COLLECTORS
WASTE COLLECTION SYSTEMS ASSESSED AND GOOD PRACTICES IDENTIFIED

Executive Summary of COLLECTORS deliverable D1.3: Selection of 12 validated case studies

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Introduction & goal

The aim of the Collectors project is to identify and highlight existing good practices on the collection and sorting of packaging and paper waste (PPW), waste electrical and electronic equipment (WEEE) and construction and demolition waste (CDW). As part of the project, an inventory of 242 waste collection systems operating in different regions in Europe was conducted. The outcome from the inventory is a database that includes information from systems currently in place for collecting PPW, WEEE and CDW from mainly private households and similar sources.

Within the project, it is considered that good practices should be identified and evaluated based on their performance on several dimensions that include quality of the collected waste, economics, environment and societal acceptance. The database parameters for describing the characteristics and performance of the waste collection systems on these dimensions were defined at the beginning of the project together with external experts and members of the Regional Working Group (RWG).

The database includes 73 WEEE collection systems from 18 different countries. Regarding PPW, 135 systems from 25 countries are included and finally, the database has of 34 CDW collection systems from 17 different countries. Based on the information included in the database, the project highlights 12 case studies that act as examples of good practices in different local conditions. The case studies include five WEEE collection systems, five PPW collection systems and two CDW collection systems.

The aim of this executive summary is to describe the approach for identifying a group of potential cases from the inventory database for detailed environmental and socio-economic analysis. In addition, relevant findings from the case selection are summarized.

The method for selecting the case studies

For selecting the 12 case studies, methods of multicriteria group decision-making were applied. Multicriteria decision-making (MCDM) can be used for breaking down complex problems into manageable components. With the help of MCDM, different dimensions that are important for the decision-making context may be considered and evaluated one at a time. With the help of group

decision-making methods, opinions from several decision-makers (possibly having different values and preferences) can be collected and included in the decision.

The scope of the case selection was limited to problem structuring and solving by MCDM, resulting in a ranking of the waste collection systems in the inventory database. Only the parameters and information that was available in the database was used in the decision-making. Further consideration by the project group was needed for the final selection of the case studies, which is outside the scope of this executive summary. These issues to consider include e.g. the availability of data for the case study and interest of the targeted region to participate in the study. However, the identification of the potential cases did take into account that the cases should be located in different countries across Europe, and represent different regional characteristics.

Altogether three multicriteria decision-making (MCDM) exercises were conducted as part of the RWG meeting that took place in Malta, in September 2018. During the RWG meetings, MCDM was applied for collecting feedback and opinions from the members of the RWG and other invited local and European experts in a structured way. RWG members were experts working within public waste management companies and other public organisations across Europe.

Results from the decision-making workshop

The experts who participated in the group decision-making were asked to give their preferred weights for a range of performance-oriented criteria. The criteria weights were elicited using the SWING method. The weights described the importance given for a waste collection system's performance in a certain criterion, such as capture rate. In order to manage with the data gaps in selected performance criteria, an approach was devised where two different but redundant aggregation methods, which translate the criterion performances and weights into a ranking of the alternatives, were simultaneously used. Applied methods were the value based Multi-Attribute Value Theory (MAVT) and the outranking method PROMETHEE. The use of these two aggregation methods was chosen based on their fundamentally different manners to deal with missing data. Finally, the stakeholders' views were incorporated into the definition of the necessary constraints to make sure the proposed cases not only were performing well but also represented a sufficient geographical spread and conditions where waste collection might be especially challenging or interesting. The decision-makers were asked to vote for two of the most important non-performance-related parameters that best define the conditions where the collection system is applied and what challenges it faces. Lower- and higher-than-median values in these parameters

should then be represented in the final selection of cases. The selected and weighed criteria are presented in Table 1.

Table 1. The preferred database parameters for selection and benchmarking of the waste collection systems in the COLLECTORS database. The criterion weights (describing the normalized importance of the criterion compared to others) are presented in parenthesis.

	The regional parameters that were judged to have the most impact on the collection system	Criteria used for ranking the waste collection system (weights in parentheses)
Packaging and paper waste	• Tourism & commuters, Annual overnight stays per inhabitant • Total MSW generation, kg per capita / year	• Share of Glass in mixed residual waste, % (0.11) • Share of Paper and cardboard in mixed residual waste, % (0.10) • Share of Metal in mixed residual waste, % (0.10) • Share of Plastic in mixed residual waste, % (0.12) • Capture rate of Glass, % (0.14) • Capture rate of Packaging and non-packaging (paper), % (0.14) • Capture rate of Plastic, % (0.15) • Capture rate of Metal, % (0.13)
Waste electrical and electronic equipment	• Population density, No. of inhabitants per km^2 • GDP per inhabitant, € / inhabitant	• Share of WEEE in mixed residual waste, % (0.52) • Total WEEE collected per inhabitant, kg / inhabitant (0.48)
Construction and demolition waste	• GDP per inhabitant, € / inhabitant	• Number of inhabitants per CAS

As only two or five cases per waste stream are selected for case study phase, a maximum number of two regional parameters were able to be included per waste stream. Other important regional parameters which were considered to have impact on the waste collection of PPW were type of housing (detached and semi-detached houses in %) in the region, total population in the region (inhabitants), population density (inhabitants / km^2) and GDP per inhabitant (€ / inhabitant). Other

important regional parameter affecting the collection on WEEE were the estimated WEEE generation (kg/capita/year). Regarding CDW, the other validated parameters were the type of housing, population density, remoteness of the region and population growth.

The highlighted parameters in Table 1 were validated during the project work and successive RWG meetings for data availability and relevance for the identification of good waste collection practices. Therefore, these parameters can be considered valid for benchmarking purposes in waste collection and management also outside the Collectors-project. However, they focus only on the capture rates of the materials, which is due to environmental and economic parameters being omitted from the case selection because of insufficient data available. In fact, the RWG indicated the importance of social, environmental and economic indicators during the MCDM workshops. Based on the case studies, the Collectors project will be able to propose methods for assessing these indicators and their further use in decision-making.

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