GUIDELINE DOCUMENT:

RECOMMENDATIONS ON COLLECTION STRATEGIES

DECEMBER 2014

Recommendations on collection systems for paper for recycling

Contents

Glossary

Terminology	Definition
Bring system	Type of collection system where citizens have to bring their waste/recyclables to certain collection points, e. g. public containers or recycling yards.
Collection (of paper and board)	Gathering of paper and paper products from industrial and commercial outlets, from households and offices for recycling (collection includes transport to the sorting/processing or recycling plant/paper mill).
Collection system	Waste and recyclable can be collected in different ways. The most suitable and common systems to collect paper for recycling are described and reviewed in the appendix.
Collection schemes	Is a model how to organise collection of different types of waste/recyclables countrywide, mostly including target rates (e. g. dual systems for packaging, take back systems for batteries).
Commingled collection	All recyclable fractions are collected together in a single bin/container including a mix of paper, board, glass bottles, cans, plastics, etc. and are sorted afterwards.
Mixed paper for recycling	Means that used graphic paper and board/cardboard are collected in one bin/container.
Paper and board for recycling /1/ (often referred to as "paper for recycling")	Natural fibre based paper and board suitable for recycling and consisting of • paper and board in any shape, • products made predominately from paper and board, which may include other constituents that cannot be removed by dry sorting, such as coatings and laminates, spiral bindings, etc. Remark: Previously known as "recovered paper".
Pay-as-you-throw	Households are charged waste fees according the amount of residual waste they dispose (e. g. paying by bought waste sack, pay-by-weight, pay-by-volume).

Pick up system	All collection systems where waste/recyclables are picked up from citizens' homes, e. g. bins/containers on the premises (onsite bins/containers), bundle collection of graphic paper for recycling and board/cardboard.
Residual waste	Remaining solid waste after separation of recyclables and hazardous waste collected in households (ideally not including any recyclable fractions/hazardous waste).
Separately collected graphic paper for recycling	Means that graphic paper and board/cardboard are collected in different bins/containers.
Separately collected paper for recycling	Means that paper for recycling is collected separately from other recyclable fractions and from residual waste.
Waste lock	Systems where residents need to use a special key (very often a chip) to open a lock to dispose their waste. Commonly they are combined with identification systems for the usage of pay-as-you-throw systems.

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1. Introduction

Paper represents one of the best recycled material in Europe and a good example how the circular economy may work promoting proximity recycling thus creating new job opportunities at local level. Currently, the statistics /2/ show that at European level 71.7 % of this material goes back into new paper products. Nonetheless, the quality of this material is clearly affected by some present mega trends. The sharp decline of newspapers consumption in most of the European countries is reducing one of the best known recycled paper products meanwhile the concomitant increase in the share of paper based packaging products poses new challenges due to the high diversification of these products. In order to keep the currently high paper recycling rate or even improve it in the future, a clearer definition of recycling oriented eco-design is necessary as well as a further development of the life cycle thinking in the whole paper value chain. The quality of the collected paper for recycling has to be considered as equally important as the amount of collected paper by local decision makers. Besides, the extended producer responsibility for an effective material recycling shall become a key driver in the decision process of environmentally focused companies.

The collected paper for recycling in Central Europe (CE) accounts for approximately 16 million tonnes, representing about one third of the amount used by the European paper industry. However, the recycling rates are quite different among the CE countries. Some of them are approaching the theoretical limit in collection whereas others still show a significant potential that must be exploited. Lesson learning from best practices is a key point and communication through suitable expert based guidelines is very much relevant to spread correct information thus helping the paper value chain stakeholders to better contribute at the sustainability of the paper recycling loop.

This document gives a brief overview about interests of different stakeholder groups in the value chain followed by recommendations for an optimised collection of paper for recycling. It focuses on the collection from households as there lies – especially in countries and regions with low recycling rates – the most potential for improvements considering quality and quantity of the collected material. Households also have special requirements for the organisation of collection in respect to multitude of sources, variety of paper products and socio-economic diversity.

2. Guidelines on reducing the areas of conflicts

2.1 Overview

What virtually all waste management systems have in common is a certain divergence of the business objectives of their various stakeholders. In paper recycling these stakeholders are in the first place municipalities, waste management companies and paper mills.

Their overarching objectives are profitability (waste management companies), quantity (municipalities) and quality (paper mills) respectively (s. figure 1).

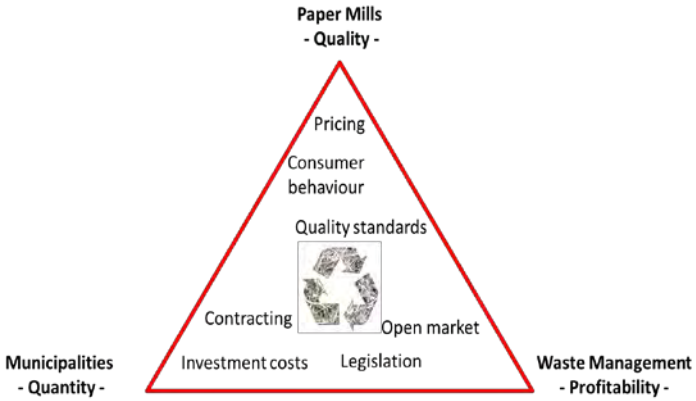

Figure 1: Objectives of stakeholders and areas of conflicts

Experience has shown that these very interests can diverge to an extent which creates a significant potential for conflicts which might render the installation of an efficient collection system difficult or hardly possible. In order to make corresponding attempts successful it is crucial to identify and analyse the areas of potential conflicts, to address them properly, to develop strategies which do not allow difficulties to become problems and to eventually find a common understanding for a set of rules on the basis of a well-balanced agreement to which all stakeholders can adhere.
This chapter of the guideline report focuses on the analysis of the main actors' roles, their constraints and flexibilities and the different agendas resulting from their diverse expectations. It undertakes an attempt to give guidelines of how to pave the way for proper and sustained solutions.

2.2 Contracting and concepts

2.2.1 LONG-TERM CONTRACTS BETWEEN STAKEHOLDERS AND OTHER CONTRACTING ASPECTS

Legally, the municipalities in CE countries have the responsibility to organise the collection of waste 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.

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 /3/.

In order to mitigate such undesired consequences for both the municipalities and the waste management companies both parties should agree on reasonable terms of such contracts. Their minimum duration should not be shorter than 5 years /3/.

In a recent interview, BVSE (German Association for Secondary Raw Materials and Waste Management) emphasised the importance of contracts between waste management companies and paper mills which give room for adapting prices and fees /3/.

Another important aspect to be addressed when drafting a contract between stakeholders is the transparency of its design. In this context the new EU DIRECTIVE 2014/24 on public procurement and concessions, which entered into force in April 2014, is of particular importance. As far as best practice specifications for tendering the collection of paper for recycling is concerned, CEPI (Confederation of European Paper Industries) published corresponding guidelines in November of the same year /4/. According to these guidelines

"A waste management tender for the collection of paper for recycling should include the following specifications linked to EU public tendering rules:

- Collection method and quality
- Paper for recycling collection rate
- Life-cycle considerations
- Support in raising citizens' awareness
- Using only collectors guaranteeing sound environmental management
- Separation of collection, sorting and marketing of the collected material
- Health and Safety considerations"

2.2.2 RETHINK OF PUBLIC PRIVATE PARTNERSHIPS

Recycling facilities belong to the most capital-intensive components of efficient waste management systems /6/. This should be duly taken into account when a municipality has to make a decision as to which company they shall entrust the task because only financially sufficiently strong companies will be in a position to make the investments necessary to provide an appropriate and sustainable service.

Although chapter 3.2.2 discusses investments in new sorting plants in a more unbiased way, the project team recommends to consider as well public private partnerships (PPP), which involves a contract between a public sector and a private party as one option for setting-up e. g. a sorting

plant – especially for urban and metropolitan areas where expected collection quantities might justify such an approach. Both parties may profit from each other: waste management companies from the technical equipment of municipalities and municipalities from the know-how of waste management companies /3/.

2.2.3 INCLUSION OF REGIONAL INDUSTRIES

Increasing both, quantity and quality of the collected paper for recycling and simultaneously keeping the conflicts between all stakeholders on a tolerable level should always be high on the agenda when discussing the introduction of a new collection system. In cases where such a system already exists it is advisable to rethink and, if necessary, revise the existing concept. An important issue in this context is the inclusion of the regional industries. The municipalities should ensure that the collection strategy for paper for recycling addresses the needs and requirements of the local paper industry as well as other industries (which could possibly make use of the residues generated by the recycling processes) and the existence and capacity of sorting plants in their areas. If there are, for instance, paper mills in the area producing graphic paper entirely or partly based on paper for recycling, the installation of a system providing the possibility to separately collect paper and board is possibly the better choice (see further information also in chapter 3.2.2).

2.3 Communication and education

2.3.1 PUBLIC RELATION (PR) ACTIVITIES FOR LOCAL USE OF PAPER FOR RECYCLING

Due to the rapidly increasing awareness of the menace of an unabated climate change the meaningfulness of resource and energy efficiency in order to reduce our environmental footprint has in Europe been beyond dispute for many years. The necessity for transport efficiency, though, has not yet received the same attention, in spite of the fact that a substantial part of the CO_2-emissions in Europe results from transport activities. As quite some of those activities are related to waste management and recycling, both, industry and society should aim to use collected secondary raw materials to the largest possible extent close to where they were collected, i. e. close the various recycling loops.

To raise the awareness of the importance of regional recycling loops, municipalities supported by regional paper mills should take care of different PR activities for the local use of paper for recycling, e. g. publication of recycling ways on municipality websites. The federal state of Steiermark in Austria does it very exemplary (s. figure2).

Other ideas to support regional recycling loops by PR could be:

- to develop different events in cooperation with local waste management companies, e. g. PR events on recycling yards at an "open day" or
- to support environmental education in schools and kindergartens, e. g. excursion day to discover the paper way of life.

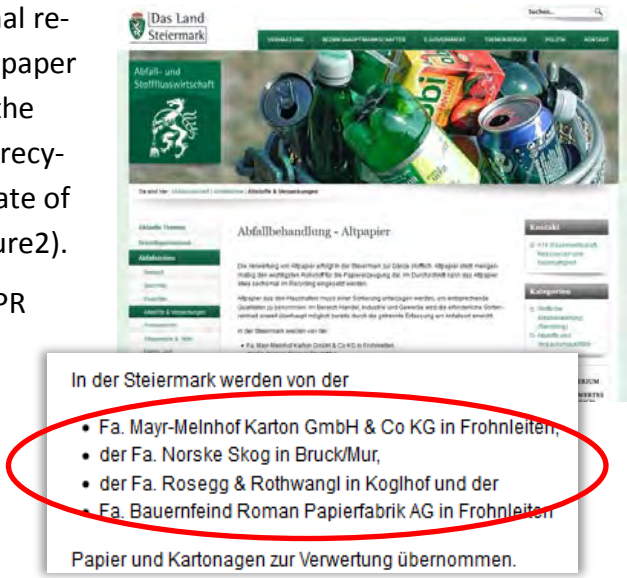

Figure 2: Example of publication of recycling ways on municipality's website /7/

2.3.2 *DIALOGUE BETWEEN ALL MAJOR STAKEHOLDERS*

The main prerequisite for an efficient reconciliation of conflicts or problems between stakeholders is their readiness to openly present all relevant positions and arguments and to discuss them in order to – in due time – find appropriate solutions fairly balancing the diverse interests. To make this procedure happen it should be institutionalised in the form of joint meetings organised on a regular basis or on demand of one of the stakeholders.

2.3.3 *EDUCATION OF STAKEHOLDERS*

Some problems and conflicts in the paper recycling business only occur, because the stakeholders act in reciprocal though unconscious ignorance of the mutual benefit or detriment their individual actions trigger to other stakeholders. This just reflects the fact that all well-established industries have – over years or decades – developed their own language, their own control techniques, their own assessment procedures, all of which facilitate the communication within their own industry but are anything but instrumental when it comes to communicate with others. This also applies to the paper recycling business. Continuous efforts should therefore be made to give all stakeholders the opportunity to understand at least the basics of each other's business and the constraints and expectations they have to cope with in order to become aware what is achievable and what is impossible in their specific business and that of their fellow-stakeholders.

There are quite a few examples for this. A typical and particularly problematic one is the use of different methods to characterise paper for recycling quality. If all stakeholders would agree to use only a limited number of well-established and proven methods (e. g. the various INGEDE methods which are widely accepted all over Europe and beyond) disputes regarding the quality of paper for recycling would largely become redundant. Furthermore, municipalities, especially in countries with less stringent legal standards, should also draft their waste management directives with a view to the requirements of the recycling industries. This, however, would require a certain expertise or at least the provision of sufficient background information about process requirements and product characteristics. It is up to the stakeholders to provide this information. This would also help to eliminate dispute concerning quality requirements.

2.4 Legislation and other aspects

In spite of a common understanding of the general waste hierarchy (s. figure 3), legislation, directives and recommendations regarding environmental and recycling issues are not in all cases sufficiently harmonised among the EU member states. In countries like Germany or Austria where waste management and material recovery and recycling have a comparatively long history and are highly developed, the requirements are more stringent and clear than in countries like Poland, where e. g. countrywide standardised waste separation directives do not exit. This is undoubtedly one of the reasons why quantities and qualities of collected paper for recycling differ so strongly between the countries. Another most adverse result of these regional differences is the lack or complete unavailability of reliable statistics which makes it virtually impossible to exactly quantify the yet untapped potential of paper for recycling.

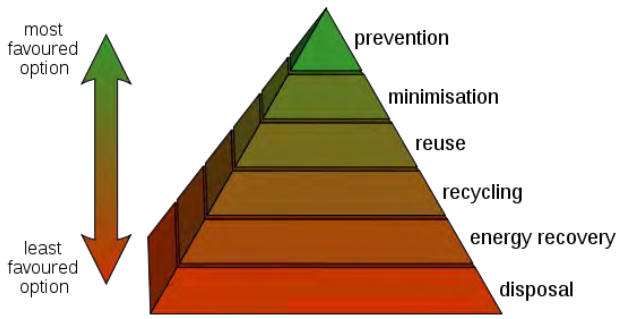

Figure 3: The waste hierarchy /34/

2.4.1 IMPLEMENTATION OF RECYCLING TARGETS

As any strategy also recycling strategies require a detailed plan for achieving their specific goals within a reasonable period of time. The more precisely this specific goal is defined, the higher is the probability of success. The first step in initialising or improving a collection system for paper for recycling in a given region or municipality, therefore, should be the definition of a reasonable collection rate. National and European averages could serve as references. But in order to be accepted by the local society, it is important that a target rate appears achievable and takes local conditions into account. And it is equally important that such rates are understood as dynamic targets which allow adjustments once the conditions for which they have been set have changed.

2.4.2 *RULES CONCERNING RESPONSIBILITY*

In order to make collection efforts independent from market prices, to cover the costs and investments for technology, infrastructure and transport and to avoid lengthy legal disputes, clear rules concerning responsibility for collection from households must be defined, established and put into force:

- Because of the high level of technology and infrastructure needed collection of paper for recycling from households should be organised by municipalities, which simultaneously bear all corresponding responsibilities. They, however, should be free to commission necessary activities entirely or partly to third parties which demonstrably are in a position to provide the required services.
- The project team came to the conclusion that the installation of intensive pick up systems, like onsite bins/containers by third parties not commissioned by local authorities cannot be recommended. But:
- Private collections shops (bring system) which in many cases offer a little compensation and thus give additional motivation in particular to low income citizens, typically provide high quality paper for recycling /20/. They should be allowed by authorities as long as this is compatible with the financing of the municipal waste system.
- The same applies to collections organised by schools, kindergartens or charity organisations which should also be supported by authorities not least as they can be regarded as part of an environmental education programme.

2.4.3 *EVALUATION OF TAKE-BACK SYSTEM FOR PACKAGING*

Take-back systems for packaging of no matter which material are organised differently in various CE countries. While most take-back system work smoothly and are very well accepted for instance in the Czech Republic (uniform labelling, nationwide educational campaigns, one organisation in charge) /8/, the “dual system” for packaging is discussed very critical in Germany. By some interest groups the system is regarded as too complicated and not transparent enough.

Such improvable take back systems for packaging should be evaluated concerning minimising organisational efforts in general and the usefulness of inclusion of pure paper and board packaging in particular as the latter are in most cases collected together with graphical paper for recycling, which is not included in the take back system.

2.4.4 COUNTRYWIDE/EUROPE-WIDE STANDARDISED MINIMUM WASTE SEPARATION

It is not only the collection and recycling rates of paper for recycling but also the level of waste separation which is crucial to paper for recycling quality but which varies a lot in the different CE countries and even between regions of the same country. This results in equally broad variations in the quality of the collected paper for recycling. Therefore, a minimum standard of waste separation for the whole country or across the whole EU should be defined and practised. In this context the collection of paper for recycling separately from any other recyclable must no longer be called into question. The decision on this issue should not be left to the municipality level, because this may lead to an insufficient spread of this strategy and consequently a poor quality paper for recycling.

2.4.5 SUPPORT OF DEVELOPMENT OF USEFUL WASTE MANAGEMENT TECHNOLOGIES

It is well known that financial incentives can lead to innovations. Waste management companies can invest more in their facilities, machines and personal in order to enhance recycling processes, once they receive public support for the development of useful waste management technology.

2.4.6 STRICTER CONTROL OF WASTE / RECYCLABLE FRACTION FLOWS

Example Poland: The legislation on the maintenance of cleanliness and order in municipalities („Ustawa o utrzymaniu czystości i porządku w gminach“) in Poland entered into force in 2013, but the recycling rate of paper and board in Poland is still very low, the lowest in the EU area /9/. There are a variety of reasons for this, but one of the main aspects is the laxity in monitoring waste flows /9, 10/. Therefore, in particular in countries with low recycling rates streams of waste and recyclable material should be monitored more strictly by authorities.

3. Guidelines to improve waste management

3.1 Overview

Own data and other sources /11/ did not give any clear indication that certain collection systems offer superior effects on quantities and qualities of paper for recycling. Instead, apart from legal framework, the success of collection systems is mainly influenced by other, mainly socio-economic factors on a very local level. Collection rates and the quality of the collected fractions vary often even between different parts of the same community /3, 12/. One of the most determinant factors is the building structure of a certain area which very commonly is also an indicator for the social structure of the people living there. The following guidelines focus on recommendations for local authorities as it is their responsibility to organise the disposal of municipal solid waste. They are simultaneously the interface to the citizens who represent the fourth important stakeholder group.

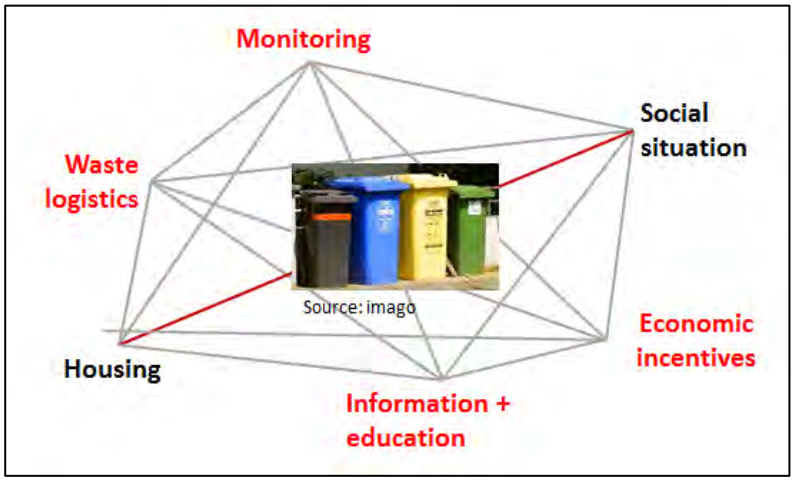

Figure 4: Factors for the success of collection systems (red: influenceable by municipalities)

The guidelines given below only work as a combination with each other and are supplemented by successful practical examples. These examples also show that a comprehensive approach of the different waste/recyclable streams is needed. Collection of paper for recycling cannot be addressed on its own.

Many of the recommendations mentioned are included in the online tool elaborated by the EcoPaperLoop project team to optimise paper for recycling collection depending on the conditions in a certain area. This tool can be found on the internet **http://www.ecopaperloop.eu/outcome**.

3.2 Waste logistics

3.2.1 NO COMMINGLED COLLECTION

There are strong opinions that the best strategy to collect municipal waste is commingled collection, i. e. a system in which all recyclable materials are collected together in a single container before they are split into different fractions. Until the latter happens, however, sufficient time is

allowed for cross-contaminations between the different components, which can be critical in terms of the quality of what is collected.

In fact, it is only a small number of recyclables which can be extracted from municipal waste in huge quantities, namely glass, iron and non-iron metals, plastic material and last but not least paper and board. If only for that they all would deserve to be collected separately, i. e. not commingled with any other recyclables. This, however, is not always possible - for logistical, economic or organisational reasons. Once a selection has to be made as to which recyclable should preferably be collected separately, the total amount and possible detrimental effects of commingling on each of them should be taken into consideration. As far as paper and board is concerned there cannot be any reasonable doubt, that the total amount in which they normally occur would place them very high if not highest on such an agenda. What comes on top is that many of the contaminants which inevitably come together in commingled collections would by and large not interfere with the quality of plastics, metals or glass, while they could possibly cause irreversible quality losses of the paper and board fraction as well as problems with the respective recycling processes.

Against this background the collection of paper and board separate from all other recyclables is an indispensable prerequisite for both highest quantities and best qualities of paper for recycling.

There were and still are intensive discussions about the superior cost effectiveness of commingled waste collections. Even if this were true, it is in most cases only true for the collection as such – i. e. as long as the costs related to the necessary subsequent sorting process are ignored. They, in fact, can easily eat up all the alleged cost savings from the collection as recently published studies confirm. They suggest that if all the costs along the whole paper recycling chain are considered appropriately, commingled collection can no longer be regarded the most economic and even less a suitable collection method for paper and board /13/.

Collecting paper for recycling separately from other recyclables, however, is a necessity but not in itself sufficient prerequisite for the provision of high quality paper for recycling. Special care should, for instance, be given to certain products which are deemed acceptable in some cases but are firmly rejected in others. Paper-based liquid packages are just one example of this. Clear labelling on collection bins/containers (and on products) as well as information of citizens via other media are efficient tools to achieve positive results in this respect (see chapters 3.4.1 and 3.4.2).

3.2.2 SEPARATE COLLECTION OF GRAPHIC PAPER

While - in the light of resource efficiency - collection of paper and board separate from other recyclables is according to what has been said above indispensable, the separate collection of graphic paper and paper-based packaging material deserves more detailed considerations. As stated in chapter 2.2.3 it is important to include other stakeholders in the decision-making processes of municipalities concerning collection systems for the various recyclables.

The existence of a local paper industry in or close to a given region would surely suggest to regard this industry as an important stakeholder when it comes to improve waste management strategies. If the local paper industry comprises mills producing graphic papers from paper for recycling and if the expected potential for collectable graphic paper for recycling in the region would justify the efforts, the installation of a collection system providing both graphic and non-graphic paper fractions separately should be taken into consideration. Municipalities and waste management companies could benefit from better prices for deinking grades, paper mills from pre-sorted material. This seems to be particularly important as the amount of collected graphic paper is shrinking. The price difference between mixed and sorted paper for recycling, however, are usually too small to justify investments in automatic sorting plants /14/. Manual sorting might be an option though probably at least equally questionable from an economic point of view. Separating at the source, i. e. already in the households would be the best solution but it might require special efforts in motivation and education.

On the other hand the existence of state-of-the-art sorting plants should be duly taken into account in the decision-making process for new or improved collection systems. If such plants are already in operation their inclusion in the collections system, however, should not be envisaged without thoroughly balancing its pros and cons. Most probably it will turn out that the cons outweigh the pros considerably.

If there are mills in the region which produce paper or board based on paper for recycling and if the total production capacity of these mills is high enough there is no reason – besides possibly economic considerations – to collect anything but mixed paper for recycling.

3.2.3 USER-FRIENDLY COLLECTION SYSTEMS

User-friendliness, i. e. comfort and convenience are particularly decisive characteristics of successfull bring collection systems. There are, however, many factors determining in how far corresponding requirements and expectations are met. The most obvious and important characteristics of a user-friendly bring collection system are

- easy accessibility, which includes short ways for the user as well as sufficient and appropriate parking facilities allowing for easy unloading close to e. g. containers or bins,
- unmistakable and transparent information on what kind of recyclables have to be disposed of in which container,
- appropriate maintenance and cleanliness of the whole site
- helpful and competent supervisors (in particular in recycling yards).

These rather ambitious demands cannot be met everywhere. For that reason it is not surprising that the introduction of onsite paper bins resulted in improved collection rates in many municipalities /15/. Own data confirm that many communities in countries with high collection rates offer their citizens a mixture of pick up and bring systems.

But also the type of dwelling, the availability of space for the installation of collection points and the local infrastructure strongly determine which collection system is the most appropriate one. For distinctly rural areas with a relatively poor infrastructure, for instance, providing short distances to the next collection point is probably not a realistic criterion for a good solution. Here collection points like public containers at highly frequented locations, e. g. next to shopping centres, sport centres, local administration centres and the like could be reasonable alternatives.

The appendix includes an overview of collection systems regarded as suitable for collection of paper for recycling by the project team including possible applications, advantages and disadvantages.

Example: Ljubljana, Slovenia /16/: The dwelling situation in Ljubljana, the capital of Slovenia, is dominated by rented or privately owned flats in small or medium-sized apartment buildings as well as private properties. In 2008 the city of Ljubljana installed a new collection system for paper for recycling in order to significantly improve the local collection rate and to decrease the amount of residual waste in households. The core features of the collection system are underground containers providing 5 different deposit shafts for paper, packaging, glass, organic and residual waste respectively. Collection points are evenly distributed across the city's area on paths frequently walked by the citizens in a way that the next collection point can be reached within less than 150 meters. For the disposal of residual waste each household has its own chip card. Containers are accessed via card and residual waste is weighed and charged. All containers are emptied on a weekly basis. Special emphasis is given to

Figure 5: Underground container system in Ljubljana /16/

an effective maintenance of the collection points in order to ensure and safeguard the highest possible level of acceptance. After having been in operation now for several years the new system convincingly demonstrated its superiority over the previous system. The amount of residual waste decreased by more than 50 % from 97 kt in 2007 to 47 kt in 2013 while at the same time the amount of separately collected paper for recycling rose by almost 80 % from 6.4 kt in 2007 to 11.5 kt in 2013 /17/.

3.2.4 *Design of collection points, adaptation of collection intervals and container capacities*

A systematic and well-arranged installation of bins or containers as well as clear labelling supports correct recovery of all recyclable fractions. If the circumstances do not allow to provide an appropriate level of convenience and monitoring locked or fenced containers can help to minimise contamination, miss-sorting and paper thievery. It has as well emerged that the smaller the number of households is which use a specific collection point, the higher is the amount of paper for recycling collected, the better is its quality and the easier it is to keep it clean and tidy. In any case type and size of bins/containers need to be adapted to the given requirements in particular with respect to capacity and emptying frequency. An unkempt location will inevitably drastically reduce the acceptance of its envisaged clientele and the readiness to separate recyclables and residual waste properly /12/.

Figure 6: Inadequate capacities or too low emptying frequencies resulting in overfilled containers (photo: R. Zelm)

Modern waste management companies, no matter if public or private, already offer monitoring of filling levels for bins/containers to duly adapt collection frequencies or container capacities respectively /18/. Developments in sensors technology and remote control facilities make further progress in this field likely – provided the waste management companies' financial leeway is sufficiently large.

3.3 Guidelines concerning economic incentives

3.3.1 REWARD CITIZENS

Rewarding citizens for making their used paper and board products available for recycling can – irrespective of the amount – be an appropriate way to make them aware of the value of these products as precious raw materials and thus motivate them to use collection systems. Experience has shown that corresponding efforts are particularly effective with lower income groups but by far not exclusively.

In general there are a number of different ways how rewarding can be practised. Some examples are given below.

There are already some communities in CE which compensate their citizens for collecting paper for recycling in onsite bins/containers on the basis of weight /19/. This, however, requires collection vehicles equipped with weighing systems. Another approach would be to pay citizens for graphic paper for recycling already separately collected at home and brought to recycling yards similar to privately operated collections shops.

Other communities support the collection of paper for recycling by non-profit organisations, kindergartens and charity organisations, not least to use this as an instrument for environmental education. Profits are in many cases donated to charitable activities.

Another interesting approach is reported from Slovenia where the community of Vrhnika, close to Ljubljana – for budget reasons – refrained from installing an expensive pick-up system for recyclables. They instead provide so-called “eco-islands” evenly distributed on public or private ground all across the municipality with containers for paper for recycling, glass and other packaging material. Citizens who were prepared to transfer part of their property to the municipality to allow for the installation of such “islands” and to take the responsibility to keep these places tidy and clean, received credits (in the form of reduced waste charges) /16/. Possibly a good idea to get citizens better involved in waste management and worth to be considered in particular in regions with modest or low economic prosperity – provided that the demand for separate collection of paper for recycling is respected.

In any case, the minimum requirement should be that separate collection of paper for recycling needs to be free of charge for citizens.

3.3.2 *PERSONALISATION OF DISPOSAL FEES FOR A FAIR WASTE CHARGING SYSTEM*

The introduction of personalised (pay-as-you-throw) disposal fees for residual waste – while disposal of recyclables remains free or is offered at lower charges – has proven very effectively to redirect recyclable fraction streams and to minimise the amount of recyclables in residual waste /21, 22/. There is of course a certain risk that such a system encourages abuse, e. g. by disposing residual waste via cheaper recyclable waste streams or by dumping residual waste into the environment. But many case studies like the Ljubljana example (s. chapter 3.2.3) give evidence that the beneficial effects outweigh the risks.

Figure 7: Example for a waste look with identification system at Wohnungsgenossenschaft „Elbtal“ Heidenau, Germany (photo: S. Guerrero Mercado)

There exist a number of different types of pay-as-you-throw systems from technically sophisticated waste locks which charge disposed waste by volume or weight to simple sack fees as common in Switzerland. To demonstrate the effects one example from Germany is portrayed below.

Case Study Heidelberg, Germany /23/:

In 1999 a pilot pay-as-you-throw project was introduced for residual waste in two large residential complexes. The aims of the project were to improve the quality of selective collection and to simultaneously reduce the amount of residual waste significantly. The collection sites for the various fractions were fenced off and the necessary information was provided with the help of easily visible signboards. Residual waste could be disposed of in different volumes which were recorded by sensors in the waste locks. A two-part fee system was established comprising of an annual flat rate for all households and a variable fee which depended on the frequency of the use of the service and on the volume of waste disposed of in the refuse containers. A comprehensive communication campaign was carried out before implementing the system. As a result the selective collection of recyclables in the two areas increased from 50 % to 84 %, and there was an average overall reduction in residual waste of 21 %. Impurities detected in bins for recyclables increased from 1 to 3 %.

An investigation in one of the two complexes revealed that

- Most respondents were generally happy with the operation and appearance of the system.
- More than 70 % of the respondents agreed to the “polluter pays” principle.
- Only 13 % rejected this idea and another 13 % were undecided.

Personalisation of disposal fees of course only works if the waste disposal charge is high enough to provide a reasonable economic incentive for better separation of recyclables. This experience was also reported from Poland where fees for residual waste are far too low to motivate citizens for better separation /10/.

3.4 Guidelines regarding information and education

3.4.1 MULTICHANNEL MARKETING

Efforts to improve collection rates and quality of paper for recycling will only succeed with the cooperation of the public. Therefore appropriate and efficient communication and public relation strategies need to be developed and put into action. This is particularly important in cases where new collection systems or even national collection schemes are to be implemented. Professional communication activities initiated by local authorities and other stakeholders including environmental groups are a basic requirement for a successful realisation.

"Multichannel marketing" is the best way to reach the majority of the citizens of a region or municipality. The spectrum of potential means ranges from phone hotlines (especially after changes), web-based information and social media, posters, flyers, specific information for home owners and tenants and customer magazines as well as promotional messages on collection lorries, just to mention a few. If significant parts of the population in the region have different cultural and linguistic backgrounds all information campaigns also have to take this in due consideration.

The involvement of experienced waste management consultants can also be instrumental. Such experts are very often employed at local authorities in countries with a long and successful recycling history and should not only have the knowledge and experience but also the capability to disseminate and communicate relevant information in the proper way and to accompany interested parties like housing associations, public institutions, kindergartens etc. in the decision and implementation phase of the installation of a waste management system.

Another aspect which must not be underestimated are widely spread rumors and half-truths around the recycling business in general, be it on purpose or not. There are citizens who tend to believe that separately collected fractions will later be mixed with other fractions and used for different purposes than those announced. Therefore, it is very important to communicate openly and transparently information about purpose and recycling ways of paper for recycling and the other recyclables /12/ – and to act accordingly.

Case Study Cappanori, Italy /25/:

Cappanori is a town of 46,700 inhabitants near Lucca (Tuscany) which installed a pick-up collection system in several steps between 2005 and 2010. The motivation of this effort was Cappanori's participation in what is called the "Zero Waste Initiative", a campaign on European level to promote waste prevention, separate collection, the reduction of residual waste as well as driving cultural change and engaging communities /24/. Well in advance meetings were held in public places in Cappanori to involve citizens and to gather ideas of how to implement the system. Printed information was distributed to all inhabitants. A few weeks before the system was started in a given part of the town, volunteers distributed free waste separation kits to all homes, including the various bins and bags required as well as more detailed printed information. These volunteers were trained to give competent answer to the residents' questions about the new system. The result was an immediate and effective participation in the system. A study covering three Italian municipalities which had introduced a pick up system showed the best results for Cappanori concerning both, participation (99 %) and satisfaction (94 %). This gives a strong evidence for the importance of a well organised preparation phase - 98.6 % of all Capannori residents had received printed information about the changes, 46 % had attended meetings about the new system and 91 % knew where to go to ask for additional information about waste collection /25/.

3.4.2 CONSISTENT LAYOUT

The purpose of advertising and marketing is to make a product known and distinct in order to let it succeed on the market. In this context, the so-called recognition factor is a crucial characteristic. Basically the same also applies to waste management systems. Their recognition factor is made up of a consistent layout of e.g. containers or bins including uniform colour schemes and pictograms. The more distinct and wide-spread this programme identity is, the better it will perform.

Figure 8: Container for collection of paper for recycling in Czech Republic /8/

A good example for this is the waste management system established by ECO-KOM in the Czech Republic. This system organises the take back system for packaging countrywide. Their containers are easily visible all over the country due to their uniform colouring and labelling, which substantially contributed to the remarkable success this system has achieved /9/.

3.4.3 *ENVIRONMENTAL EDUCATION, AWARENESS BUILDING AND SOCIAL INCLUSION*

There has never been a voluntary change in human behaviour and attitudes without prior education, awareness building and training. This is also the case when people are to be familiarised with new habits and procedures – like making use of a new waste collection system. In this process many parties have to become involved like authorities on different levels, paper mills, waste management companies, kindergartens and charity organisations, schools as well as non-governmental organisations. The process should be accepted as a long-term and a dynamic objective for the whole society and should start as early as possible, already with the youngest. Environmental education definitely should be a part of early education. It should to the largest possible extent be supported by attractive pedagogical concepts and events e. g. visits paper mills, recycling yards, sorting plants and the like.

Motivating local enterprises to put more emphasis on environmental issues or even to create "green jobs" is also supposed to have a very positive effect on public awareness and can be a chance to include residents with poor qualification and modest income into the process, especially in regions with lower GDP. For instance the Catalan town of Argentona launched a pick up collection system for paper for recycling in 2008. The service is provided by a local social enterprise which employs people at risk of social exclusion. One of the conclusions of transforming the local collection system was "…apart from boosting recycling rates, the largest share of collection costs are shifted from costs related to equipment, technologies and disposal, to creating new jobs, which ultimately feeds back into the local economy /26/."

Figure 9: Environmental programme with mascot Tonda Obal on separate collection for schools in Czech Republic /8/

3.5 Special solutions for large housing estates

As different studies show large housing estates in many cases still offer potential for improvements even in countries with high recycling rates /12/.

Because of the typically pronounced anonymity and the lack of correlations between the amount of waste a tenant generates and the disposal costs he has to pay, it seems especially important to introduce personalised fees for residual waste to motivate for better separation.

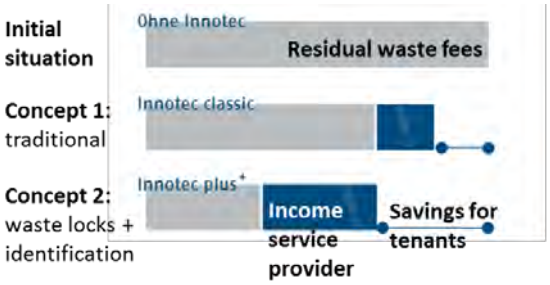

Figure 10: Example of reduction for waste fees and performance contracting /27/

For instance in Germany, and probably also in other countries with high recycling rates, private and public companies are specialised to offer closed concepts for such building estates. Services include waste analysis, consultancy, layout and management (cleaning, re-sorting etc.) of collection points, information of tenants, financial clearing of waste fees /18, 27/.

The implementation of such concepts is very often financed over performance contracting by saving waste fees as illustrated in figure 10.

3.6 Monitoring

Inclusion and motivation of citizens tops control and punishment. But the mere existence of instruments of monitoring may already show positive effects. Local authorities or the enterprises which are in charge to collect household waste often refuse to empty bins which contain not properly sorted recyclables, thus forcing property management and owners to re-sort or to install care takers as “waste policy”.

Another way would be a regular quality control by local authorities especially for public collection points and the possibility for citizens to report problematic spots to the municipality.

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5. Appendix: Suitable collection systems for paper for recycling

The evaluation of the different collection systems reflects the project teams' opinion and means the following: ++ = very good, + = good, +- = pendant, - = bad, -- = very bad.

Onsite paper bins/containers (pick up system)

Bins/containers are positioned at the citizens' property. In CE countries with high collection rates this system is quite common. Many municipalities introduced it in the last couple of years and offer the paper bin as free of charge service to its residents. Commonly it is used to collect mixed paper for recycling. But it would be also possible to install separate bins/containers for graphic paper for recycling and board/cardboard if accepted by residents (less space, more separation). If there are two bins/containers, either two collection tours or a collection truck with two compartments is needed. As there needs to be enough space for onsite paper bins/containers on the property, it is sometimes unsuitable for densely build-up areas and buildings without reserved space for disposal systems.

	Onsite bin/container	
User-friendliness	Most comfortable system for citizens because of short ways => positive effects on collection quantities.	++
Quality of paper for reycling	Good quality with few impurities. Experiences: between 2–5 % non-paper components /28, 29/. Paper for recycling protected against moisture.	+
Costs	Experience (mixed paper for recycling): specific collection cost in €/t (incl. investments for bins) relatively high and in the same range of public containers /30/. Relatively high costs for replacement of bins.	-
Other aspects	Reasonable collection intervals needed. Installation of weighting system on collection vehicles would allow compensation for collected paper for recycling. Neighbourhood bin/container sharing as possible solution for little space. In case of high portion of impurities (especially were many people use the same containers) installation of waste locks or locked/fenced containers may have positive effects.	

Kerbside collection (pick up system)

The term kerbside collection system means a doorstep collection systems, where household are asked to leave their recyclable on the kerbside on specified dates to be separately collected. Concerning paper for recycling kerbside collection, it has to be properly prepared (without plastic wrappings and inserts, the cardboard flattened) and packed often with strings to bundles. In CE countries with high collection rates bundle collection decreased in the last decade /31/. Some municipalities require the use of special bags or citizens take own boxes to place their paper for recycling on the collection date. Graphic paper for recycling and board/cardboard are collected separately. Kerbside collection is suitable for most building structures, but could be difficult to realise for citizens and collectors were many people live on limited space, e. g. high risers.

	Kerbside collection	
User-friendliness	Short ways for citizens, but space for storage until collection day needed. Additional efforts for citizens in case of bundling.	+-
Quality of paper for recycling	Very good quality with impurities close to zero. Paper for recycling not protected against moisture in case no roofed collection spot near the doorstep is available.	++
Costs	Probably remarkable lower than onsite bins/containers. Better profitability for paper for recycling achievable because of very good quality and avoidance of sorting costs.	+
Other aspects		

Public conventional containers and underground containers (bring system)

Conventional containers and underground containers are placed on public ground at places where they are reachable for citizens. Conventional containers are suitable for urban areas, but also for rural areas with a relatively high population density. For areas with low population density installation close to highly frequented locations is a good option. Underground containers, in contrast to conventional containers, have the container body placed underground and offer higher collection capacities. Underground containers are particular recommended were smart appearance is an important point for decision finding. They are very well suited for urban and densely built-up areas.

For collection a special garbage truck is needed that can lift the containers up. In the case of separate collection of graphic paper for recycling and board/cardboard special trucks with 2 compartments or an extra collection tour is necessary.

Public containers are probably the best system if a municipality decides for separate collection of graphic paper for recycling and board/cardboard, because manual re-sorting of separately collected graphic paper for recycling seems to be economical (experience: 10 % miss-sorting in public containers) /28/.

	Conventional container	
User-friendliness	Depends strongly on the distance between the residents' home and the collection points. Beneficial if containers are situated on main paths or closed to highly frequented locations.	+-
Quality of paper for recycling	Varying a lot depending from the area. Example for good result: 2–3 % non-paper components /28/. Too small slots for bigger packaging may cause disposal of paper for recycling outside containers.	+
Costs	Experience for mixed paper for recycling: specific collection cost in €/t relatively high and in the same range of onsite bin /30/. Higher collection costs for separate containers for graphic paper for recycling and board/cardboard if two collection tours needed /29/. May be compensated by higher returns.	-
Other aspects	Experience with feasible distance: max. 500 m /16, 33/. Adequate collection intervals and container sizes/numbers avoiding disposal of paper for recycling outside containers. Easier to expand compared to underground containers.	

	Underground container	
User-friendliness	Depends strongly from the distance between the residents' home and the collection points. Beneficial if containers are situated on main paths or closed to highly frequented locations. More convenient to fill compared to conventional containers (e. g. for people with disabilities)	+
Quality of paper for recycling	See conventional containers	+
Costs	Higher investment costs than for public containers because of excavation of the pit and concrete casing (roughly 10 times higher /32/). Efficient emptying of containers and cost savings because of fewer emptying /32/.	-
Other aspects	Experience with feasible distance: max. 500 m /16, 33/. Save space on public area and integrate better into the townscape than conventional public containers. Noise reduction. No smell emissions. Offer good possibilities to integrate identification and weighting systems. No expansion possible.	

Recycling yard (bring system)

A recycling yard is an enclosed yard very often operated by municipalities where big containers for recyclables are assembled and commonly also hazardous substances and special waste can be disposed. It is possible to discard large objects e. g. big cardboard packaging, because the containers are usually open. Graphic paper for recycling and board/cardboard are in most cases collected separately. It is not recommended to offer recycling yards as the only system for residents because of their low user-friendliness.

	Recycling yards	
User-friendliness	Very often only accessible by car. Long distances to reach collection point, especially in rural areas. Causing fuel costs very often without compensation for separate collection. Good for large formatted paper for recycling. Less convenient for working people, because opening hours very often correspond with working hours.	--
Quality of paper for recycling	Very good with only very few impurities, because delivered paper for recycling is checked by staff. Educating of residents possible.	++
Costs:	Experience: specific collection cost in €/t roughly 30 % lower than for onsite bin/containers and public containers /30/.	+
Other aspects	Planning recycling yards the location should be chosen carefully as they require a high level of mobility of residents. With low mobility rates especially locations closed to frequented spots, e. g. shopping areas, are beneficial.	

Collection shop (bring system)

Collection shops are privately owned collection points where citizens can bring their recyclables like paper and board. In return they receive a small amount of money based on the weight. Often collection shops have the dimensions of recycling yards. Graphic paper and board/cardboard are selected separately at collection shops. Collection shops are very often used by resident with lower income.

	Collection shop	
User-friendliness	Often only accessible by car. If so => causing fuel costs, but offer small compensation for separate collection. Less convenient for working people, because opening hours very often correspond with working hours.	-
Quality of paper for recycling	Very good with only very few impurities, because delivered paper for recycling is checked by staff. Educating of citizens possible.	++
Costs	Probably similar to recycling yards.	+
Other aspects	Location of collection shops closed to frequented spots, e. g. shopping areas, are beneficial, especially in rural areas as they require a certain level of mobility. The existence of collection shops may motivate paper thievery from easy accessible onsite bins/containers and public containers.	