FUNDING PROGRAMME: Joint Research Centre (JRC) **SUBPROGRAM:** **Stichting Circle Economy**	

TITLUL PROIECTULUI/ACRONIM:
Quantification and composition analysis of textiles intended for re-use, recycling and disposal

CONTRACT NO.: JRC/SVQ/2023/MVP/0008 / 2023

TOTAL PROJECT BUDGET: -	**INCDTP'S BUDGET:**12.780 Eur
PROJECT STARTING DATA: 30.06.2023	**PROJECT ENDING DATA:** 30.06.2024

PAGINA WEB:

PARTNERS:

JRC - Fhasion for Good - Coordinator	
MATOHA, England	
INCIEN , Czech Republic	
HUMANA, Italy	
INCDTP, Romania	

GENERAL OBJECTIVE:
Building on the Sorting for Circularity Europe project, and extensive experience from similar projects, such as the Interreg Fibersort project and previous textile composition analyses, the objective of the project is to create a scalable train-the-trainer approach replicating and expanding the tested methodology to geographies that play a strategic role in global trade of textile waste and are under-researched currently (central and eastern European regions). At the same time, through strategic partnerships, the project aims to expand the tested methodology to also include data and quality standards of textile waste managed as municipal waste (TMW). The study is designed to meet the research requirements outlined in the Technical Specifications tender document by JRC-Seville.

SPECIFIC OBJECTIVES:
1.To quantify the current management routes of textiles in 3 selected EU Member States
2. To map potential future management routes of post-consumer textiles in 3 EU Member States
3. To generate a common understanding of textile flows across Europe, and beyond
4. To build local capacity to lead textiles quantification and characterization studies
5. To inform policy and investments to incentivize the transition to circular textiles
 WORK PACKAGES:
1. Development of a resource-efficient sampling and measurement strategy
2. Consulting textile sorting and processing units
3. Determination of masses and evaluation of textile composition in TIR and TMW
4. Reporting and data analysis
5. Expert recommendations and technical support

NEW ELEMENTS/SCIENTIFIC CONCEPT:
Fibre-to-fibre textile recycling commitments and policies continue to grow as one of the key strategic components driving companies to support the transition to a circular fashion industry. Brands and manufacturers have made great efforts to increase the use and recyclability of secondary raw materials, such as the Global Fashion Agenda 2020 Circularity Commitments, Ellen MacArthur's Make Fashion Circular

Commitments and the Jeans Redesign Guidelines[1] or WRAPs Textiles 2030. Following the commitments, the number of facilities that have been certified by the Recycled Claim Standard (RCS) have also increased ninefold between 2014 and 2019, with an increase in the number of facilities certified to operate under recycled content standard. The European Commission is also expected to drive further changes in the EU policy landscape in the coming years as the EU textile strategy for sustainable and circular textiles evolves.

To effectively support policymaking, there is a need to close the current technical and knowledge gaps by developing data-driven impact assessments to capture all the dimensions of textile waste flows and their impact in the EU at the highest level of detail. Furthermore, to holistically inform any future investments, it is imperative to understand the characteristics of post-consumer textiles available in the European market, as well as the business case for monetisation through recycling.

To this end, in 2020 Circle Economy in collaboration with Fashion for Good, created the Sorting for Circularity Europe Project to address this gap to accelerate experimentation and investments in the space of sorting technologies and fibre-to-fibre recycling, exploring textiles materials in depth. The Project was aimed at analysing types of waste being generated, quantities available as feedstock for recycling, and the ability to channel textile waste as feedstock for those with innovative solutions. Focused on six countries, Circle Economy assessed post-consumer textiles in Belgium, Germany, the Netherlands, Spain, the United Kingdom and Poland. As part of the project, three resources were made available: a report, which provides powerful information on which informed decisions can be made for further investment, policy developments and next steps towards circularity; a Sorters Handbook, which is a guide to conduct further trials and continue to build a knowledge of fibre composition of post consumer textiles, sorting and recycling processes; and a Recyclers Database, which is an overview of over 100 fibre-to-fibre mechanical and chemical recyclers and their technical specifications, providing an understanding of end markets for textiles sorted based on composition.

EXPECTED EXPLOITABLE RESULTS:

WP 1.

1.1. Identification of the sampling area and factors to be considered;

1.2. Determination of the sampling scheme and protocol;

1.3. Development of the sample size proposal;

1.4. Ensuring a quality control system for consistent sampling and storage

WP 2.

2.1 Understanding the current quality requirements for the management of separately collected textiles intended for reuse/recycling

2.2. Development of appropriate future routes for the management of used textiles and waste

WP3

3.1. Determination or informed estimation of textile mass flows at each of the selected TMW/TIR sampling points

3.2. Determination of the mass of impurities present in separately collected, sampled textiles, subdivided by category

3.3. Estimation of the fibre composition of TMW and the different fractions/streams of TIR

3.4. Identification of other information on barriers to recycling

3.5. Assessment of the envisaged management routes under a future scenario of improved management of textile waste ending up in TMW.

WP4

4.1. Writing the report

4.2. Review of content and integration of changes

WP5

5.1. Consultation with the JRC team

OBTAINED RESULTS:

Analysis of the state of implementation of European legislation in Romania

-Interviews with companies involved in the collection and sorting of textile waste of TIR type (6 companies) and TMW (2 companies) and specialized associations highlighted that the collection rate in Romania is approximately 15%, which is significantly below the European average of 38% and the documented presence of textile waste within mixed waste (TMW) was estimated at 5-6%. The internal reuse rate is extremely low in Romania,

compared to Italy where it can reach up to 40% (re-use for fractions exported to countries outside Europe). Interviewees indicated that approximately 23% of TIR is exported as recyclable, the rest is directed to local charities for recycling or incinerated at a cost of up to 150 euros/ton. Domestic charity reuse systems are operated by the Red Cross, CARITAS and smaller organizations.

Determination of the structure of TIR-type textile waste

The analyses were carried out in two stages: January 2024 (lot I) and May 2024 (lot II). Lot I consisted of 1500 kg of used clothes, respectively 8720 pieces of clothing with an average weight of 172 gr./item. and lot II of 1520 kg of used clothes, respectively 5396 pieces with an average weight of 280 gr./item.

-For each component of the used clothes lots in the TIR category, analyzed with the Matoha device, approx. 30 indicators were recorded and for the basic indicators: fibrous composite, color, degree of wear, textile support structure and the age of the recipient, the evolution per lot and fractions was analyzed.

The following were highlighted:

-Multicoloured products are predominant;

-The share of knitted products was higher (55.6% and 55.0% respectively) compared to woven products (44.0% and 44.5% respectively).

- Articles with multiple fibrous composition were dominant (about 46.0%) followed by those made of 100%bbc (about 32.0%)

-The share of articles with advanced wear and low reuse potential was 19.9% and those with high reuse potential 80.6%.

Structural analysis by the MATOHA device

-The articles analyzed in the age group – adult held the share (about 60.0%)

TIR waste textiles

TMW textile waste

Determination of the structure of TMW textile waste

The research activity was carried out in two stages on a batch of approximately 1000 kg of municipal waste (mixed waste), at a specialized economic agent (3D Gren) that processes municipal waste. Each TMW batch was made up of 2 types of waste, those collected more or less separately, identified as textile bins (TB), and those found directly in mixed solid waste, identified as textile non-bins (NB).

-Both TMW I and TMW II batches had a share of items that are not collected in special containers (79.2% and 52.4% respectively). They are found in municipal waste (the population includes them in household waste).

-Items with a fabric structure recorded a higher share compared to knitwear (46.4% compared to 42.5%);

-Degree of wear: it was between 52.2-62.2% of grade II and 14.4-20% of grade III.

-The colour black had a share of 25.1% followed by multi-colored items -24.9%;

-The share was held by items made of fibre mixtures: 50.5%-62.9%.

Research team-INCDTP

DISSEMINATION, PATENT APPLICATIONS, AWARDS:

BDI published papers:

- Visileanu Emilia, Grosu Catalin , Dondea Felicia, Scarlat Razvan , Vladu Alina Florentina, *Structural characteristics of textiles collected for reuse and recycling*,Annals of the University of Oradea, Fascicle of Textiles, Leatherwork, vol.25, issue 2, pag.93-100.
- Grosu Marian Cătălin, Visileanu Emilia, Vladu Alina Florentina, Scarlat Răzvan-Victor, Dondea Maria-Felicia, *Aspects relating to the structure of the textile fraction contained in municipal solid waste,* Proceedings of 24th International Multidisciplinary Scientific GeoConference SGEM 2024 (29.06 – 08.07, 2024)
- Dondea Felicia, Visileanu Emilia, Cătălin Grosu, Răzvan Scarlat, *Defining the possible routes of textile waste in Romania,* Proceedings of 10th International Conference on Advanced Materials and Systems, Bucharest, Romania, 30-31 October 2024, ICAMS 2024

Scientific communication:

- Seminar organized by the Transylvania Cluster and the General Secretariat of the Government on 29.09.2023 and presentation of the paper: Analysis of actions and opportunities in the textile and sustainable fashion industry from the perspective of the National Strategy for the Circular Economy, author Emilia Visileanu.
- Seminar of the VIZIONAIRING-AGIR Club on 25.01.2024 and presentation of the paper: Circular economy – a model of production and consumption, author Emilia Visileanu.
- 24th International Multidisciplinary Scientific GeoConference SGEM 2024 (29 Jun - 8 Jul, 2024), Albena, Bulgaria cu lucrarea: *Aspects relating to the structure of the textile fraction contained in municipal solid waste,* authors*:* Grosu Marian Cătălin, Visileanu Emilia Vladu Alina Florentina, Scarlat Răzvan-Victor, Dondea Maria-Felicia.
- The 10th International Conference on Advanced Materials and Systems, Bucharest, Romania,30-31 October 2024, ICAMS 2024 cu lucrarea: *Defining the possible routes of textile waste in Romania,* authors: Dondea Felicia, Visileanu Emilia, Cătălin Grosu, Răzvan Scarlat.

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