



2. TECHNICAL SPECIFICATIONS REGARDING THE PAYT APPROACH

The identification of the waste service user is mandatory to develop a PAYT scheme where the taxpayer contributes according to their performance (quantity of generation and quality of separation).

A starting point in the configuration of PAYT and KAYT (Know-As-You-Throw scheme¹) is deciding which waste fractions will be monitored. The fractions to be monitored are those that will be used to calculate the fee of each user, either to charge them or to incentivize their separation or to report information in the KAYT system.

2.1. Technology for user identification and punctual measurement

The waste charge varies according to the amount of waste delivered for the fractions that are charged. The amount of generated waste of these fractions can be measured by volume, weight, or, less precisely, by the number of deliveries. In door-to-door systems, it is generally measured by volume. Hence, each taxpayer has standardised buckets or bins with a known volume, which is registered with each use. In the case of pre-payment systems using a pre-paid bag, the price of the bag also varies according to its volume. However, there is also the possibility of measuring by weight; in this case, a high-precision weighing system must be incorporated in the truck.

In closed smart containers, a volumetric chamber or drawer system can be installed. These chamber systems mainly consist of a rotating semi-cylindrical drum anchored to the lid of the container, with an opening system linked to user identification. The chamber system or the volumetric drawer has a limited disposal volume (e.g. 20, 30, or 50 litres), so every delivery represents the volume of the drum. These chamber systems may also incorporate a scale that weighs the delivered waste.

In closed smart containers without chamber system, only deliveries per user can be measured. With the number of deliveries per user, the information on the frequency of collection and the total container volume, it is possible to calculate the average volume per contribution and -if there is a limited amount of users that have permission to access each container- the average value delivered per user can be calculated.

2.2. Considerations about fractions to be measured

To decide which fractions to measure or include in the design of the new fair waste charge or PAYT scheme, the following must be considered:

¹ In parallel to PAYT schemes, KAYT schemes promote knowledge to the user of their behaviour (number of deliveries made of each fraction) and with this and the presence of prizes linked to good behaviour, an improvement of waste results wants to be achieved.





- Taxing the residual waste represents an incentive both to reduce residual waste and to participate in waste selective collection. For this reason, this is always a fraction to monitor and charge in a PAYT scheme. Some systems are only based on incentivising separate collection of biowaste and recyclables to prevent impurities in these fractions, so prefer to leave residual waste unmonitored.
- The organic fraction represents the most important fraction by weight and is the priority to collect selectively.
 - At household level, it is not recommended to charge so as to not discourage correct separation. To achieve a correct separation, it is recommended to monitor and incentivize it with bonuses (PAYT).
 - On the other hand, in large commercial waste producers, it is suggested to charge organic waste (PAYT), since commercial generation varies a lot depending on the type of business, and for some of them the volume of generation requires high frequency of collection, thus increasing the cost of the service. Therefore, the organic fraction, in general, is proposed to be charged at the commercial level to differentiate the waste charge between the businesses that generate significant amounts of organic waste and those that do not.
- The packaging fraction can be significantly reduced through changing habits, and it is one of the most difficult fractions to recycle, so there are also reasons to charge it. Some municipalities have decided to apply incentives for packaging separation, but it is not highly recommended because it can have the unintended consequence of encouraging its generation. When it is charged (PAYT), the fee should be lower than the residual fraction to not discourage its proper separation.
- Paper, cardboard, and glass are fractions that are not worth charging so as to not discourage their selective collection. Furthermore, collection of these fractions does not represent a net cost for the municipality due to the income they can generate. Moreover, they are fractions that are already very consolidated and generally well separated.

2.3. Relating the tariff to the measurement

The fractions that should be charged or incentivised depend on the waste collection system in use (doorto-door, smart containers, or a combination of both). In this chapter, different demonstration cases are presented.

- In a door-to-door collection system, it is recommended to charge the residual fraction and, if necessary, the packaging fraction because these are the fractions that are highest priority to reduce. There is also the possibility of incentivising the organic fraction applying bonuses to encourage its separation.
- In a smart container collection system for households, a charge on residual waste fraction and a bonus for participating in the organic waste collection could be applied based on the number of deliveries. The residual fraction is recommended to be charged because it is the fraction that is highest priority to reduce. A chamber system is recommended to introduce for this waste fraction to measure the quantity of waste disposed of. The organic fraction bonus is recommended because it encourages proper separation, but also because it minimizes the risk of waste tourism or dumping. In addition, to avoid waste tourism or illegal dumping, it would be





necessary to do thorough monitoring of the data to detect possible abnormalities among the taxpayers.

- In mixed collection systems, where areas with door-to-door collection and areas with smart containers coexist, a similar system could be applied in both models in order to minimise waste tourism. For this reason, it would be recommended to apply a model that charges and bonuses equally in both areas of the municipality, such as, for example, a payment model according to the number of deliveries of residual waste fraction, and an incentive model through bonuses according to the number of deliveries of the organic waste fraction.
- In the case of a commercial door-to-door collection system, residual waste and packaging waste could be charged based on the volume and number of deliveries. Additionally, the organic waste fraction could be charged; however, this fraction could be charged through a pre-paid system and would be paid by the annual contracted volume to not discourage its separation. If the risk of illegal dumping to containers in the public space is high (the inappropriate use of containers from businesses under door-to-door collection systems) incentivisation of organic waste separation is recommended.

In contexts with door-to-door collection for both households and businesses, as there are no potential escape points in the public space, any commercial pay-as-you-throw model can work properly if it is appropriately planned and implemented. On the other hand, in contexts with household collection through open containers in the public space and with an exclusive commercial door-to-door collection, it is important to assess which model of pay-as-you-throw would be the most robust to minimise the leakage of commercial waste into the household circuit.

In these cases, businesses must use different models of containers from the ones that are used by households, to discourage fraud. The model of pre-payment per bucket with a predetermined frequency does not create incentives for fraud, since the amount is paid in advance; however, it does not create as many incentives for recycling and reduction. The commercial pay-per-bag model would be the most difficult to monitor and could have many system breakpoints and illegal dumping.