used in temperatures between 10°C and 40°C.
- First-generation Matoha scanners were used for this study. Matoha now have improved their scanners with e.g. better elastane detection and continue adding additional materials and improving the accuracy of their devices.

# 4. Contact

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For further information and collaboration we invite you to contact

**Fashion for Good (Project Lead)**

- Dolly Vellanki, Innovation Analyst - [scaling@fashionforgood.com](mailto:scaling@fashionforgood.com)

**Circle Economy (Project Lead and Methodology Implementation)**

- Hilde van Duijn, Associate Senior Strategist - [hilde@circle-economy.com](mailto:hilde@circle-economy.com)
- Ola Bąkowska, Project Manager - [ola@circle-economy.com](mailto:ola@circle-economy.com)

**Refashion (Methodology Consultant and Refashion Textile Materials Library Development)**

Cécile Martin, Innovation & Recycling Manager - [c.martin@refashion.fr](mailto:c.martin@refashion.fr)

**Terra (Methodology Implementation)**

- Brendan Guérin, Circular Economy Consultant - [brendan.guerin@terra.coop](mailto:brendan.guerin@terra.coop)

**Matoha (Technology Provider)**

- Chris Newton, Head of Sales - [chris@matoha.com](mailto:chris@matoha.com)

## **ANNEX 1: CHARACTERISTICS TRACKED DURING ANALYSIS**

This Annex lists garment characteristics tracked on the Matoha app during the Project.

### **1. MONO OR MULTI-LAYER ARTICLE** (choose mono-layer/multi-layer)

Check in Definitions section for definitions of both mono and multi-layered articles. Multi-layer case 2 articles were not considered as multi-layer articles, but as mono-layer articles with textile disruptors.

### **2. MATERIAL COMPOSITION** (NIR scan or manual input only if not recognised by the scanner and legible composition label present)

The FabriTell NIR scanner can recognise the following pure materials and all two-components blends of these materials (in 1% increments, usually  $\pm 10\%$ ):

- Cotton
- Polyester
- Viscose
- Wool
- Elastane
- Polyamide
- Silk
- Acrylic
- Acetate

For the purpose of the Project and to improve its identification performance, the detection algorithms of the Matoha FabriTell scanners have been adjusted based on the NIR footprints of the reference textile materials library developed by Refashion. It is therefore expected that the material compositions that can be found in the Refashion textile materials library should be more accurately recognised by the scanner. Contact Refashion and Matoha for further information on the Refashion textile materials library and the accurate recognition of composition (see Section 4. Contact).

### **3. PRODUCT CATEGORY**

The following product categories, based on a simplified version of Refashion's product categories, were tracked during the analysis.

A first selection will require a choice of age: Adult, Children (4 to 14 years old), Babies (0 to 4 years old), Accessories, Other.

This will lead the sorter in the app to a second and third choice in terms of the product category of the article being sorted (as indicated in the table below).



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**Table 1: Product Categories**

Age	Category Label	Product Category	List Of Products Within Category
Adults	Tops	Coats	Coat, large jacket type coat, cape, poncho, duffle-coat, canadian, overcoat, pea coat, parka, winter jacket (bomber, teddy, etc) - excluding denim
Adults	Tops	Lightweight Jackets	Windstoppers, blazers, light jacket, waistcoat under jacket, ultralight down jacket, poncho jacket, workwear jackets - excluding denim
Adults	Tops	Heavy Jackets	Ski jacket, big puffer jacket (short, long, with or without sleeves), ski suit, quilted jackets, leather jackets - excluding denim
Adults	Tops	Denim Jackets	Only denim jackets, blazers, overcoats
Adults	Tops	Shirts, Blouses (woven)	Shirt, blouse, blouse, tunic, other woven top
Adults	Tops	T-shirts and Polos (knits)	T-shirt (whatever its shape: wrap, top with straps, halter top, V-neck, round neck, tank top, etc.), polo shirt (long and short sleeves), rugby polo shirt, undershirt, sports jersey , technical T-shirt (thermal / UV) or other knitted t-shirts (eg. jersey, morley, piqué).
Adults	Tops	Waterproof Rainwear	Waterproof trench coat, rain cape, rain poncho
Adults	Tops	Sweaters (knits)	Heavy or light knit sweater (long sleeves, short sleeves, sleeveless, poncho sweater, turtleneck, V-neck, round neck), sweatshirt, bolero, fleece hoodies, cardigans, jumpers, tracksuit top, jogging top - excluding large jacket types coat
Adults	Bottoms	Sports Trousers (knits)	Sweatpants or jogging pants, leggings, jeggings, tregging, tapered pants, long johns - excluding denim

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<b>Adults</b>	Bottoms	Trousers (woven)	Pants, capris, knickers, jodhpurs, fatigues, chinos, harem pants - excluding denim
<b>Adults</b>	Bottoms	Denim Trousers	Pants, capris, knickers, jeans, jodhpurs, fatigues, chinos, harem pants - all in denim
<b>Adults</b>	Bottoms	Skirts	Skirt, culottes, petticoat - including tulle skirt (tutu type)
<b>Adults</b>	Bottoms	Shorts, Bermuda Shorts	Shorts, Bermuda shorts up to knee length - excluding denim
<b>Adults</b>	Bottoms	Denim Skirt	Skirt, culottes - all in denim
<b>Adults</b>	Bottoms	Denim Shorts	Shorts, Bermuda shorts up to knee length - all in denim
<b>Adults</b>	Underwear	All Bottoms	Panties, briefs, thongs, boyshorts, hipster, bodysuit, boxer shorts, boxer briefs - including sheathing, sheath, panty, shaping jumpsuit, period panties - excluding long underwear
<b>Adults</b>	Underwear	Bras and Lingerie	Bra (half cup, push-up, full cup, bandeau, shell, brassiere, etc), top with integrated bra, corset, waist cinche, bustier, camisoles, garter belt, leotards
<b>Adults</b>	Underwear	Swimwear	Swim brief, swimming trunks, one-piece swimsuit including neoprene, two-piece swimsuit, tankini, neoprene top, neoprene jacket - excluding T- UV and off shirt Full neoprene suit (only)
<b>Adults</b>	Underwear	Socks and Hosiery	socks, hosiery
<b>Adults</b>	Overall	Jumpsuits, Overalls (including workwear)	Jumpsuit, short jumpsuit, overalls, one-piece workwear (overalls, jumpsuits, aprons) -excluding denim and ski suits

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<b>Adults</b>	Overall	Denim Dresses, Overalls and Jumpsuits	Long, short, midi dress, ceremony dress, cocktail dress, evening dress, Jumpsuit, short jumpsuit, overalls, one-piece workwear (overalls, jumpsuits, aprons) - all in denim
<b>Adults</b>	Overall	Home Wear	Kimono, negligee, night gown, pajama sets, nightgown, loungewear
<b>Adults</b>	Overall	Dresses	Long, short, midi dress - including sweater dress -, ceremony dress, cocktail dress, evening dress - including wedding dress
<b>Adults</b>	Overall	Reflective Safety Wear	Reflective safety waistcoats, jackets, pants, jumpsuits
<b>Adults</b>	Overall	Costumes and Disguises	Costumes and disguises (e.g. halloween costumes and accessories)
<b>Children</b>	Tops	Coats	0-14 years old. Coat, large jacket type coat, cape, poncho, duffle-coat, canadian, overcoat, pea coat, parka, winter jacket (bomber, teddy, etc) - excluding denim
<b>Children</b>	Tops	Lightweight Jackets	0-14 years old. Windstoppers, blazers, light jacket, waistcoat under jacket, ultralight down jacket, poncho jacket, workwear jackets, blousons - excluding denim
<b>Children</b>	Tops	Heavy Jackets	0-14 years old. Ski jacket, big puffer jacket (short, long, with or without sleeves), ski suit, quilted jackets, leather jackets - excluding denim
<b>Children</b>	Tops	Denim Jackets	0-14 years old. Only denim jackets, blazers, overcoats
<b>Children</b>	Tops	Shirts, Blouses (woven)	0-14 years old. Shirt, blouse, blouse, tunic, other woven top

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<b>Children</b>	Tops	T-shirts and Polos (knits)	0-14 years old. T-shirt (whatever its shape: wrap, top with straps, halter top, V-neck, round neck, tank top, etc.), polo shirt (long and short sleeves), rugby polo shirt, undershirt, sports jersey , technical T-shirt (thermal / UV) or other knitted t-shirts (eg. jersey, morley, piqué).
<b>Children</b>	Tops	Waterproof Rainwear	0-14 years old. Waterproof trench coat, rain cape, rain poncho
<b>Children</b>	Tops	Sweaters (knits)	0-14 years old. Heavy or light knit sweater (long sleeves, short sleeves, sleeveless, poncho sweater, turtleneck, V-neck, round neck), sweatshirt, bolero, fleece hoodies, cardigans, jumpers, tracksuit top, jogging top - excluding large jacket types coat
<b>Children</b>	Bottoms	Sports Trousers (knits)	0-14 years old. Sweatpants or jogging pants, leggings, jeggings, tregging, tapered pants, long johns - excluding denim
<b>Children</b>	Bottoms	Trousers (woven)	0-14 years old. Pants, capris, knickers, jodhpurs, fatigues, chinos, harem pants - excluding denim
<b>Children</b>	Bottoms	Denim Trousers	0-14 years old. Pants, capris, knickers, jeans, jodhpurs, fatigues, chinos, harem pants - all in denim
<b>Children</b>	Bottoms	Skirts	0-14 years old. Skirt, culottes, petticoat - including tulle skirt (tutu type)
<b>Children</b>	Bottoms	Shorts, Bermuda shorts	0-14 years old. Shorts, Bermuda shorts up to knee length - excluding denim
<b>Children</b>	Bottoms	Denim Skirt	0-14 years old. Skirt, culottes, petticoat - all in denim
<b>Children</b>	Bottoms	Denim Shorts	0-14 years old. Shorts, Bermuda shorts up to knee length - all in denim
<b>Children</b>	Underwear	All Bottoms	0-14 years old. Panties, briefs, boyshorts, bodysuits, boxers, boxers

## Annexes

<b>Children</b>	Underwear	Bras and Lingerie	0-14 years old. Bras for little girls
<b>Children</b>	Underwear	Swimwear	0-14 years old. Swim brief, swimming trunks, one-piece swimsuit including neoprene, two-piece swimsuit, tankini, neoprene top, neoprene jacket - excluding T- UV and off shirt Full neoprene suit (only)
<b>Children</b>	Underwear	Socks and Hosiery	0-14 years old. socks, hosiery
<b>Children</b>	Overall	Jumpsuits, overalls (including workwear)	0-14 years old. Jumpsuit, short jumpsuit, overalls -excluding denim and ski suits
<b>Children</b>	Overall	Denim dresses, overalls and jumpsuits	0-14 years old. Jumpsuit, short jumpsuit, overalls -excluding denim and ski suits
<b>Children</b>	Overall	Home wear	0-14 years old. Kimono, negligee, night gown, pajama sets, nightgown, loungewear
<b>Children</b>	Overall	Dresses	0-14 years old. Long, short, midi dress - including sweater dress -, formal dress
<b>Children</b>	Overall	Reflective safety wear	0-14 years old. Reflective safety waistcoats, jackets, pants, jumpsuits
<b>Children</b>	Overall	Costumes and disguises	0-14 years old. Costumes and disguises (e.g. halloween costumes and accessories)
<b>Babies</b>	-	Clothes	0-3 years. Jumpsuit, pilot, over-pajamas, coat, shirt, t-shirt, romper, sweater, bloomers, blouse, waistcoat, sweatshirt, dress, overalls, pants, shorts, leggings, polo shirt , jogging, growsuits, pajamas, bodysuits
<b>Babies</b>	-	Underwear and Accessories	0-3 years. Panties, bib, hat, scarf, cloth diapers, slippers, socks, tights, gloves

# Annexes

<b>Accessories</b>	-	Medium Accessories	Scarf, shawl, scarf, stole, chèche, snood, choker, sarong
<b>Accessories</b>	-	Hats and Headwear	Hat, beret, bob, cap, toque, balaclava, visor, beanie, chapka and headgear in general
<b>Accessories</b>	-	Gloves and Mittens	Gloves for protection against the cold, fashion accessory, gardening, sport, welding, or mittens for use as washcloth - including exfoliant, oven mitt, potholder, cleaning glove (microfibre or other), scrub glove
<b>Accessories</b>	-	Small Accessories	Tie, bow tie, mock collar, mock cuff, fabric belt, pocket square, mantilla, suspenders, handkerchief
<b>Other</b>	-	Fabrics by the Metre	Fabrics by the metre for clothes (3 yards = 1 pcs) or for curtains, mosquito net, bed linen, bath linen, table linen (3 metres = 1pcs)
<b>Other</b>	-	Household Linen	Covers, Duvet covers, Bed linen, Table linen, Curtains, Sheets, Pillow/bolster cases and protective covers , Bath linen and carpet (wet area), Towels, Tablecloths, Napkin, Placemats, Shades
<b>Other</b>	-	Other	Articles that do not fit any of the categories above

## 4. COLOUR

There are 11 choices of colour programmed in the Matoha app: Black, Blue, Brown, Green, Grey, Orange, Purple, Red, White, Yellow, Multi-colour. Pink was entered as Red.

## 5. PRESENCE & MATERIAL OF DISRUPTORS

The following trims and hardware are considered disruptors to recycling and if present, should be tracked according to what material they are made of (Plastic, Metal, Textile, Other). If no disruptors are present, they should be tracked as None. If there are different disruptors made of different material, the disruptors are tracked as Other. The following tables illustrate different types of disruptors.

# Annexes

## ANNEX 2: CATEGORISATION AND EXAMPLES OF DISRUPTORS

**Table 2: Metal disruptors examples**

<b>METAL</b> Disruptors Examples
Zipper
Button
Rivet
Hook and Bar
Fastener
Buckle
Snap Button
Carabiner
Hook and Eye
Underwire (Bra)
Eyelet or Ring
Charm

**Table 3: Plastic disruptors examples**

<b>PLASTIC</b> Disruptors Examples
Reflective Strip
Button
Zipper
Epaulette
Collar Support
Pearl
Foam
Snap Button
Fastener
Buckle

# Annexes

**Table 4: Fabric disruptors examples**

<b>FABRIC</b> Disruptors Examples
Elastic
String
Ribbon
Patch
Pompon (if different from main layer)
Inset / Yoke (if different from main layer)
Embroidery
Pocket (if another fabric than main)

**Table 5: Other disruptors examples**

<b>OTHER</b> Disruptors Examples
Leather
Fur
Pendant (multiple materials)
Print
Brandenburg Trim (wood)
Sequin
Lurex Thread



# References

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