Executive summary

D2.2 Analysis of boundary conditions for waste collection systems

TASK 2.1 IDENTIFICATION OF MAIN BOUNDARY CONDITIONS FOR BETTER-PERFORMING WASTE COLLECTION SYSTEMS

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Credits

Disclaimer

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Introduction

In the circular economy, the role of the waste collection system is both to provide a service to citizens so that they can get rid of their waste, and to turn waste into a resource by recycling the sorted fractions.

On the one hand, a waste collection system should provide a suitable framework to citizens so they are willing to cooperate and, on the other hand, enable the collected waste to be sorted and recycled into valuable secondary materials, so that the material loops can be closed.

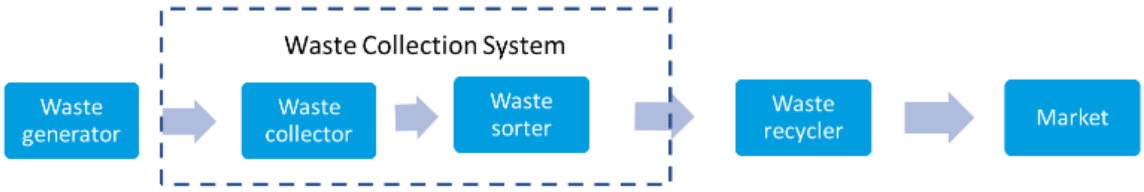

Figure 1: waste collection system in the recycling value chain

The analysis of the role of the waste collection system within this recycling value chain is to be reported in several reports within the framework of the COLLECTORS project:

- D2.1 Methodology report: this report describes the approach to be used to analyse the role of the waste collection system in the recycling value chain;
- D2.2 Analysis of boundary conditions for waste collection systems: this report analyses in a general way the role of the waste collection system;
- D2.4 Report on solutions for tackling systemic and technical boundary conditions: based on the analysis of several specific case studies, this report describes how a waste collection system can help to produce recycled materials of high quality;
- D2.5 Report on implemented solutions and key elements in selected cases for societal acceptance: this report describes the factors that influence the behaviour of citizens to participate in a waste collection system

Boundary conditions for effective waste collection

Objective

The goal of the report D2.2 Analysis of boundary conditions for waste collection systems is to provide a general analysis of the role of the waste collection system within the recycling value chain. This role is double: providing a service to citizens (= citizens' perspective, and making secondary materials of high quality available to recyclers through sorting and recycling (= recyclers' perspective).

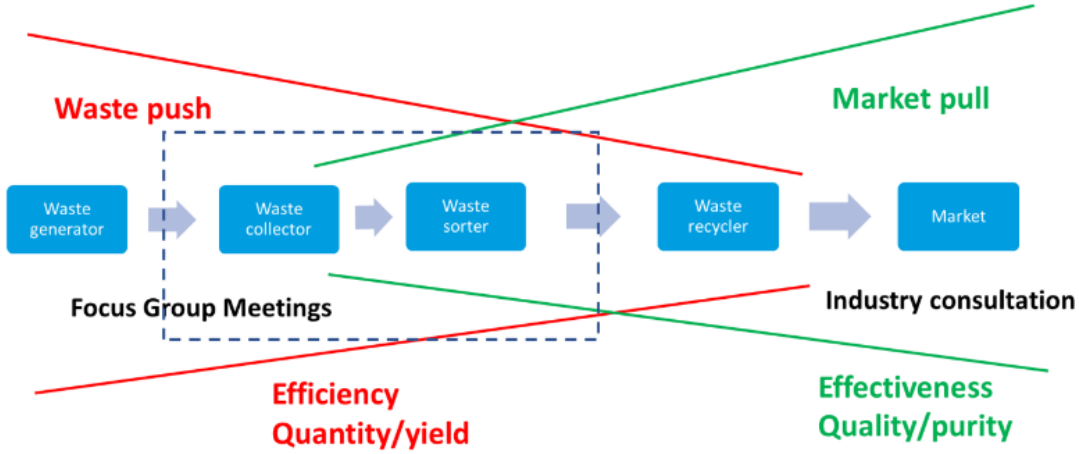

Figure 2: Circular Economy concept shifts recycling from waste push to market pull

Description

For recyclers, waste collection systems should be design so that they can provide qualitative secondary material from the collected waste. After analysing the recyclers' perspective, it seems that there 3 factors that can improve the sorting and recycling process following the waste collection:

- **Traceability of the collected waste**: relevant information would include the exact scope of the waste collection (what is exactly collected, and what is not). The more information recyclers can obtain about the origin of products that have become waste, the more they know about the materials it is composed of, and the higher the chance are that these materials can be recycled into high quality products;
- **Supply of collected waste**: in order to be able to operate in a steady way, a minimum amount of waste has to be supplied to the sorter and recycler;
- **Quality of the waste**: the (sorted) waste should meet some quality requirements to enhance recycling into marketable secondary materials; additionally, the quality level

should show stability in relation with the flexibility of the recycling and manufacturing infrastructure, to enable the reception of the waste and secondary materials.

The potential of a waste collection system to contribute to better recycling mainly lies in its capacity to provide significant quantities of waste, in line with the quality requirements for the corresponding secondary materials (i.e. high capture rates and low levels of impurity). The identification of the main boundary conditions for a waste collection system from a circular economy perspective shows us that the **quality of the waste** is a dominant factor in enhancing the performance of the recycling value chain, by providing more or better recycling

Therefore, we analysed the **relation between the (sorted) waste, the corresponding secondary materials, and end-applications**, and **described the quality requirements** that allow recycling processes to produce marketable secondary materials, both for separately collected paper and packaging waste fractions and for WEEE.

As a conclusion we drafted a table (presented below) providing an overview per waste fraction of all possible collection methods, collected fractions, sorting outputs and recycling outputs.

As a next step (in D2.4 Report on solutions for tackling systemic and technical boundary conditions), we will use this table to assess a selection of case studies to demonstrate the relation between the waste collection methods and the corresponding secondary materials and end applications.

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Table 1: Overview of collection method, collected fractions, sorting outputs and recycling outputs for PPW and WEEE

Fraction	Container glass waste	Paper & cardboard waste	Plastic packaging waste	Steel & aluminium packaging waste	WEEE
Collection method	• Door-to-door • Bring point • CAS • Door-to-door + bring points • Bring points + CAS • Door-to-door + bring points + CAS • Bring points + CAS + other	• Door-to-door • Bring point • CAS • Door-to-door + bring points • Door-to door + CAS • Bring points + CAS • Door-to-door + bring points + CAS • Bring points + CAS + other	• Door-to-door • Bring point • CAS • Other • Door-to-door + bring points • Door-to door + CAS • Bring points + CAS	• Door-to-door • Bring point • CAS • Other • Door-to-door + bring points • Door-to door + CAS • Bring points + CAS	• CAS • Retailer bring point • Non-retailer bring point • Pick-up on request • Mobile bring point • Other
Collection output	• Mixed container glass co-mingled with other wastes • Mixed container glass • Clear container glass • Coloured container glass	• Newspapers & magazines • Cardboard • Mixed paper & cardboard • Paper & cardboard co-mingled with other wastes	• Plastic packaging co-mingled with other packaging waste • Plastic packaging only, co-mingling all polymers • Single type of packaging (e.g. only bottles) and/or a single polymer (e.g. PET) • Mix of two or more target polymers (e.g. PET, HDPE, LDPE, PE, PP) and/or packaging types (e.g. bottles and foils)	• Aluminium and steel packaging co-mingled with other packaging waste, often including drinking cartons • Aluminium beverage cans only • Metal packaging • Metal packaging co-mingled with other dry recyclables	• Temperature exchange equipment • Screens & monitors • Lamps • Large appliances • Small household appliances • Small IT
Sorting output	• Brown container glass cullet • Green container glass cullet • Clear container glass cullet • Mixed container glass cullet	• mixed paper & cardboard • corrugated and kraft • newspapers & magazines • other and special grades	• Mono-colour or mixed colour bales or bags containing a single polymer (PP, PET, LDPE, HDPE, PS, EPS)	• Baled or briquetted aluminium cans and/or aluminium meal trays, rigid containers, aerosol cans, screw closures and cappings • Baled steel drums and cans • Baled drinking cartons	• Depolluted appliances • Parts from dismantling (cables, compressors, casings, coils & motors, circuit boards, drives, batteries…)

Recycling output	• Container glass (flint, brown, green) • Insulation mineral wool (short glass fibre) • Ceramic sanitary ware • Fluxing agent in brick manufacture • Sports turf and related applications • Water filtration media • Abrasive • Aggregate in construction materials • Reflective highway paint	• Newsprint • Other graphic papers • Case materials • Carton board • Wrappings and other packaging • Sanitary and household • Other paper and board • Construction materials (insulation, bricks and furniture) • Animal beddings or compost • Fibre applications in construction and manufacturing (in concrete, asphalt, brake linings)	• Mono-colour rPET • Mono-colour rLDPE / rLLDPE • Mono-colour rHDPE • Mono-colour rPP • Mixed plastic pellets	• 3000-series wrought aluminium alloys • Low carbon steel • Fibres	• Material-related waste streams for recycling: ○ Aluminium scrap, ferrous scrap, copper scrap, circuit boards ○ PP, PE, PS, ABS and mixes thereof ○ Glass and mineral fractions

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WASTE COLLECTION SYSTEMS ASSESSED AND GOOD PRACTICES IDENTIFIED

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