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GOOD AND BEST PRACTICE *Handbook*

FOR THE COLLECTION OF PAPER AND BOARD FOR RECYCLING

IMPACTPAPEREC

Boosting separate paper collection

GOOD AND BEST PRACTICE HANDBOOK FOR THE COLLECTION OF PAPER AND BOARD FOR RECYCLING

VERSION 4.0

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Edited by ITENE (Packaging, Transport and Logistics Research Centre)

With the assistance of:
Association of Cities and Regions for Sustainable Resource Management (ACR+), Confederation of European Industries (CEPI), SAICA, HAMBURGUER RECYCLING, STORA ENSO, CITEO, PTS, PROPAKMA, S.C. TEGA S.A, C.C. CARREFOUR, German Institute for Standardisation (DIN), European Environmental Bureau (EEB), FENIX DUPNICA, SFANTU GHEORGHE MUNICIPALITY (Romania), MIHAI VITEAZU MUNICIPALITY (Romania), DUPNITSA MUNICIPALITY (Bulgaria), MEZDRA MUNICIPALITY (Bulgaria) and TRIVALIS MUNICIPALITY (France)

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Abbreviations

BE	Belgium
BG	Bulgaria
BSI	British Standards Institution
BP	Best Practice
BPWG	Best Practice Working Groups
CEN	European Committee for Standardisation
CEN/TS	European Technical Specifications
CEN/TR	European Technical Reports
CENELEC	European Committee for Electrotechnical Standardisation
CWA	CEN Workshop Agreements
DE	Germany
DIN	German Institute for Standardisation
D-t-D	Door to door
EC	European Commission
EN	European Standard
EPR	Extended Producer Responsibility
ES	Spain
ESC	External Support Committee
ETSI	European Telecommunication Standards Institute
GP	Good Practice
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardisation
ITU	International Telecommunications Union
KPI	Key Performance Indicator
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
NEN	Netherlands Standardisation Institute
PAYT	Pay as you through
PfR	Paper and board for recycling
PO	Poland
RO	Romania
SL	Slovenia
UK	United Kingdom
WFD	Waste Framework Directive

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Definitions[1]

Source

HOUSEHOLD

Private end-user.

BUSINESS

Small Business: Small shops and offices in household-assimilated waste collection.

Big Business: Big business such as big shops, supermarkets, shopping malls, logistics and distribution centres and big office buildings.

End user

CONSUMER

Private end-user. Different building structures (detached house, town house, apartment building). Source: households.

RETAIL

Shops selling consumer goods, such as food, clothing, cosmetics, electronics and books. Household assimilated waste collection. These tipically have service contracts with PfR trading or container service companies and do not participate in the municipal collection system, specially large retailers. Source: small and big businesses.

OFFICES

Big and small offices of large companies, life insurance agencies, insurance broker, estate agents, banks, lawyers, freelancers, medical practice, consultants, etc. The big offices of large companies tipically have service contracts with PfR trading or container service companies and do not participate in the municipal collection system.

Source: big/small businesses

RESTAURANTS

Business that provides a food service, such as restaurants, pubs, cafés and fast food. Material: mixed paper & board, packaging, special paper products. Source: small and big businesses (household assimilated collection possible).

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Type of collection unit

BAG

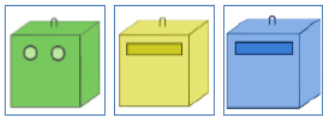
Receptacle for (normally plastic bags) with different capacities (60-120 litres) for depositing waste and recyclables. Collection system: Door-to-Door/ bring banks (Sees section 3).

BIN

Receptable for waste and recyclables; equipped with a lid and often on wheels; usually emptied into the collection vehicle. There are different capacities available (for example, small bin: 6-240 litre capacity, large bin: 660-1100 litre capacity, etc.). Collection system: bring banks and Door-to-Door (See section 3).

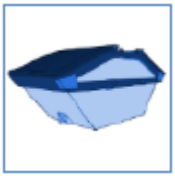
BUNDLE

Number of items, like newspapers or cardboard, fastened together with yarn or the like.



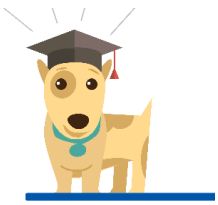
CONTAINER

Receptacle for recyclable with a capacity of 1500-4000 litres; often used for collection of recyclables at a bring bank; usually emptied into the collection vehicle. Collection system: bring bank (See section 3)



LARGE CONTAINER

Receptacle for waste and recyclables with different capacities; often used for commercial and industrial collection and at recycling yards. Collection system: Recycling yards (See section 3).



[1] For further information, see " D3.1. Current collection models in the cities under study (34)

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Material characteristics **(waste & recyclable streams and sorted fractions)**

RECYCLABLES

Materials that can be reprocessed into feedstock for new products. Common examples are paper, cardboard, glass, aluminium and plastic.

GRAPHIC PAPER

Paper made for printing text or images (newspapers, magazines, office paper, etc). The sorted stream ´graphic paper´corresponds to paper for recycling grade 1.11.00 (according to the European List of Standard Grades of Paper and Board for Recycling EN 643)

CARDBOARD

Board (paperboard): The generic term applied to certain types of paper frequently characterized by their relatively high rigidity. The primary distinction between paper and board is normally based on thickness or "grammage" (the basis weight), though, in some instances, the distinction is based on the characteristics and/or end use. For example, some materials of lower grammage, such as certain grades of folding boxboard and corrugated raw materials, are generally referred to as "board", while other materials of higher grammage, such as certain grades of blotting, felt or drawing paper, are generally referred to as "paper".

Packaging paper: The type of high-strength paper used for wrapping and packing after conversion to packaging (boxes, bags). This covers both paper and board.

The sorted stream 'cardboard' corresponds to PfR grades 1.04.xx and 1.05.xx.

COMMINGLED

Dry mixed recyclables that are collected together (single-stream).

NON-PAPER COMPONENTS

According to EN 643, a non-paper component is any foreign matter included in the paper and board fraction for recycling which is not a constituent part of the product and can be separated by dry sorting, such as metal, plastic, glass, textiles, wood, sand, building materials and synthetic materials"

PAPER AND BOARD (p&b)

Any product based on paper and/or board, printed and/or converted to fulfil its designated purpose.

PAPER AND BOARD FOR RECYCLING (PfR) (recovered paper)

Paper and board material collected separately at source for intended use a secondary raw material only. Paper and board material collected with other recyclables is also called Paper for Recycling after sorting and when intended for use as a secondary raw material for recycling (Note: in this document PfR means PfR separately collected at source unless specifically mentioned otherwise).

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Collection systems

COLLECTION

The process of picking up waste from households, businesses, or a collection point, loading them into a vehicle, and transporting them to a processing, transfer, or disposal site. (See section 3)

SEPARATE COLLECTION

Setting aside recyclable materials from the waste stream before they are collected with other municipal solid waste, to facilitate recycling. In addition, separate collection of compostable materials, to facilitate composting. (See section 3)

SELECTIVE COLLECTION

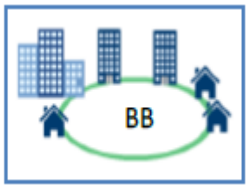
For the purpose of this project the term selective collection is used to characterize separate collection into graphic paper and packaging cardboard. (See section 3)

DOOR TO DOOR (kerbside collection- pick up system)

Direct collection of materials from individual households (or shops), either from front door or kerb. (See section 3)

DROP-OFF SYSTEM

The waste generator takes accumulated waste by foot or by car to a central location and drops it there into containers. It can be a bring bank or a recycling yard.



BRING BANK (DROP-OFF SYSTEM)

Collection of waste and recyclables in separate containers, above ground or underground, in close proximity to the end user (usually max. distance 100-200 m) and spread in sufficient numbers across residential areas. (See section 3)

RECYCLING YARD (DROP-OFF SYSTEM)

Centralised site authorised by the authorities for the separate collection of domestic waste and recyclables. Usually qualified staff available. (See section 3)

COLLECTION SHOPS

Special "shops for secondary raw materials" where residents receive a small financial compensation.

COMMINGLED COLLECTION

Paper and board collected together with other recyclables such as metal, plastics and glass in a different stream from residual waste. Also called multi-material collection. (See section 3)

INFORMAL SECTOR

Existence of scavengers and waste pickers, picking up recyclables, in urban settlements and landfills.

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Processing

PROCESSING

Preparing municipal waste and recyclable materials for subsequent use or management, using processes such as manual processes, baling, magnetic separation, crushing and shredding. The term is also used for separation of mixed waste streams.

SORTING STATION

The sorting plant consists of one or more mechanical separation stages (e.g. screen, magnetic separator) and might be even equipped with optical sorting units (VIS and NIR), in most cases combined with manual sorting. If manual sorting mainly serves a quality control purpose, them it is termed automated sorting.

MATERIALS RECOVERY FACILITY (MRF)

Waste processing facility that combines mechanical sorting with a form of biological treatment such as composting, biodrying or anaerobic digestion. It usually treats mixed waste

Recovery and disposal

RECYCLING

The process of transforming materials into raw materials for manufacturing new products, which may or may not be similar to the original product

RECYCLING PLANT

Industrial plant, using secondary raw materials, such as glass, plastics, cardboard, paper, metals for production of new products.

LANDFILL

<u>Controlled dump</u>

A planned landfill that incorporates to some extent some of the features of a sanitary landfill: siting with respect to hydrogeological suitability, grading, compaction in some cases, leachate control, partial gas management, regular (not usually daily) cover, access control, basic record-keeping, and controlled waste picking.

<u>Sanitary landfill</u>

An engineered method of disposing of solid waste on land, in a manner that meets most of the standard specifications, including sound siting, extensive site preparation, proper leachate and gas management and monitoring, compaction, daily and final cover, complete access control, and record-keeping.

<u>Uncontroled/Illegal landfill</u>

The dumping of waste and recyclables illegally instead of using an authorised method such as kerbside collection or using an authorised rubbish dump. It is the illegal deposit of any waste onto land, including waste and reyclebles dumped or tipped on a site with no licence to accept mixed waste.

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PAPER AND BOARD PLANT

Special recycling plant, using paper for recycling as the raw material for the production of paper, board or moulded fibre products.

Other terms and definitions

BEST PRACTICE

In the context of IMPACTPapeRec, a Best Practice is an essential practice that should be implemented everywhere; it has a positive impact and is crucial to success.

GOOD PRACTICE

In the context of IMPACTPapeRec, a Good Practice can be defined as a practice that brings better results but might not be feasible to implement everywhere; brings a positive impact only under certain conditions and/or is crucial under specific circumstances.

MUNICIPAL SOLID WASTE

Waste collected eighter on behalf of municipality authorities or directly by the private sector (business or private non-profit institutions) not on behalf of municipalities. The bulk of the waste stream originates from households, although similar waste from sources such as businesses, offices, public institutions and selected municipal services are also included. It also includes bulky waste but excludes waste from municipal sewage networks, end-of-life vehicles and municipal construction and demolition waste.

Domestic waste / household waste: Waste and recyclables originating from households (regardless of wthether they are collected door to door, in bring banks or recycling yards).

MUNICIPAL RECYCLING RATE (Paper recycling rate)

Recycling rate = % (Tonnage of municipal waste recycled / Tonnage of total municipal waste generated). Recycling generally includes material recycling, composting and anaerobic digestion.

For paper and board the recycling rate is calculated as a percentage with the DREC methodology: Tonnage of paper & cardboard recycled/ Tonnage of total paper & cardboard in municipal waste (unless mentioned otherwise). Contrary to the general definition, composting and anaerobic digestion are excluded from the paper & board recycling rate.

(Note: Total amount of municipal waste does not include waste that is not collected (litter, house fires, etc.)

PRODUCER RESPONSIBILITY ORGANISATION

A Producer Responsibility Organisation is an entity set up in collective EPR schemes to implement the EPR principle in the name of all the adhering companies.

RESIDUAL WASTE

Waste that is not separately collected, also called refuse or mixed waste.

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1. INTRODUCTION

Background

Current production of paper and board in the EU stands at 91 million tonnes per year. In 2015, consumption of paper and board stood at 82.5 million tonnes. 71.5% of all paper consumed in Europe, i.e. 59 million tonnes, was recycled after its collection from households, businesses, industry and offices. The paper recycling rate is therefore 71.5% (1). The contribution of paper and board for recycling (PfR) to the raw material mix of the European paper industry has increased over the last few years from 25 million tonnes in 1991 to 47.7 million tonnes in 2015. (1)

However, this increase in the availability of PfR has not taken place in all EU states, and this is especially true in central and eastern European countries. Moreover, the quality of the collected material does not always meet paper recycling requirements. These two factors imply that the recent increases in the collection of PfR achieved over the last few years will be difficult to sustain without additional measures.

This project therefore focuses on countries where paper and board still largely ends up in residual waste or where the predominant collection scheme is commingled (i.e. paper is separated from residual waste but is still mixed with other recyclables such as metals and plastics). The countries focused on here are Bulgaria, Poland and Romania from the first category and France and the UK from the second (2).

*Note: EU-28 +2: *EU-28 + Norway and Switzerland*

Figure 1. Paper recycling rates in world regions in 2015 (Source: CEPI and RISI).

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1.1 Description of the handbook and its objectives

IMPACTPapeRec was a European project to boost the Circular Economy by further increasing separate collection of paper and board and promoting appropriate schemes to avoid landfilling and incineration. It came under the topic "Waste-4d-2015 Raw materials partnerships".

IMPACTPapeRec was a consortium of 19 partners from eight countries; Austria, Belgium, Bulgaria, France, Germany, Poland, Romania and Spain

As the main outcome of the work carried out by the IMPACTPapeRec project, this "GOOD and BEST PRACTICE HANDBOOK" contains valuable information that aims to assist the different European regions in increasing the amount of paper collected for recycling, and supporting them in the implementation of best collection procedures and of practices which bring greater results.

To ensure that this handbook address key aspects and are easy to use, the partners involved in the project have been asked for regular feedback and validation of the content.

To improve the development and promotion of GOOD and BEST PRACTICES in paper collection there is a need to implement common evaluation and benchmarking methodologies. This methodology is completely described in Deliverable 2.2. of the project (2). This handbook therefore includes valuable information for the collection of PfR, which has been validated in the five countries that have been the focus of the project (Bulgaria, France, Poland, Romania and the UK). This integrated approach has led to the present handbook, which provides:

i. A knowledge database on current strategies, concepts and activities in best performing municipalities and European regions.
ii. A synthesis of good and best practices in the collection of paper for recycling.
iii. Conclusions and recommendations for the creation and implementation of good and best practices.
iv. Contacts for further information.

This "GOOD and BEST PRACTICE HANDBOOK" could serve as a guide for policy-makers and municipalities to develop and implement innovative solutions for the collection of PfR.

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The purpose of distinguishing between GOOD PRACTICE (GP) and BEST PRACTICE (BP) is as follows: instead of aiming to reach an abstract ideal state, the user is inspired by existing practices that are already up and running in another location.

Additionally, "The GOOD and BEST PRACTICE HANDBOOK" comes in two forms: a paper form to download, and a web version (http://impactpaperec.eu/) which includes an interactive tool to ensure accessibility for users in different European countries. It is also a living document which will be updated until January 2018. From that time on, no updates will take place.

1.2 Current situation in different European regions

The pulp and paper industry in Europe has undergone continuous growth over the last few years, which has increased the amount of paper and board for recycling (PfR) available as well as the amount of paper consumed, reaching 59 million tonnes in 2015 (1). Demand for PfR in Asia has increased even more. 10 million of the 59 million tonnes collected, were exported to Asia.

In this global context, the availability of European PfR as a raw material has forced industry and government to boost actions to ensure its constant and sustainable procurement. All the PfR collected is currently recycled, with the PfR collection rate equal to the PfR recycling rate, with the exception of cases in which the quality of the collected materials does not meet industrial requirements (i.e. high wet content, presence of contaminants). These cases have also been tackled in the IMPACTPapeRec Project. All this considered, current EU paper-recycling rates reached 71.5% in 2015 (1), as has already been mentioned above. This project focuses on countries with low and medium average paper recycling rates in order to boost their recycling performance.

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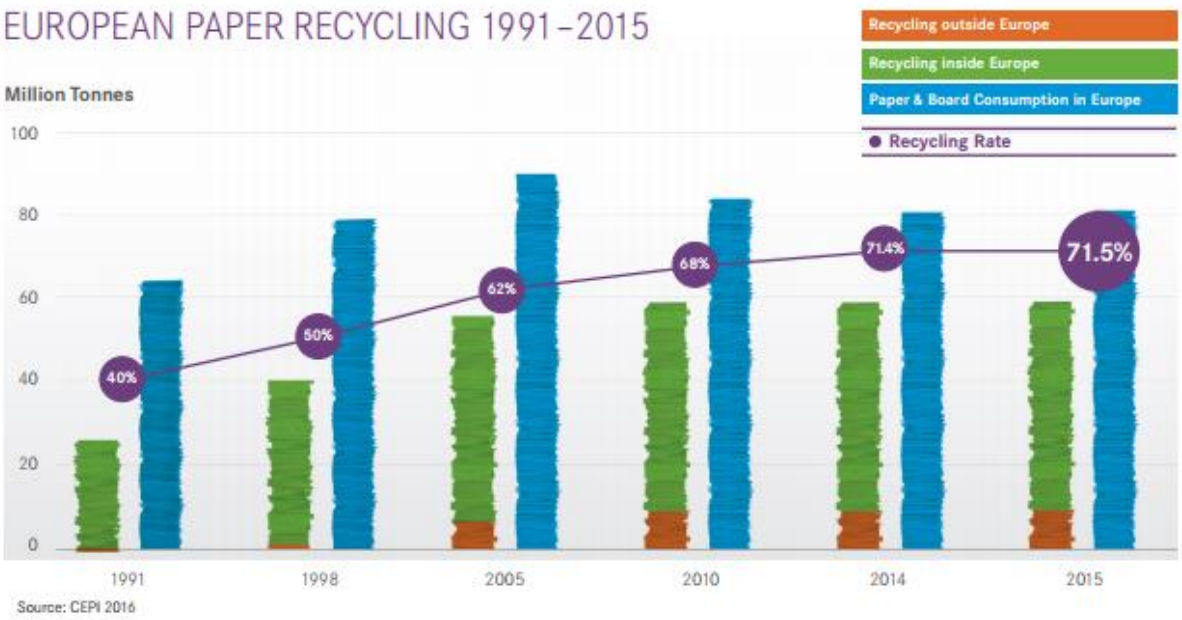

Figure 2. European paper recycling rates 1991 – 2015 (1) (Source: CEPI)

Despite the high collection and recycling ratio (almost 90%) (1) of paper and board from commerce and industry (applied in different industrial uses; i.e. corrugated boxes, office paper), as a result of the implementation of specific industrial PfR collection systems, there is still considerable room for improvement in municipal PfR collection and recycling rates. Theoretically, 80% of household paper is recoverable (the remaining 20% is not recoverable due to its characteristics; i.e. toilet paper, wallpaper, tissue) (1). Moreover, policy trends have established the need for a progressive increase in recovery rates as well as prioritising recycling and recovery, in this order, and avoiding elimination via landfill[2].

When EU paper and board collection and recycling rates are analysed (Figure 3 shows representative countries from north, south, east and central Europe), there is a notable gap between the different collection systems used in Europe. Three different systems are employed, depending on the different regions: ① Door-to-Door: Separate collection of paper and board from other waste streams, ② Bring Bank sites: Paper and board are separated from other waste streams, ③ Together with other recyclables like glass and plastic.

[2] Waste Framework Directive 2008/98/EC: http://ec.europa.eu/environment/waste/framework/

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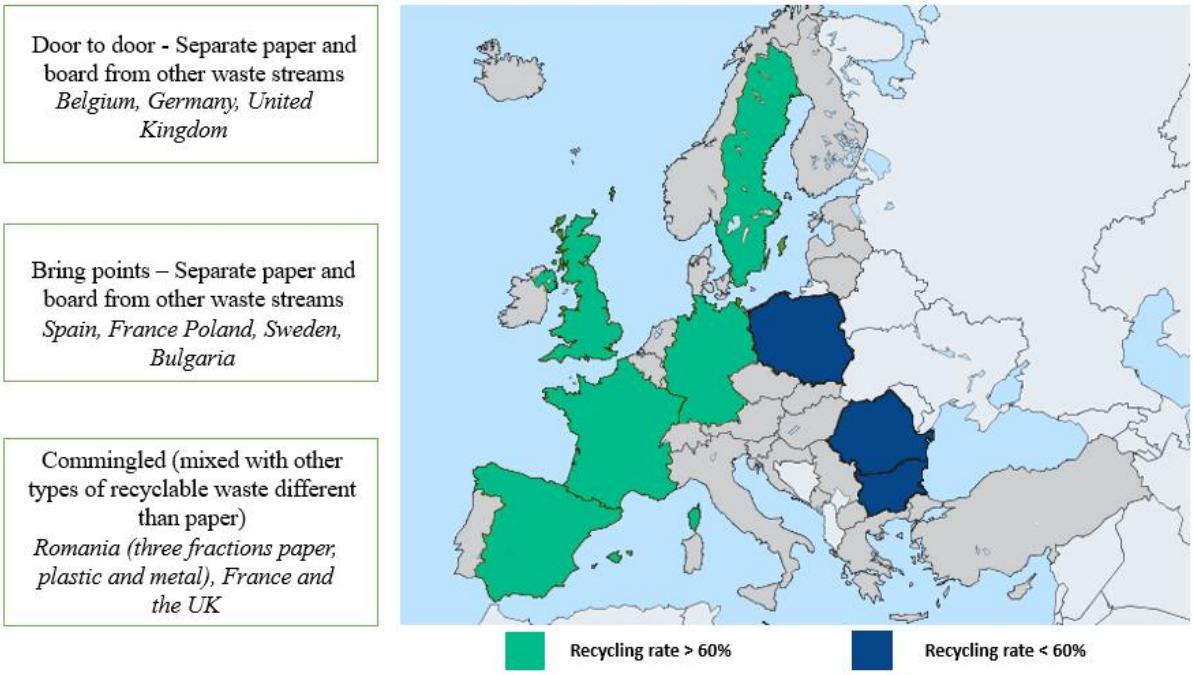

Figure 3. Paper recycling rate in 2015. Data from different collection systems in European regions (3)

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As shown in Figure 3, recycling rates in central, southern and northern European countries (Belgium, Germany, Sweden, Spain, France and UK) exceeded 70% in 2015, whilst these rates in eastern European countries (Poland, Romania, Bulgaria) were below 60%.

Figure 4. National recycling rates in Europe in 2015 (Source: CEPI) (1)

In general terms and according to CEPI's "*Final Monitoring Report of the 2011-2015 period*", 15 European countries exceeded the 70% recycling rate whilst 10 European countries were below 60% in 2015. (1)

Some of the issues that may cause the low rates in some countries include scarce authority knowledge and engagement, low citizen-awareness, poor management skills, and a non-restrictive legal framework, among others.

In this sense, **both quantity and quality are key aspects to be considered for efficient paper and board recycling.** Even in countries with high collection rates, poor quality of the PfR collected could risk progress in increasing recycling rates, and especially in the manufacturing of added value recovered-paper products. Hence, there are still quality issues to be addressed while maintaining the high levels achieved in the best-in-class collection systems.

Countries with separate collection schemes reach **higher recycling rates** with better quality of the PfR collected.

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2. LEGISLATION, STANDARDISATION, INCENTIVES & POLICY MEASURES

2.1 Relevant European legislation and obligations for Member States

About 72% of paper is recycled in Europe.

IMPACTPapeRec is completely aligned with European policy objectives regarding the prioritisation of recycling and recovery instead of landfilling, as defined by current European and national legislation on waste, such as the **Waste Framework Directive**, and the proposal of the European Commission for a **Circular Economy**, stressing the importance of separate collection.

IMPACTPapeRec is also related to emerging European initiatives whose objectives include the reuse of by-products and waste fractions in alternative production processes to prevent landfilling, such as the European Innovation Partnership on Raw Materials "IMPACT – Introduction and Improvement of Separate Paper Collection to avoid landfilling and incineration".

EU policy on waste management is set out in the Community Strategy for Waste Management and is embodied in the **Waste Framework Directive (2008/98/EC)**[3]. The EU's approach to waste management is based on the "**waste hierarchy**", which sets a priority order when shaping waste policy and managing waste at operational level. Prevention is the best option, followed by preparing for re-use, recycling and other forms of recovery. Disposal such as landfilling and incineration without energy recovery are to be considered as a last resort (Figure 6).

Figure 5. Paper and board recycling rates in Europe in 2015 (2) (Source: CEPI)

[3] http://ec.europa.eu/environment/waste/framework/

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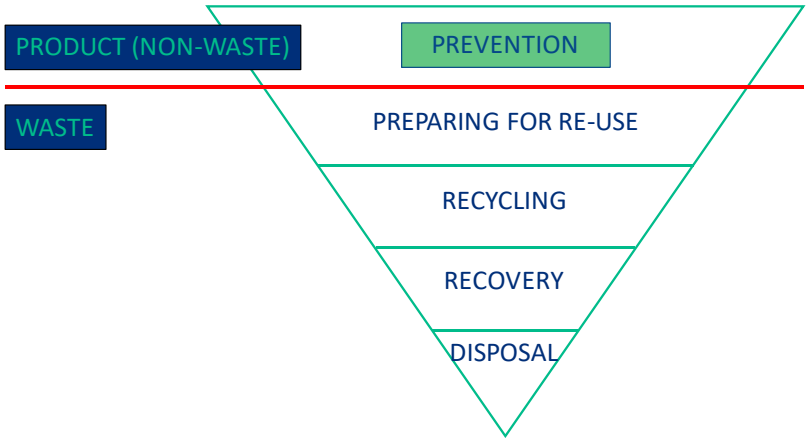

Figure 6. Waste Management Hierarchy (WFD). (Source: European Commission)

Article 10 of the WFD sets out the general requirement for separate collection and obliges Member States to set up separate collection systems for at least paper and board, metal, plastic and glass by 2015.

The Circular Economy Action Plan comprises specific targets for creating an ambitious long-term roadmap for waste management and recycling in Europe. The three quantitative targets, in which paper and board are included, are set out below:

- A binding landfill target to reduce landfill to a maximum of 10% of municipal waste by 2030.
- A target to prepare 65% per cent of municipal waste for re-use and recycling by 2030.
- A target to prepare 75% of packaging waste for re-use and recycling by 2030 (with supplementary targets for specific packaging materials).

The EU recognises seven overarching principles for waste management, which are described in the box below (4).

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Table 1. Seven principles for waste management in the EU's policy on waste management (Source: EC) (4)

Principles for Waste Management and Priorities for Implementing Waste Management Legislation
Waste management hierarchy: Waste management strategies must aim primarily to prevent the generation of waste and to reduce its harmfulness. Where this is not possible, waste materials should be reused, recycled or recovered, or used as a source of energy. As a final resort, waste should be disposed of safely (e.g. by incineration or in landfill sites).
Self-sufficiency at Community and, if possible, at Member State level. Member States need to establish, in co-operation with other Member States, an integrated and adequate network of waste disposal facilities.
Best available technique not entailing excessive cost (BATNEEC): Emissions from installations to the environment should be reduced as much as possible and in the most economically efficient way.
Proximity: Wastes should be disposed of as close to the source as possible.
Precautionary principle: The lack of full scientific certainty should not be used as an excuse for failing to act. Where there is a credible risk to the environment or human health from acting or not acting with regard to waste fractions, that which serve to provide a cost-effective response to the risk identified should be pursued.
Producer responsibility: Economic operators, and particularly manufacturers of products, have to be involved in the objective to close the life cycle of substances, components and products from their production throughout their useful life until they become waste.
Polluter pays: Those responsible for generating or for the generation of waste, and consequent adverse effects on the environment, should be required to pay the costs of avoiding or alleviating those adverse consequences. A clear example can be seen in the Landfill Directive 99/31/EC, Article 10.

EU waste legislation aims to move waste management up the waste hierarchy, turning waste into a resource, and thus achieving the EU vision for a circular economy (5).

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2.2 Objective and benefits of European standardisation[4]

International and European standards provide a common technical language for trade partners throughout the world. For globally active businesses, international standards are important criteria for assessing the suitability of potential business partners and suppliers. They also ensure the compatibility and quality of products and services. In Europe, standardisation is a fundamental aspect of the Internal Market. The ensemble of harmonised European standards ensures free trade within the Internal Market and strengthens the competitiveness of businesses that are active in the EU. Standardisation is thus an essential instrument for success in global markets.

At European and international level, there is a variety of technical committees within the scope of paper and board for recycling. These include:

- CEN/TC 172 – Pulp, paper and board
- CEN/TC 172/WG 2 – Paper and board for recycling
- ISO/TC 6 – Paper, board and pulps

Besides standards produced by the international, European and national standards organisations, other standards are produced by a number of other types of organisation, e.g. sector associations and industry consortia. These types of standards are particularly relevant when they either contain supplementary requirements, in cases where particular groups of users have requirements that are in some way more stringent than those of European standards, or when they contain important local or application-specific requirements that are not written into the more general standards. Examples of these types of standards are the CEPI Guidelines, developed by the Confederation of European Paper Industries and the INGEDE Methods, developed by the International Association of the Deinking Industry (6).

For more information, please contact with Alexandra Engelt - DIN: Alexandra.Engelt@din.de

[4] For further information, see D3.5 Analysis of existing standards and future development recommendation

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2.3 Incentives and policy measures for paper collection and recycling

Inspired by literature research, as well as a number of well-known practical examples, the different incentives and policy measures taken into account in the IMPACTPapeRec project can be grouped into three categories: legal and economic; social and communicative; technical and operational (7)[5].

INCENTIVES

An incentive is something that motivates or encourages someone to (not) act in a certain way. An incentive for paper and board recycling is a measure that motivates or encourages a target audience to improve its performance in paper and board sorting and collection.

Encouraging a specific audience can take various forms and can include anything from the provision of information, ensuring the audience is well aware of what it should (not) do (e.g. sorting guidelines), providing adapted equipment to enable the desired behaviour (e.g. waste collection bins); through to applying measures directly rewarding or punishing a certain behaviour (e.g. fines for non-compliance with sorting instructions).

Incentives generally work in either a positive or negative way. Positive incentives seek to motivate actors to do certain actions by promising a reward, whereas negative incentives aim to motivate actions by threatening a punishment. Examples of positive incentives are subsidies for waste reduction technologies. Examples of negative incentives are applying different taxes for generating large amounts of waste. Sometimes it is only a matter of presentation (e.g. the pay-as-you-throw scheme could be seen as a penalty for those producing more waste or as a reward for those with better performance). It can also be a combination of the two options. For instance, when a landfill tax is set, the incomes from it can be used to invest in recycling equipment and/or be used to reward the ones doing the right thing.

As mentioned above, the different incentives considered in the IMPACTPapeRec project can be grouped into three categories: legal and economic; social and communicative; technical and operational.

In addition, the target audience for the various incentives may either be (local) public authorities or waste holders (individual citizens, households, small businesses,

[5] For further information, see D3.4. Recommendations on policy activities and incentives

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government). Table 2, Table 3 and Table 4 provide an overview of the different classifications and give examples of the incentives identified for each category.

1. Legal and economic incentives

Available literature suggests that economic incentives are an effective tool to increase waste sorting and recycling (8).

Table 2. Classification of legal and economic incentives identified in the IMPACTPapeRec project

Incentive category	Incentives	Target audience	
		Public authorities	Waste holders
Legal and economic: Regulatory measures having a legal basis and/or financial implications; mandatory	Legal obligations: - Mandatory separate collection for different waste streams (incl. paper) - High collection/recycling targets	√ √	√
	Bans and restrictions: - Ban/ restriction on landfilling - Ban/ restriction on incineration - Ban on house fires (burning paper for heating)	√ √	√
	Economic: - Landfill taxes or fees - Incineration taxes or fees - Pay-As-You-Throw schemes - Discount on waste tax for separate collection of recyclables - Penalties for non-compliance with mandatory separate collection - Separate waste bill linked to the quantity/separate collection rate - Financing EPR schemes for specific streams.	√ √ √	√ √ √ √

2. Social and communicative incentives

Effective communication and awareness-raising activities can improve the chances that recycling information will be taken on board and acted upon. Communication intervention is usually closely related to the legal/political framework and to technical/ infrastructure-based solutions. Therefore, it is complementary and enhances the other two aspects.

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Table 3. Classification of the social and communicative incentives identified in the IMPACTPapeRec project

Incentive category	Incentives	Target audience	
		Public authorities	Waste holders
Social and communicative: Measures aiming to provide information and raise awareness; mainly on a voluntary basis	Communication campaigns and information channels: - Awareness-raising campaigns - Provision of complete information about waste collection and recycling - Open days in recycling facilities/paper mills - Promotion of good practices and best practices - Use of Eco labels and certifications	√ √ √	√ √ √ √
	Awards and competitions: - Competitions with prizes for most collected/recycled quantities	√	√

3. Technical and operational incentives

Separate collection by waste holders requires the use of resources on their behalf (such as time, space, effort). Therefore, making the action of separate collection more convenient (minimising distances to collection points, collection frequency, number of materials collected, etc.) should increase their participation. A number of studies confirm that convenience is a key determinant for separate waste collection (9).

Table 4. Classification of the technical and operational incentives identified in the IMPACTPapeRec project

Incentive category	Incentives	Target audience	
		Public authorities	Waste holders
Technical and operational: Material infrastructure and equipment, organisational and logistics measures and expertise	Collection infrastructure: - Convenience and sufficiency of collection infrastructure - Provision of collection infrastructure through EPR schemes	 √	√ √
	Organisation and logistics: - Consultancy and adapted solutions by EPR schemes - Convenient and frequent service - Less convenient collection for residual waste relative to separated/ Chip to open the residual waste bin (with limitations on disposal and easy to enter paper)	√	 √ √

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Policy measures

It would be unrealistic and even incorrect to say that the formulation of policy follows a clear and consistent pathway or route. Policy development is actually an involved and sometimes haphazard process that differs widely depending upon the concern being addressed. Sometimes it is a long and winding road with lots of detours and stops along the way. Despite the variations in policy process, there are some general steps (described below) that are common to its development. These are:

- Selecting the desired objective.
- Identifying the goal of the objective.
- Determining the pathway required to reach that objective.
- Designing the specific programme or measure required to reach that goal.
- Implementing the measure and assessing its impact.

Costing of future key measures

According to literature, there are two main approaches to estimating adaptation costs. The top-down approach evaluates total climate change impacts and the optimal adaptation level. However, it neglects the specific characteristics of actual adaptation measures, which are important for evaluating the impacts of real adaptation policy. Furthermore, the top-down-approach can rarely distinguish between private and public adaptation – a question of major relevance for designing adaptation policies at EU level. The other stream of economic evaluation is bottom-up-literature, often focusing on specific adaptation options in a specific period and location, and a certain political, societal and natural context. The costing exercise in this project relied extensively on this kind of literature, since only bottom-up studies allow sufficiently detailed insights into the cost drivers of adaptation measures.

Current legislative status – Waste Directive

The present legislation on paper for recycling defines general requirements. No specific environmental obligations apply to paper products. The packaging waste directive gives reference to the EN packaging standards which provide guidelines on how to implement essential packaging requirements across the board (see section2.1.). When paper enters the waste stream, the general rules covered in the Waste Framework Directive apply, as they do for all other materials. Regulation concerning collection, sorting and the use of paper for recycling is generally acceptable. Overregulation that could become a barrier to

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development should be avoided. Nevertheless, there are obstacles and weaknesses in the present regulation that need to be improved. Separate collection is widely interpreted.

Policy guidelines related to the Waste Framework Directive

- Legislation is lacking comprehensiveness. Therefore, more emphasis on closed loop re-cycling management is needed to clearly define the responsibilities of all the actors involved.
- Recycling is adequately placed in the waste hierarchy of the Waste Framework Directive, but clear definitions and quality standards for determining recyclability, including certification methods and guidelines, are needed at EU level.
- The priority should be ensuring implementation of existing legislation in all countries, and consistency between EU, national and regional regulations. Greater transparency is needed to facilitate implementation.
- Legislation improvements are essential, but greater awareness of recyclability issues is even more important. More investment in education, awareness-raising and promotion of good practice in paper recycling among all the actors involved is necessary, including enhanced general knowledge about the definitions of the entire paper loop (i.e. the difference between recyclability, recycling and recycled paper) and the most important pre-conditions for the quality of paper for recycling. Support for technological development should also be enforced.
- A "life-cycle thinking" approach should be applied, promoting compliance with sustainability targets among all actors in the chain; eco-design for the paper value chain to improve and move production towards products that are more recyclable, and for waste management to ensure higher collection levels, proper sorting and access to quality paper for recycling.
- Policy measures must be strengthened to stimulate actors in the paper loop for more efficient recycling, such as rewarding tax and fee incentives, stimulating investment in developing technology, and strengthening market development initiatives (i.e. GPP).

The different policy measures considered in the IMPACTPapeRec project can also be grouped into three categories: legal and economic; social and communicative; technical and operational, just like the incentives.

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1. Legal and economic policy measures

Table 5. Legal and economic policy measures identified in the IMPACTPapeRec project

Legal obligations
- Establish criteria for recyclability - Establish regional as well as national-level targets - Increase recycling targets - Establishment of waste management plans: regularly and at different levels (national, regional, local; but also for companies and industries) - Separate targets for the recovery of material quotas from industries and from citizens - Internal policies on recycling and separate collection in companies - Separate collection obligation at EU level - Green public procurement criteria for all public documents (Ex: Ecolabel) - Simplify Annex VII procedures[6] - Implement 5.01 in municipal tenders[7]
Bans and restrictions
- Avoid overcapacity of residual waste treatment - Landfill ban for recyclable paper
Economic
- Pay-As-You-Throw schemes - Incineration taxes or fees - Increase taxes for landfilling paper waste from municipal collection - Boost local recycling/recovery companies which are authorised to work near the areas where the waste is generated (as long as this measure is in line with market interests) - Fines for citizens that do not comply with rules - Funding for the compilation of necessary data and information

[6] Annex VII (of the European Waste Directive) requires waste exporters to fill in details of exactly what kind of material is being shipped, where it originated and the facility overseas that the material is being shipped to. http://ec.europa.eu/environment/waste/framework/

[7] Grade 5.01 is one of the grades defining paper purity (for recycling) contained in the European Standard EN643. 5.01 is the only grade with a maximum level of over 1.5% of non-paper components. This is due to the fact that these materials do not often undergo additional sorting between collection and the paper mill. Grade 5.01 includes mixed recovered paper and board; and unsorted paper and board, separated at source.

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2. Social and communicative policy measures

Table 6. Social and communicative policy measures identified in the IMPACTPapeRec project

Communication campaigns and information channels
- Better communication, cooperation and transparency between stakeholders - Platforms for discussion and exchange of good practices - Guidelines and handbooks for municipalities, ministries and businesses - Terminology for collection systems in different languages (dictionary) - Inclusion of social groups (non-profit organisations) to legalise collectors - Awareness-raising and education on PfR

3. Technical and operational policy measures

Table 7. Technical and operational policy measures identified in the IMPACTPapeRec project

Technical
- Coordinated local solutions and policies will improve collection rates - Measurements methods for PfR quality - Traceability of material - Enhanced technology development for separating different waste fractions - Making the paper value chain more transparent
Operational
- Stopping commingled collection

For more information, please contact with:
- **For incentives for paper collection and recycling:**

Lisa Labriga – ACR+ : ls@acrplus.org
Bilyana Spasova: - ACR+ : bs@acrplus.org
- **For policy measures for paper collection and recycling:**

Ulrich Leberle – CEPI : u.leberle@cepi.org
Giulia Fadini – CEPI: g.fadini@cepi.org

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3. COLLECTION OF PAPER AND BOARD SYSTEMS

In the European Union, several types of collection systems for PfR have been merged. A description of the most relevant collection systems is shown below: bring banks, door-to-door, separate collection, selective collection and recycling yards. The degree of separation of these collection systems is also explained for each system.

For more information, see deliverable 3.1 "Introduction and Improvement of Separate Paper Collection to Avoid Landfilling and Incineration (34).

3.1 COLLECTION SYSTEM

3.1.1 Bring recycling sites

According to WRAP (the UK Waste and Resources Action Programme) (10), bring recycling sites are defined as areas in car parks and on streets, at which local authorities or third parties, provide containers ("banks") for the public to deposit recyclable materials.

WRAP[8] has published a guide for local authorities to help them improve the performance of bring recycling sites. The guide describes how to review current bring recycling provision, including performance monitoring, to make better informed decisions in the future about bring recycling, as part of the overall service provided to residents (10). This guide should be used as a step-by-step reference guide and a conceptual directive.

[8] WRAP is the UK's Waste & Resources Action Programme, It must be taken into account that there are differences in the UK from European collection systems.

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3.1.1.1 Bring banks

Bring banks are permanent recycling facilities that allow citizens to bring their dry recyclable materials for recycling whenever they want to. In some cases, such as Germany where a schedule is established for using bring banks in residential areas to avoid noise pollution for citizens living nearby.

Figure 7. Bring bank site in Szczecin (Poland) (11). (Source: IMPACTPapeRec Project)

Bring banks are usually positioned in easily accessible locations with good roadside parking to make collection as convenient as possible.

Bring bank collection systems enable the collection of waste and recyclables in separate containers, above ground or underground, in close proximity to the end user (usually max. distance of 100-200 m) and in sufficient numbers across residential areas (11).

3.1.1.2 Recycling yards

Centralised site authorised by the authorities for the separate collection of domestic waste and recyclables.

Figure 8. HWRC (household waste recycling centre) recycling yard. Merthyr Tydfil (UK). (Source: IMPACTPapeRec Project)

They are public facilities with free, open access for citizens in which urban waste, recyclables, hazardous waste and large-volume waste that must not be deposited in standard street containers are collected and sorted. They usually have opening hours.

They are especially aimed at catering for waste whose components can be firstly treated and then reused as raw materials when manufacturing new products (13). These kinds of facilities usually require qualified staff to be on hand (11).

Figure 9. HWRC (household waste recycling centre) recycling yard. Merthyr Tydfil (UK). (Source: IMPACTPapeRec Project)

The kind of materials that are accepted in these recycling yards varies according to the site. This means it is important to publish the location, opening hours and type of material collected on the corresponding

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municipal website. The following list shows the materials that are typically accepted in recycling yards.

Table 8. Commonly accepted waste in recycling yards (13)

COMMONLY ACCEPTED WASTE[9]
Paints, varnishes, glues, paint strippers, synthetic turpentine, dyes, wood protectors
Batteries and accumulators
Vehicle batteries
Fluorescent or special lamps (halogen)
Chemicals and packaging containing dangerous products such as pesticides, cleaning products and disinfectants
Aerosol sprays
Bulky waste
Electrical and electronic waste
White goods
Used oil
Green waste
Waste from refurbishing

**N.B.: Materials will vary according to each site*

3.1.2 Door-to-door collection

Figure 10. Door-to-door collection of recyclables – plastic & metal packaging and cardboard in Merthyr Tydfil *(UK) (11). (Source: IMPACTPapeRec project).*

Door-to-door collection (also called kerbside collection) consists of the direct collection of materials from individual households (or shops), either directly from their doors or from the kerbside. Almost any domestic waste stream can be collected by a door-to-door system: residual waste, bio-waste, packaging, paper, cardboard and glass.

The results of door-to-door collection achieved in municipalities could be better in some cases, both in terms of the amounts collected and of the quality of separation. For example, in areas with door-to-door collection, separate collection rates are between 60-

[9] All waste fractions and recyclables that cannot be collected in conventional urban collection systems (bring banks, door-to-door, etc.)

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85% of total MSW generation, whereas the rates achieved by other systems range from 20% to 50%, at the most (14).

The philosophy behind door-to-door is to turn separation at source into the most convenient option and discourage the delivery of large amounts of residual waste.

Implementation of door-to-door collection has proved very successful in areas with lower population densities, where it is easier to identify the origin of the waste and recyclables. door-to-door collection systems require a change of citizens' habits, which can be achieved by suitable communication campaigns.

door-to-door collection models enable the identification of waste generators and therefore bring with them the implementation of fairer payment systems, such as PAYT (payment for generation, e.g. payment per bag or payment per bin), (14) (15).

3.2 COLLECTED MATERIAL

3.2.1 Separate collection

The Waste Framework Directive (WFD) defines separate collection in Article 3 (3) as follows: 'separate collection' means "the collection where a waste stream is kept separately by type and nature to facilitate a specific treatment". In other words, ´separate collection´ sets aside recyclable materials from the waste stream before they are collected with other municipal solid waste, to facilitate recycling. In addition, separate collection of compostable materials also exists, to facilitate composting (11).

In this sense, separate collection of individual waste fractions is a pre-condition for fostering high-quality recycling and high recycling rates. Thus, Article 10 of the Waste Framework Directive sets out the general requirement for separate collection and obliges Member States to set up separate collection systems for at least paper, metal, plastic and glass by 2015 (3).

Figure 11. Separate collection of plastic and metal in Merthyr Tydfil (UK) (11). (Source: IMPACTPapeRec project)

Separate waste collection facilitates the recycling of this waste, which, in turn, leads to (16):

1. Decreased consumption of raw materials
2. Water and energy savings
3. Reduced greenhouse gas emissions

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4. Increased useful life of landfills

In this kind of collection, citizens play a key role in the separation of waste in households, markets, offices and services, placing urban waste in different containers.

3.2.2 Selective collection

´Selective collection´ consists of the introduction of a new container (in the bring bank collection system) or new bag (in door-to-door collection) to separate graphic paper from packaging cardboard[10]. This enables separation at source of two different paper fractions, thus decreasing (or even potentially eliminating) the need for subsequent technical sorting: 1. graphic paper and 2. non-graphic paper (mainly packaging cardboard).

Graphic paper and copy paper play an important role in the range of paper grades produced and in worldwide need for paper. This stream corresponds to paper and board for recycling, grade 1.11.00 (17). Separation of graphic paper from the rest of paper and board in the collection phase increases its market value due to the reduction of sorting costs.

As a rule, mass products and newspapers are produced with a large percentage of paper and board for recycling. By contrast, magazines normally use fresh fibres due to the demanding requirements made by consumers in terms of appearance and tactile feel. Nevertheless, even the magazine sector is starting to use paper and board for recycling now (18).

3.2.3 Commingled collection

Figure 12. Commingled collection of recyclables in Merthyr Tydfil (UK). (11) (Source: IMPACTPapeRec Project)

Commingled collection is the traditional waste system in which all recyclables are collected together. The main drawback of this system is the difficulty in the subsequent treatment of the materials collected due to their low quality derived from cross contamination.

In commingled collection, paper and board are collected together with other recyclables such as metal, plastics and

[10] For the purpose of this project, the term selective collection is used to describe the separate collection of graphic paper and packaging cardboard.

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glass in a different stream from residual waste. It is also called multi-material collection.

Commingled collections face quality problems from two sources: cross contamination and the technical and physical capacity of MRFs in separating materials in the volumes delivered to them (19).

A simple example of quality issues is paper and board. If paper and board are stored separately from other waste streams and kept dry they can be recycled. If paper and board are contaminated with food this can cause odour problems in the finished product and bacterial activity may decrease their strength.

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4. GOOD AND BEST PRACTICES FOR THE COLLECTION OF PAPER AND BOARD

The goal of using best practice (BP) is as follows: instead of aiming to reach an abstract ideal state, the user is inspired by existing practices that are already up and running in another location (2). After analysing the "practices" identified in the project, a clear distinction was made between good practice (GP) and best practice according to three criteria that are described below.

There is no common definition for good practice or best practice either in the academic literature, or among practitioners. In the case of best practice, the most widely accepted and broadly used definition focuses on its "functional" orientation (20).

In this sense, from a bibliographic perspective, a best practice can be defined as: *a practice that is not only good, but also that has been proven to work well and produce good results, and is therefore recommended as a model*. Therefore, it is a successful experience which has been tested and validated, in the broadest sense. Furthermore, it has been repeated and deserves to be shared so that more people can adopt it (21).

In the IMPACTPapeRec context, the distinction between good practice and best practice is dependent on three conditions. Best practice is defined as follows:

a) It can be implemented everywhere
b) It brings a positive impact
c) It is crucial to success

Hence, to create best practices, all three conditions should necessarily apply. Conversely, a practice is classified as good practice if this is not the case or if one or more conditions apply.

Accordingly, a **good practice** can be defined as a practice that brings better results but might not be feasible to implement everywhere; brings a positive impact only under certain conditions and/or is crucial to success under specific circumstances.

And as stated before, a **best practice** is an essential practice that should be implemented everywhere; it has a positive impact and is crucial to success.

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How to identify Good Practice or Best Practice for your municipality?

For a municipality, the methodology to identify good practice and best practice to boost paper collections for efficient recycling consists mainly of two steps (22):

Identify the municipality´s requirements

- In order to be as effective as possible, it is vital to identify the specific *needs of your municipality* as well as the *needs of the citizens* and the community you serve. This step involves not only considering immediate needs, but also anticipating future needs.

Identify applicable good practices and best practices

- After areas of need have been identified, potential practices need to be bechmarked to address them. This can be done by identifying existing practices that the project has validated to meet the criteria of a best, promising, or innovative practice while meeting the needs of *citizens* and municipality targets.

To help with the identification of good practices and best practices, the IMPACTPapeRec Project has launched an online tool entitled **"The Selection Tree"**: Selection Tree Tool

The selection tree guides the user through a step-by-step process that will help them to determine which solutions are best for their municipality. Further explanation of this tool is available in **Annex II.**

4.1 List of Good Practices and Best Practices

In the IMPACTPapeRec context, 34 good and best practices have been identified and grouped into four categories:

- Operational aspects
- Policy, legislation and economic aspects
- Monitoring and control aspects
- Information and communication aspects

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- **Operational aspects**

Service to citizens

1.1 Specific collection system adapted to real needs

Selection of the best collection system (e.g. Bring banks, door-to-door, recycling yards, mobile collection points) for each zone of the municipality by taking into account its specific characteristics and needs: type of building, density of population, and demographics. The decision of the most suitable system in each neighbourhood should be based on a "step by step" list of requirements. All stakeholders should be engaged in this process.

1.2 Separate collection system for paper and board

Introduction of a separate collection system for paper and board to offer citizens the possibility to separate it from their residual waste and other recyclables.

1.3 Constant technological innovation in paper and board collection

Implementation of a systematic process of continuous technological innovation through annual meetings between local authority, paper mills and other groups interested (e.g. Experts on recycling, recycling companies, waste collectors) to: analyse existing indicators in paper and board collection, identify problems and challenges, analyse arising technologies, decide technological changes to be done.

1.4 User-friendly collection containers

Use of container with ergonomic design adapted to different kind of users (i.e. Children, elderly people and disabled citizens). Furthermore, containers and surrounding spaces should be kept clean, accessible, well-lighted and good conditions in general.

Type of collection system

1.5 Volunteer collection of paper and board

Specific campaigns for the collection of paper and board by public and private municipal centres (e.g. Schools, sports clubs) which may provide an extra revenue and used for helping to fund their activities and needs.

1.6 Selective collection system for graphic paper

Introduction of a new container/bag for the selective collection of graphic paper (in addition to the separate collection of paper and board). This will allow to collect two different paper fractions separately: (1) graphic paper and (2) non-graphic paper (mainly packaging paper and board) thus decreasing (or even potentially eliminating) the need for subsequent technical sorting.

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1.7 Underground containers in higher population density areas

Implementation of a network of underground containers in dense areas of the city. Underground containers are an interesting solution to overcome difficulties linked with the implementation of separate collection in dense areas and vertical housing.

1.8 Compacting collection trucks

Use of trucks equipped with a compactor in order to reduce the volume of the paper and board collected. This will allow increasing the amounts collected by each truck, making collection more efficient.

1.9 Container-opening system adapted to paper and board

Use of containers with openings adapted to the size and shape of the material deposited (i.e. Graphic paper, paper and board packaging). Wide and flat openings are preferred.

- **Policy, legislation and economic aspects**

Policy

2.1 Ambitious strategy and targets

Implementation of a systematic process for the progressive improvement of paper and board collection in the municipality. It will be based on annual meetings between municipality, paper collectors and others interested groups such as citizen association to: analyse existing indicators in paper and board collection, identify problems and challenges, define potential solutions, select solutions to be implemented, and set objectives for next year.

2.2 Cluster of municipalities

Agreements between municipalities to enhance networking and the exchange of strategies and best practices.

Economic aspects

2.3 Pay-as-you-throw

Fee calculation based on the principle that the less waste you produce (or more and better you sort), the less you pay. Different options for the different collection systems should be considered (e.g. Smart card or barcode stickers for bring banks).

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Other economic aspects

2.4 Tender for waste and recyclables collection service

Fee calculation based on the principle that the less waste you produce (or more and better you sort), the less you pay. Different options for the different collection systems should be considered (e.g. Smart card or barcode stickers for bring banks).

2.5 Ordinance on separate paper and board collection in public institutions

Implementation of a new ordinance in order to boost the commitment of public institutions on the separate collection of paper and board (schools, universities, hospitals and public buildings).

- **Monitoring and control aspects**

Controlling activities

3.1 Data collection and monitoring of paper for recycling quality parameters

Implementation of sampling procedures to control the quality of paper for recycling. Main parameters to be measured are: material composition, impurities, ashes, moisture, and sticky contaminants.

3.2 Monitoring and control of the composition of residual waste and paper and board in other recyclable streams

Implementation of a methodology to monitor and analyse the composition of residual waste. Based on that, specific actions will be taken in order to get more recyclable/ recoverable material out of the residual stream (i.e. Separate collection).

3.3. Control measures to prevent paper theft

Control and enforcement of measures to avoid theft of paper for recycling. Measures established could be based on container design or control units (camera surveillance, municipal police who watch for those entities, which receive PfR in an illegal way).

Use of information and communication technology (ICT)

3.4 Optimisation of collection routes

Implementation of an optimization software which will plan in advance the routes of the collecting trucks, trying to be as effective as possible and taking into account some aspects such us: collection calendar for households, filling level of the containers or energy savings.

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3.5 Filling level control for containers

Implementation a system to control filling level of containers to monitor collection rates and improve planning procedures (efficient planning).

Collection rates and improve planning procedures (efficient planning)

3.6 Publication of paper collection KPIs

Collection, processing and publishing the key performance indicators on paper and board management in the municipal website (e.g. Separate collection rate, costs, recycling rate). Also, improvements achieved each year and objectives for the next one should be included in order to gain transparency.

- **Information and Communication**

General information and communication activities

4.1 Information on containers and bags

Include an illustrative and brief information about paper collection with the recycling instructions (collection schedules and allowed materials) in order to clarify doubts to the citizens, recycling processes and targets appointed by the municipality, both in containers and bags.

4.2 Selection of a comprehensive and functional communication package

Considering the local conditions, demographic characteristics, cultural aspects and options available for selecting the most suitable communication strategy to develop.

4.3 Include citizens actively in the information loop (making citizens actors)

Establishment of a bi-directional communication among municipalities, waste and resource managers, experts and citizens, in order to get inputs from all stakeholders involved. It could be deployed by establishing periodical survey such as campaigns, assemblies, apps, web platforms and face-to-face meetings. Citizens can use these interactive platforms to cooperate with new ideas, opinions or to participate in voting processes.

Communication channels

4.4 Waste ambassadors

Appointing people to inform citizens about the collection system established in the municipality in order to boost their participation. Ambassadors can play an interesting role making the communication to flow. Information will be given by door-to-door visits and information points in the neighbourhoods.

4.5 Website on paper and board collection and recycling

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Website explaining the municipal paper and board collection system in an easy way. It will also show the benefits of paper and board recycling. This website will be promoted through all channels used by the municipality (e.g. Local newspaper, information on bins, leaflets, social networks, radio, waste ambassadors).

4.6 Roadshows, events and workshops

Organization of outdoor visual activities to engage local residents and small businesses on paper and board recycling.

4.7 Monitoring of communication campaigns

Evaluation of the communication campaigns performance carried out through the comparison between investments (i.e. Personnel and costs) and results achieved (i.e. Paper and board collection and recycling rate). Measuring the impact of the campaign as a whole should be done using the monitoring techniques guided by aims, objectives and key performance indicators.

Public awareness activities

4.8 Publication of stimulating news on paper and board collection and recycling

Dissemination of successful stories on paper and board recycling to draw attention, inspiring and stimulating citizens (e.g. Use of recycled paper by public bodies, increasing collection rate of newspaper on one neighbourhood). The good stories should be specific and based on reliable data.

4.9 Competitions rewarding best performance in collection and recycling

Establishment of competitions (e.g. Municipalities, schools, companies) in order to award the best performances or excellent behaviour in paper collection (e.g. Higher collection rates, best quality of the paper and board collected).

4.10 Educational areas on paper and board collection and recycling

Integration of a reserved area in recycling yards and/or sorting plants in order to teach visitors (e.g. Kids, students, retired people) on paper and board collection and recycling.

4.11 Dissemination of the environmental and economic benefits of paper recycling

Development and launch of awareness campaigns based on illustrative and clear examples of the recycling benefits (e.g. Co2 reduction or saved trees because of the paper recycled last year in the municipality).

4.12 Involvement of celebrities in awareness campaigns

Appointment of a celebrity to be the public image to spread the message about the importance of recycling.

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4.13 Targeted communication campaigns

Identification of the social groups in which paper and board collection should be improved and develop targeted communication campaigns for them (e.g. Schools, kindergartens, new homeowners, tourists in holiday flats).

4.14 Associations of citizens providing direct feedback to municipalities

Creation of association of citizens who get together to discuss issues about paper and board collection. Their feedback is afterwards used by the municipality to improve the paper and board collection system.

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The following table shows the list and classification of good practices and best practices:

Table 9. List and classification of good practices and best practices identified in the IMPACTPapeRec project

GOOD PRACTICES		BEST PRACTICES	
Operational aspects			
1.3	Constant technological innovation in paper and board collection	1.1	Specific collection system adapted to real needs
1.5	Volunteer collection of paper and board	1.2	Separate collection system for paper and board
1.6	Selective collection system for graphic paper	1.4	User-friendly collection containers
1.7	Underground containers in higher population density areas	1.9	Container-opening systems adapted to paper and board
1.8	Compacting collection trucks		
Policy, legislation and economic aspects			
2.2	Cluster of municipalities	2.1	Ambitious strategy and targets
2.3	Pay-as-you-throw	2.5	Ordinance on separate paper and board collection in public institutions
2.4	Tender for waste and recyclables collection service		
Monitoring and control aspects			
3.3	Control measures to prevent paper theft	3.1	Data collection and monitoring of PfR quality parameters
3.4	Optimisation of collection routes	3.2	Monitoring and control of the composition of residual waste and paper and board in other recyclable streams
3.5	Filling level control for containers		
3.6	Publication of paper collection KPIs		
Information and communication aspects			
4.3	Include citizens actively in the information loop (making citizens actors)	4.1.	Information on containers and bags
4.4	Waste ambassadors	4.2	Selection of a comprehensive and functional communication package
4.5	Website on paper and board collection and recycling	4.7	Monitoring of communication campaigns
4.6	Roadshows, events and workshops	4.13	Targeted communication campaigns
4.8	Publication of stimulating news on paper and board collection and recycling		
4.9	Competitions rewarding best performance in collection and recycling		
4.10	Educational areas on paper and board collection and recycling		
4.11	Dissemination of the environmental and economic benefits of paper recycling		
4.12	Involvement of celebrities in awareness campaigns		
4.14	Associations of citizens providing direct feedback to municipalities		

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4.2 Factsheets

Each good practice and best practice has been described in an individual factsheet. These factsheets contain introductory information which municipalities can use to implement these practices. The objective of the factsheets is to be a starting point to help municipalities with the implementation of potential solutions for their municipalities. Each factsheet contains the following information.

1. **Background**

   This section provides the reader with the essential context needed to understand the issue at hand and its significance. The content of the background varies depending on the good practice or best practice so that it is truly relevant to the practice being explained. It can describe the state of the art of technology, collection system, or relevant information that provides the municipalities with a basic understanding of the problem.

2. **Action**

   Clear and concise description of the practice. Basic instructions to let the municipality know what it needs to do to implement the good practice or best practice.

3. **Examples of locations where the practice has already been implemented**

   Each good practice and best practice includes real examples so that the user can visualise how it has been implemented in other municipalities/centres. Whenever possible, the impacts and outcomes of implementation have also been included. These examples include illustrative pictures and elements to facilitate the understanding of the good practices and best practices.

4. **Keep in mind that...**

   In this section, municipalities are provided with a description of the main conditions required for the application of each good practice and best practice, as well as potential issues that are important to the success of the implementation.

5. **How to start?**

   This section includes tips to help users to implement each good practice and best practice. The objective of this section is to act as a starting point for the implementation of good practices and best practices in the municipalities. Should this occur, some good practices and best practices will require the input of further information from professionals and experts.

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6. **Potential benefits**

   According to the nature of each good practice and best practice, the potential benefits that can be achieved with their implementation have been divided into economic (), environmental () and social () benefits.

7. **References**

   The sources of the information included in the factsheets.

The good and best practices factsheets are available online to download in pdf form.

Good and Best Practices Factsheets

See Annex I. Good and Best Practice Factsheets

5. EVALUATION OF PERFORMANCE IN THE COLLECTION OF PAPER AND BOARD

To evaluate paper & board collection performance, performance indicators are a useful tool. Measurement through KPIs helps to monitor performance of good practice/best practice application and can also serve to benchmark against other territories or over time.

An Excel tool has been developed for evaluation and comparison purposes, based on a total of 10 performance indicators, divided into four categories of KPIs (Key Performance Indicators):

- Operational
- Economic
- Social
- Environmental

Evaluation of performance in paper and board for recycling collection

See Annex II. USER MANUAL: The evaluation II

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5.1 Introduction to the KPI evaluation methodology

The Key Performance Indicators (KPIs) help us to measure how well companies, business units, projects or individuals are performing compared to their strategic goals and objectives. Well-designed KPIs provide the vital navigation instruments that give us a clear understanding of current levels of performance in paper and board recycling in a municipality. Effective decision-makers and managers understand that they need information on the key dimensions of performance and that this can be achieved by distilling them into these vital KPIs.

The most effective KPIs in a municipality are closely tied to strategic objectives and help to answer the most critical business questions and to identify the problems concerning the collection of paper and board. A good starting point is therefore to identify the questions that decision-makers, managers or external stakeholders (citizens included) need to answer. One or two so-called Key Performance Questions (KPQs) should be identified for each strategic objective.

Once the most important business questions have been articulated, companies will then be able to select or develop the right KPIs to best answer them. Thus, all the KPIs will be strategic, relevant and meaningful. (23)

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6. SELECTION TREE

Planning means making a sequence of decisions. The choices made at the initial stage of the planning process determine the set of alternatives in the subsequent steps. Thus, the planning process consists of interdependent decisions, leading progressively to the final project plan (24).

In this scenario, the selection tree method is a suitable tool to be used. It assumes that the decision process consists of a finite number of stages, at which various decisions are made. For each decision, a finite, and usually relatively small, number of options are defined. This means that there is a sequence of questions and choices that drives the selection through the "branches" of a tree in order to reach the "tips" where the solutions for the problem are laid out. The applications of selection trees in project decisions and resource allocation have been demonstrated in multiple projects (25), (26), (27), (28), (29), (30).

In the IMPACTPapeRec project, a selection tree has been designed with three different levels of multiple-choice selection options, ending with the good practices and best practices that have been proposed to solve or address the problems under study.

Selection tree tool

See Annex III: USER MANUAL: The evaluation tool

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7. BACKGROUND AND FURTHER INFORMATION

7.1 The project

IMPACTPapeRec was a European project to boost the Circular Economy by further increasing separate collection of paper and board and promoting appropriate schemes to avoid landfilling and incineration. It came under the topic "Waste-4d-2015 Raw materials partnerships".

IMPACTPapeRec was a consortium of 19 partners from eight countries; Austria, Belgium, Bulgaria, France, Germany, Poland, Romania and Spain. The innovative approach of the defined participatory strategies on separate paper collection for efficient recycling was based on the commitment of the entire paper value chain: Municipalities (Sfantu Gheorghe, Mihai Viteazu, Dupnitsa, Mezdra, Trivalis), large paper companies (SAICA, Hamburger Recycling, Stora Enso), a large waste management company (TEGA), an international network of cities and regions (ACR+), an eNGO (EEB), research organisations (ITENE and PTS), a European retailer (C.C Carrefour Spain), representative SME groups (PROPAKMA, Fenix Dupnica), the German Institute for Standardisation (DIN), an EPR scheme (CITEO[11]) and the European paper sector organisation (CEPI). They represented a balanced view of the entire value chain.

[11] Previously ECOFOLIO. Eco-Emballages and Ecofolio merged in 2017 to become CITEO, which was set up by businesses to limit the environmental impact of packaging and paper.

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Figure 13. Partners in the IMPACTPapeRec project

IMPACTPapeRec acted as a common European information point for the collection of paper and board for recycling in European municipalities by pooling and disseminating information and bringing together stakeholders from the value chain to exchange results, findings and experiences. In order to improve the development and promotion of GOOD and BEST PRACTICES in paper collection, there was a need to establish common evaluation and benchmarking methodologies.

The main outcome of the work carried out by the IMPACTPapeRec project was this GOOD and BEST PRACTICE HANDBOOK, containing an analysis of the PRACTICES used for the collection of paper and board. The aim of the handbook is to support the different European regions in the implementation of best collection procedures.

7.2 Methodology

The methodology used to identify good practices and best practices is thoroughly explained in D2.2. Methodology for IMPACTPapeRec best practices and working instructions (2) as mentioned on numerous occasions in this document. Moreover, the methodology for the analysis of good practices and best practices is completely explained in the D3.2. Innovative models and best practices to be implemented in cities under study.

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7.3 Project partners expertise in paper and board collection

Table 10. Contact details of project partners with expert knowledge

STAKEHOLDER GROUP	PROJECT PARTNERS WITH EXPERT KNOWLEDGE
Citizens	EEB
Municipalities	ACR+
Waste Management Industry	Hamburger recycling
Paper industry	CEPI, SAICA
Research and consulting	ITENE, Propakma, PTS
Standardisation	DIN

** see contact details below for each organisation

Full Name	Short name	Type	Country	
INSTITUTO TECNOLÓGICO DEL EMBALAJE, TRANSPORTE Y LOGÍSITICA	ITENE	RTD	SPAIN	

General entity description: www.itene.com

ITENE is an R&D technological centre specialising in packaging, logistics, transport and mobility. Its mission is to generate scientific and technological knowledge and to add value to companies through the implementation of R+D+I and through the transfer of knowledge as well as the dissemination of best practices from previous projects, in order to provide relevant information to interested entities in relevant sectors. ITENE provides business solutions with an integrated view of the supply chain, from raw materials, to design and development of packaging and packaging systems, optimisation of the movement and distribution of goods until the products reach the consumer and are ultimately managed as waste, all within a framework of sustainable performance.

Contact details:

- Antonio Dobón as coordinator of the IMPACTPapeRec project - adobon@itene.com
- César Aliaga - caliaga@itene.com
- Dolores Herrero - dolores.herrero@itene.com

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- Silvia Martinez - silvia.martinez@itene.com

Full Name	Short name	Type	Country	
CONFEDERATION OF EUROPEAN PAPER INDUSTRY	CEPI	Paper Industry	BELGIUM	

General entity description: www.cepi.org

The Confederation of European Paper Industries (CEPI) is a Brussels-based non-profit organisation that brings together the European pulp and paper industry, championing industry achievements and the benefits of its products. Through its 18 members countries (17 European Union members plus Norway) CEPI represents 515 pulp, paper and board-producing companies across Europe, ranging from small and medium-sized companies to multinationals, as well as 940 paper mills. Together they represent 23% of world production.

Contact details:

- Ulrich Leberle – u.leberle@cepi.org
- Annie Xystouris – a.xystouris@cepi.org
- Giulia Fadini - g.fadini@cepi.org

Full Name	Short name	Type	Country	
ASSOCIATION OF CITIES AND REGIONS FOR RECYCLING AND SUSTAINABLE DEVELOPMENT	ACR+	Association	BELGIUM	

General entity description: www.acrplus.org

ACR+ is an international network of cities and regions which share the aim of promoting smart resource consumption and sustainable waste management through prevention at source, reuse and recycling. ACR+ has around 90 members across EU Member States and neighbouring countries (Mediterranean region), which are mainly local and regional authorities as well as national networks of local authorities representing around 1,100 municipalities. Through its activities, ACR+ strives to develop the expertise and skills of public authorities in effective waste-product-resource policies, as well as encourage practical action.

Contact details:

- Byliana Spasova - bs@acrplus.org

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Full Name	Short name	Type	Country	
SOCIEDAD ANÓNIMA INDUSTRIAS CELULOSA ARAGONESA	SAICA	Paper Industry	SPAIN	SAICA PAPER | NATUR | PACK

General entity description: www.saica.com

The SAICA GROUP carries out its business in three sectors: environmental services and waste collection (SAICA NATUR), paper for corrugated board production (SAICA PAPER) and packaging production, mainly corrugated board (SAICA PACK). SAICA PAPER is the core of the company, but the three business units are closely linked. All of the company's production comes from recycled paper, thus it is 100% based on paper for recycling as a secondary raw material. SAICA PAPER owns and manages four paper mills in Saragossa and El Burgo de Ebro (both in the province of Saragossa) in Spain, Venizel (north of Paris) in France, and in Partington (south of Manchester) in the United Kingdom. As the biggest consumers of paper for recycling in Spain and France, the group is heavily involved in the collection of paper in these countries, and especially in Spain.
Contact details:

- Guillermo Vallés - guillermo.valles@saica.com

Full Name	Short name	Type	Country	
HAMBURGER RECYCLING GROUP GMBH	HAMBURGER RECYCLING GROUP	Waste management industry	AUSTRIA	Hamburger Recycling PRINZHORN GROUP

General entity description: www.hamburger-recycling.com

Hamburger Recycling, whose core competences lie in collection, treatment, trade and transport, closes the loop between paper production (Hamburger Containerboard) and packaging production (Dunapack Packaging) in Prinzhorn Holding. The company's ongoing investments in collection, separation and treatment of paper for recycling ensure the supply of its own plants and external industries with high quality secondary raw materials and commodities. Hamburger focuses on new projects (green field) as well as the acquisition and integration of existing companies (brown field) into our divisional structures. Our main aim is the expansion of disposal services for the retail and wholesale trade, and for industry and communities.
Contact details:

- Slobodan Simovic - slobodan.simovic@hamburger-recycling.com

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- Maja Huljiev - maja.huljev@hamburger-ens.hr

Full Name	Short name	Type	Country
PAPIERTECHNISCHE STIFTUNG	PTS	RTD	GERMANY

General entity description: www.ptspaper.de

With a total of 75 research projects per year, PTS is one of the most important members of the German AiF (Union of Industrial Research Associations) and belongs to the major paper institutes worldwide consulted by the paper industry and related sectors. PTS research covers the whole production chain from the raw material (wood) to the end product (paper) and also takes in recycling technologies, thus responding to global challenges such as resource-efficient products and processes bearing in mind climate change; sustainable products and processes securing the supply of raw materials; and new paper and packaging products that meet the demands of an information society marked by demographic changes. PTS supports regional, national and European associations in the paper industry, the forest sector and the waste treatment and recycling sector by participating in expert committees and conferences.

Contact details:

- Lydia Tempel - lydia.tempel@ptspaper.de
- Mike Schiefer - mike.schiefer@ptspaper.de

Full Name	Short name	Type	Country
DIN DEUTSCHES INSTITUT FÜR NORMUNG E. V.	DIN	Standardisation	GERMANY

General entity description: www.din.de

The remit of DIN, a registered non-profit association, is to encourage, organise, steer and moderate standardisation and specification activities in systematic and transparent procedures for the benefit of society as a whole, while safeguarding the public interest at national, European and international level. DIN is a member of the European Committee for Standardisation (CEN) and the International Organisation for Standardisation (ISO). DIN is represented on different committees at European level (CEN) and international level (ISO). In particular, DIN is involved in technical committees (CEN/TC 172) on European paper, board and pulp (ISO/TC 6) at international level.

Contact details:

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- Alexandra Engelt - Alexandra.Engelt@din.de

Full Name	Short name	Type	Country	
PROPAKMA GmbH	PROPAKMA	RDT	GERMANY	PROPAKMA

General entity description: www.propakma.com

Propakma is a newly created company whose activities include technical and technological services for the paper and other related industries, as well as the representation of interests, and the management of associations. The owner, Andreas Faul, has been the Managing Director of INGEDE(www.ingede.org), the International Deinking Industry Association, since mid-2003.
Contact details:

- Andreas Fault - andreas.faul@propakma.com

Full Name	Short name	Type	Country	
EUROPEAN ENVIRONMENTAL BUREAU	EEB	NGO	BELGIUM	EEB European Environmental Bureau

General entity description: www.eeb.org/

The European Environmental Bureau (EEB) is the environmental voice of European citizens, standing for environmental justice, sustainable development and participatory democracy. Its remit for the EU is to ensure all citizens have a healthy environment and rich biodiversity. The EEB, set up in 1974, is Europe's largest coalition of grassroots environmental organisations. It stands out for its expert insight into a vast amount of environmental issues; ranging from biodiversity to waste, nanotechnology, chemicals, ecolabels, climate change and many other areas. Meetings with members are held regularly in the shape of working groups, focusing on important environmental issues, with the demands of these groups then being promoted at European and global level. Its policy officers are in constant dialogue with the European institutions (Commission, Parliament and Council) and relevant departments of the United Nations (UNDESA, UNEP) and the OECD, and efforts are made to improve and protect environmental laws in Europe and beyond. The EEB also supplies quality information to the public, its members and European institutions through articles, reports and papers.
Contact details:

- Piotr Barczak: piotr.barczak@eeb.org

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 690182

Annex I. Good and Best Practices Factsheets

IMPACTPAPEREC
Boosting separate paper collection

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

SPECIFIC COLLECTION SYSTEM ADAPTED TO THE REAL NEEDS

BEST PRACTICE

Background (REF: 1, 2 & 3)

The selection of a well-performing waste and recyclables collection system is the basis for proper recycling. Waste and recyclables collection systems commonly applied in Europe can be classified by:

- **Type of recipient:** container (surface/ underground), bin, bag (plastic), etc.
- **Distance to collection point:** Pick-up (door-to-door, kerbside) and drop-off system (bring banks and recycling yards).
- **Type of fractions collected:** selective and separate collection (only one material fraction), mixed (all fractions together) or commingled (all recyclables together). Five fractions, including paper & board, are obligatory to be collected separately according to the EU framework. However, while EU legislation does allow not only separate, but also commingled collection, research shows that separate collection of paper & board is essential for achieving good results in paper & board recycling.
- **Frequency:** daily, weekly, fortnightly, monthly, bi-monthly, etc.

Each collection system is a combination of the elements above, and should be decided according to the characteristics and preferences of each territory.

ACTION

Select the best collection system for each area of the municipality by considering its specific characteristics and needs: climate, type of urbanisation (buildings, density of population), demographics, infrastructure, etc.

Examples of best practice implemented

Household waste collection in Barcelona (Spain) (REF: 4)

Barcelona has an extensive municipal service for the daily collection of household waste according to the characteristics of each urban district.

- **Blue containers for paper and cardboard:** All citizens have recycling collection containers located less than 100 meters from their home.
- **Manual bag collection service:** Door-to-door waste collection of different types of waste and recyclables service in specific zones including the old part of the city, where is especially difficult to place containers or access with vehicles.
- **Recycling yards:** Used to get rid of municipal waste fractions which can't be thrown into street containers.

Waste management plan 2018 in Copenhagen (Denmark) (REF: 6)

In the Waste Management Plan 2018, the efforts of the City for a more resource efficient waste management system fall under four topics each with a specific target and a number of measures and concrete initiatives. Each topic furthermore contains a ***flagship project.***

Under the **Topic 2: "Better separation among citizens and business",** by 2018 **all citizens in the City of Copenhagen must have access to separation of the most ordinary types of waste near their home, and all institutions of the City will source-separate their waste.** Those measures directly related with paper and board collection are:

SEE MORE: *Resource and Waste Management Plan 2018 in Copenhagen City*

MEASURES	
1. Better separation options in block of flats. Better marks and signs, review and optimisation of waste schemes, higher recycling rates through trials with citizens	**2. More options for separation in single family houses.** Better service in waste collection voluntary cardboard container
3. Integration of innovative waste solutions in the urban space. More separation options in inner city, multifunctional waste solutions in the public space, clear common guidelines for waste solutions	**4. More separation in the business community** Better separation in municipal institutions

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

SPECIFIC COLLECTION SYSTEM ADAPTED TO THE REAL NEEDS

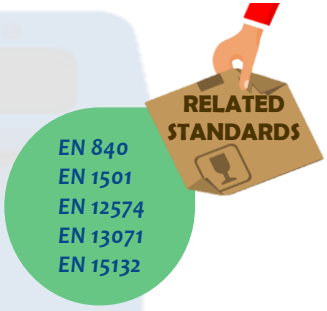
BEST PRACTICE

Keep in mind that...

- **Characteristics of the territory and its socio-demographic characteristics define the type of collection scheme.**
- **All stakeholders should be engaged in the process.**
- **Some businesses/retailers/offices could have service contracts with traders of PfR or container service companies and do not participate at the municipal collection system.**

How to start? (REF: 7)

- **Define the baseline:** Collecting reliable data and other information on the existing waste and recyclables situation is a critical first step. The aim of gathering this background information is to provide a realistic and quantitative basis for the development of the plan, based on actual data and prioritized requirements and needs.
- **Identify the roles & responsibilities of key stakeholders**.
- **Identify the strong & weak points of the current Solid Waste Management (SWM) system**. Problems may be characterized as either: Internal to the SWM such as lack of equipment or planning capacity; Both internal & external like accelerated waste generation, lack of co-ordination etc.; and External problems such as uncontrolled urbanization, population explosions etc. will generally have to be accepted and adapted.
- **Prepare the appropriate SWM action plans**: It is the core of the planning procedures as it defines the actions to be implemented and which will establish the new SWM system.
- **Provide guidelines** on how to pass from the planning phase to the implementation phase.
- **Control of technological measures**: An outline of waste and recyclables ensures identification of areas in which technological measures should be taken to eliminate or minimize certain types of waste.



- **Outline of governance requirements**: SWM plans make way for statement of financial, institutional and social requirements. On this basis, the need for future actions, such as investments in SWM plans, public awareness campaigns, training courses for the relevant authorities and etc., may be determined.
- **Monitoring & review** constitute an essential and integral part of the planning process, ensuring both that the plan remains relevant to its goals and objectives over time. The simplest and most common monitoring tools are visual observations, general feed-back from the work-force and customer complaints. Nevertheless, it is requested a more detailed and formal analysis such as definitions of KPIs.

Potential benefits (REF: 7)

It could result in a lower cost of overall waste and recyclables management	●		●
Less environmental pollution	●	●	●
Conservation of raw materials		●	
Conservation of resources, since appropriate planning does not allow inappropriate investments	●		●
Better coordination between urban services	●	●	●
People is more satisfied with the service provided			●
Better cost management and higher cost recovery	●		●

References:

1. ACR+ (2009) – Municipal Waste in Europe – Towards a European Recycling Society, Chapter 7 "Organising collections"
2. IMPACTPAPEREC (2017): Deliverable 3.2
3. ZERO WASTE (2009): Low cost ZERO WASTE municipality
4. AJUNTAMENT DE BARCELONA (2016): Ecology, Urban Planning and Mobility
5. CITISCOPE (2016): How Ljubljana turned itself into Europe's 'green capital'.
6. CITY OF COPENHAGEN: Resource and Waste Management Plan 2018
7. ISWA: Solid Waste. Guidelines for successful planning

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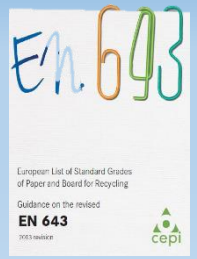
Boosting separate paper collection

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

SEPARATE COLLECTION SYSTEM FOR PAPER AND BOARD

BEST PRACTICE

Background (REF: 1,2)



Today there are over 60 recognised grades of recovered paper in Europe (EN 643), categorised into five main groups by the *Confederation of European Paper Industries* (CEPI), and *the Bureau of International Recycling* (BIR), divided into: Ordinary grades, Medium grades, High grades, Kraft grades and Special grades.

It is important to keep paper and board separated from the rest of municipal waste streams due to several reasons:

- Paper is the one of the biggest fractions (according to volume) in the dry recyclables mix; hence it has a big potential as a resource.
- If quality is good, can be recycled up to 6-7 times (average of 3.5 times) → closing the loop.
- Vulnerable to impurities → should be collected separately from other fractions.
- Separation at the source minimises the need for subsequent sorting operations.

ACTION

Introduce a separate collection system for paper and board to offer citizens the possibility to separate it from their residual waste and other recyclables

Example of best practice implemented

Selective Collection of Paper and Board in Berlin (Germany)

(REF: 4)

Berlin has almost 100% coverage of separate door-to-door collection for the source separated collection of paper and board, glass and bio-waste.

Figure 1- Selective collection containers in Berlin

For the case of Paper and Board, the selective collection system covers the whole city. Materials collected by this system are: newspapers, magazines, catalogues, office paper, packaging paper, cardboard and cards. A door-to-door collection system is used (blue wheelie bins). The service is given by several organizations. Additionally, bring banks are also present throughout the city.

Some indicators about paper and board collection are shown below:

Collection Coverage	*Household nearly 100% and businesses 100%*
Annual Collected Quantities	*160,574 t: 47.2 kg/cap*
Source Fundings	*BSR (municipal collection service) finances itself from the collection fees and other charges for services but it does not generate profits. Then, cost reductions directly benefit fee-payers*

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SEPARATE COLLECTION SYSTEM FOR PAPER AND BOARD

BEST PRACTICE

Related BP: *"Specific collection system adapted to the real needs"*

Keep in mind that...

- ⚠ Characteristics of a territory and its socio-demographic characteristics define the type of collection scheme.
- ⚠ Regarding the technical issues, it is necessary to develop an accurate system, adapting type and size of collection containers, establishing an adequate frequency for the collection.
- ⚠ The whole process of collection – transport – sorting – recycling should be considered when defining the collection system.

How to start? (REF: 4)

- Define properly the specific characteristics of the fraction(s) to be collected (graphic paper-cardboard, paper and board, etc.).
- Size the system: make an estimation of the amount of waste and resources (including identification of potential grades) generated.
- Select the adequate and most promising collection system for your territory.
- Conduct an information campaign addressed to citizens, providing them with accurate and easy-to-understand information.
- Monitoring performance of separate collection system.

Potential benefits

Increased cost efficiency, getting a higher benefit from PfR, which would balance the investment needed	●	●	●
Better quality of collected material, reducing therefore sorting costs	●		
Paper for Recycling by separate collection motivates citizens and make them aware of their participation in the recycling process	●	●	●
Potential use of PfR for "added-value applications"	●		●

EN 643
EN 840
EN 1501
EN 12574
EN 13071
EN 15132

References:

1. CEPI KEY STATISTICS (2014)
2. PAPER.ORG (2013): Recovery and recycling of paper and board (Factsheet)
3. Waste Framework Directive 2008/98/EC
4. KOMMUNAL SERVICE JENA (2014): Separated waste collection system in Jena (Germany)
5. EUROPEAN COMMISSION (2015): Assessment of separate collection schemes in the 28 capitals of the EU

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Boosting separate paper collection

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CONSTANT TECHNOLOGICAL INNOVATION IN PAPER AND BOARD COLLECTION

GOOD PRACTICE

Background (REF: 1)

European legislation on waste sets clear targets for reduction of waste and establishes an ambitious and credible long-term path for waste management and recycling. The European waste targets (e.g. recycling 65% of municipal waste by 2030, recycling 75% of packaging waste by 2030, reduce landfill to maximum of 10% of municipal waste by 2030) are accompanied by concrete measures to address obstacles, such as innovation.

Innovation in key aspects of waste and recyclables management may help to achieve these targets: low-cost interventions, big data analysis and new regulations on landfills are key factors for the smart management of waste in cities.

Read more: *High Tech and Low Cost Solutions to Handle Urban Waste*

ACTION

Implementation of a systematic process of continuous technological innovation through annual meetings to: analyse existing indicators in paper and board collection, identify problems and challenges, analyse arising technologies and decide technological changes to be done

Examples of good practice implemented

Big Data for PfR collection in Rotterdam (The Netherlands) (REF: 2)

This city is using big data to improve the logistics of paper and cardboard collection. In this project, digital sensors help ensure there is space inside collection containers and prevent obstructions. *"We started in March 2015,"* says Joost van Maaren, head of Collection and Reuse of Waste in Rotterdam. ***"At present, we check about 250 paper containers. Real-time analysis of data allows us to empty bins when they are about 80% full."***

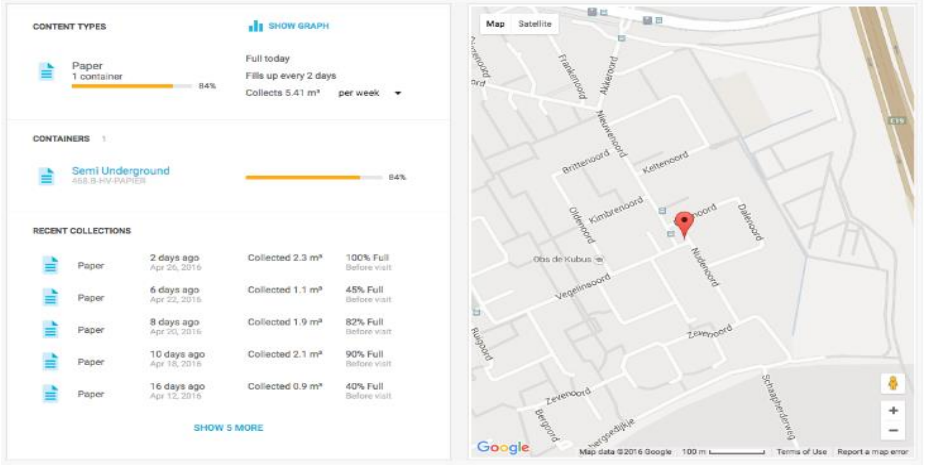

Figure-1. Software for waste and recyclables collection implemented in Rotterdam. Source: Cities Today

Valladolid (Spain), Genoa (Italy) and Kartal (Turkey) (REF: 3)

These three municipalities have been involved in the European project R2Cities where researchers have drawn up a feasibility study to introduce low-cost innovations to enhance separate waste collection at a social housing estate in cities' suburbs. **Project plans include increasing the percentage of door-to-door collections to 72%, compared with the present 30%, and stockpiling wastes at recycling plants to obtain revenue from it.** A second phase of the project looks to allocate the organic portion of the waste to a local compost site to avoid transport costs and pollution, then use the organic material in green areas of the city.

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CONSTANT TECHNOLOGICAL INNOVATION IN PAPER AND BOARD COLLECTION

GOOD PRACTICE

Keep in mind that... (REF: 4)

- ⚠ A specific municipal budget item should be reserved for this purpose.
- ⚠ It is important to include members from different areas in the strategy definition (e.g. industry, politicians, experts, citizens) in order to have a holistic view of these issues.
- ⚠ It is important to pay attention to private initiatives; European projects calls and Annual Congresses developed by local/national companies. This can be a good source of ideas since main barriers, future perspectives and challenges are usually exposed.

How to start? (REF: 5)

- Prescribe innovation as an objective within the strategy and make it part of regular work.
- Define the KPIs related to collection and management of paper for recycling in the municipality and measure them.
- Develop a study of the initial situation of the municipality, taking into account previous KPIs, identifying key processes, bottlenecks, challenges and areas for improvement.
- Invest in developing a systematic process of technological innovation in order to improve the issues that have been found.
- Look for innovation projects, other partners looking to achieve the same objectives or that can complete a part of the recycling chain.
- Establish a set of objectives based on a SMART methodology
- Define specific measures (operational, legislative, economics, etc.) to achieve objectives, including information about: responsible to implement it, deadlines and expected impact.
- Schedule regular meetings (at least) with main stakeholders involved to review targets achievement, success of implemented measures and to plan the strategy for the next year.
- Communicate results to the whole working group (e.g. by creating an information channel so that during the rest of the year the information can be updated).

Potential Benefits (REF: 4)

Improvement in paper and board collection and recycling rates due to the improvements in technology derived from innovation investment	●	●	●
Improvement in management structure, being able to monitor performance and allocate optimally resources	●	●	●
Innovation including different actors from the waste and recyclables management chain will enable decision makers to have a holistic view of the main problems and find solutions for the whole system		●	●
Increase the municipality status and reputation due to the investment in innovation		●	●

References:

1. R2CITIES: Residential Renovation towards nearly zero energy CITIES
2. CITIES TODAY (2016): Rotterdam increases efficiency of waste collection
3. EU-SMARTCITIES: "NEARLY ZERO" RESIDENTIAL DISTRICT: Develop a replicability strategy to design, building and management.
4. AUSTRALIAN GOVERNMENT: Waste Technology and Innovation Study
5. GENG ET AL. (2010): Evaluation of innovative municipal solid waste management through urban symbiosis: a case study of Kawasaki

IMPACTPAPEREC

Boosting separate paper collection

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USER-FRIENDLY COLLECTION CONTAINER

BEST PRACTICE

Background (REF: 1)

Recycling should be easy and encouraging for all the population. Thus, the design of the collection infrastructure should be appealing and adapted to all the users. Furthermore, proper maintenance and clean surroundings are also important to boost paper and board recycling as well as the adaptability of the frequency of collection and opening hours of recycling yards to all citizens.

User-friendliness, i.e. comfort and convenience, are particularly decisive characteristics of successful bring collection systems. (REF: 5)

ACTION

Use of containers with ergonomic design adapted to different kind of users (i.e. children, elderly and disabled people) and ensure their proper condition and maintenance as well as the adaptability of the frequency of collection and opening hours of recycling yards to all citizens

Example of best practice implemented

Ljubljana experience (Slovenia) (REF: 2, 3)

In 2013, **Ljubljana introduced a simpler and more user-friendly method of collecting packaging, which was going to increase the quantities collected.** Using their own bins/containers outside their buildings, residents collect residual waste, biowaste, packaging and paper. They also collect packaging at collection points or eco-Islands situated in public areas.

Figure-1. Picture of ergonomic underground container in Ljubljana. Source: European Green Capital 2016

Furthermore, since 2008 **Ljubljana government has been replacing ordinary containers in the centre of the city with underground collection points**, thus rationalising waste management and **improving the appearance of the city**. Glass, packaging and paper can be deposited by anyone, while a card is required to deposit organic and residual waste (available free of charge to all household users living in the area).

ECOLOGICAL COLLECTION SITES:

Ecological collection sites for the separate collection of waste are intended for all users who wish to deposit separately collected waste, not only those living in the vicinity. As a rule, they are located at a permanent collection and pick-up public site and comprise the bins for collecting packaging, paper and glass. Additionally, there are established several ways to obtain the dates and the schedule of waste removal for the citizens.

In the territory covered by SNAGA (waste manager in Ljubljana), there is one collection unit for separate fractions per 124 inhabitants, which is twice as much as foreseen in the ordinance.

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USER-FRIENDLY COLLECTION CONTAINER

BEST PRACTICE

Keep in mind that...

- **Design is important. It should be inclusive for the maximum part of the population (specially considering children, elderly and disabled people).**

Figure-2. Containers for recycling adapted to the material and to disabled people in Ljubljana (Slovenia). Source: European Green Capital 2016

How to start? (REF:3)

- **Make a cleaning plan for the containers and the surroundings (adapted to the needs).**
- **Check for container maintenance regularly.**
- **Make an analysis of your containers. Are they ergonomic and adapted to the users? To analyse this, surveys can be very useful to hear users' opinions. If this is not the case, consider it for future container purchase.**

Potential benefits

Easier use of the containers for the citizens	●	●	●
More comfort and convenience for the citizens			●
Cleaner city		●	●
Prevention of other material in the paper and board container		●	●
Increase of paper and board collection rates	●	●	●

RELATED STANDARDS

ISO/TR 14062
ISO 24505

References:

1. ECOPAPERLOOP, Optimising paper products, Packaging and collection systems EU (2012-2014)
2. LJUBLJANA (2016): European Green Capital 2016
3. SNAGA (2017): Waste manager in Ljubljana
4. SEPARE COLLECTION IN LJUBLJANA (Slovenia) (2015): Capital factsheet on separate collection
5. ECOPAPERLOOP: Guideline: Recommendations on collection strategies

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VOLUNTEER COLLECTION OF PAPER AND BOARD

GOOD PRACTICE

Background (REF: 1)

"Volunteer collections" are an interesting way for your municipality to start going green... and get a reward for it!

Volunteer collection is an initiative that public or private organisation (e.g. schools, sports, clubs, charity organisations, etc.) at local level (neighbourhoods, sports clubs, etc.) can implement in a municipality by collecting paper and board separately.

This collection is done apart of the regular municipal collection system, hence, depending on the municipality a special permission may be needed.

Volunteer collection can entail a benefit for the entire community, not only by raising money but also by increasing environmental awareness in people.

ACTION

Separate collection of paper and board by public and private organisations at local level (e.g. schools, sports clubs, charity organisations, etc).

Examples of good practice implemented

Kempten, Oberallgäu and Lindau (Germany) (REF: 2)

The counties of Oberallgäu and Lindau together with the city of Kempten consolidated to a common public association for waste and resources collection, *"Zweckverband für Abfallwirtschaft Kempten" (ZAK)*. **A special permission allows not-for-profit associations, NGOs, or sports clubs to collect PfR on their own behalf and by their own means. This system collects selectively graphic paper in bundles or boxes directly from households, via private cars, transporters, tractors, etc.** These are local collections and usually just cover one village or town. Frequency varies, depending on the village/town. By experience volunteer collection takes place 2-6 times per year. Separate collection of PfR has a long tradition on this territory: Volunteers collection since a long time, paper containers (BB) in 1980s, and recycling yards in 1990s. The paper bin (door-to-door collection of paper & board) was introduced in 2008. Paper bins are provided to the households free of charge and the next bring bank is within walking distance (one per 500 to 600 inhabitants). For selective collection of graphic paper citizens can make use of the recycling yards (one for 7500 to 8000 inhabitants) and the volunteer collection. 60% of the households have a paper bin and those provide 40% of the collected paper.

Fire brigade Wolsdorf (Germany) (REF: 3)

The volunteer fire company Wolsdorf collects each year recovered paper from houses of the villages. The proceeds are donated to the Wolsdorf Children's and Youth Fire Brigade.

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VOLUNTEER COLLECTION OF PAPER AND BOARD

GOOD PRACTICE

Keep in mind that...

- The "volunteer collection" would be more suitable to be implemented on those territories where are just starting off and don´t have a very well established public collection system.
- Good coordination and communication among the municipality and the volunteer group is important.
- Evaluate the impact of this type of collection in the overall collection of the municipality. Especially, ensure that the volunteer collection system is mainly able to divert paper and cardboard from the residual household waste stream (dedicated to landfill or incineration) rather than create difficulties at the existing selective collection of the municipality.
- Such collection can affect quantities of paper for recycling (PfR) collected by the municipality itself.

How to start? (REF: 4)

- Give a special permission which allows not-for-profit associations, NGOs, schools or sports clubs to collect PfR on their own behalf and by their own means.
- Give recommendations and information on methods to collect paper and board and how to communicate results to the municipality.
- Establish an efficient communication channel to allow the organization to communicate with the municipality.
- Evaluate and monitor the quantities of PfR collected by the organization.

Potential benefits

Increase in the collection of paper and board		●	●
Better quality of collected material, reducing therefore sorting costs	●		
Collect funds for a social cause	●		●
commitment of citizens on paper and board separation at home by financing both a social and environmental cause		●	●

References:

1. GREENWORLD 365: School Fundraisers Go Green to Raise Money
2. IMPACTPAPEREC (2016): Kempten, Oberallgäu and Lindau, Germany
3. The Wolsdorf Volunteer Fire Brigade, Germany
4. APPLEGATE INSULATION: Tips for Organizing Your Newspaper Recycling

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SELECTIVE COLLECTION SYSTEM FOR GRAPHIC PAPER

GOOD PRACTICE

Background (REF: 1, 2)

Figure 1- Graphic paper

A separate collection of paper and board is an essential feature of a waste and resource management system. If paper and board are collected together, they are mostly subsequently sorted into graphic paper and into packaging paper and board in order to make optimum use of the resource. A proper selective collection concept can make this additional sorting obsolete.

The collected stream 'graphic paper' should correspond to paper for recycling grade 1.11.00. (according to the EN 643).

Graphic paper has an important role in the range of paper grades produced and in the worldwide need for paper. Typically, mass products such as newsprint are produced with a large portion of recycled paper.

The separation in the collection phase of graphic paper from the rest of paper and board raises its value on the market as long as a local market for graphic paper exists.

ACTION

Introduce selective collection for graphic paper. This allows the separation at the source of two different paper fractions thus decreasing (or even potentially eliminating) the need for subsequent technical sorting: (1) graphic paper and (2) non-graphic paper (mainly packaging paper and board)

Examples of good practice implemented

Selective collection of Graphic Paper in Sweden (REF: 3)

In Sweden a statutory producer responsibility for eight product groups: packaging, tires, magazines and newspapers (graphic papers), cars, electrical and electronic products (including incandescent bulbs and certain light fittings), batteries, pharmaceuticals, radioactive products and unclaimed radioactive sources.

Today, the producers' collection system for packaging waste and magazines and newspapers (graphic papers) consists of a nationwide scheme with recycling stations. Producers also subsidise the establishment of collection systems in residential areas where packaging waste and magazines and newspapers (graphic papers) are sorted and collected. Such collection systems are provided either by the municipality or by waste management company. The contractor that is hired by the municipality or the waste management company delivers the collected waste to a collection point nominated by one of the producers.

The collection and processing of magazines and newspapers (graphic papers) is financed by the forestry industry.

Recycling yard in Kempten (Germany) (REF: 4)

In this recycling yard, they collect different three different types of paper (news and magazines, packaging paper and board and mixed paper) according to their recycling grade:
1.11.00 News and magazines, 1.02 Assorted mixed waste paper, 1.04.00 packaging paper and board and 1.02.00 mixed paper.

More information: Andreas Faul (PROPAKMA) → andreas.faul@propakma.com

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SELECTIVE COLLECTION SYSTEM FOR GRAPHIC PAPER

GOOD PRACTICE

Keep in mind that...

- This Good Practice should be applied additionally to the separate collection of paper and board.
- Any change in the collection system requires an appropriate information campaign for citizens.

Related BP: *"Separate collection system for paper and board"*

GUIDELINE

EN 643 Standard- European list of Standard grades of recovered paper and board

European List of Standard Grades of Paper and Board for Recycling EN 643 by CEPI: This guidance document has been created to give advice to sellers and buyers of paper for recycling on the changes to EN 643 from its 2002 version to the revised 2013 version. It gives information about the type of (graphic) paper fractions with highest market value. This document should assist the market and facilitate penetration of the revised EN 643.

Paper for Recycling Quality Control Guidelines

How to start? (REF: 5)

- Analyse the potential results with a cost-benefit analysis.
- Define properly the specific characteristics of the stream that you are going to collect, taking into account the recycling process.
- Make an estimation of the quantities of waste and resources to be collected in order to properly set up the system.
- Select the best suited performing collection system.
- Conduct an information campaign addressed to citizens, providing them accurate and easy-to-understand information.
- Monitoring performance of selective graphic paper collection system, based on a cost-benefit analysis.

Related BP: *"Specific collection system adapted to the real needs"*

Potential benefits

Better quality of collected material, reducing therefore sorting costs	●	●	●
Higher recycling rate owing to a higher quality material	●	●	
Higher price of material sold	●		

Standards listed in BP "Specific collection system adapted to the real needs" might be relevant.

EN 643	*EN 12574*
EN 840	*EN 13071*
EN 1501	*EN 15132*

References:

1. CEPI (2013): European List of Standard Grades of Paper and Board for Recycling EN 643
2. VOITH: Graphic papers All information has its value – and its paper
3. FROM WASTE MANAGEMENT TO RECOURSE EFFICIENCY (2012): Sweden´s Waste Plan 2012-2017
4. KOMMUNAL SERVICE JENA (2016): Separated waste collection system in Jena/Germany
5. DORR RECYCLING YARD IN KEMPTEN (Germany) (2016)
6. CEN (2003): EN 643 Standard

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UNDERGROUND CONTAINERS IN HIGHER POPULATION DENSITY AREA

GOOD PRACTICE

Background (REF: 1)

Underground containers are an interesting solution to overcome difficulties linked with the implementation of separate collection in dense areas and vertical housing. They offer several advantages over traditional wheelie bins: less handling needed, less space consumption, better integration into the landscape, cleaner surroundings, less odours, higher capacities leading to less overflowing and lower collection frequencies.

Underground containers are also regarded as a good way to raise awareness and inform citizens about selective collection since they bring a more positive image of waste and resources collection.

ACTION

Analyse the specific characteristics and needs of each area and if adequate: design an underground collection system in higher population density areas with adapted openings to establish cleaner surroundings and improve the collection efficiency

Example of good practice implemented

Underground containers in Paris region (France) (REF: 1)

Figure-1. Underground containers in Paris (France). Source: Regions for Recycling

Syndicat Emeraude is an intermunicipal organisation bringing together 17 municipalities, in charge of municipal waste and recyclables collection and treatment for a population of about 270 000 inhabitants. The territory encompasses dense areas and a rate of vertical housing of about 55%. **To overcome difficulties linked with high density and vertical housing, the first underground containers were implemented in 2006 as a pilot project.**

Following the success of the pilot action, there was an increasing demand on the territory. **The first introduction of underground container was made in 2006 in a single apartment block. By the end of 2012, around 850 containers were installed.**

The results showed that municipalities experiencing a moderate or high installation of underground containers had increasing collected quantities per capita (respectively +9 and +10%), whereas other municipalities' performances were more stable. Other positive outcomes were reported:

- **Cleaner living environment for residents: as waste and resources are being stocked underground, it consumes less public space.**
- **The fact that all containers are grouped together makes it easier for users to understand the sorting guidelines.**
- **Bigger containers leading to less frequent collection tours lead to savings (calculated decrease of 30% for the costs of collection). Collection route is also shorter.**
- **The system is also less constraining for caretakers, who do not have to take out containers on the kerbside anymore.**

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UNDERGROUND CONTAINERS IN HIGHER POPULATION DENSITY AREA

GOOD PRACTICE

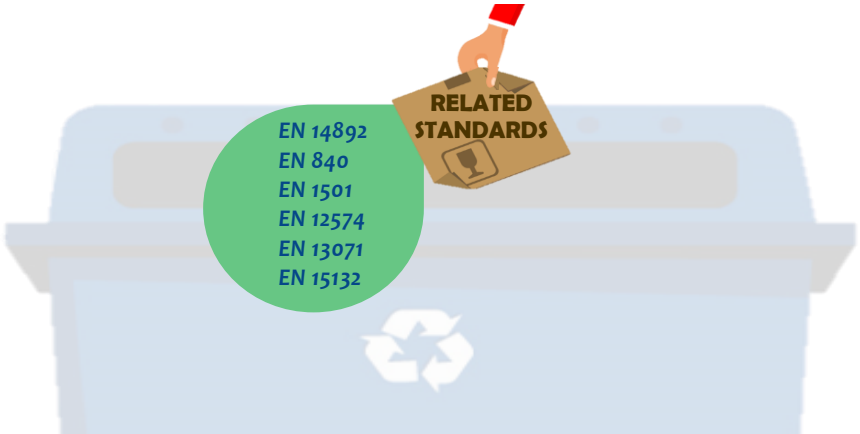
Keep in mind that... (REF: 2)

- High investment costs, especially for urban environments.
- You should also establish an evaluation system, based on KPIs in order to be able to monitor solution adopted.
- It is important to consider costs and benefits of the selected solutions.
- For large cardboard, collection can be less effective than other materials unless openings are adapted.
- In some cases, underground containers can result in reduced quality and higher contamination.

Related BP: *"Container opening system adapted to paper and board"*

How to start? (REF: 1)

- Analysing morphology and socio-demography of the municipality.
- Constant communication activities during the implementation of the system toward every main stakeholder is also a key for success.
- Since the system relies on a collection truck with a compactor, it requires a certain number of collection points to be made profitable.
- The containers should be located within a short distance from the entry door of the apartment block, so that it is not too inconvenient for users and it reduces noise issues for the surrounding apartments.
- Monitoring collection systems and advice on possible improvements.



Potential benefits (REF: 2 & 3)

Aesthetically the system blends well with the surroundings	●	●
Flexible times (in practice) for dropping off waste		●
Cost of collection is potentially lower than with other systems	●	

Figure-2. Underground containers with adapted openings in Barcelona (Spain). Source: Ajuntament de Barcelona (Spain)

References:

1. REGIONS FOR RECYCLING (2014): Good practice, Paris region: Underground containers
2. ZERO WASTE: SYSTEM CHARACTERIZATION
3. WASTE MANAGEMENT WORLD (2011): Underground Bins for London Households

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COMPACTING COLLECTION TRUCKS

GOOD PRACTICE

Background (REF: 1)

A waste compactor is a powerful machine whose main function is to compress the waste reducing its volume and allowing the entry of more waste thus, making transport more efficient.

Waste compaction is a common practice in waste collection. In fact, compactors can be found in many urban waste collection trucks.

A compactor has two main parts: a waste feeder, where the compacting equipment is located, and a tank, where the (compacted) waste is stored. The incoming waste is deposited in the feeder, where a press plate pushes it to the tank. Once filled, when more incoming waste and recyclables are added and the pressure plate pushes it to the tank, the waste is compressed thanks to the pressing force exerted by the press plate.

Related BP: *"Optimization of collection routes"*

ACTION

Use of trucks provided with a compactor in order to reduce the volume of the Paper for Recycling collected

More information:
Guillermo Vallés (SAICA, Spain) → guillermo.valles@saica.com

Examples of good practice implemented

Use of compacting truck for paper and board collection in Urola Erdia (Spain) (REF: 3)

The technical specifications established in the tendering process for MSW collection in 'Urola Erdia' require the use of a **20 m³ compacting truck for the collection of organic, light packaging, PfR and mixed waste.** It also specifies that compacting truck should be rear-load and suitable for containers between 80 and 1300 l. In addition, the rear-load compactor collection box must be fully installed in the chassis cab. The main benefit of installing compactor in the truck is the volume reduction making transport more efficient.

Use of compacting truck for paper and board collection in Málaga (Spain) (REF: 4)

Figure-1. Lateral loading compactors used in Malaga (Spain). Source: Limasa

There are two types of separate collection of PfR operating in the city of Málaga. The first one is carried out by **upper loading with compactor trucks and cranes to collect igloo-type and underground containers**. The other system is made by **lateral loading compactors.**

The separate collection of PfR is organized through the design of routes that comprise a series of containers with equal frequency of filling. Due to the characteristics and the use of this resource has, there will be containers with usual filling and others in which it is sporadic. Therefore, the collection route will be longer than for other waste and recyclables.

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COMPACTING COLLECTION TRUCKS

GOOD PRACTICE

Keep in mind that...

- The use of compacting trucks might be justified in many cases. Nevertheless, a proper analysis of the required type of vehicles when designing your collection system is mandatory.
- Tank storing capacities and compacting rates of collecting trucks should be considered. The selection of the truck type should be aligned with other elements of the collection system, specially types of bins, containers etc. in use.
- The implementation would be particularly interesting for rural areas with long distances and in those zones with high collection rates.
- The compacting collection trucks fit very well when the quality of the material is high. However, the compactor makes much more difficult the cleaning process requested for that material with impurities before sending it to paper mills.

How to start?

- Define properly the amount of PfR expected to be collected.
- Analyse the catalogue of compacting vehicles available and select the best fitting.
- Determine the number of trucks necessary according to estimations of quantity.
- Check with sorting plant/recycling company that compacted product fits their requirements.
- If the municipality is not performing directly collection activities: include a special chapter about 'trucks to be used' in the corresponding technical specifications of the contract with the waste management company.
- Include additional measures to optimize filling of truck (e.g. redesign of routes, collecting calendars, etc.)

Potential benefits (REF. 3,4)

The compaction of the collected material, allows to increase the amount of paper for recycling transported per trip, which makes transport more energy efficient (i.e. fuel saving).	●	●	●
Increase efficiency of collection operations	●	●	

References:

1. RECYTRANS: soluciones globales para el reciclaje
2. KISSAN ENGINEERING
3. UROLAERDIA: pliego de condiciones técnicas para la contratación del suministro de un camión recolector de residuos sólidos urbanos
4. COMPACTING COLLECTION TRUCKS OF PAPER AND BOARD IN MÁLAGA (SPAIN)

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CONTAINER OPENING SYSTEM ADAPTED TO PAPER AND BOARD

BEST PRACTICE

Background (REF: 1,2)

Figure-1. PfR container collection in Madrid. Source: ASPAPEL

Paper is a material consisting of a thin sheet made of cellulose pulp. Cardboard is comprised of several layers of paper. Therefore, cardboard is thicker, harder and stronger than paper. Box styles in Europe are typically defined by a 4-digit code specified by the European Federation of Corrugated Board Manufacturers (FEFCO).

Therefore, paper and board collection containers should be also adapted for the collection of folded packaging board.

It has been found that open top containers contain more erroneous wastes than those with a shape-adapted opening. Containers are usually designed according to EN 13071-1:2008-10, which set minimum design requirements. In the specific case of paper & board, it is recommended to include flat openings (long and thin), in order to allow the material entrance while at the same time hindering theft of paper.

ACTION

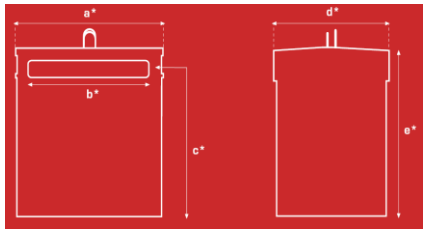
Use containers with openings adapted to the size and shape of the material deposited (i.e. graphic paper, paper and board packaging)

Example of best practice implemented

Metallic container for paper & board collection, recommended by ASPAPEL and ECOEMBES (Spain) (REF: 3, 4)

Metallic container for paper & board collection, recommended by ECOEMBES (Spain).

This type of container is specially designed for PfR collection of recyclables with the support of the ASPAPEL and Spanish Packaging Producer Responsibility Organisation ECOEMBES.



a*	***1600 mm***
b*	***1002x170 mm***
c*	***1300 mm***
d*	***1200 mm***
e*	***1630 mm***

Figure-2. PfR container design (REF. 3)

In the program "Tu papel 21", paper and board coming from small commerces, establishes a communication campaign identifying those collection points where the PfR can be deposited.

Figure-3. Example of cardboard collection point for small commerces. Source: ASPAPEL

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CONTAINER OPENING SYSTEM ADAPTED TO PAPER AND BOARD

BEST PRACTICE

Keep in mind that...

- Dimensions of the opening should be decided taking into account the material to be introduced inside.
- Container design should be adapted to the collection method (truck used) and vice versa.
- The opening size and shape can be combined with an antitheft system.
- If graphic paper is collected selectively use smaller openings than for paper and board collection.

Related GP: "Selective Collection System for Graphic Paper"

How to start?

- Defining properly the shape and size of waste to be introduced (e.g. magazines/newspapers, small boxes, flat pieces of cardboard, folding boxes, big rigid boxes).
- Analyse other external factors that can affect the decision (e.g. kind of users, antitheft measures, collecting truck to be used)
- Check and analyse available market solutions.
- Select the best-fitting alternative.
- Monitor performance of the system (e.g. check regularly material introduced inside, observe if material is placed outside the container).

Potential benefits

Easier use of the containers for the citizens	●	●	●
More comfort and convenience for the citizens			●
Cleaner city		●	●
Prevention of other material in the paper and board container		●	●
Increase of paper and board collection rates	●	●	●

EN 840
EN 1501
EN 12574
EN 13071
EN 15132

References:

1. ECOEMBES (2008): Recogida selectiva de papel
2. EN 13071-1:2008-10
3. THESAL: Contenedores de superficie
4. ASPAPEL (2013): Asociación Española de Fabricantes de Pasta, Papel y Cartón

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AMBITIUS STRATEGY AND TARGETS

BEST PRACTICE

Background (REF: 1, 2)

Consumption of paper and board in the EU stands at 82 million tonnes, 58 million of which are recycled to make new paper and board products. 47 million tonnes are recycled in Europe and 11 in other countries, meaning a paper recycling rate of 71.7% in Europe.

European legislation on waste sets clear targets for reduction of waste and establishes an ambitious and credible long-term path for waste management and recycling. The non-recycling waste reduction targets (e.g. recycling 65% of municipal waste by 2030, recycling 75% of packaging waste by 2030, reduce landfill to maximum of 10% of municipal waste by 2030) are accompanied by concrete measures to address obstacles.

European countries and specially municipalities should include specific annual targets and measures in order to reach these thresholds by 2030.

ACTION

Set ambitious targets and describe a complete and ambitious local strategy, that aims at least the EU/national targets (see European targets in *Directive 2008/98/CE*).

Example of best practice implemented

City of Westminster: Municipal Waste Management Strategy 2016 – 2031 (UK) (REF: 3)

City of Westminster

This strategy has been developed to provide a framework for sustainable waste management in Westminster.

The strategy sets out how municipal waste will be managed between 2016 and 2031.

The strategy provides a set of aims and objectives and specific targets which will support achieving sustainable waste management.

The strategy covers the Council's municipal collection and disposal arrangements for waste reduction, reuse, recycling, composting, treatment and disposal.

To see the complete strategy: *DEFRA: Municipal Waste Management Strategies 2016-2031* (REF: 4)

Keep in mind that...

- **A specific municipal budget item should be reserved for this purpose.**
- **It is important to include a range of different stakeholders in the strategy definition (e.g. industry, politicians, experts, citizens) in order to have a holistic view of the issue.**
- **Regular data collection and monitoring activities help assess performance and take decisions.**

Related BP: *"Data collection and monitoring of PfR quality parameters"*

Related BP: *"Monitoring and control of the composition of residual waste and paper and board in other recyclables streams"*

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AMBITIUS STRATEGY AND TARGETS

BEST PRACTICE

- Targets could be defined according to minimum requirements defined by national legislation regulation collection/recycling target for paper and board. However, municipalities may set more ambitious targets on a local level.
- It could be interesting to consider private initiatives and Annual Congresses developed by local/national companies – these can be a good source of ideas since main barriers, future perspectives and challenges are usually exposed.
- Strategy should be analyzed according to its results and potentially changed (if it is required).

How to start?

- Study the initial situation of the municipality, taking into account previous KPIs, identifying key processes, bottlenecks, challenges and areas for improvement.
- Establish a set of objectives using, for example, SMART methodology – setting objectives which are Specific, Measurable, Achievable, Realistic, Time-related.
- Define a set of KPIs (to be updated annually) related to collection and management of PfR in the municipality and measure them over time.
- Define specific measures (operational, legislative, economic, etc.) to achieve objectives, including information about: responsible to implement it, deadline and expected impact. Those KPIs should be defined by each stakeholder in order to keep everybody involved in the target reaching.
- Define potential solutions for each of the current problems, bottlenecks and challenges identified.
- Schedule annual meetings (at least) with main stakeholders involved to review targets achievement and success of implemented measures and to plan the strategy for the next year.
- Communicate results to interested groups such as citizens, paper mills, waste managers and national authorities (e.g. by creating an information channel so that during the rest of the year the information can be updated by the municipality).

Potential Benefits

Increase in paper and board collected, because of the commitment with established targets and the specific measures implemented for the purpose.	●	●	●
Improvement in management structure, being able to monitor performance and allocate optimally resources.	●		
Multi-stakeholder meetings will enable the decision makers to have a holistic view of the main problems and set new realistic objectives for next years.	●	●	●
Increase in citizens' confidence and motivation	●		●

References:

1. CEPI (2017): IMPACTPAPEREC PROJECT CONFERENCE
2. DIRECTIVE 2008/98/CE
3. CITY OF WESTMINSTER: MUNICIPAL WASTE MANAGEMENT STRATEGY 2016 – 2031(UK)
4. DEFRA (DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS): MUNICIPAL WASTE MANAGEMENT STRATEGIES 2016-2031

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CLUSTER OF MUNICIPALITIES

GOOD PRACTICE

Background (REF 1)

Local and regional waste management systems are designed in accordance with the specificities of the territory covered. Many territories have similar local or regional characteristics and all of them share the same European legal framework and general objectives. Therefore, creating clusters among municipalities of a near territory to waste management, can involve potential benefits such as improving their performance and setting targets more ambitious.

Waste managers also benefit from this situation since they can give service to higher population.

ACTION

Create a cluster of several municipalities to paper recycling management. Implementation of synergies and coordination among municipalities to share and explore collection options at the level of the region

Examples of good practice implemented

SCOM Est Vendée - TRIVALIS (France) (REF 2)

SCOM Est Vendée is an association of 4 "intermunicipalities" (as it is called in French) gathering 40 municipalities. It is in charge of residual waste collection, separate collection and management of civic amenity sites on its territory. **SCOM is a member of Trivalis to which it has delegated waste and recyclables collection and treatment operations.**

This competency includes treatment itself, collection, disposal of final waste, as well as transport, sorting, composting or storage.

Figure-1. Municipal Recyclables Waste Managemet tackled by Trivalis. Source: Trivalis

Trivalis is a joint association gathering the 269 municipalities of the Vendée region – either directly or through larger groupings of "intermunicipalities" (17 "intermunicipalities" in total).

Municipalities have waste collection and treatment competencies. As members of Trivalis, they have transferred these competencies to Trivalis.

These 17 communities determine the mode of collection in their territory, the frequencies of passage, the types of containers and the fee for the collection of household waste.

Figure-2. Organizational diagram of Municipal Waste Management in Vendée region (REF 2)

See "References" section for more examples of GP implemented. (REF: 4)

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CLUSTER OF MUNICIPALITIES

GOOD PRACTICE

Keep in mind that... (REF 3,4)

- **The regional approach should be constituted specifically to provide a particular service** (municipal solid waste management and disposal).
- **It is governed by a board of directors, a council, authority or some similar executive over sighted body, unique to the cluster.**
- It may or **may not involve the participation of private sector service provider.**
- It is vital that **legislative and policy issues are considered carefully** when local authorities are evaluating strategic waste management options as the fulfilment of statutory and non-statutory requirements will represent an important consideration in the decision-making process. Decisions concerning statutory and non-statutory requirements will impact on the scope, duration, flexibility and costs of future contracts for waste management
- Municipalities considering regionalization should recognize that **costs and benefits of regional projects**, although shared, **will not necessarily be identical for all communities**. Municipal officials might need to consider the tradeoffs of sharing common facilities and equipment.

How to start? (REF 4)

- **General description of the region. Which municipalities are going to take part on the waste management system?**
- **Setting the Waste Management Scene. Definition of key players and key strategic drivers.**
- **Review of national and local policy and legislative framework applicable as well as the EU waste policy.**
- **Approaches for the management of waste. Definition of the waste to be collected and treated.**
- **Appoint the local authority which will collect the Municipal Waste.**

GUIDELINE

North West Region Waste Management Plan (UK)

Potential benefits (REF 3,4)

Improvement of the green image of the municipality	●	●	
Increase of the environmental awareness regarding separate collection	●	●	●
Improvement of the green image of the municipality	●	●	●
Increase of the recycling rates of the city			●
Improvement of the citizens' perception about their municipal entities	●	●	

References:

1. REGIONS FOR RECYCLING (EU funded project)
2. TRIVALIS. ENSEMBLE VALORISONS NOS DÉCHETS
3. D-WASTE. REGIONAL APPROACH MUNICIPAL SOLID WASTE MANAGMENT
4. Other example of GP implemented: NORTH WEST WASTE (UK)

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PAY-AS-YOU-THROW

GOOD PRACTICE

Background (REF: 1)

The 'polluters pays' principle is the commonly accepted practice that those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment. PAYT (Pay As You Through) schemes are an application of that principle.

In the traditional schemes for household waste management in Europe, the services are financed via general taxes or due a fixed recurring fee in bills of other supply services as electricity, regardless of the produced waste amount. The cost is usually calculated based on living space and the number of household members. This way of financing is unfair for people who produce little waste either because of their recycling-composting efforts or because they don't over-consume.

Pay-as-you-throw is breaking with this tradition. In PAYT schemes household pay a variable amount depending on the quantity of waste generated by them and the corresponding service they obtained for its disposal.

ACTION

Calculate service fee based on the principle that the less waste you produce (and/or more and better you sort) the less you pay

Examples of good practice implemented

Project HEC PAYT (Greece) (REF: 1)

The project was funded by the European programme LIFE (2009 to 2011) implemented the first pilot PAYT system in Greece using four scenarios covering 1,500 households in Elefsina. Weighing equipment was purchased and installed on garbage collection trucks and a sensitivity analysis carried out to compare the impact to different pricing schemes.

Based on an exhaustive inventory of waste production, implementation was regularly assessed and adjustments made as required. The following waste management improvements were achieved, surpassing most objectives:

- ✓ 25.8% of waste was diverted from landfill
- ✓ Recycling of 56% of packaging waste
- ✓ Recycling of 4.6kg of WEEE per participating person
- ✓ Composting of 17.1% of organic waste

The results of the project were positive and it continued after the funding expired.

PAYT system in Interza (Belgium) (REF: 2)

The introduction of the PAYT system (door-to-door + recycling yards) in 2001 resulted in a decrease of residual waste and an increase in the separate collection of recyclables via door-to-door and bring banks. In 2005 the capacity of underground containers doubled (instead of over-ground level facilities) resulting in a further increase of separately collected recyclables via underground containers, the door-to-door separate recyclables collection remaining stable throughout the years. **The residual waste door-to-door collection decreased throughout the years achieving a 50% drop in 2014 as compared to 2001.**

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PAY-AS-YOU-THROW

GOOD PRACTICE

Keep in mind that...

- Check the legal compliance in your country.
- Charging for waste can result in some problems such as illegal dumping, open burning and illegal disposal methods. However, these problems have been reported very little by communities where PAYT has been implemented.
- Some administrative processes are necessary to ensure billing and collection. Some communities forego billing by requiring the purchase of approved waste bags, or weight gauges.
- For some forms of PAYT, user identification is necessary for proper functioning.
- It is both critical and challenging to build public consensus, which will require good planning and public education efforts.

How to start? (REF:1, 3)

- Analyse the current collection systems, in order to define the best model for data collection and monitoring.
- Analyse and select the best PAYT system, according to the collection system in use:
  - **Bins.** Customers select an appropriate size or number of containers. Residents who dispose of more are charged more.
  - **Bags.** Customers buy bags printed with logos. The price of the bag includes collection, transport and disposal. The more bags one fills, the more pays.
  - **Stickers/Tags.** Customers buy stickers or tags to affix to the bag. Customers can use any type of bag they wish and attach the sticker on it.
  - **Hybrid programmes:** Combination of current collection system with a new incentive-based system. Instead of unlimited collection for one monthly fee, customers have a limited volume of service. If more waste is produced, then the customer must pay an excess amount.
  - **Weighing based programmes.** A modified scale on trucks weighs garbage containers, and customers are charged for their actual kilos disposed.
- Perform a costs-benefit analysis for the municipal collection and management systems.
- Select fees to be charged to citizens, accordingly to the PAYT system chosen.
- If necessary, implement a user identification system (particularly suitable for areas where the individual assignment of collection containers to the users is impossible or difficult to implement).
- Develop an information and awareness campaign to inform citizens about the new PAYT model.
- Monitor performance of the new system.

Potential benefits

Increase of paper and board collection	●	●	●
Increase citizen participation in recycling activities	●	●	●
A variable pricing promotes equity in user payments by basing cost on actual volume of waste generated	●		●
Higher transparency of service and thus promotion of a more reliable public image of waste services	●		●

References:

1. LIFE ENVIRONMENT PROJECT: Pay-as-you-throw
2. ACR+: Cross-analysis of 'Pay-As-You-Throw' schemes in selected EU municipalities
3. ENVIRONMENTAL PROTECTION AGENCY (US): Pay-as-you-throw
4. ENERGY AND ENVIRONMENTAL AFFAIRS (US): Pay-As-You-Throw (PAYT)/Save-Money-And-Reduce-Trash (SMART)
5. SUSTAINABLE CITIES INSTITUTE (US): Pay-as-you-throw Programs

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TENDER FOR WASTE AND RECYCLABLES COLLECTION SERVICE

GOOD PRACTICE

Background (REF: 1)

Legally, municipalities in EU countries have the responsibility to organise the collection of waste and recyclables from households. As decision makers, they can conclude contracts with waste management companies and/or paper mills or any other party able to provide the required service. These contracts for collection of solid waste and/or recyclables generally range from 2 to 7 years.

In some countries waste management companies are only offered short contract terms by the municipalities. This might result in insufficient planning security for the service providers and thus in less sustainable approaches and in the worst case in a pronounced disinclination to invest in new technologies. Increasing competition between waste management companies in times of dwindling profit margins further exacerbates the situation. In order to mitigate such undesired consequences for both the municipalities and the waste and recyclables management companies both parties should agree on reasonable terms of such contracts. A duration of 5 years is considered as the minimum.

ACTION

To establish a tendering process for the selection of the best-possible waste management company based on long-term contracts and the accomplishment of the fixed targets by the municipality

Example of good practice implemented

24 Waste Service Providers have been invited to tender for framework contract in UK (REF: 2)

Figure 1- Waste service collection in UK

Twenty-four waste service providers have been invited to tender for a framework contract which could save councils 85 million in procurement costs over the next four years.

The groundbreaking Waste Management Services Contract, which has a potential value of 1.7 billion, is being developed by improvement and Efficiency South East (iESE) and the London Waste and Recycling Board on behalf of 141 local authorities.

The contracts, once in place, municipalities involved with the framework will be able to use it for four years from April 2012 to procure contracts individually or in partnership, appointing a single contractor for up to 10 years.

Mr Greenfield explained that standardly, it took around 12-18 months to procure a waste collection contract but that iESE was hoping to cut that time in half.

Keep in mind that (REF: 1, 3)

- **Tender should follow an open and transparent process.**
- **The procedure should consider the specifications linked to the EU public tendering rules (collection method and quality, collection rates, environmental standards, support on raising citizens´ awareness, and use of innovative technologies).**
- **Conditions of the tendering process should be published in advance (including minimum characteristics of the service, contract period and evaluation criteria).**
- **Contract should be based on long-term contracts.**

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TENDER FOR WASTE AND RECYCLABLES COLLECTION SERVICE

GOOD PRACTICE

How to start? (REF: 3)

- Check expiry and associated clauses of existing contract.
- Notify current provider that contract is being terminated and put out to tender. Note: old contract should not be terminated before the new one is valid.
- Identify scope of services required and what you need from service provider.
- Identify requirements and condition for the service performance.
- Undertake site visits with tendering waste and recycling contractors.
- Receive tenders (submitted in specified timeframe).
- Review tenders and seek clarification from tendering contractors.

GUIDELINE

Best practice specifications for tendering the collection of Paper for Recycling: This Best Practice publication, as well as the free calculation tool for collection target benchmarking are examples of how national or regional competent authorities can all ensure that the new rules are put in practice and start contributing to a more transparent, efficient and professional public procurement. These elements are all vital in relaunching growth in the Single Market. (REF: 5)

Waste Public Procurement

Potential benefits (REF: 4,6,7)

Improvement in KPIs, due to the agreed conditions between waste manager company and municipality during the tendering process.	●	●	●
Externalization of services , avoiding the necessity of dedicated staff for waste management activities.	●		●
Increased trust in the systems. Tendering is an open process with conditions published in advance.			●
The public administration obtains the best available conditions, in terms of price and quality of the service.	●	●	●

References:

1. ECOPAPERLOOP (2014): Optimising Paper Products, Packaging and Collection Systems
2. iESE (2012): 24 waste service providers have been invited to tender for a framework contract
3. ZERO WASTE PROGRAM IN AUSTRALIA (2014): WASTE AND RECYCLING TENDER GUIDELINES
4. OFFICE TEAM (2013): The top 6 benefits of long-term supplier relationships
5. CEPI (2014): Best practice specifications for tendering the collection of Paper for Recycling
6. NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS RECYCLING CONTRACT NEGOTIATION GUIDEBOOK.
7. LET'S RECYCLE (2014): Waste industry defends long-term contracts
8. RECYCLING TODAY (2017): Re-Gen signs long-term contract with 5 Recycling Group

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

ORDINANCE ON SEPARATE PAPER AND BOARD COLLECTION IN PUBLIC INSTITUTIONS

BEST PRACTICE

Background (REF: 2)

Separate collection should be promoted by public bodies in public institutions and buildings. It is important that municipalities and public entities normalize and encourage the separate collection of recyclables, thus reducing waste. In this way, citizens perceive that segregation of waste and recyclables is a good practice.

One action that cities and towns may choose to reach these goals is to establish and implement a mandatory recycling initiative at the local level in public institutions and buildings. Many cities and towns have found that these initiatives are not only effective at increasing recycling, but also result in financial savings through avoided disposal costs and recycling revenues.

ACTION

Ordinance implementation for the separate collection of paper and board in public institutions (schools, universities, hospitals and public buildings)

Example of best practice implemented

Town of Chelmsford Mandatory Recycling Case Study (EEUU)(REF: 1)

In 2005, with trash disposal at an all-time high – 16,000 tons of trash incinerated at $67.50/ton and a recycling rate of 16% - **the Town of Chelmsford adopted a bylaw prohibiting the disposal of recyclable materials in the residual waste.** This bylaw went into effect on January 30, 2006 and was applicable to all households, including apartments and condominiums, municipal and school properties.

Direct outreach to building and property managers;

Town Manager notified all municipal department heads and employees that EVERYONE must recycle;

Articles ran on the front page of the local newspaper;

Created information for town web page, including information on where to get a recycling bin, resulting in more bins being distributed than ever had been before.

The first three months under the bylaw the town recycled 570 tons of paper, 255 tons of containers, and 40 tons of cardboard.

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ORDINANCE ON SEPARATE PAPER AND BOARD COLLECTION IN PUBLIC INSTITUTIONS

BEST PRACTICE

Keep in mind that...

- Public bodies shall promote separate collection of paper and board as a consequence of the ordinance implementation.
- The employees should ideally be made owners & ambassadors of this change, through a comprehensive approach in strategy & communication.
- Concern and commitment by the responsible of the public institutions (schools, hospitals, cultural centers, municipal buildings etc.) to practice separate collection of paper and board is key.
- Resources (space and financial assistance) for the implementation of systems suitable for the separate collection of paper and board need to be provided.
- One of the key factors is that all stakeholders are committed in making and maintaining and efficient collection scheme. By contrast, high cost could jeopardize the project not long after its beginning.

How to start? (REF: 1)

- **Determine program characteristics. The municipality needs to determine what kind of enforcement the program will have. Things to consider:**
  - What materials are you prohibiting from disposal?
  - What action will be taken against those violating the disposal prohibition?
  - Will you implement incentives for good performing individuals or departments?
  - Will there be a grace-period of "friendly reminders" before fines go into effect?
- **Determine point of contact: No matter how effectively you've communicated, there will be those who have questions, and you'll need to designate a point of contact to handle them. Be sure to include a phone number to a real person.**
- **Determine baseline trash and recycling figures before start of program to monitor progress.**

Potential Benefits

Increase of the quantity and quality of paper and board collected	●	●	
Increase of the environmental awareness regarding separate collection	●	●	●
Improvement of the green image of the municipality	●	●	●
Improvement of the citizens' perception about their municipal entities		●	●
Increase of the recycling rates of the city	●	●	

References:

1. MASSDEP MUNICIPAL WASTE (2005): Using Mandatory Recycling to Reduce Disposal Costs

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

DATA COLLECTION AND MONITORING OF PfR QUALITY PARAMETERS

BEST PRACTICE

Background (REF: 1)

There are different methods to assess how well the recycling service is working in the municipality.

Monitoring and evaluating scheme performance is something that all local authorities should be doing as a matter of routine. Not only does it enable you to assess whether schemes are performing as expected, it also helps diagnose problems, design new approaches and ultimately improve efficiency and effectiveness. One of key parameters to evaluate the efficiency of the paper and board collection and sorting scheme is the quality of the PfR. Currently, the main controls are focuses on measurement of two parameters (moisture content and non-paper components). For deinking grades (dedicated to deinking paper mill), the composition between graphic papers and cardboard in the paper grade is also measured.

In IMPACTPapeRec Project those two quality parameters have been defined as follow (REF: 8):

1. **Impurities:** Describes the amount of non-paper components in the Paper for Recycling. It can be measured at two different points of the process.
2. **Moisture content:** According to EN 643: 10 % maximum. Paper mills usually have individual requirements depending on PfR grade. Most paper mills set a maximum allowed level of moisture and do not accept PfR that exceeds this level (mostly: 20, 25 or 30 %). Moisture is economically important and it will be deducted if exceeding the 10 %. **To see more information and calculation, click on: *IMPACTPAPEREC: Evaluation of your Performance***

ACTION

The municipality or the collection company must establish the implementation of sampling procedures to control the quality (mainly banned materials, impurities and moisture) and data collection of paper for recycling collaborating with the recycling facilities (paper mills and sorting plants)

Example of best practice implemented

Pajaritas azules (Blue Birdies) -ASPAPEL (Spain) (REF: 2, 3)

Pajaritas Azules
Tu papel 21 · Municipios

Figure-1. "Blue birdies" logo

ASPAPEL promotes paper and board collection and recycling with its **"Blue Birdies"** programme as part of the "Tu Papel Es Importante" project. The aim is to develop selective collection and recycling of paper and board at municipal level and contribute to sustainable development.

"Blue Birdies" is a system of evaluation, assessment and certification of paper and board collection for local authorities.

The certification process starts with an assessment and environmental audit of the general situation of paper and board collection in the town based on 21 indicators, grouped into 5 blocks: Blue bin collection, supplementary collection, public information and awareness, regulation and planning, and outcome and traceability to final recycling (where are included **"The evaluation of the quality of the paper and board collected", "Paper recycling rate", "Traceability of paper and board collection to final recycling in the paper mill" and "Annual evolution of the collection of paper and cardboard"). In those indicators are considered the % of moisture content and non-paper components.**

León city council has been awarded with "Blue Birdies" in 2017 for the excellence level in its management and selective collection of paper and board.
During 2016, in León, 3.9 million kg of paper and board were collected, bringing the ratio per capita to 31 kg, 7% more than in 2015 (29 kg/inhab). Of the 3.9 million kg collected, 86.5% was collected in blue containers (3.3 million kg). The collection of paper and board accounts for 38.9%of the total weight of the separate collection. **(REF: 4)**

Figure-2. León city council (Spain) awarded by "Blue Birdies". Source: ASPAPEL

More information: Andrea Orallo (ASPAPEL) → a.orallo@aspapel.com

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

DATA COLLECTION AND MONITORING OF PfR QUALITY PARAMETERS

BEST PRACTICE

Keep in mind that... (REF: 5)

- Cooperation between the municipality and recycling facilities for data exchange is needed.
- The recycling facilities need to establish procedures for gathering and managing data, including methods for sampling and measurement.
- Trained staff who control the information and in charge to request the quality data (monthly preferably) to the waste and resource manager. Including data management analysis (necessary for benefits).
- Definition of KPIs in synergy with the recycling facility.
- The Producer Responsibility Organization is an interesting organization to define quality targets as well as implement common rules to measure and follow up the quality of PfR.

How to start? (REF: 6,7)

- Describe the procedure of mutual agreement, standard terms and conditions should be indicated as part of the general conditions for recycling facilities approval. See guideline 2. It provides concepts, views and specific working approaches, which when combined create a road map. It should be used as a step by step reference guide and a conceptual directive.
- A program to collect the data from the municipalities and recycling facilities must be developed. All those data must be aggregated in a database periodically.
- Training and education for employees with common background is recommended.
- Quality control procedures in which paper mills should be based on EN 643 Standard.

A number of guideline documents addressing quality control have been issued in the paper sector, including (click on it to download):

GUIDELINE

1. *Recovered Paper Quality Control Guidelines (CEPI and ERPA)*
2. *Best Practices for the Global Inspection of Recovered Paper (CEPI)*
3. *INGEDE Methods 7,8 and 14*

RELATED STANDARDS

EN 643
EN ISO 638
prEN 17085
EN ISO 186

Potential benefits (REF: 6,7)

Clear picture of the flows makes possible to identify where improvements are needed.	●	●	
Clearer differentiation of the high-quality waste paper, and recognisable distinction to lower-quality waste paper.	●		
Online quality and quantitave monitoring.	●		●
Online monitoring of outgoing quality incl. quality certification of sorting plant operators.	●		●
Comparison between municipalities.		●	●
implemented, thus the evaluation of the effectiveness is possible.	●	●	
Follow-up of the quality of paper achieved throughout years.		●	●
Increase the paper and board collection rate.	●	●	●

References:

1. WRAP (2010): Improving the Performance of Waste Diversion Schemes
2. ASPAPEL (2017): Annual programme "Blue Birdies"
3. ASPAPEL (2017): Tu papel 21 programme
4. LEON CITY COUNCIL, SPAIN (2017): Certified by "Blue Birdies"
5. CEPI (2016) Paper for Recycling quality control Guidelines
6. JRC and IPTS (2011): End-of-waste criteria for waste paper. Technical proposal
7. NORTHEAST RECYCLING COUNCIL (2002): Recycling data collection programs
8. IMPACTPAPEREC: Evaluation of your Performance

IMPACTPAPEREC
Boosting separate paper collection

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

MONITORING AND CONTROL OF THE COMPOSITION OF RESIDUAL WASTE AND PAPER AND BOARD IN OTHER RECYCLABELS STREAMS

BEST PRACTICE

Background (REF:1)

Used paper and board is collected preferably separately from other recyclables and from residual waste. However, some paper and board ends up in wrong waste streams. The objective is to collect as much as possible through separated collection. To achieve this, it is important to perform data collection and monitoring to know what is the current separation rate.

Monitoring this rate is complex since it needs the evaluation of the composition of the materials collected through separate collection and also through the rest of waste streams.

Figure-1. Manual monitoring of co-mingled collection stream. Source: WRAP

Monitoring closely the other waste fractions and regular analysis of the composition with accurate procedures is needed to establish actions to get more material out of the other streams and into separate collection system. This monitoring needs to be complemented by strict control of the sorting efforts of users, thus enforcing separate collection of paper.

ACTION

Implementation of a methodology to monitor and analyse the quantity of paper and board in other waste streams (residual and other recyclables). Based on that, specific actions will be taken to get more recyclable/ recoverable material out of the other streams

Example of best practice implemented

Northumberland (England) waste analysis. (REF:2)

Figure-2. Manual monitoring of stream from co-mingled collection. Source: WRAP

Northumberland County Council identified the need for a waste composition analysis to assess the impact of a recent campaign to increase recycling. Waste was manually sorted. Moreover, each fraction was weighted, also calculating the contamination levels.

The results showed the need to implement an improvement plan to address the problem of low capture rates and high contamination levels.

Waste composition analysis was carried out by an external contractor. It was undertaken in June 2007 and October 2007 over the six-district council area, before and after the communications campaign. The external contractor that carried out the waste composition analysis also undertook contamination monitoring. **The KPIs used were: % Capture, % Contamination and % Committed recyclers.**

The application of this measure allowed to detect where more effort was needed to increase the collection rate. In fact, thanks to this practice, **the capture rates for paper and board increased by 2% during the period from June to October.**

Keep in mind that...

- **The residual waste analysis composition needs a carefully detailed methodology to work properly.**
- **Strong attention must be paid into the moisture content of the different residual waste streams. Usually, paper and board in a co-mingled collection is overweighed as this material absorbs moisture from the other material.**

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MONITORING AND CONTROL OF THE COMPOSITION OF RESIDUAL WASTE AND PAPER AND BOARD IN OTHER RECYCLABELS STREAMS

BEST PRACTICE

How to start? (REF: 1, 2,3)

The Scottish Environmental Protection Agency (SEPA) has published a guidance on carrying out a household waste composition study. The main steps to follow are:

1 **Waste Compositional Sampling Strategy Design**	An effective WCA (Waste Composition Analysis) programme must be based on waste samples that are representative of the target area as a whole (usually a whole Local Authority). This first step considers the different sources of variation in relation to kerbside collected household waste and then describes the design of a WCA programme needed to ensure that a 'good' sample is obtained within the constraints of time and cost.
2 **Waste Categorisation**	The development of a suitable and clear list of waste categories is central to the successful design of a waste analysis programme. A standard could be applied.
3 **Procurement**	This step provides advice on procurement where local authorities will be obtaining the services of an external WCA contractor. It is assumed that local authorities will follow their own procurement processes and detail of the procurement journey has not been repeated here. The local authorities may consider the cost, key elements (timescales, insurance., estimated sort weights, flexibility…), tender assessment.
4 **Operational Aspects**	Include the responsibilities for local authority and WCA contractor regarding responsibility for management. Project initiation, Health & safety, staff training and supervision, communications-project team, communications- external, sort site selection, equipment, Kerbside sample collection, waste sorting and data recording.
5 **Data Analysis and Reporting**	The sub- steps included are consolidating and analysing data and reporting.

GUIDELINE

Guidance on the Methodology for Waste Composition Analysis

WRAP (Waste and Resources Action Programme) recommends that a professional company with appropriate experience, insurance and health and safety policies is employed for this task. Although anyone can learn how to carry out a waste analysis given suitable training.

RELATED STANDARDS

EN 643
EN ISO 638
prEN 17085
EN ISO 186

Potential benefits (REF:1)

The evaluation of the collection rates enables sorting plants to know the amount of paper for recycling available. This provides very useful information for the local authority but also for the site operator as many contracts are now designed to provide incentives for site staff to divert more waste away from landfill. Without such monitoring data, it is difficult to identify the potential to improve segregation efficiencies.

Increase quantities of paper for recycling which means and increase of income to municipalities	●	●	●
Stronger motivation of citizens to participate in a scheme that works			●
Cleaner areas around the containers	●		●
Ensure that the paper for recycling stays in the hands of the stakeholder responsible for the collection	●		●
Less vandalism	●	●	●

References:

1. WRAP (2015). Improving the Performance of Waste Diversion Schemes (2015): A Good Practice Guide to Monitoring and Evaluation. Chapter 7. Monitoring capture rates.
2. WRAP (2015). Improving the Performance of Waste Diversion Schemes: A Good Practice Guide to Monitoring and Evaluation. Annex 1
3. ZERO WASTE SCOTLAND (2015). Guidance on the Methodology for Waste Composition Analysis.

IMPACTPAPEREC

Boosting separate paper collection

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

CONTROL MEASURES TO PREVENT PAPER THEFT

GOOD PRACTICE

Background (REF:1, 2)

Figure-1. Picture of typical theft of paper and board for recycling in Madrid (Spain)

Theft of paper and board for recycling (PfR) is a common problem in several European countries. This fact can create a disadvantage for some companies operating in Europe. The payment of PfR in cash by collection shops can boost paper theft by the informal sector. These payments can lead to a fiscal advantage for non-legal companies, reducing the competitiveness of traditional paper firms as well as legal employment would be destroyed and transformed into illegal employment and the social problems that it involves that makes even more difficult to include them in official system.

Such payments remain a common practice in other countries, which show high rates of theft (eastern Europe mainly). This fact means economic losses which are needed to cover the cost of collection for recycling. Additionally, statistics about municipal collection wouldn´t reflect the real collection rate of paper and board.

ACTION

Control and enforcement of measures to avoid paper theft for recycling. Measures established could be based on container design or surveillance units

Examples of good practice implemented

ANTI-THEFT CONTAINERS in Madrid (SPAIN) (REF:2)

Figure-2. Anti-theft container designed in Madrid (Spain). Source: ECOEMBES

ECOEMBES and RECIPAP in collaboration with the Municipality of Madrid (Spain) have installed 66 anti-theft containers in several neighbourhoods in order to avoid theft of paper for recycling.

This new anti-theft design is based on a long and narrow opening to avoid the entrance of arms and also the extraction of material.

The requirements for the anti-theft container are: universal, i.e. applicable to all paper and board containers, robust design since it doesn't suppose any danger to the people and no interfere in the opening and closing of the own container.

In addition to anti-theft containers, the municipal police have organized control units in those entities which, presumably, receive paper and board collected in an illegal way. Further, the municipal police carries out actions to intercept illegal collectors and applies the corresponding inspection record.

ANTI-THEFT CONTAINERS in Zagreb (Croatia)

Figure-3. Anti-theft container implemented in Zagreb (Croatia). Source: partner of the IMPACTPapeRec project

A new pilot case of anti-theft containers is carrying out in Zagreb with the design of containers showed in Figure 3.

More information: Maja Huljev (Hamburger Recycling) → maja.huljev@hamburger-ens.hr

IMPACTPAPEREC
Boosting separate paper collection

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CONTROL MEASURES TO PREVENT PAPER THEFT

GOOD PRACTICE

Keep in mind that...

- Measures have to be implemented in a coordinated way by the municipality and the company responsible of the design of the container. The municipality works in collaboration providing data and designing the container allocation plan.
- Collection points receiving PfR against cash should be closely monitored.

How to start?

- Evaluate whether paper theft is posing significant problems for quantity and quality in your municipality.
- Establish of procedures to detect infractions and to sanction them to ensure consistency.
- Perform technical and economic evaluation to identify the best anti-theft measures for the territory (e.g. key card, design containers, video surveillance, communal police groups etc.)
- Investment cost depends on the technical level of implementation: more technical level, more cost.

Potential benefits (REF:2)

Increase quantities of PfR which means an increase of income to municipalities	●	●	●
Stronger motivation of citizens to participate in a scheme that works			●
Cleaner areas around containers	●		●
Ensure that PfR stays in hands of the stakeholder responsible of the collection	●		●
Less vandalism	●	●	●

References:

1. EUROPEAN COMMISSION (2015): The efficient functioning of waste markets in the European Union
2. ECOEMBES (2016): Press room ECOEMBES and ASPAPEL collaborate to design anti-theft paper containers in Madrid (Spain)

IMPACTPAPEREC
Boosting separate paper collection

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OPTIMIZATION OF COLLECTION ROUTES

GOOD PRACTICE

Background (REF:1)

Most of the budget dedicated by municipalities and waste management companies for waste management goes to collection and transport. This is clearly an area for municipalities to evaluate for cost saving measures. Therefore, the municipalities should be very interested to implement more efficient truck routes (e.g. monitor filling levels of containers which avoid picking up empty containers and predict the future collection needs, efficient driving, plan the collection routes properly) to reduce its overall costs for collecting municipal solid waste and recyclables from residential homes and bring banks.

ACTION

Implementation of an optimization tool which will plan the routes of the collecting trucks and would reduce the overall travel cost of municipal waste and recyclables collection

Related GP: *"Control of the filling level of containers"*

Examples of good practice implemented

LIFE EWAS project- Seville (Spain) (REF:2)

Figure-1. Quamtra system outline

Life EWAS project aims the innovation in the area of public of waste management by demonstrating the potential of new information technologies to optimize current EU waste management operational methodologies and to establish the ***"Quamtra system"*** to optimize collection routes by constantly monitoring the content level of waste containers.

More information: Project Coordinator → jmorales@wtelecom.es

By installing sensors in the containers, it is possible to receive **real-time alerts** for collection based on container content level, temperature variation (fires) or movement (shaking) enabling a reduction in damage liability and response time.

The implementation of *"Quamtra system"* lets savings more than 60% as compared with the system implemented before.

SENSdumpster in Barcelona (Spain) (REF:3)

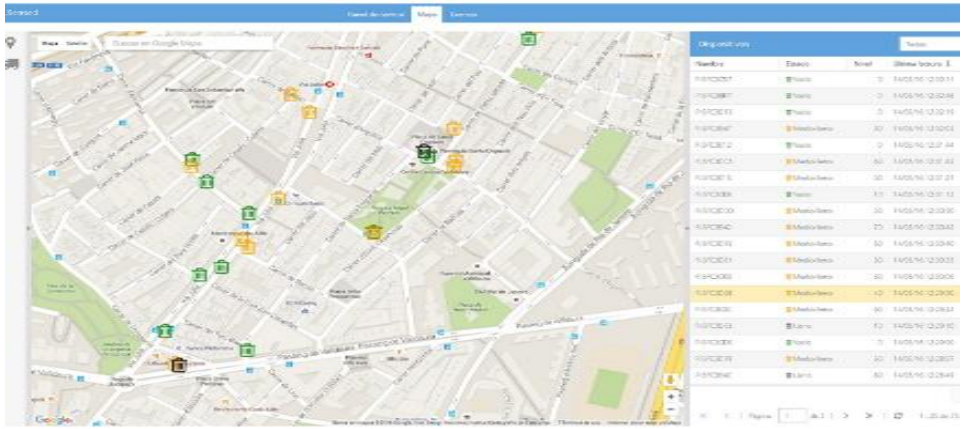

Figure-2. SENSdumpster software implemented in Barcelona (Spain). Source: SAYME

Barcelona Municipality has installed a technology solution named ***"SENSdumpster"*** based on networks of wireless sensors of ultra-low consumption in 107 paper bring banks on the city. This technology uses **real-time monitoring** of the bring banks and daily calculation of the **most efficient collection routes** which allows to achieve efficiency improvements in the processes of urban waste collection with the aim of offering better service to the citizens. This technology includes the control of the filling level of containers through sensors.

Savings up to 50% in waste collection costs and filling level status monitoring (among others).

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OPTIMIZATION OF COLLECTION ROUTES

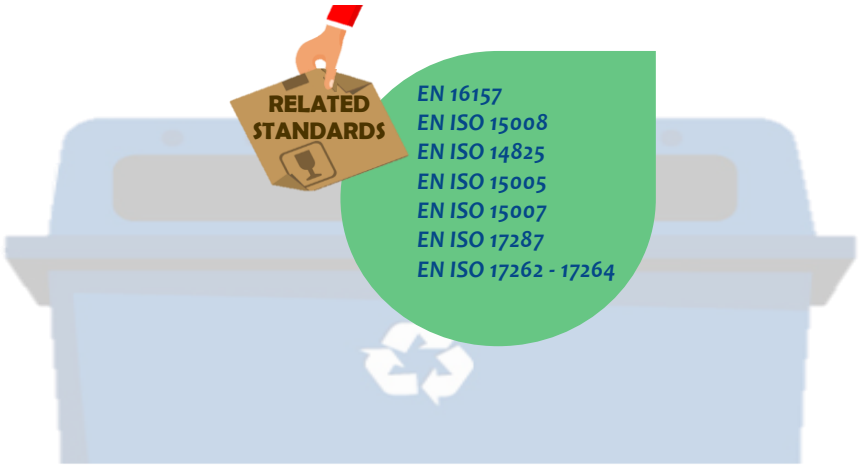
GOOD PRACTICE

Keep in mind that...

- Initial investment for the software required.
- Geography of the area of waste collection should be considered
- Market research should be done for the most appropriate technology.
- The system is currently helpful for bring banks. For individual (blue) bins, which are put to the curb by citizens, it is not necessary.

How to start? (REF:5)

- Look for a competent company able to inform and install the system.
- Train the employees that are going to use the software, to achieve maximum profit of the tool.
- Start with the software for few trucks and/or few containers as a trial in small city districts.
- Make regular checks of the results and the characteristics which should be improved.
- Finally implement the system in the entire city.



Potential benefits (REF: 5, 6)

Municipalities			
Operational cost reduction by up to 35%	●		●
Reduction collection cost by optimizing routes and fuel	●	●	
Real time filling stated of containers	●	●	●
Container location monitoring	●		●
ROI < 2 years	●		
Emission reduction through optimization routes		●	●
Better quality of service and street cleaning		●	●
Civic awareness			●

Waste management companies			
Easy installation and deployment	●		●
Remote configuration of dispositves	●		●
Route and fuel optimization	●	●	
Integrable with client waste managment solutions	●		●
ROI< 2 years			●
Installable in wide range of existing containers in the markets	●	●	

References:

1. ECOTEC (2003): Costs for Municipal Waste Management in the EU
2. LIFE EWAS PROJECT (2016): Seville study case
3. SAYME (2017): Sensdumpster for smart cities
4. UNIVERSITY OF REDLANDS (2013): Example case software on optimization of collection routes in Redlands (California) based on GIS data
5. AMCS WASTE PLANNER (2017): Improving waste collection and transportation efficiency
6. QUAMTRA SYSTEM (2016): Waste Management Solutions

IMPACTPAPEREC
Boosting separate paper collection

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CONTROL OF THE FILLING LEVEL OF CONTAINERS

GOOD PRACTICE

Background (REF:1, 2)

The current effects of a fast-local population increase, large and dense residential areas, tourist increase and a pressing demand for urban environmental protection create a challenge for waste and resource managers. In many cases, the overflowing of the containers is a problem for the municipality. However, in other cases, containers are in places where the filling occurs slower than in other areas which if not controlled, may result in inefficient collection routes. The information about filling level of containers allows waste resource managers to plan optimized collection routes for waste and recyclables collection. Several cities are implementing different tools depending on the available resources. Those tools used are: automatic filling level sensors, monitoring in situ, and citizens' app/website or data collection by truck drivers.

ACTION

Implementation of a system to control filling level of containers, monitor collection rates and improve planning procedures in bring banks (efficient planning)

Examples of good practice implemented

SmartBin Technology in Dublin (Ireland) (REF.3)

Intelligent remote monitoring solutions allow to optimize logistic resources (reducing of collection costs up to 50%). This technology allows to know the filling level of containers, also reducing problems such as over-filling and complaints from citizens.

Figure-1. SmarBin outline implemented in Dublin (Ireland)

The municipality of Dublin has included in its Litter Management Plan 2016-2018, many initiatives including smart bin technologies. Currently, smart bin technologies are being tested through two trials.

In the South East Area, 52 smart bin units have replaced conventional bins on 2 routes. Suitability and new efficiencies are currently being evaluated. This initiative will also be soon implemented in the North West Area.

Increasing Waste Management Efficiency in Rotterdam (Netherlands) (REF:4)

Rotterdam has implemented a pilot case for Paper and Cardboard Waste Fractions with an innovative company in smart waste management and its Dutch partner TWS. The extended use of this waste management data analytics and route planning will help further the city's push towards a circular economy. It consists in the implementation of intelligence and cloud based filling-level monitoring. These sensors continuously monitor the fill level of the containers and are linked to the waste department's project office via cloud servers. Alternatively, smart plans dynamic collection route planning system were operating. Data is collected during the day from all the sensors in the pilot area. Fill levels and fill rates are compared to trend data to predict the future waste collection needs.

"The goals we set for the pilot have been easily surpassed and there are less trucks driving through the city on more efficient routes," Joost van Maaren, Head of Collection and Reuse of Waste at the municipality of Rotterdam, told Cities Today.

IMPACTPAPEREC
Boosting separate paper collection

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CONTROL OF THE FILLING LEVEL OF CONTAINERS

GOOD PRACTICE

"The technology to monitor fill-levels in waste containers is well understood, however, key to our requirements was a dynamic route planning system. This waste and recyclables management offers one of the only systems that reliably offers both capabilities. This essential development is helping us to eliminate static collection routes and bring a focus on only emptying containers which need servicing."

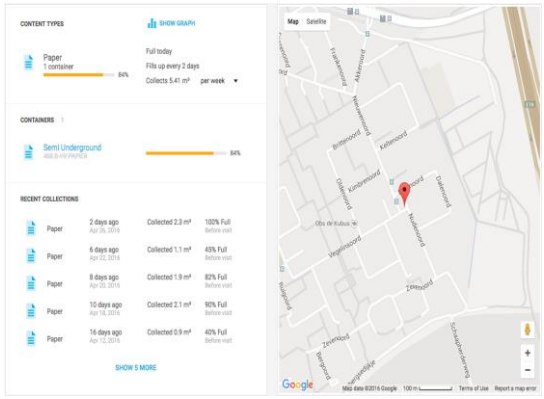

Figure-2. Digital System implemented in Rotterdam (Netherlands). Source: ENEVO

Commenting on the results of the pilot, Joost van Maaren stated, *"We found by monitoring fill rates, we had the opportunity to reduce the number of collection days, we found that we were easily able to meet the target of a 20 percent reduction"*

See "References" section for more examples of GP implemented. (REF:8)

Keep in mind that... (REF:4 ,5)

- Watch out for vandalism.
- It is applicable on bring banks.
- The solution cannot prevent overfill of containers during off-hours.

How to start? (REF: 2,3)

- Look for a company to help create the best possible solution.
- Wireless connection is needed.
- Filling sensors need to be assembled in the container.
- Train the personnel on how to properly use it.
- Perform periodic checks to verify proper functioning and periodic maintenance (not very frequent).

Potential Benefits (REF: 2,6, 7)

Waste collection emits less CO_2		●	
Reduction collection cost by optimazing routes and fuel	●	●	●
Operational cosl reduction by up to 35%	●		
Real time filling states of containers	●	●	●
Improve goverments-to-citizens communication (city dwellers are given a simple tool for reporting their needs and problems, and municipal workers can respond to them more quickly and efficiently)	●		●
Waste collection service settlement gets easier (the documentation is easily available for both parties: the municipality and the waste collection company)		●	●

References:

1. POLITECNICO DI MILANO & UNI OF SHANGHAI (2008). Paper on Sensorized waste collection container for content estimation and collection optimization
2. ECOBINS (2017). Sensor level, monitoring in situ and app for citizens in Szczecin, Poland.
3. SMARTBIN. Smartbin technology in Dublin (Ireland)
4. ENEVO (2016). Increasing Waste Management Efficiency in Rotterdam (Netherlands)
5. SMARTUP CITVIEs (2017). Smart waste containers
6. JAES GESTIÓN DE RESIDUOS (2017). TIC Smart Cities
7. QUAMTRA SYSTEM (2016): Waste Management Solution
8. OTHER EXAMPLE → INTELI (2016): Smart city Good Practice Intelligent Waste Management System in Cascais (Portugal)

IMPACTPAPEREC
Boosting separate paper collection

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PUBLICATION OF PAPER COLLECTION KPIs

GOOD PRACTICE

Background (REF: 1 & 2)

Key Performance Indicators (KPIs) are quantifiable measures that encapsulate critical success factors and are a framework for measuring achievements. They are presented as units of measurement (e.g. number, percentage, tonnage).

Establishing KPIs will allow the municipality to measure the performance on waste management. KPIs will also allow them to establish quantified objectives and verify their fulfilment, making the continuous improvement easier. KPIs and established objectives should be measurable, easy to understand, achievable and easy to manage.

Accurate and regular data is needed. Information to be compiled can include a summary of waste streams, collection dates, volumes collected, cost of collection, additional charges, bin rental fees and/or performance against KPIs.

The publication of the results is very important to create trust in the system. This information can be shown in the municipality's website, town hall, public locations, etc.

ACTION

Collection, processing and publishing KPIs on paper and board management on the municipal website. Also, improvements achieved each year and objectives for the next one should be included in order to gain transparency

Example of good practice implemented

Planning a sustainable future for the City of London (UK) (REF: 3)

London launched a strategy which seeks to lay out a vision for how the City of London will deal with its waste from 2013 until 2020.

They use three performance indicators to report the performance of their collection service;

- **Recycling rate,** which is the quantity of materials sent for recycling or composting as a percentage of the total household waste collected (formerly NI 191) II.
- **The weight per household of residual waste produced per year,** commonly referred to as kg/hh/yr (formerly NI 192) III.
- **The percentage of municipal waste sent to landfill of the total waste collected (formerly NI 193).**

Table-1. Follow-up and publication of the three-municipal waste KPIs defined in the city of London

Indicator	2007/08	2008/09	2009/10	2010/11	2011/12
Recycling rate (NI 192)	34.27%	34.11%	34.37%	38.65%	37.10%
Kg/hh/yr of residual waste (NI 191)	Not measured for this year	568.53	542.08	464.00	465.08
Percentage of waste to landfill % (NI 193)	89.5%	83.4%	77.4%	75.0%	21.4%

Related to these KPIs several objectives, targets and actions have been established for future years. The results were published in a public report as well as in the city's website.

SEE MORE: *Examples of KPIs*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

PUBLICATION OF PAPER COLLECTION KPIs

GOOD PRACTICE

Keep in mind that... (REF: 1)

- It is important to plan dates and methodology for the collection of information to calculate the related KPIs.

How to start? (REF: 1)

- Choose the objectives to link to the KPIs: each objective that you set should have at least one related KPI.
- Choose KPIs that will help to measure your performance against your objectives.
- Gather the relevant data in an appropriate manner.
- Publish the KPIs in a public information database or location.
- Compare your monitoring data with the data from previous monitoring to identify any patterns or trends such as increases or decreases in figures over time.

GUIDELINE

Improving the Performance of Waste Diversion Scheme: A good practice guide to monitoring and evaluation (WRAP,2010).

Potential benefits (REF: 7)

Publication of improvements achieved each year and objetives for the next one leads to publication of improvements achieved each year and objetives for the next one leads to increased transparency for the public	•	•	
KPIs results from differents years will facilitate the comparison and evaluation of recycling performances	•	•	•
Setting KPIs will help you to decide what to monitor and the method that will be needed			•
The commitment of the citizens will increase as they are involved in the achievements of the system	•	•	

References:

1. WRAP (2010): Improving the Performance of Waste Diversion Scheme: A good practice guide to monitoring and evaluation
2. SUSTAINABILITY VICTORIA: Best Practice Waste and Recycling Contracts
3. CITY OF LONDON: WASTE STRATEGY 2013-2020
4. WRAP (2010): Improving the Performance of Waste Diversion Schemes: A Good Practice Guide to Monitoring and Evaluation. CHAPTER 4

IMPACTPAPEREC

Boosting separate paper collection

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

INFORMATION ON CONTAINERS AND BAGS

BEST PRACTICE

Background

People's confusion about separate collection results in mistakes, apathy and scepticism, and it is causing people to throw tons of waste and wrong materials in the recycling bins every day. This confusion can be due, among other reasons, to unclear labels on recycling containers and bins. Presence of wrong materials in recycling bins has serious consequences on the economic result of recycling.

If information given to citizens is adequate and well communicated, the result will be higher commitment in contributing to reach recycling targets and objectives. Citizens should be provided regular and consistent information via different channels, including at the point of ultimate separation – i.e. on the collection containers and bags themselves. The information aims to clarify doubts of citizens, increase their understanding of recycling processes and could include recycling targets as an additional motivation.

ACTION

Include illustrative and a brief information about paper collection with the recycling instructions both on containers and bags

Examples of best practice implemented

Medway Council (United Kingdom) – Bags for recycling (REF: 1)

Figure-1. Informative Paper and board bags collection in Medway council (UK). Source: Recycle (UK)

At Medway Council in UK, citizens can collect separately paper and board using blue reusable bag. This bag is properly illustrated to allow the collection of newspapers/magazines, telephone directories, envelopes, junk mail, paper, flattened cardboard, cereal and egg boxes.

University of Illinois (Chicago, USA) - Labels for paper bins (REF: 2)

Figure-2. Labels used for Paper and board collection in Uni of Illinois (Chicago, USA). Source: Uni of Illinois

The Sustainability Office of the University of Illinois has developed informative labels for all the campus and university containers, which allows staff, teachers and students **to know how to recycle mixed paper.**

These labels show which items can be collected and which cannot at the paper bin.

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INFORMATION ON CONTAINERS AND BAGS

BEST PRACTICE

Keep in mind that...

- **Information on bags and containers does not need to include text, clear images and illustrations can be sufficient for proper understanding. It is advisable to use very graphic material so that people can understand the message directly.**
- **The installation of a QR code on the label/container may also be appropriate. In this way, citizens will have online information. However, this additional element would never replace a proper information on the bin.**
- **In case that the informative collection bag is not made by paper or board, don´t deposit into the container of paper for recycling.**

How to start? (REF: 4)

- **Use images (not just text):** The addition of images to the graphics more than doubled the recycling rate. People can understand the message faster and it's more effective.
- **Keep consistent color-coding:** Use the same colors associated to the waste stream to help reinforce the connection and help people make the right choice.
- **Keep it simple:** People only have about 2 seconds to make a decision as they approach a recycling container. If they are overloaded with images/text it becomes overwhelming.
- **Clearly visible:** Make sure you place recycling graphics where people can see them. Most popular choices are on the front of the container, on a backboard or next to the openings.
- **Consistency is key:** It's vital to ensure that all recycling labels throughout your municipality are consistent in terms of image, color and text.
- **Overcoming language barriers:** If your municipality includes a high percentage of people who speak a different language, take this into account when designing your recycling graphics to help them participate.
- **Update your recycling graphics if changes are made:** Just remember to update your graphics whenever you make a change to help people adapt to the new behavior. Also change your labels when they get deteriorated.

Potential benefits

Increment of citizens knowledge and engagement		●	●
Redution of impurities by an improved segregation of materials	●	●	
Low investment needed	●		

References:

1. MEDWAY COUNCIL, UK (2017) – Recycling bags.
2. UNIVERSITY OF ILLINOIS, USA (2017) – Labels for paper bins.
3. PETER KELLEY, UNIVERSITY OF WASHINGTON (2016) – Cash in the trash: interactive composting, recycling station shows savings in real time.
4. CLEAN RIVER (2017) – 8 Tips for effective recycling posters.

IMPACTPAPEREC
Boosting separate paper collection

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SELECTION OF A COMPREHENSIVE AND FUNCTIONAL COMMUNICATION PACKAGE

BEST PRACTICE

Background

Developing a good communication campaign is a key element for building and improving citizens' awareness. Nowadays there are many different channels available for conveying a specific message to citizens (e.g. social networks, TV, radio, newspapers and other printed media, personal contacts, information in municipal sources). Prepare a communication plan carefully to attract the targeted audience and to formulate the message in a most effective way.

In order to reach as many people as possible, it is necessary to make use not only of one option, but a combination of several of them, taking into account that different social groups make different use of resources and have different points of view.

Related BP: *"Targeted communication campaigns"*

ACTION

Define the most suitable communication strategy by considering the local conditions, demographic characteristics, cultural aspects, targeted audience, message, language and other relevant aspects

Examples of best practice implemented

Taxi livery and bus rear poster in Wirral (UK) (REF:1)

Flyer encouraging recycling in Trafford (UK) (REF:1)

Brighton and Hove City Council (UK) has a Facebook Page dedicated to recycling and refuse (REF:1)

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SELECTION OF A COMPREHENSIVE AND FUNCTIONAL COMMUNICATION PACKAGE

BEST PRACTICE

Keep in mind that... (REF:1,3)

- To communicate the message in an efficient manner, it is important to study and recognize the specific sections of the population that we want to reach (e.g. affluent families, young professionals, students, elderly people, etc) or people living in particular geographic areas (e.g. particular housing estates, neighbourhoods, towns or villages or collection rounds).
- It is also important to identify internal and external potential sources of funding, resources and support, from the beginning of the communication planning process.
- It may be necessary to take advice from experts in marketing and dissemination techniques since there are several factors to bear in mind that are necessary to perform an efficient campaign.
- Secure the budget.

GUIDELINE

Improving recycling through effective communications (WRAP)

Potential benefits (REF:1, 4)

An appropriate campaign can lead to the following benefits:

Increase the recycling rates	●	●	●
Better understanding of the message and more engagement to the people		●	●
People will encourage recycling habits with their relatives and friends - multiplier effect of communication efforts		●	●

How to start? (REF:1)

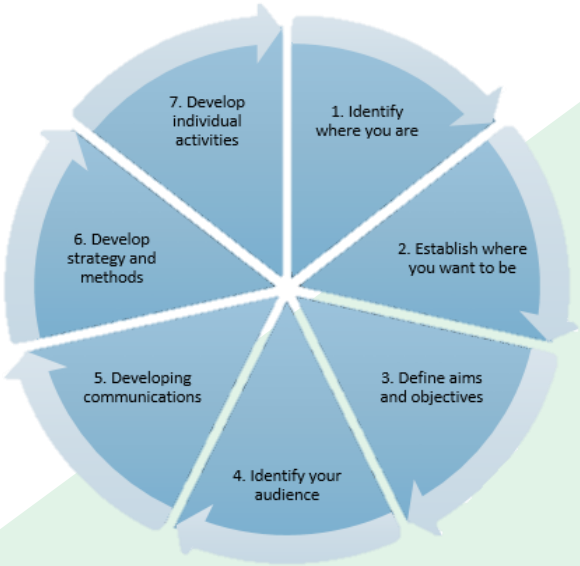

Figure-1. Planning cycle of communication campaign.
Source: WRAP

RELATED STANDARDS

EN 16848
EN 16935
Standards listed in BP "Ambitious strategy and targets" might be relevant.

References:

1. WRAP (2013) – Communications guidance: Improving recycling through effective communications.
2. RECYCLE NOW – Recycle at work.
3. ZERO WASTE PRO (2013) – Promoting zero waste practices and tools.
4. KEVIN M. MARKS, UNIVERSITY OF WISCONSIN (2013) – The Effects of Different Marketing and Awareness Strategies on Recycling and Waste Minimization in

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INCLUDE CITIZENS ACTIVELY IN THE INFORMATION LOOP (MAKING CITIZENS ACTORS)

GOOD PRACTICE

Background

Citizens' are often directly affected by municipal decisions in waste management activities, especially regarding waste and recyclables collection. In turn, municipalities need citizens' help and involvement to ensure success in the implementation of new measures and changes. Therefore, citizens' opinions, concerns and suggestions are essential in correctly defining the system.

For the inclusion of citizens in the information loop some alternatives could be chosen, for instance establishing periodical survey campaigns, regular assemblies where changes and issues are discussed, using apps or web platforms, or even through home visits with individual face-to-face meetings.

ACTION

Establish a series of actions to increase the implication and participation of citizens in the information loop, for instance: efficient bi-directional communication with citizens in order to get inputs and ideas from them

Examples of good practice implemented

LONDON: Mayor calls for much improved recycling infrastructures (REF: 2)

LONDON: Mayor calls for much improved recycling infrastructures. With the aim of completing the **Mayor's Infrastructure Plan by the winter of 2014/15, a public consultation invited feedback from Government, Londoners, businesses and the wider South-East region** to implement an improved waste collection and recycling throughout all London boroughs.

OXFORDSHIRE (UK): The Oxfordshire Waste Partnership (OWP) wants to hear public views over its new recycling and waste management strategy (REF: 3)

David Dodds, incoming chairman of OWP, said: ***"With such a high recycling rate in Oxfordshire, the challenges to push it higher are great, but with the support and involvement of the public we can make our area one of the greenest in the UK".*** The consultation is an opportunity for Oxfordshire residents to consider the county's waste management policies up to 2030, and OWP is asking a series of questions to seek views in a number of areas.

Figure-1. Advertisement campaign to engage citizens in Oxfordshire

GIJÓN (Spain) creates the municipal council for the prevention and recycling of waste (REF: 4)

The purpose of the council is to channel and favour the **participation of citizens**, their associations and other entities interested in the knowledge, planning and management of all those matters that, in relation to the municipality, are involved with the protection of the environment, human health and increased sustainability.

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Boosting separate paper collection

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INCLUDE CITIZENS ACTIVELY IN THE INFORMATION LOOP (MAKING CITIZENS ACTORS)

GOOD PRACTICE

Keep in mind that...

- ⚠ High interest of citizens to participate in waste management decision making processes is needed.
- ⚠ Implementation has to be transparent and/or legally defined (e.g. there should be Privacy Policy if personal information is required).
- ⚠ It would be interesting to deploy a study about the demographic situation of the area and the participant profile, in order to determine the best strategy for the information sharing (e.g. apps/websites for communication maybe are not effective in areas with high percentage of elderly people).
- ⚠ A communication plan, including activities to be developed, dates/deadlines and showing tools available for establishing communication, would be necessary.

How to start? (REF: 5)

- Identify potential citizens to be involved by performing a demographic/cultural/socioeconomic study of the possible participants (citizens interested in the participation and information processes) in order to implicate representative population groups of the municipality.
- Define best performing strategies to involve citizens in the information loop.
- Web platforms, apps, citizen surveys, assemblies can be a good option to engage citizens to participate in the information loop.
- Set a dissemination and communication strategy in order to inform citizens that they have the option to participate in decision making processes and how they can participate.
- Define the main points/information to be discussed with the citizens and the kind of feedback that is expected to be collected.

Potential benefits

Citizen satisfaction since they feel as part of the system.			●
Increase the citizen engagement and therefore increase the quantity and quality of paper for recycling due to the information received and direct feedback about problems to address them directly.	●	●	●
The point of view of the citizens as actors of the waste management chain can be very valuable in decision making processes and it can lead to new actions and decisions to improve paper recycling rates.	●	●	

Related BP: *"Targeted communication campaigns"*

References:

1. SILPA KAZA, LISA YAO AND CLAIRE MARKGRAF (2016) – Five ways to increase participation in local waste services.
2. EASY RECYCLING (2016) – Mayor calls for much improved recycling infrastructure in London.
3. BUCKINGHAMTODAY, UK (2012) – Give your views on ways to improve recycling.
4. EL COMERCIO (2016) – Gijón creates the municipal board for the prevention and recycling of waste (in Spanish).
5. SILPA KAZA, SUSTAINABLE CITIES (2016) – Five ways to increase citizen participation in local waste services.

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WASTE AMBASSADORS

GOOD PRACTICE

Background (REF: 1 & 3)

Communication is a key to citizens' engagement in paper recycling. However, it has been demonstrated that, although print media are influential (for the decision of households to recycle), face-to-face communication is the most effective medium to convince people to start recycling.

For this purpose, "waste ambassadors" (also called "waste (prevention) officers", "recycling officers", "waste (prevention) advisors") can be engaged at local level in order to raise the awareness among the general public. This will be a give and take conversation as they will answer questions and identify barriers households face when managing their waste. The information gathered will better lead the decision makers on how to make recycling and composting easier for householders. Waste ambassadors interact directly with the residents and therefore have the potential to achieve more engagement and long-lasting behaviour changes.

ACTION

Appointing people to inform citizens about the collection system established in the municipality in order to boost their participation in the recycling loop

Examples of good practice implemented

Waste Ambassadors to facilitate 600 local workshops on household waste management (Ireland) (REF: 3)

Figure-1. Voice organization logo

Voice of Irish Concern for the Environment (VOICE) is set to team up with the **three regional waste authorities** this autumn to roll out an **information campaign to resolve confusion and instruct the public on waste management.**

Over 600 household waste workshops are set to be held across the country, with the immediate goal to resolve confusion over what can be placed into the waste, recycle and food bins respectively. **VOICE, which focuses on waste & water issue, will manage 25 'Waste Ambassadors' who will be responsible for running the workshops in collaboration with the regional waste authorities and are currently looking for individuals interested in running the workshops.**

In addition to helping to clarify per-lift and weight-based charging models, the campaigns will also guide the public on waste prevention and how to improve their recycling habits.

According to VOICE Coordinator, Mindy O'Brien, the project will help to address public confusion around the three 'R's: "reduce, recycle and rot".

"We are very excited about this hands-on approach and cannot wait to hire and train our new team of waste ambassadors and tackle waste in a real way."

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WASTE AMBASSADORS

GOOD PRACTICE

How to start? (REF: 4)

- **Recruit a team to manage the Recycling Ambassador Programme:** this can be done through paid job offers or in a voluntary basis. Social networks and the municipality web can be a channel to achieve this.
- **Explain to the waste ambassadors the waste management policy of the municipality and all related topics that you want them to discuss with the citizens** (explain how the system works, practical advice, etc.).
- **Plan workshops with citizens.**
  - Plan day and location and advance and make sure citizens are aware of these workshops.
  - Use posters and leaflets with visual information to make easier for citizens to understand the message.
- **Plan face-to-face meetings at individual houses.**
  - Organize the routes to reach all the population involved.
  - Design questionnaires to get feedback directly from citizens.
- **Organize regular meetings with the waste ambassadors in order to receive inputs and feedback from citizens.** These meetings can be a bi-directional information channel in which the municipality explains the last novelties about the city' waste management system.

Keep in mind that...

- **Waste ambassador should be able to collaborate with the city council and the citizens.**
- **The city council must be open to share information with the waste and resource ambassadors.**
- **City decision makers have to accept different opinions and should be willing to listen and take into account what the citizens have to say.**
- **With motivation, open-mind, cooperation and effort the waste and resource ambassadors can have great results in short time.**
- **Internet communication channels: Live chat or fixing individual appointments by use of internet calendars.**

Potential benefits

Increase information and communication between citizens and city council about paper and cardboard recycling activities.	●	●	●
Better communication and feedback			●

References:

1. J.-D. M. SAPHORES, H. NIXON, O. A. OGUNSEITAN AND A. A. SHAPIRO, ENVIRON. BEHAV., 38, 183 (2006).
2. REGIONS FOR RECYCLING (2014) – Good practice styria: Municipal waste consultancy
3. VOICE (2017) - Waste Ambassadors
4. EMILY COHEN, ROADRUNNER (2016) – Commingled corner: how to become your office's eco ambassador.

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WEBSITE ON PAPER AND BOARD COLLECTION AND RECYCLING

GOOD PRACTICE

Background (REF: 1)

Although the rate of separate collection of paper and board for recycling is increasing throughout Europe, the numbers could be further improved by increasing citizens' awareness of how the system works, which items can be separately collected and which ones can be further recycled or reused.

In the context of public awareness campaigns, it is important that municipalities promote actions and tools to accompany the citizens in improving household waste and recyclabes collection. Websites are a good way to show those tools and to provide information about paper and board collection.

ACTION

Build a website explaining the municipal paper and board collection system in an easy way, showing also the benefits of paper and board recycling. This website will be promoted through all possible channels used by the municipality

Examples of good practice implemented

The Hamburg Website (Germany) (REF: 2)

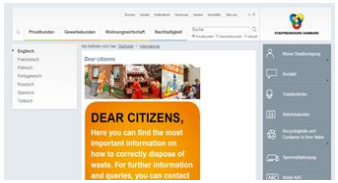

Figure-1. Public Waste Management website in Hamburg (Germany)

For Hamburg, the public waste management company has a specific webpage on its website dedicated to the different waste fractions. **The webpage dedicated to paper and board includes accessible explanation of why it is important to separate paper from all other materials.** It also includes information on the collection service, different options for the collection (door- to-door street containers, recycling yards), what should (not) be separately collected with the paper fraction and several practical tips.

The Bromley Website (UK) (REF: 3)

Figure-2. Specific section about paper recycling and collection in the website

This website of the London District of Bromley (United Kingdom) has a specific **sub-section called "Paper and recycling collection". It features a recycling guide and a list of concrete items to be deposited in the dedicated black paper recycling box, also those that should not be put inside.**

The website contains further useful information like *"what to do if you have too much paper for your black box"*, *"what happens if the paper gest wet"*, or *"how can you stop your paper recycling blowing in the wind"*.

OCU website publishes data about wastes and recyclables in the Spanish municipalities (SPAIN) (REF: 4)

OCU (Organization of consumers and users in Spain) publishes a report with the objective to assess the quality of information of the authorities close to the citizens (mainly town councils) in matters of waste, to verify how easy it is to contact them and solve doubts, at the same time as analysing the quality of the information made available to the public, to be able to conclude whether it is sufficient to keep the citizens informed and motivate.

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WEBSITE ON PAPER AND BOARD COLLECTION AND RECYCLING

GOOD PRACTICE

Keep in mind that...

- It is necessary to understand the citizens' needs on paper and board collection and their motivation on recycling in order to adapt the website.
- The information must be presented in a clear way, so that all citizens can understand it independently of their background. If there is high proportion of foreign-residents or tourists, consider multilingual versions of the content.
- It would be useful to systemise information relative to all collected waste streams on a single website by creating different sections for each stream.
- Coordination with different actors might be required to ensure information is consistent and exhaustive (ex. Producer Responsibility Organisation(s) for packaging).

How to start?

- Collect and analyse information of interest on paper and board collection system and paper and board recycling, including contact information for citizens.
- Organize and provide information clearly.
- Design the website in an attractive way.
- Promote the existence of the website by local media.

Potential benefits

Provide useful information on paper and board collection systems			●
Increase the knowledge of the citizen about the operation of the system and the benefits of recycling		●	●
Promote separate collection and recycling of paper and board	●	●	●
Improve the image of the municipality			●
Use of the ICT (Information and Communication Technologies) as an awareness tool	●	●	●

References:

1. BARCELONA CITY COUNCIL; Ecology, Urban Planning and Mobility Area – Household waste collection.
2. STADTREINIGUNG HAMBURG - website from the public waste management of Hamburg.
3. BROMLEY – website from the London District of Bromley.
4. OCU (2014): The quality of municipal information on waste

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ROADSHOWS, EVENTS AND WORKSHOPS

GOOD PRACTICE

Background (REF: 1)

Holding workshops, events or roadshows is a good method to communicate face-to-face with your residents. Different types of activities may include:

- **Displays, exhibitions, shows and events such as roadshows (in shopping centres, town centres etc) that target local residents and are designed for one-to-one engagement.**
- **Public meetings are events targeting local residents and designed for one-to-one engagement.**
- **Attending popular public events and shows – such as community fetes, meals, agricultural or village shows etc.**
- **You could even make up your own events/awareness/activity days – but remember to allow adequate lead time for planning and publicity.**

ACTION

Organization of visual activities to engage local residents and small businesses on paper and board recycling

Related BP: *"Selection of a comprehensive and functional communication package"*

Examples of good practice implemented

Durham County Council (UK) (REF: 2 & 3)

Figure-1. Bin it right campaign in UK. Source: Durham County Council

This municipality launched the ***Bin it Right campaign*** in April 2014 to encourage residents to recycle their household waste. The campaign includes: website, facebook page and twitter feeds; posters and leaflets in community locations; collection vehicle livery; leaflets and articles in Durham County news; press releases; bins stickers; door-knocking in targeted areas; **roadshows and community events**; presentations to community groups/schools and targeting persistent offenders.

The campaign has significantly improved the quality of the material collected (paper and board included) from the kerbside for recycling and enabled them to recycle, reuse or compost 43% of all household waste collected, in the case of organic waste.

RecycleWeek in East London (UK) (REF: 4)

Roadshows across East London pretended to explain what could be recycled at home. Armed with relevant information and new initiatives a roadshow is a great opportunity to start recycling more.

See picture 3 below.

Figure-2. Picture of a roadshow in RecycleWeek in London (UK). Source: Recycle for London

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ROADSHOWS, EVENTS AND WORKSHOPS

GOOD PRACTICE

Keep in mind that... (REF: 1)

- Summer is generally better for holding events (especially outdoor) when it is warmer and drier.
- Know exactly whom you want to target and where to go to reach them, allow plenty of time and prepare well in advance.
- Identify and timetable key regional events that could be used for communications events.
- Be careful to select events that will reach your residents and not visitors from elsewhere.
- The keys to holding successful events are targeting, planning and organisation.

How to start? (REF:1)

- Selection of a good location and timing is critical – pick busy places/times.
- Take a display panel, the more engaging your display the better, as it will encourage more people to come and talk.
- Include some activities to entertain or draw people to your stand where you can engage them (noisy sounds with recycled instruments or face painting can attract children and families).
- Your activities should complement your display, not overshadow it.
- Reinforce your communications messages with practical giveaways or give 'freebies' away in return for something e.g. a conversation about recycling, completing a survey questionnaire or making a pledge to recycle more (your giveaways should be branded, made from recycled materials, if possible, and they should be useful so people don't just throw them away (e.g. fridge magnets, reusable bags…).

Potential benefits

Citizen satisfaction since they feel as part of the system			●
Increase the citizen engagement and therefore increase the quantity and quality of paper for recycling due to the information received and direct feedback about probelms to address them directly	●	●	●
The point of view of the citizens as actors of the waste management chain can be very valuable in decision making processes and it can lead to new actions and decisions to improve paper recycling rates	●	●	

Figure-3. Picture of a roadshow in RecycleWeek in London (UK). Source: Recycle for London

References:

1. WRAP (2013) – Improving recycling trough effective communications.
2. DURHAM COUNTY COUNCIL (2015) – Successful recycling campaign extended.
3. VICTORIA BURRELL, WASTE STRATEGY TEAM MANAGER (2015) – Bin it right! -Countywide Contamination Campaign.
4. RECYCLE FOR LONDON (2016) – Recycle week roadshow.

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MONITORING OF COMMUNICATION CAMPAIGNS

BEST PRACTICE

Background (REF:1)

Measuring the impact of communications campaigns requires monitoring and evaluation. It is essential to be able to improve and adapt the approach, and to ensure cost efficient use of available resources. Setting aims, objectives and key performance indicators (KPIs) for monitoring is helpful to decide what to monitor and the method that will be needed.

ACTION

Evaluation of the communication campaigns by comparing investments and results achieved

Example of best practice implemented

Durham Country Council (UK) participation rate monitoring (REF: 2)

Figure-1: Communication campaign in Durham Country Council. Source: Durham Country Council

In order to **monitor the effectiveness of a communications campaign to promote the "Kerb-it" scheme in low performing areas, Durham Country Council conducted participation monitoring.**

The pre- and post- campaign participation monitoring was undertaken across a representative sample of properties, with 1100 properties identified in each of the four districts considered. In each area, the full collection round was monitored for consistency. A further round was monitored in Durham related to the student population. The collection service was fortnightly, so the monitoring was over a six-week period.

The results were very useful in demonstrating the impact of the campaign. They showed that participation had increased by 9.5% overall across all the campaign target areas. Specific monitoring had been conducted in student areas, and this showed a significant increase of 16.8% in participation levels. Combined with other monitoring data such as tonnage and survey data, the results allowed the council to determine the success of the campaign and make improvements to its communication strategy.

Keep in mind that...

- **Measuring the impact of a campaign as a whole should be done using monitoring techniques guided by the aims, objectives and KPIs (general and specific to the campaign).**
- **A lot of factors should be taken into account when evaluating the results of a communication campaign. For example: counting hits on a website does not tell the ways in which people are making use of it.**
- **There is a need of transparency/legally defined implementation.**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

MONITORING OF COMMUNICATION CAMPAIGNS

BEST PRACTICE

How to start? (REF: 3, 4, 5)

There are different types of objectives that can be set to help you monitor and evaluate communication activities, such as those recommended by:

- Input objectives are those that describe what will be done, and are therefore a measure of your effort.
- Outcome objectives are those that describe a change that must happen as a result of communications.
- Impact objectives are those that describe what ultimate result of communications should be.

Table-1: Example of SMART objectives for monitoring communications

Communication campaign objective	Objective type	Associated monitoring objective
To distribute 15500 instructional leaflets to households by end March 2010.	Input	To keep a record of the number of leaflets distributed to households 12 by March 2010.
To increase the proportion of committed recyclers among Ward 12 residents during 2010 from a baseline of 35% to 65%.	Outcome	To measure the number of committed recyclers in Ward 12 by conducting a committed recycler survey of 1100 householders in January 2011.
To increase the amount of material recycled per household from 175 kg/hh/year to 220kg/hh/year by March 2011.	Impact	To measure the amount of material recycled per household by analysing tonnage figures against household numbers every month until March 2011.

GUIDELINE

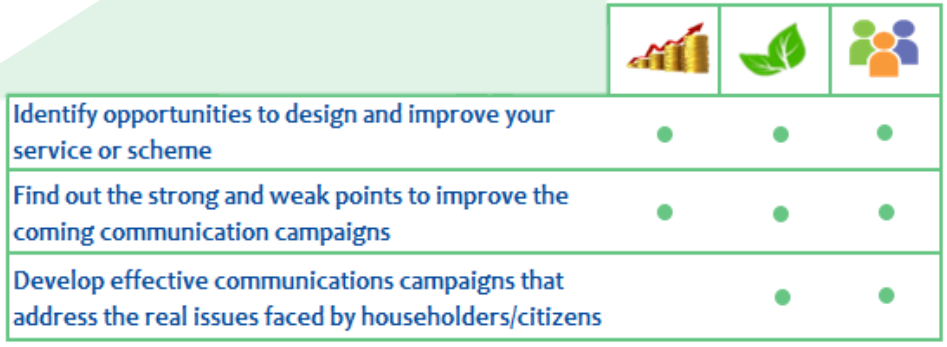
For specific information about how do a monitoring of an awareness campaign, please visit link: *Wrap (2010) - Improving the Performance of Waste diversion Scheme: A good practice guide to monitoring and evaluation – chapter 10 – Monitoring communications campaigns*

Over the years, the Public Relations industry has developed tools aimed at assessing cost-effectiveness of mass media input measure and these may be valuable in defining inputs. Two main tools have been developed for this purpose:

- Opportunities to See (OTS): used to assess the size of the audience that could be potentially reached.
- Advertising Value Equivalent (AVE): used to assess printed coverage other than advertising.

In order to measure campaign success, a survey can be distributed after the campaigning activity has ended as long as people´s knowledge and awareness were measured before any campaigning took place. The difference can be at least partly attributed to the campaign.

Potential benefits



References:

1. Wrap (2010) – Improving the Performance of Waste diversion Scheme: A good practice guide to monitoring and evaluation.
2. Wrap (2010) – REF 1 – Annex 1. Example description.
3. Wrap (2010) – REF 1– Chapter 4 – 9.
4. Wrap (2010) – REF 1– Chapter 10 – Monitoring communications campaigns.
5. Wrap (2010) – REF 1 – Chapter 4 – Monitoring awareness, claimed behaviour and satisfaction.

IMPACTPAPEREC

Boosting separate paper collection

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

PUBLICATION OF STIMULATING NEWS ON PAPER AND BOARD COLLECTION AND RECYCLING

GOOD PRACTICE

Background (REF: 1)

Population should be aware of the actions and possibilities they could take as individuals to have a positive impact (localized actions, undertaken by citizens, should cumulate to have global effects). The publication of these actions and effects can give ideas and serve as inspiration to engage other citizens.

News that confirm good information about recycling and positive results help people to become more committed with recycling.

ACTION

Dissemination of successful stories on paper and board recycling to draw attention, inspire and engage citizens. The good stories should be specific and based on reliable data

Examples of good practice implemented

Spain's paper recycling efforts is 'among the world's elite' (REF: 2)

A total of 78% of all paper consumed in Spain was recycled in 2015 – while collection of paper for recycling reached 4.6 million tonnes.

To highlight the crucial role played by Spanish municipalities in this success story, 29 local authorities in 12 autonomous regions across Spain received recognition for their contribution to paper and board collections at the Blue Birdies 2017 Awards held recently in Madrid.

Figure-1: León city council (Spain) awarded by "Blue Birdies". Source: ASPAPEL

More information: Andrea Orallo (ASPAPEL) →
a.orallo@aspapel.com

New 74% paper recycling target set for 2020 (European Union) (REF: 3)

The European paper recycling value chain has already made significant strides on the paper recycling rate in the EU having reached a near theoretical maximum of 71.5% in 2015. The industry is now seeking to make another move forward with an enhanced rate of 74% by 2020 building on the progress achieved since 2000 by preceding European Declarations on Paper Recycling.

"Having already achieved an effective recycling rate of 71.5%, the European paper recycling value chain is willing to go a step further with a new 74% target. This elevated rate will play an integral role in boosting the circularity of Europe's economy" says Ulrich Leberle, Secretary of the EPRC/Raw Materials Director at CEPI.

IMPACTPAPEREC
Boosting separate paper collection

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PUBLICATION OF STIMULATING NEWS ON PAPER AND BOARD COLLECTION AND RECYCLING

GOOD PRACTICE

Keep in mind that...

- Advertising and promoting sustainable ideas is key for citizens to know them.
- Creative and original news will get more attention.

How to start?

- Seek and collect interesting information related to the selective collection of paper and board and the use of paper for recycling.
- Disseminate the news in order to reach as many citizens as possible.

Potential benefits

Paper waste reduction	●	●	
Promoting use of recycled paper	●	●	
Motivation for paper recycling and its subsequent use		●	●
Improvement of the brand image in the case of companies	●	●	●
Consolidation of environmental commitment by organizations, institutions, schools, etc.		●	
Changes in the habits of life and consumption of society		●	●
Increased environmental awareness		●	●
Serve as inspiration for new ideas for innovation and research	●	●	●

References:

1. RUDEL, T. K. (2011) – Local actions, global effects? Understanding the circumstances in which locally beneficial environmental actions cumulate to have global effects. Ecology and Society 16(2): 19.
2. MARTIJN REINTJES (2017) – Spain's paper recycling efforts is 'among the world's elite'. Recycling international.
3. PAPER FOR RECYCLING (2017) – New 74% paper recycling target set for 2020.

IMPACTPAPEREC
Boosting separate paper collection

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COMPETITONS REWARDING THE BEST PERFORMANCE IN COLLECTION AND RECYCLING

GOOD PRACTICE

Background (REF:1)

Competitions can be an excellent way to generate awareness and interest in paper collection. They give extra motivation to the people (to increase their paper collection) and help to reinforce the messages from the communication campaigns. Of course, these campaigns should be in line with the messages and the prizes appealing (and ideally incorporate recycled materials or promote the conservation of resources). Furthermore, the competitions can be held at different levels (Municipalities, neighbourhoods, small business, schools).

ACTION

Establishment of competitions in order to award the best performances or excellent behaviour in paper collection

Examples of good practice implemented

European Paper Recycling Awards (REF: 2)

The European Recovered Paper Council (ERPC) organizes a competition in which European – based business, community, and school recycling programs are eligible to win the European Recycling Awards.

Entries are judged based on the following criteria:

- Relevance and originality
- Achievements
- Possibility to reproduce the proj
- Cost effectiveness

Pajaritas azules (Blue Birdies)- ASPAPEL (Spain) (REF: 3,4)

ASPAPEL promotes paper and board collection and recycling with its ***"Blue Birdies"*** programme. The aim is to develop selective collection and recycling of paper and board at municipal level and contribute to sustainable. On the basis of an objective scoring system, **municipalities receive special recognition consisting of one, two or three Blue Birdies that they may keep, increase or lose the following year.**

More information: Andrea Orallo (ASPAPEL) →
a.orallo@aspapel.com

León city council has been awarded with two "Blue Birdies" in 2017 for the excellence level in its management and selective collection of paper and board. During 2016, in León, 3.9 million kg of paper and board were collected, bringing the ratio per capita to 31 kg, 7% more than in 2015 (29 kg/inhab). Of the 3.9 million kg collected, 86.5% was collected in blue containers (3.3 million kg). The collection of paper and board accounts for 38.9%of the total weight of the separate collection. (REF: 4)

Figure-1. León city council (Spain) awarded by two "Blue Birdies". Source: ASPAPEL

IMPACTPAPEREC
Boosting separate paper collection

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COMPETITONS REWARDING THE BEST PERFORMANCE IN COLLECTION AND RECYCLING

GOOD PRACTICE

Keep in mind that…

- Be aware of the legislation surrounding competition and incentive terms and conditions and liaise with the legal department to ensure you comply.
- Consider the particularities of the target audience – depending on the type of audience/ organisation/ institution, a different approach might be needed to engage the people.
- Plan and design clear and transparent competition rules, without ambiguity.
- Plan a communication strategy to highlight the message that you want to communicate and the environmental benefits of recycling.
- The action should be designed so that it has a long-lasting impact.

How to start?

- Design your competition in a way that its results are appealing for the targeted public you are addressing.
- Make sure the prize is tempting but that the core message is not forgotten.
- The rules have to be understandable by the public you are addressing.
- The message has to be clear, use illustrations, videos and other visual aids to help you with the communication.

Potential benefits

Competitions reinforce the key message at different levels using an attractive and fun method		●	●
People can be easily engaged and improvements in recycling rates can be achieved if the competitions is well planned	●	●	●
People encourage each other to increase the recycling actions due to the team competition	●	●	●
If it is well designed, the recycling habits will remain a common practice		●	●

References:

1. WRAP (2013) – Improving recycling through effective communications. Communications guidance.
2. EUROPEAN PAPER RECYCLING COUNCIL (EPRC) (2017) – European paper recycling awards.
3. ASPAPEL (2017): Blue Birdies programme
4. LEON CITY COUNCIl (2017): Awarded by "Blue Birdies"
5. MARIUS PEDERSEN A.S. (2012) – 4th School Competition in waste paper collection

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EDUCATIONAL AREAS ON PAPER AND BOARD COLLECTION AND RECYCLING

GOOD PRACTICE

Background (REF: 1)

Fun activities are a great way to learn how about the environmental benefits of recycling and how to separate waste correctly. This is especially true for children who in addition have a powerful influence over the recycling habits of a household.

Such activities can be even more effective if they are performed at the point where the actual process of recycling happens or where separate collection is done. For paper and cardboard specifically, such activities can illustrate how separately collected paper becomes usable again after the process of recycling.

Due to this, recycling yards/sorting plants should have facilities and reserved areas for children to play games or engage in other activities/crafts so that they understand the concept of a circular economy and learn the importance of recycling.

ACTION

Integration of a reserved area in recycling yards and/or sorting plants in order to inform visitors (e.g. children, students, retired people) on paper and board collection and recycling

Examples of good practice implemented

Recycling yard in La Rioja (Spain) (REF: 2)

This treatment plant in La Rioja (Spain) has educational facilities including a visitor centre and an environmental classroom, where students and general public can learn about recycling of solid waste, using different didactic methods.

They also offer the possibility of a guided tour through the whole plant, to understand how they add value to waste and the importance of everyone in this closed loop. **The visit involves environmental educators performing different activities such as handmade crafts or games to reinforce the message of how important it is to correctly separate the waste that we produce in our houses.**

Figure-1. Educational area in the recycling yard (La Rioja, Spain). Source: Ecoparque de la Rioja

Figure-2. Sculpture made of paper in the recycling yard (La Rioja, Spain). Source: Ecoparque de la Rioja

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EDUCATIONAL AREAS ON PAPER AND BOARD COLLECTION AND RECYCLING

GOOD PRACTICE

Keep in mind that...

- It is important to plan dates and methodology for the collection of information to calculate the related KPIs.
- The first condition in order to implement this Good Practice is to have space for it. Maybe the room is there but it is being used for other functions (i.e storage area). In this case, you should reorganize the spaces to make one of them an educational area.
- Make sure that the area that you are reserving for the educational activities is far enough from dangerous items (such as glass, machinery, operational tools, etc.).
- Identify the activities you want to perform in this area and design the space so that it is adapted to these activities.

How to start?

- Use recycled materials for the decoration of the area to make people understand the concept of circular economy.
- Decoration must be appealing for children and adults.
- Plan open days for visiting in order to show the new or existing installations.
- Organize an informative campaign so that schools and other institutions know of the existence of the facilities.
- Include a person responsible of the educational activities.

Potential benefits

Educating children early is likely to have an impact on the entire household	●	●
Visiting recycling yard can be very impressive for children and the message to communicate could be more easily understood	●	●
Practival demostrations- show children what can (and not) go in the paper recyling bin - can be easily remembered	●	●

Figure-3. Game area in the Recycling yard (La Rioja, Spain). Source: Ecoparque de la Rioja

References:

1. PLANET ART (2017) – National recycling week.
2. ECOPARQUE DE LA RIOJA (SPAIN)– Programa Residuo Responsable.

IMPACTPAPEREC
Boosting separate paper collection

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690182

DISSEMINATION OF ENVIRONMENTAL AND ECONOMIC BENEFITS OF PAPER RECYCLING

GOOD PRACTICE

Background (REF: 1)

What is the use of recycling? Today many people are still wondering this question when separating their waste and recyclables. Although the general environmental awareness is increasing, there is still a great ignorance by good part of the population about the real environmental and economic benefits of proper waste and recyclables management, and even more in the case of social benefits (improves life's quality, reduces landfills and global warming effect, generates new green jobs, etc.).

However, citizens should be aware of these benefits, because knowing them can make people more motivated and willing to recycle. Indeed, including qualitative and quantitative data in a campaign allows informing the citizen of these benefits. Furthermore, these should be shown in a very illustrative and easy way to understand for the population, encouraging the recycling habit.

ACTION

Development and launch of awareness campaigns based on illustrative and clear examples of the recycling benefits

Example of good practice implemented

"El viaje del papel" (the paper's trip), Spain (REF: 2, 3)

The Spanish association of paper and board recovers (REPACAR) with a funding from the Ministry of the Environment and Rural and Marine Affairs (MAPAMA), **developed an environmental educational campaign showing the benefits and how to recycle paper and board.** Easy and intuitive, it uses 6 cartoon videos in a website with the objective to boost paper and board recycling in the school pupils.

Figure-1: Logo of "The paper´s trip"

"Paper recycling in the office"- European paper recycling council (REF: 4)

Illustrative campaign launched for paper recycling in the office. The brochure includes the basic rules for serving the environment by recycling paper as well as the benefits when the employee recycles paper. In that way, the employee is more committed for recycling.

Figure-2: Illustrative campaign for paper recycling in the office". Source: CEPI

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DISSEMINATION OF ENVIRONMENTAL AND ECONOMIC BENEFITS OF PAPER RECYCLING

GOOD PRACTICE

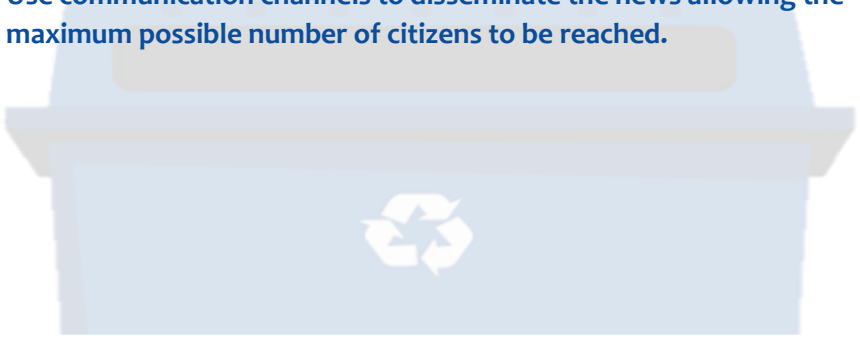
Keep in mind that...

- It is important to have factual data (better quantitative data) about the benefits of recycling in order to show quantifiable benefits.
- The character of those campaigns must be as objective as possible, so that citizen does not feel coerced.
- It is important to use the appropriate media for the campaigns dissemination.
- It is important to define the target population and their needs and concerns in order to approach them properly through the announcements or campaigns.

How to start?

- Contact the paper associations of your country and collect interesting information related to the benefits of recycling paper and board – or alternatively – to the disadvantages or problems associated with non-recycling. The more impactful and original the ads or campaigns, the greater the effect on citizens.

- Use communication channels to disseminate the news allowing the maximum possible number of citizens to be reached.



Potential benefits

Promotion of paper and board recycling	●	●	
Promotion the use of recycled paper and board	●	●	
Serve as educational information for schools and other institutions		●	●
Increase social knowledge about real benefits of recycling		●	●
Serve as a marketing tool	●		
Serve as a claim for companies (green companies)	●		●

References:

1. EUROPEAN ENVIRONMENT AGENCY (EEA) (2011) – Recycling industry can boost the European economy.
2. MAPAMA (2013) – El viaje del papel.
3. THE JOURNEY (2009) – El viaje del papel.
4. EPRC (2013): Paper Recycling in the office

IMPACTPAPEREC
Boosting separate paper collection

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INVOLVEMENT OF CELEBRITIES IN AWARENESS CAMPAIGNS

GOOD PRACTICE

Background (REF: 1)

It is evident that celebrities have a strong influence on the behaviour not only of adolescents and followers, but on society in general. Many celebrities have undertaken sustainable initiatives in recent times and have manifested their environmental concern in their day-to–day life.

Therefore, it is interesting to use this power of public figures to make them serve as a model of good practices through, for example, their participation in environmental awareness campaigns.

ACTION

Appointment of a celebrity to be the public image to spread the message about the importance of recycling

Example of good practice implemented

Recycle Across America nonprofit organization – "Let's recycle right" celebrity campaign (US) (REF: 2)

Figure-1. Nonprofit organization logo dedicated standardized labelling system for recycling bins. Source: Recycle Across America

Non-profit organization dedicated to expediting environmental progress by creating the world's first and only society-wide standardized labelling system for recycling bins to make it easier for people to begin to recycle. The campaign also combines social media and digital out-of-home to engage consumers and promote the importance of recycling right.

The organization uses celebrities as a public image to spread the message about the importance of recycling, including paper and board recycling. Some celebrities, such as Kristen Bell, Angie Harmon, Stana Katic, Ian Somerhalder, Josie Maran, Alanis Morissette, Anthony Mackie, Gabby Reece, Anna Sophia Robb, Johnny Galecki and Chris Salgardo have collaborated with the cause.

Figure-2. Johnny Galecki as public figure in recycling campaign

IMPACTPAPEREC
Boosting separate paper collection

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INVOLVEMENT OF CELEBRITIES IN AWARENESS CAMPAIGNS

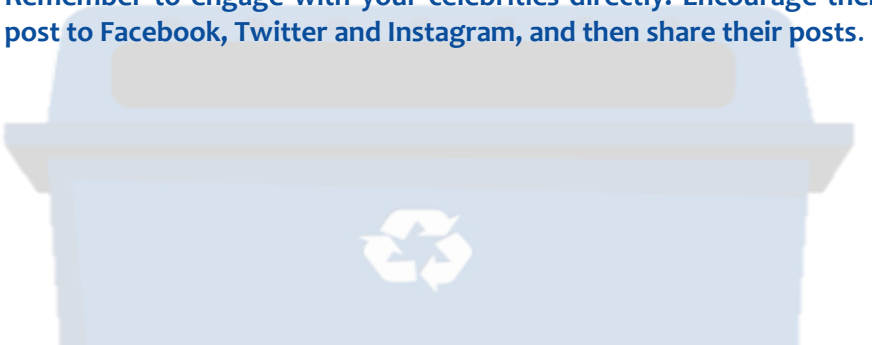
GOOD PRACTICE

Keep in mind that...

- Real commitment of the celebrities should serve as an example for their behavior in the day to day and not only in advertising campaigns not to create skepticism to the consumer.
- Select the appropriate role models.
- Celebrities must be recognised locally or nationally, as appropriate.
- They should not be controversial.

How to start? (REF: 3)

- Connect the right celebrity with the right product: Choose celebrities that really feel a commitment with recycling and the environment.
- If their reputation and actions do not reflect the product, they advertise the marketing message will appear hollow.
- Make a plan to reinforce your message.
- Choose the right media to cover your campaign: Think about the public you want to target and its characteristics.
- Don't forget social networks, the message can be disseminated easily and in a cost-effective way.
- Remember to engage with your celebrities directly: Encourage them to post to Facebook, Twitter and Instagram, and then share their posts.



Potential benefits

Influence an important part of society	●	●
They generate behavioral changes in adolescents (sustainable change from an early age)	●	●
Broad diffusion of the message in awareness campaigns for the recycling of paper	●	●
Celebrities can use their social networks to spread the message about the importance of recycling	●	●
These campaigns improve the image of celebrities, what motivates them to serve as an example of a sustainable attitude		●

References:

1. JOSE MARÍA CUBILLO, ALICIA BLANCO (2014) – Estrategias de Marketing Sectorial. Libros profesionales de empresa, ESIC.
2. RECYCLE ACROSS AMERICA (2017) – Let's recycle right!
3. JESSE BACON (2013) – The price of fame: working with celebrities on your campaign.

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TARGETED COMMUNICATION CAMPAINGS

BEST PRACTICE

Background (REF: 1)

It is important to understand the influence of lifestyles, life-stages or cultural issues in your municipality might have on the effectiveness of the recycling service and how it is communicated. There may be particular barriers specific to different groups and your communications should aim to overcome them. Different areas within your municipality may have different characteristics and need different approaches to both recycling system design and communications.

ACTION

Identification of the social groups in which paper and board collection should be improved and develop targeted communication campaigns for them (e.g. schools, kindergartens, new homeowners, tourists in holiday flats and other communities)

Examples of best practice implemented

Communication campaigns to promote recycling within luton's indian sub-continent communities in UK (REF: 2)

Figure-1. Indian citizen committed with the recycling campaign. Source: WRAP

Experience had shown that participation in recycling among Luton's Indian sub-continent communities in UK tends to be lower than in other communities in the town. Hence, **the municipality tailored the campaign to suit the cultural and social background of these communities, and to choose the best method of conveying information about the benefits of recycling and how to recycle.**

The campaign used Bollywood themed posters, billboards, advertising shells, a leaflet and roadshows to attract the attention of people who normally ignored standard recycling messages. The campaign results included an increase of 8% in the participation and 4% increase in the number of committed recyclers. The amount of residual waste in the area fell by 4,2% and the amount of dry recycling increased 9,4% in this zone.

Figure-2. Communication campaign about recycling in UK for Indian communities. Source: WRAP

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TARGETED COMMUNICATION CAMPAINGS

BEST PRACTICE

Keep in mind that... (REF: 1)

The characteristics to bear in mind include:

- Lifestyles
  - Socio-economic status (shopping and living habits)
  - Population turnover (are they students, families?)
  - Tourists (Normally they are not familiar with recycling rules of the area)
- Life stages
  - Children (they can have influence over their parents)
  - Young people (usually relatively low incomes)
  - Families (they are often involved in community activities)
  - Elderly people (may require assisted collections)
  - New neighbours in the area (may need useful information to perform their recycling)
- Cultural issues
  - Language difficulties (may need visual aids to help them understand the message)
  - Social conventions (some women will not talk to men that they don't know)
  - Social attitudes (Do people care about the environment?)
  - Religious beliefs and habits (Some people don't drink alcohol, so try to avoid these images)
  - Different recycling practices in the countries of origin

How to start? (REF: 1)

- Identify a cultural and social theme recognisable by the targeted public.
- If the targeted public are children (for instance in schools) it would be important to organize games and fun activities that help them remember and understand the message without difficulties.
- If the targeted public are new neighbours, you can include a 'welcome box' with recycling instructions, nearest recycling points, calendar of collection in door to door systems, etc.
- If the text is in other languages, check the accuracy of the final printed translated text.
- Also, check the style of the translated text. Although the original translations conform perfectly to every grammatical rule, it is important to ask for native speakers of the language.

Potential benefits

A reinforcement of the key message at a local level talking directly to the public about local recycling issues	●	●
More engagement of the citizens, since they feel attracted easily by the communication items	●	●
People will understand better the message and will encourage recycling habits with their relatives and friend	●	●

References:

1. WRAP (2013) – Improving recycling through effective communications.
2. WRAP (2008) – A communications campaign to promote recycling within Luton's Indian sub-continent communities.

IMPACTPAPEREC
Boosting separate paper collection

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ASSOCIATION OF CITIZENS GIVING DIRECT FEEDBACK TO MUNICIPALITIES

GOOD PRACTICE

Background

Citizens are key actors for recycling and in particular for the collection process, since their participation is essential for the success of the system. Their satisfaction and commitment are therefore fundamental; however, there is rarely a way for them to influence and participate in the decision-making process or give their feedback to decision-makers. Thus, it is important to make the population part of paper and board collection.

Citizens associations provide a space to discuss issues about paper and board collection together. The municipality must be transparent with all the decisions and allow feedback, both from individual citizens and from civil associations with regards to local waste management.

ACTION

Get into touch with associations of citizens to enhance communication and involvement of the citizens to discuss issues about paper and board collection and to interact/give feedback to municipalities

Examples of good practice implemented

CAG – Citizens, association of Georgetown (Washington, DC) (REF: 1)

CAG
CITIZENS ASSOCIATION OF GEORGETOWN

CAG is an association in Georgetown (Washington, DC) seeking to maintain a unique mix of missions for the community, while seeing that the views and interests of residents and homeowners are well represented in the neighborhood's continuing evolution.

The Membership in CAG provides a unique opportunity to meet neighbors, share concerns and ideas, and find new ways to enjoy and improve Georgetown. Paper recycling is one of those topics tackled where following issues are discussed:

"Containers for recycling material: Paper items can be placed in paper bags; please no plastic bags. For paper and other items, many Georgetown residents use open containers such as the green bins the city used to provide or just put material out in bags. In theory, DC requires use of a closed container with wheels, such as the blue recycling cans the city sells (and is considering distributing for free). But as of now, that requirement is not being enforced.

Paper: Newspapers and inserts, magazines, catalogues, paperback and telephone books, mail (including envelopes with windows), office paper, cardboard including cereal and shoe boxes, but not coated cardboard such as milk cartons, and NO PIZZA BOXES".

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ASSOCIATION OF CITIZENS GIVING DIRECT FEEDBACK TO MUNICIPALITIES

GOOD PRACTICE

Residents' associations in York (UK) (REF: 2)

In the city of York, there are many residents' associations, each with a geographically defined area, focused on: housing concerns, community issues, local environment and local issues.

The York's city council recognizes these associations as playing an important role in building local communities. Their feedback is considered for decision-making contributing to establish their policies.

How to start? (REF: 7)

- Create an open space discussion or open an online template for consultation.
- Contact with the associations of the municipality.
- Have regular meetings with the association.
- Evaluate the association's claims.
- Improve collection system taking into account the association claims.

Keep in mind that...

- The associations' feedback to improve the paper and board collection system should be taken into account.
- Some association's claims may be difficult to achieve. Then, the municipality should evaluate if the claim can be carried out and in case it cannot, the reason should be fully justified and explained to the community.

Potential benefits (REF: 7)

Increase of the quantity and quality of paper and board collected	●	●	
Increase of the enviromnetal awareness regarding separate collection	●	●	●
Improvement of the green image of the municipality	●	●	●
Increase of the recycling rates of the city	●	●	●
Improvement of the citizens´ percepetion about their municipal entities	●	●	

References:

1. CAG (2016): Citizens association of Georgetown
2. RESIDENTS' ASSOCIATIONS IN YORK (UK)

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Annex II. USER MANUAL: The evaluation tool

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The evaluation tool

Ten performance indicators were selected to perform the analysis in this tool, six of which were considered as KPIs. The KPIs used were those analysed in-depth in Deliverable 2.2 of the IMPACTPapeRec project (2). The tool aims to provide municipalities and regions with a self-assessment instrument in paper & board management, based on their own data. The tool is available to download from the IMPACTPapeRec project website (Evaluation of your performance in PfR collection)

This tool is divided into three different main sections:

a) KPI calculation

This is the main section, focused on the calculation of each KPI based on the municipality's own data. It is divided into four main subsections according to the KPIs identified. The KPIs cover all of the operational, economic, social and environmental aspects. The list of the KPIs to be calculated is included for each of the subsections:

1. Operational
   - 1.1. Paper and board separate collection rate
   - 1.2. Impurities
   - 1.3. Moisture content
   - 1.4. Services for citizens
2. Economic
   - 2.1. Cost coverage
   - 2.2. Structure of cost coverage
   - 2.3. Costs incurred and costs avoided for the municipality
   - 2.4. Revenues for the municipality
3. Social
   - 3.1. Citizen satisfaction
4. Environmental
   - 4.1. Paper and board recycling rate

b) Chronological overview

This section enables the evolution of the indicators to be monitored over time. The period covered is 2015-2030. This section enables a comparison of situations in different periods of time or when a change in the management system is made.

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c) Performance comparison

The last section allows the municipality to be compared with other real municipalities analysed during the duration of the IMPACTPapeRec project. To comply with the confidentiality issues in the municipalities, their real names have been changed to *"Municipality A, Municipality B… Municipality J"*. In order to provide basic information about the cities, some general details have been provided:

- Region in which they are located:
  - North Europe
  - East Europe
  - West Europe
  - South Europe
- Population (inhabitants):
  - <10,000
  - 10,000 – 100,000
  - 100,000 – 500,000
  - > 500,000
- Density (inh/km^2):
  - <100
  - 100 – 1,000
  - > 1000
- Type of territory:
  - Project territory
  - Best performing territory

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How to use the tool

To start to use the tool, the user must go to the '*KPI calculation*' sheet in the excel file. This sheet will act as the main menu to check the information and surf between the different menus.

The first step to start with the assessment process is for the user to input the name of the municipality and the year to be analysed. After that, they must select the group of KPIs to be evaluated by clicking on the corresponding picture.

Figure 1: KPI tool - First step

For each group of KPIs, the user will be redirected to a specific menu. In this menu, the user can select the specific KPI to be calculated or move between the different sections.

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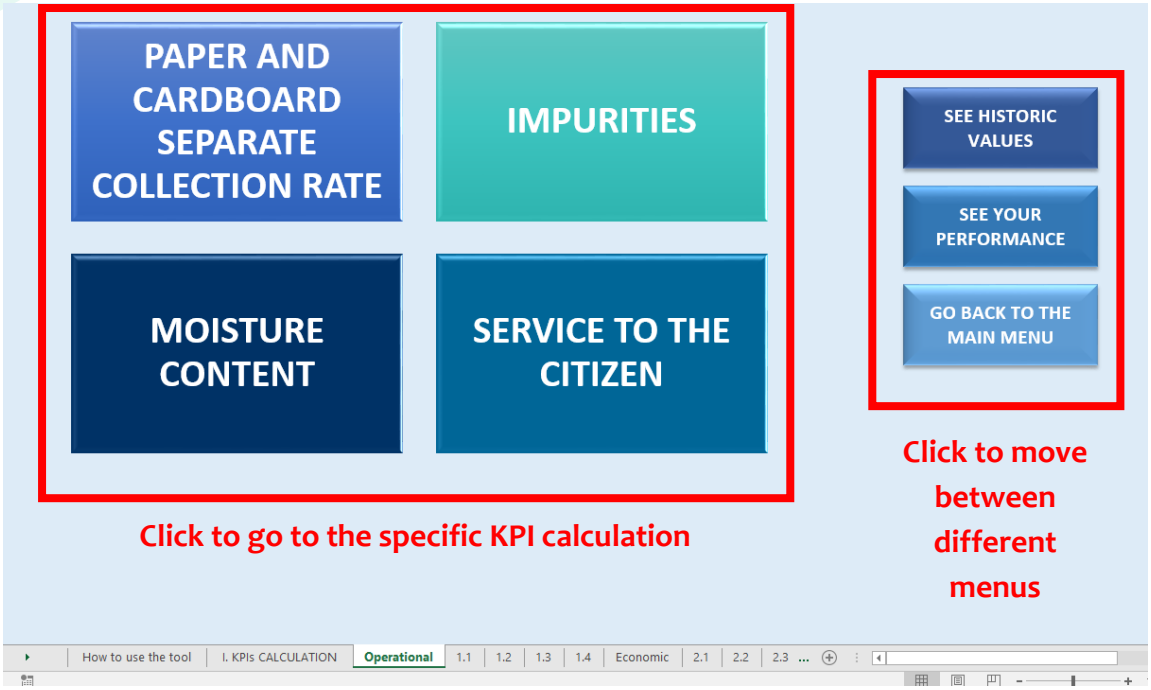

Figure 2: KPI tool - Second step

For each specific KPI sheet, the user must follow the instructions included on the left. All of the required information must be completed for an accurate calculation. After completing this information, go to the menu on the right. In this menu, a first button to calculate the value of this KPI appears, based on the data introduced. After calculating the value, the user can save it in the historical series area, by clicking on the *'Add value to historics'* button If the user wants to check their municipality performance in comparison with other municipalities, they can press the *'Compare your performance'* button. Finally, if they wish to return to the main menu they need to click on the button at the bottom.

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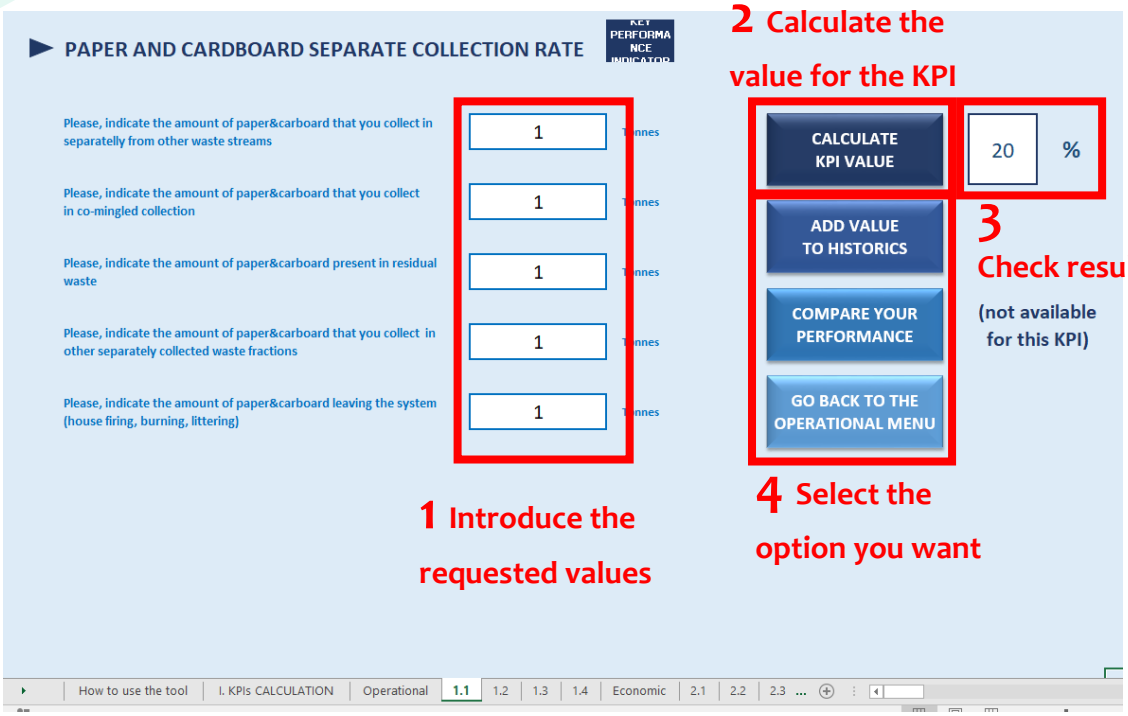

Figure 3: KPI tool - Third step

The '*Historics*' shows the main information previously sent from the KPI calculation. This information gives an overview of the evolution of each KPI during the target period. Information can be recorded from 2015 to 2030.

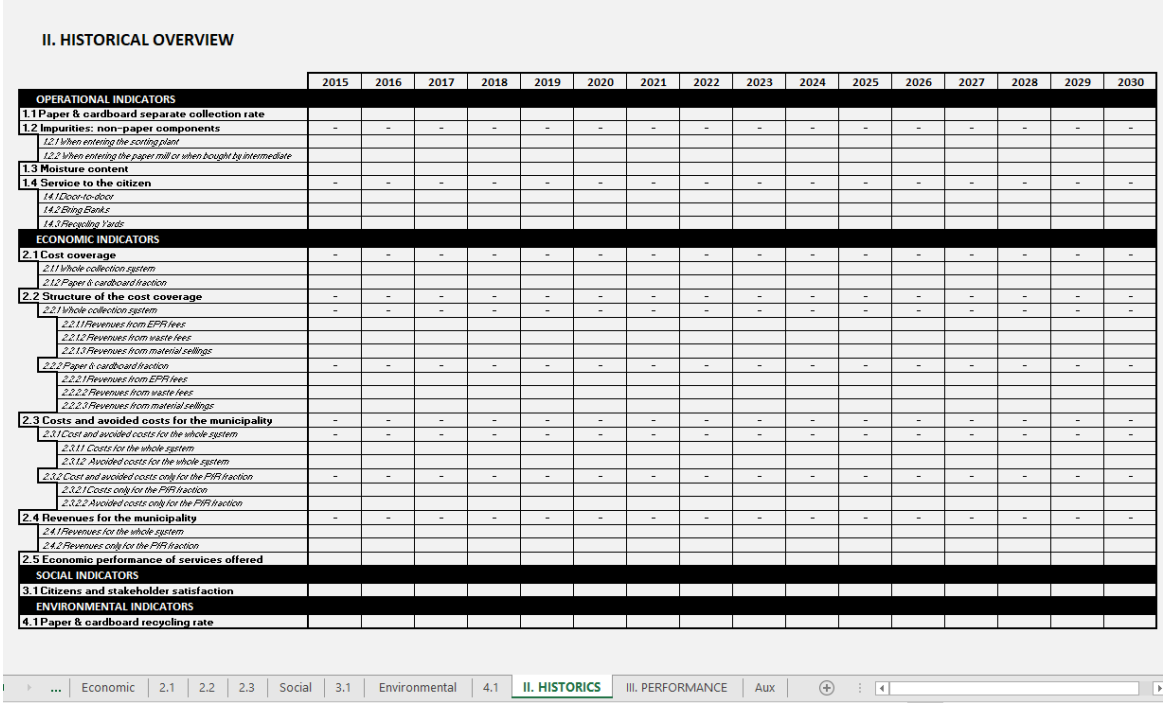

Figure 4: Municipal historical series sheet in the KPI tool

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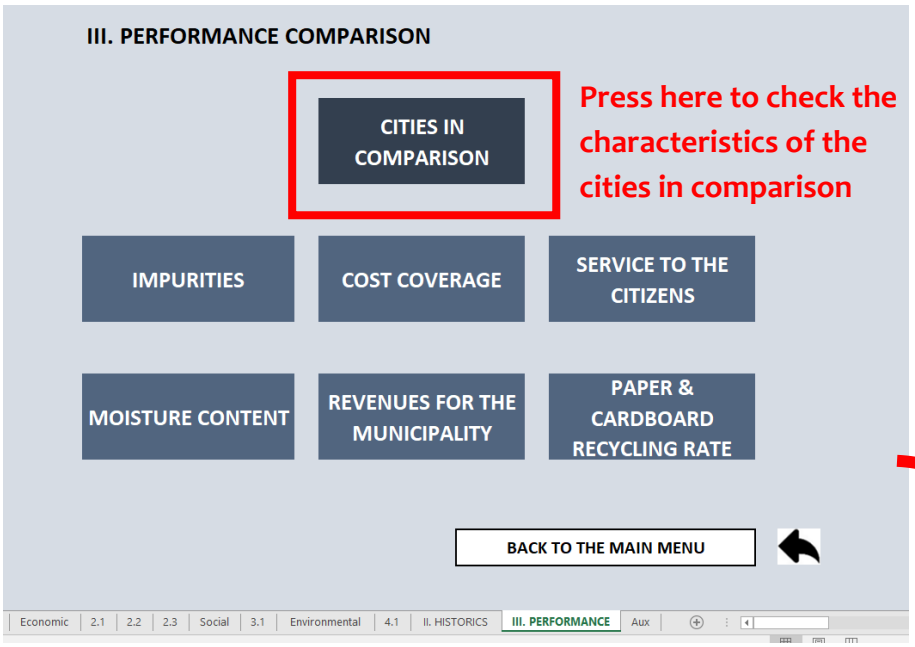
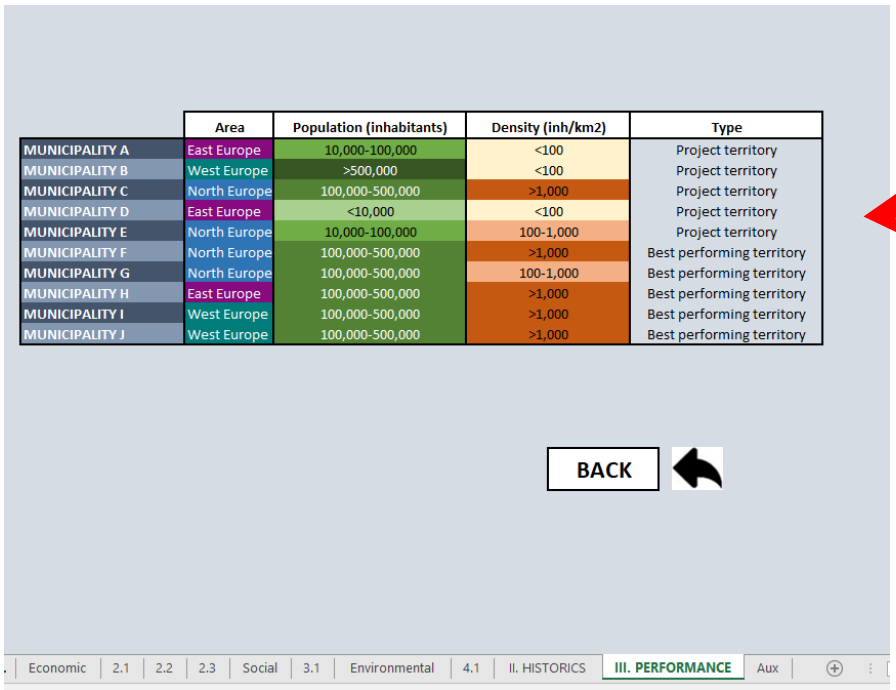
Finally, the '*Performance*' sheet shows a main menu in which to check the information. The '*Cities in comparison*' button shows a table including the main characteristics of each municipality as an example. The other buttons below redirect the user to different graphs showing information about the indicated KPIs. The user can go back to the main '*Performance menu*' or even to the main menu in this tool at any time.





	Area	Population (inhabitants)	Density (inh/km2)	Type
MUNICIPALITY A	East Europe	10,000-100,000	<100	Project territory
MUNICIPALITY B	West Europe	>500,000	<100	Project territory
MUNICIPALITY C	North Europe	100,000-500,000	>1,000	Project territory
MUNICIPALITY D	East Europe	<10,000	<100	Project territory
MUNICIPALITY E	North Europe	10,000-100,000	100-1,000	Project territory
MUNICIPALITY F	North Europe	100,000-500,000	>1,000	Best performing territory
MUNICIPALITY G	North Europe	100,000-500,000	100-1,000	Best performing territory
MUNICIPALITY H	East Europe	100,000-500,000	>1,000	Best performing territory
MUNICIPALITY I	West Europe	100,000-500,000	>1,000	Best performing territory
MUNICIPALITY J	West Europe	100,000-500,000	>1,000	Best performing territory

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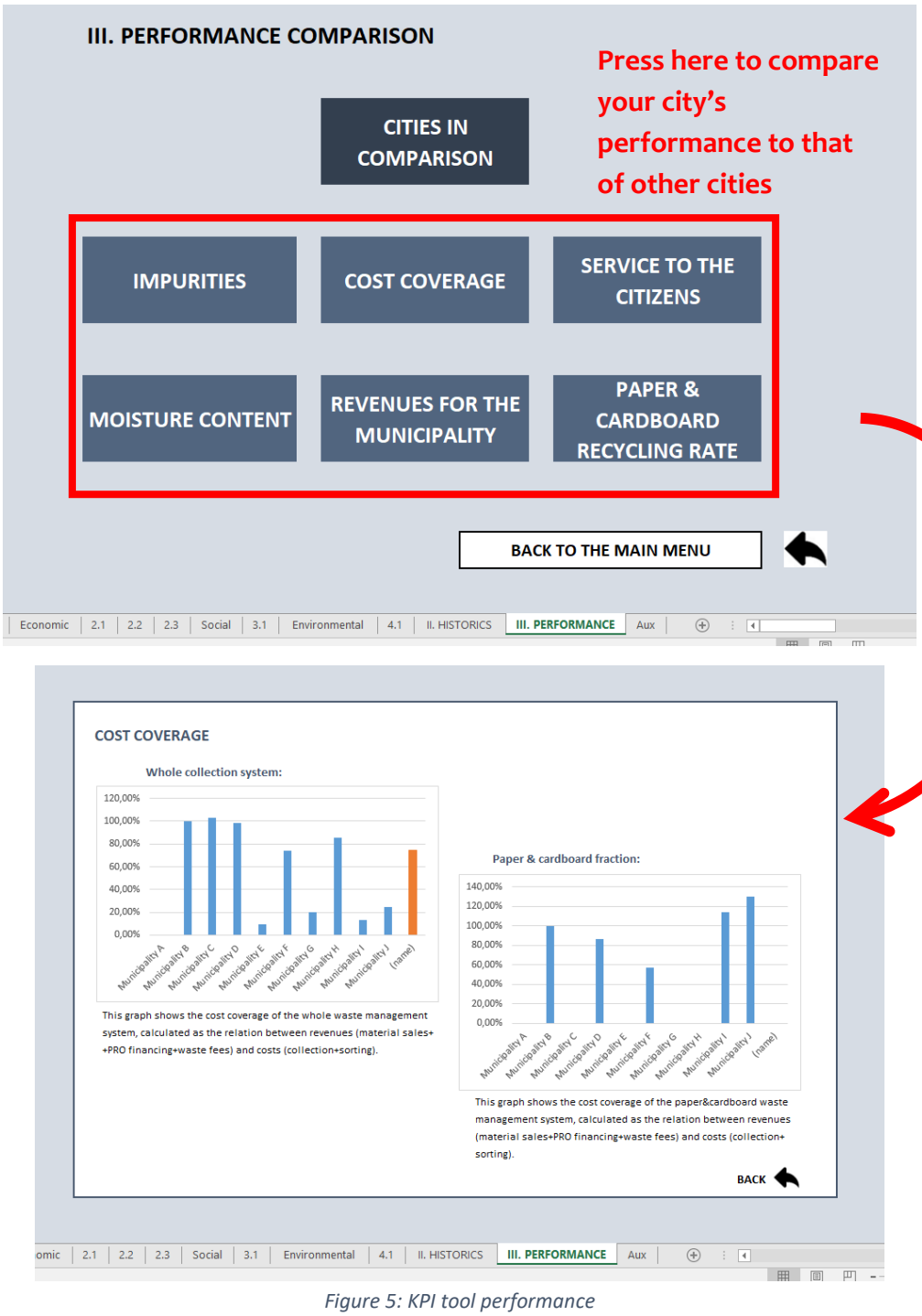

Figure 5: KPI tool performance

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Annex III. USER MANUAL: The Selection Tree

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The selection tree

LINK: Selection Tree Tool

In the IMPACTPapeRec project, a selection tree has been designed with three different levels of multiple-choice selection options ending with the good practices and best practices that have been proposed to solve or address the problems under study.

First level: NEEDS

The first level is based on the NEEDS (31) that municipalities may have. At this stage, the user should choose which of these NEEDS may constitute potential areas of improvement in paper and board collection and recycling in the municipality. At this level, the question that the user has to answer is "*Select which of the following aspects you would like to focus your efforts on or you would like to improve*". The selection tree allows the user to select one or more options at each level. In order to facilitate decision-making at this level, further explanatory comments have been included in the icon " ⓘ " in the selection tree to help the user understand each of the defined NEEDS better (see coloured text boxes in the figure below).

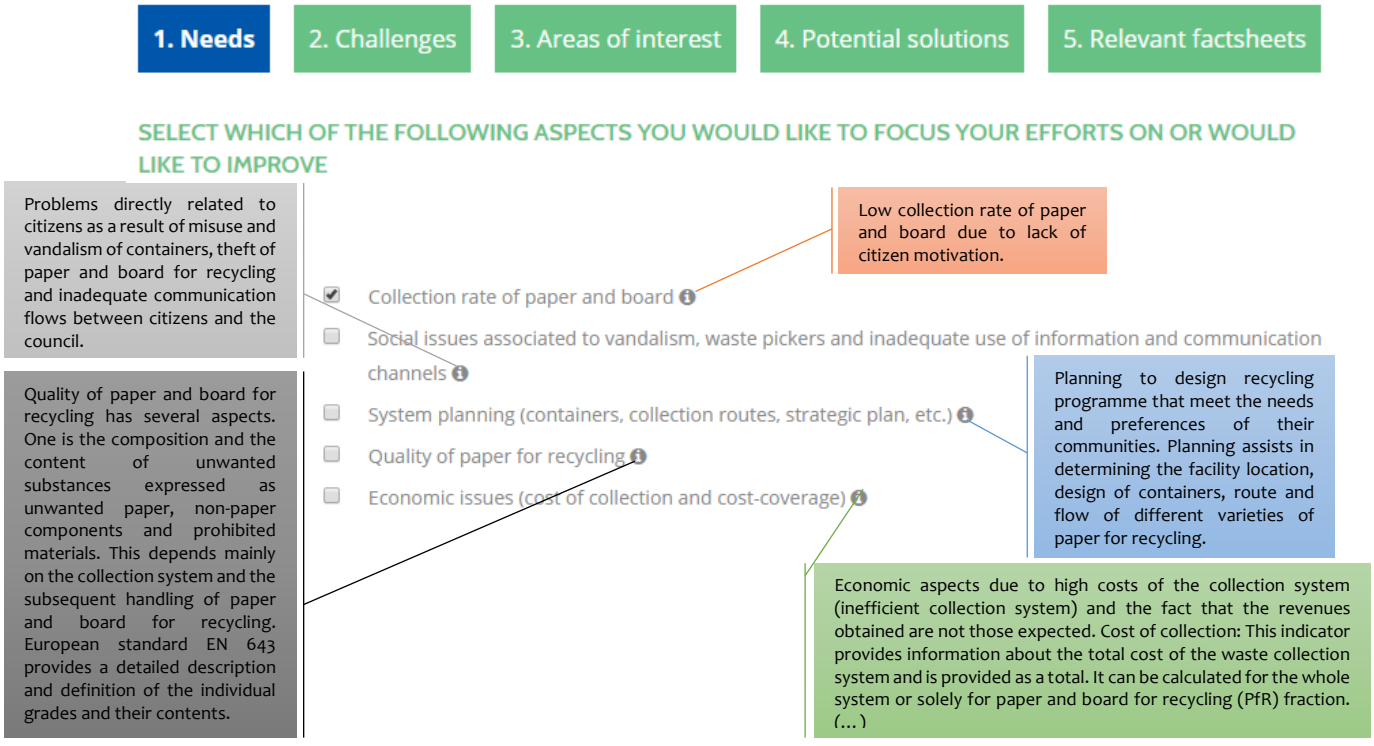

Figure 6. Level 1 of the Selection Tree: NEEDS

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Second level: CHALLENGES

Once needs have been selected in Level 1 (let's imagine only the first option "Collection rate of paper and board" has been chosen), the selection tree then takes the user to the second level of questions: CHALLENGES. On this level, the question which municipalities must answer is "*Select which of the following aspects you would like to improve*". However, the options here are more specific; Level 1 classifies the NEEDs identified in a general approach to drive the user on to a more specific level of CHALLENGES (Level 2).

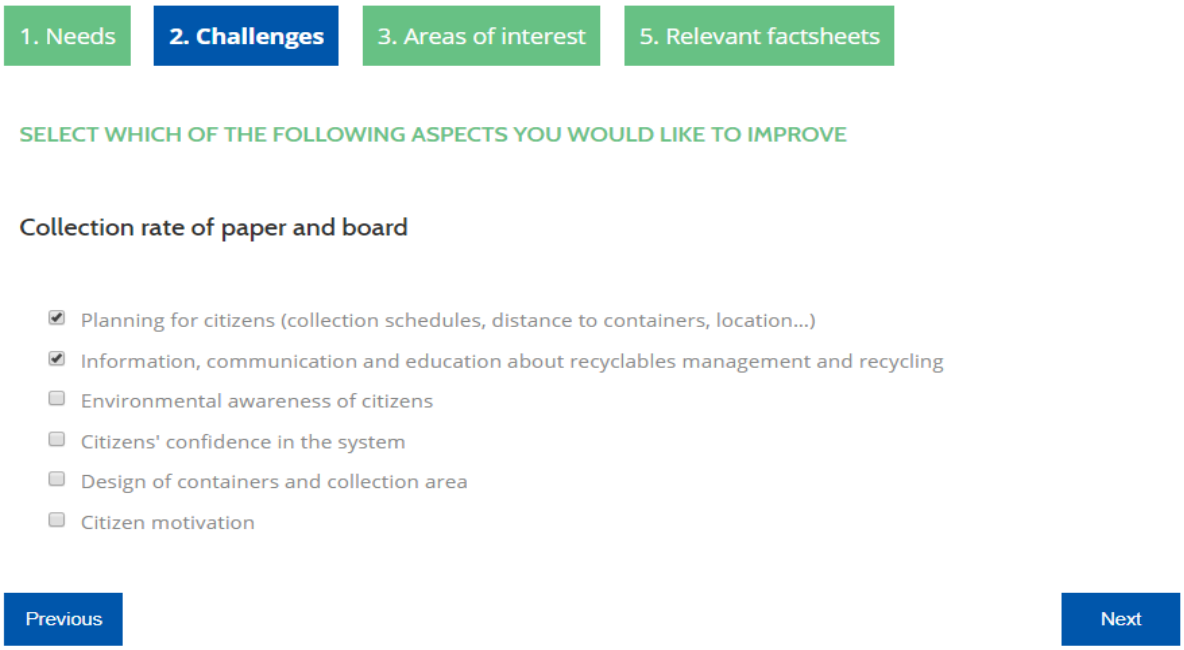

Figure 7. Level 2 of the Selection Tree: Challenges for each identified need.

Third level: AREAS OF INTEREST

Once levels 1 and 2 have been completed (let's imagine only the first two options in Level 2 "Planning for citizens (collection schedules, distance to containers, location…)" and "Information, communication and education about resource management and recycling" were chosen), the user is then taken to Level 3. This level divides the CHALLENGES in Level 2 into AREAS OF INTEREST.

The question that municipalities must answer at this level is "*What kind of solutions are you looking for*". By answering this question, the user will define the type of areas of interest in which the municipality can potentially improve.

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Some of the CHALLENGES (Level 2) do not need further classification into AREAS OF INTEREST. Hence, for these CHALLENGES there is no Level 3 (see Figure below "Planning for citizens (collection schedules, distance to containers, location…). Conversely, other CHALLENGES such as "Information, communication and education about resource management and recycling" clearly require further classification in AREAS OF INTEREST to address the problems defined by the user more specifically.

Fourth level: Relevant factsheets

In the last step, the selected FACTSHEETS (let's imagine the first one from each group has been selected) can be downloaded in pdf format (please see section **¡Error! No se encuentra el origen de la referencia.** of the Handbook for further information about FACTSHEETS).

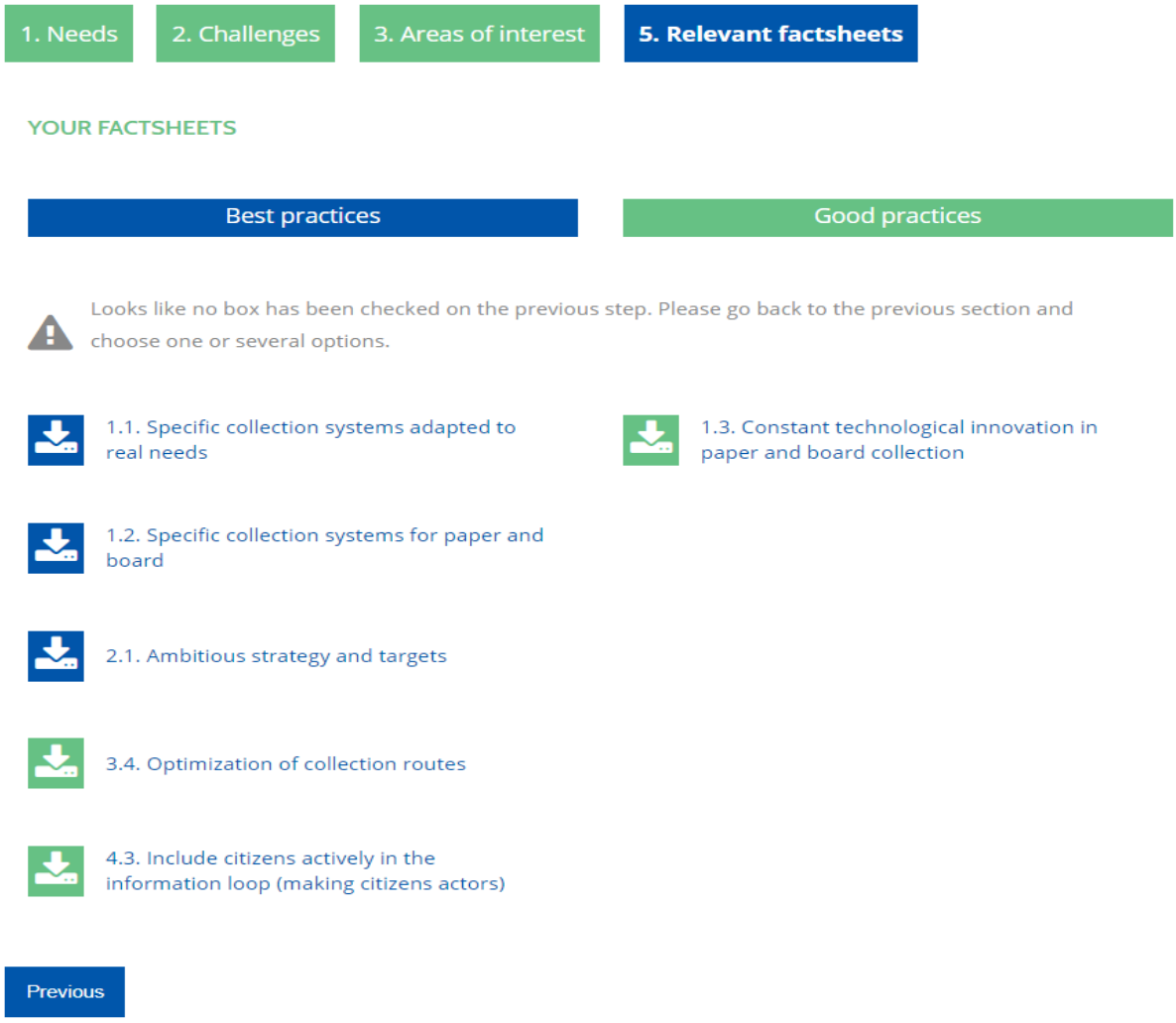

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Figure 8. Level 4 of the Selection Tree Tool. Good practices and best practices factsheets