



CirBioWaste

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“CirBioWaste”

*Fostering innovative and sustainable bio-waste
management and circular bio-economy in the
Mediterranean area*

Pay-as-you-throw (PAYT) waste charges

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zero.





OUTLINE

- 1. The PAYT concept**
- 2. Main types of PAYT Schemes**
- 3. Overview of PAYT schemes**
- 4. Fractions recommended for charging/incentivising**
- 5. Main Elements to consider**
- 6. Technology of identification**





THE PAYT CONCEPT

The **fairest** waste charges, and the **ONLY** ones **capable of creating an incentive** to reduce waste and increase separate collection, are those that link payment to the quantity and type of waste:

TAX BASE

KG/LITERS

of waste generated per household

**Pay-As-You-Throw (PAYT)
systems**



A meter is needed...

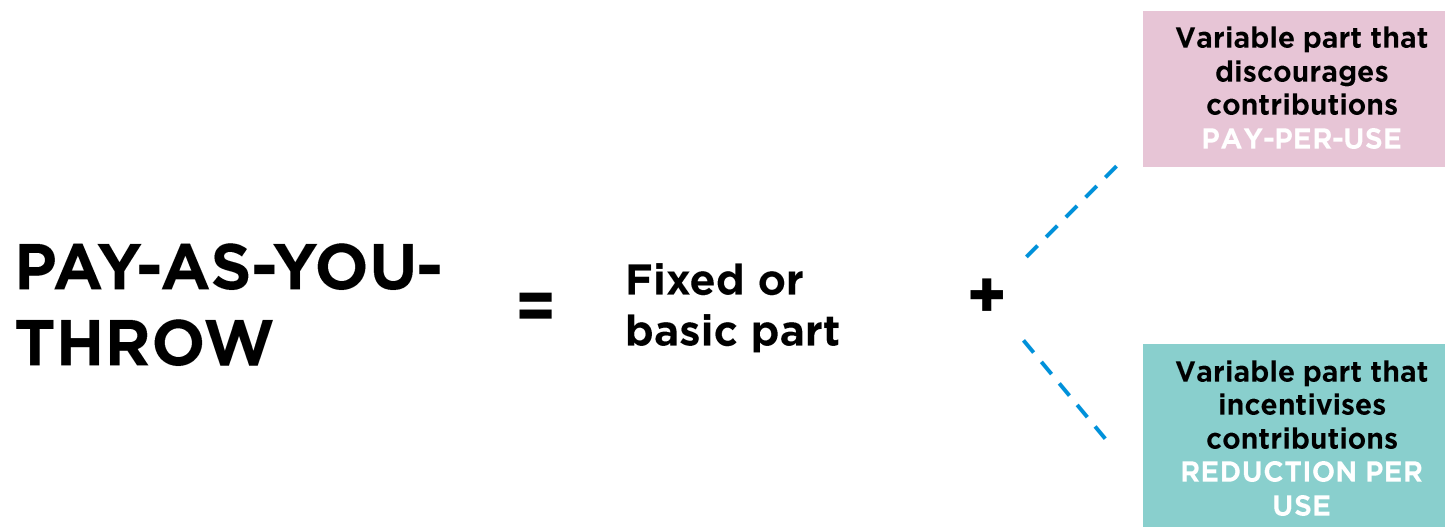


WHAT IS PAY AS YOU THROW?

- Payment of the waste charge based on the waste actually generated and the service provided.
- It requires the *identification of the generator* and the *estimation of the quantity of waste generated* **(A METER IS REQUIRED)**
- Structure: a fixed (or basic) part, independent of waste contributions, and a variable part that depends on the quantity of waste generated.
- The incentive created will depend on:
 - The choice of which fractions are charged or receive a reduction in the variable part.
 - The distribution of weights in the **structure** of the charge.



WHAT IS THE PAY-AS-YOU-THROW CHARGE?

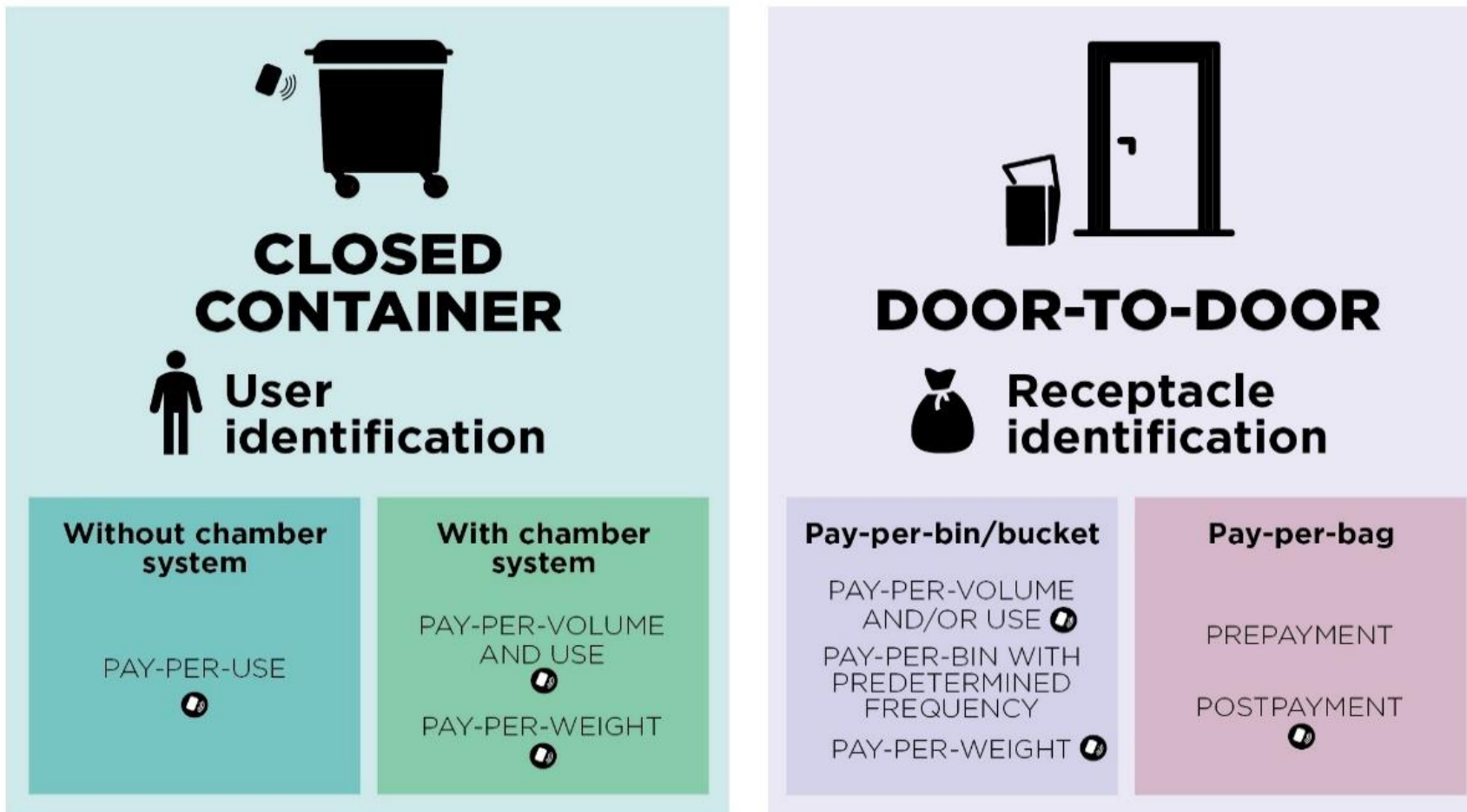


- Variable part: **pay-per-use** for fractions to be discouraged, such as the residual waste fraction or a **reduction per use** for fractions to be incentivised, such as the organic fraction (bio-waste).



PAY-AS-YOU-THROW (PAYT) SCHEMES

Types of PAYT systems





PAY-AS-YOU-THROW (PAYT) SCHEMES (some pictures)





PAY-AS-YOU-THROW (PAYT) SYSTEMS

Overview of types

a) DOOR-TO-DOOR (receptacle identification)

PAY-PER-BIN/BUCKET (with or without TAG):

- 1) PAY-PER-VOLUME AND/OR USE (number of collections)
(with RFID tag or similar)
Spain (Catalonia, the Balearic Islands and the Basque Country).
Italy.
Belgium (Antwerp).
- 2) PAY-PER-BIN WITH PREDETERMINED FREQUENCY (no RFID tag, with sticker)
Germany: widely applied.
United States (San Francisco).
Spain: applied at commercial level, mainly for the organic fraction.
- 3) PAY-PER-WEIGHT
South Korea (Seoul).





PAY AS YOU THROW (PAYT) SYSTEMS

Overview of types

a) DOOR-TO-DOOR (receptacle identification)

PAY-PER-BAG

Prepayment systems (bags without ID)

Spain: Argentona (Barcelona), Esporles (Mallorca)

Italy (Milan)



Postpayment systems (bags with tag)

Spain (Lleida)

Italy (Bergamo)

Switzerland (Zurich)





PAY-AS-YOU-THROW (PAYT) SYSTEMS

Overview of types

a) **CLOSED CONTAINER (user identification)**

(via key fob, ID cards or mobile phone)

PAY-PER-USE (number of deposits, with a possible limit on access days)

Spain (Sant Just Desvern (Barcelona), Sallent and Fonollosa (Barcelona)), Italy (Imola), Belgium (Antwerp), China (Hangzhou).

PAY-PER-VOLUME AND USE (number of deposits + limited volume, chamber system)

Austria (Styria), Norway (Bergen), Netherlands (Leiden), Germany (Heidelberg, Schwerin, Leipzig)

PAY-PER-WEIGHT (chamber system)

Sweden (Linköping)





FRACTIONS RECOMMENDED FOR CHARGING / INCENTIVISING

HOUSEHOLD AND COMMERCIAL / Door-to-door and closed containers with ID



- **Residual waste fraction (Residual Waste):** the main fraction to charge, since it creates an incentive for waste prevention and participation in separate collection. However, charging for this fraction may increase the risk of illegal dumping or waste tourism: monitoring and data-analysis mechanisms must be established.
- **Organic fraction or bio-waste (Bio-waste):** represents the heaviest fraction of municipal waste and must therefore be considered a priority in separate collection systems. For this reason, PAYT recommends:
 - At household level: charging this fraction is not recommended, as it could discourage correct separation at source. It is preferable to apply incentive mechanisms (reductions), as in SAYT systems.
 - At commercial level: for large commercial producers, charging the organic fraction is recommended, due to the high variability in generation levels between businesses and the higher costs associated with its collection.
- **Packaging fraction:** may also be subject to a charge, given its high prevention potential and the existing difficulties for its recycling. However, the applied tariff must be significantly lower than that of the residual fraction, so as not to discourage separate collection.
- **Paper-cardboard and glass fractions:** are normally not charged, as doing so could reduce participation in selective separation.





ELEMENTS

- **Selection of the PAYT model:**
 - Present and future separate collection model (DtD vs street containers)
 - Investment
 - Risk of leakage to other areas
- **Structure of the charge:**
 - % of cost coverage and distribution between:
 - General part (flat rate or not) / Variable part
 - Households / commercial activities
- **Selection of the waste fractions subject to PAYT:**
 - Residual waste (+)
 - Packaging waste (+)
 - Bio-waste (+/-)



TECHNOLOGIES FOR USER IDENTIFICATION

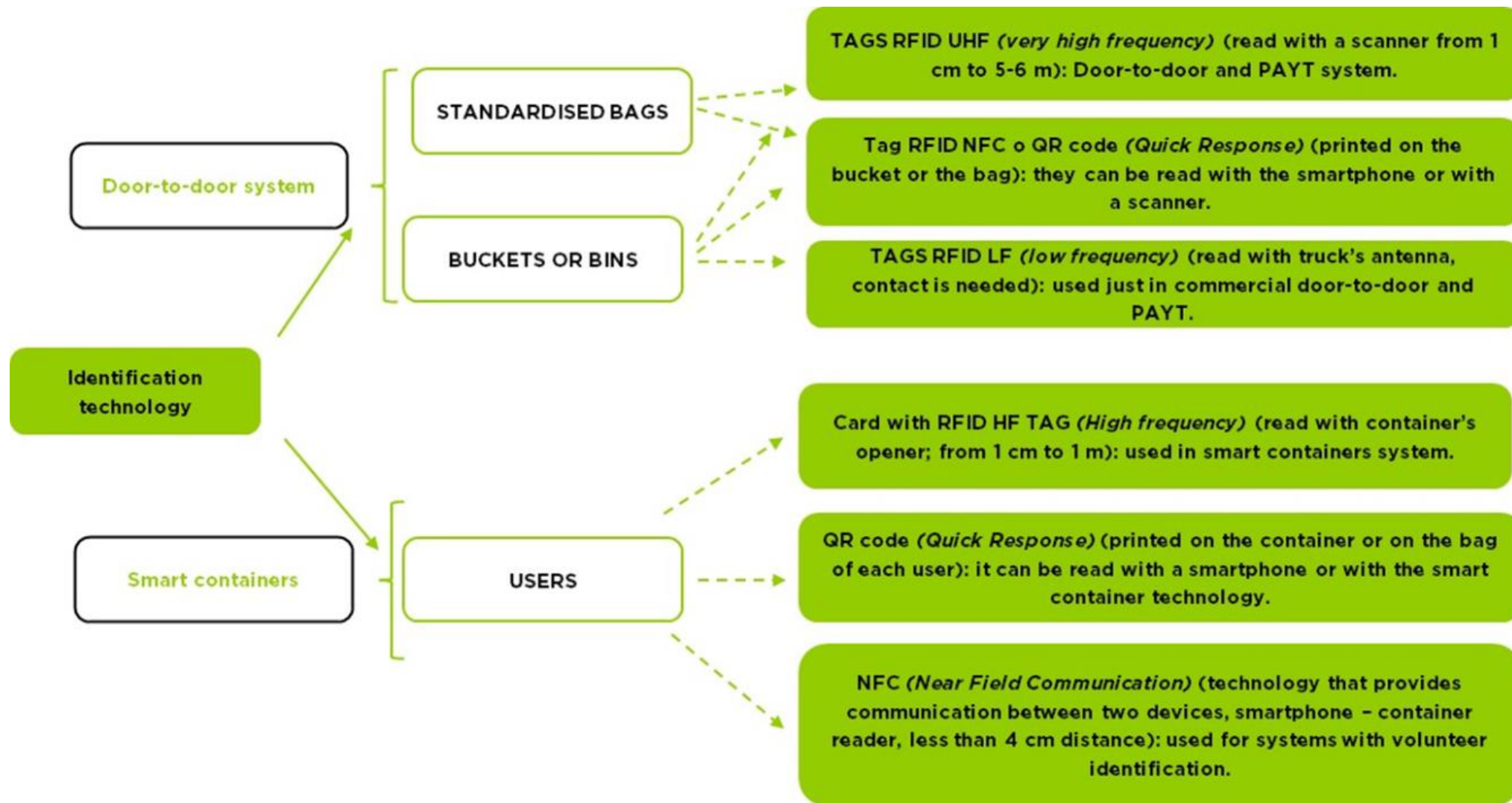


NO TECHNOLOGY: VOLUME-BASED AND PREPAID BAGS

- They represent the first generation of PAYT systems in Europe.
- They remain among the most widely used models thanks to:
 - low cost,
 - administrative simplicity,
 - and high replicability.
- Low-tech PAYT systems can be highly effective.
- They work especially well when combined with:
 - control and monitoring,
 - awareness campaigns, and
 - citizen education.
- They remain a benchmark for new PAYT systems.



USER IDENTIFICATION TECHNOLOGY





RADIO FREQUENCY IDENTIFICATION 1/4

The minimum requirements for radio frequency identification (RFID) are an antenna, a reader, and a tag. The reader sends a signal to the tag through the antenna, and the tag responds with its information.

PASSIVE RFID tags have no power source of their own; they are powered by the electromagnetic energy transmitted by the RFID reader (e.g. tags attached to bins, read by the truck's antenna or a wristband). Because radio waves powerful enough to energise passive tags are needed, the read range is shorter, ranging from near contact to 25 metres.



RADIO FREQUENCY IDENTIFICATION 2/4

The operating frequency or wavelength emitted by the RFID reader determines its application:

- High Frequency (HF): a frequency with a typical read range of 1 centimetre to 1 metre. A typical application of this frequency range is user identification using passive RFID cards (smart cards) at readers fitted in the lids of closed kerbside containers. Each use is recorded.



Source: Twente Milieu;
Styria (Austria), ID&A





RADIO FREQUENCY IDENTIFICATION 3/4

- Ultra High Frequency (UHF): its very short wavelength allows a long read range for RFID tags: typically from 1 to 5–6 metres. Applications of UHF include identifying RFID tags attached to Door-to-Door (DtD) waste bins by using the truck's antenna or a wristband.



Source: Contarina (Veneto), ID-Waste.



RADIO FREQUENCY IDENTIFICATION 4/4

- Low Frequency (LF): a long wavelength that requires close contact between the truck's antenna and the RFID tags fitted to the bins when the lifter loads the wheeled bin on the truck. LF has been used for many years in commercial Door-to-Door (DtD) collection.





NEAR FIELD COMMUNICATION

NFC technology enables communication between two electronic devices, one of which is usually a portable device such as a smartphone. The two devices must be no more than 4 cm apart.

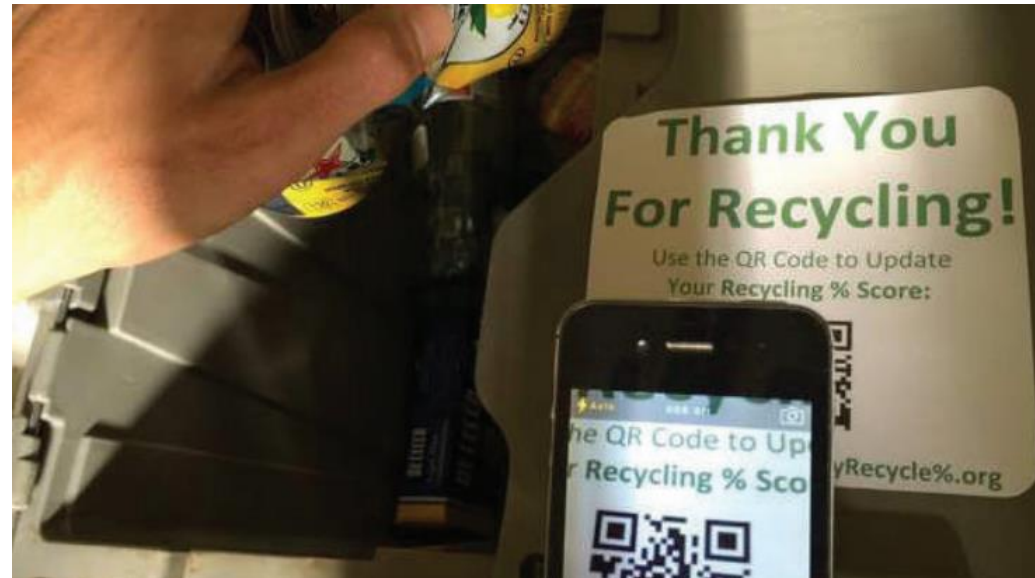
NFC-enabled devices can, in turn, act as a reader, as key, or an electronic identification document.





QR CODE

A *Quick Response* or QR code is a square two-dimensional barcode. Its main purpose is to store and transmit information, generally to *smartphones*.





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Thank you!

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