Environmental and economic footprint of know-as-you-throw (KAYT) actions

Key results from the REThinkWaste project

Discussion panel 1: Life cycle instruments for regional policies

David Font Vivanco, PhD

Life Cycle Sustainability Manager, Eco Intelligent Growth
d.font@ecointelligentgrowth.net

06 JUNE 2023 | Brussels

Let me introduce Eco Intelligent Growth

1. Who are we

Eco Intelligent Growth (EIG) is a circular consultancy firm founded in 2005 based on the Cradle to Cradle® principles.

We are part of Grupo Construcía, a group of companies that offer circularity services, from strategic consulting to the construction of circular assets.

2. Our perspective on environmental protection and resource efficiency

We work with companies, organizations and regions to materialize the change towards innovative circular models that favor economic, ecological and social prosperity, focusing primarily on the built environment.

Oriented to action and innovation, we walk step by step with our clients to bring positive impact.

BARCELONA

Our experience

1. The project

The **REthinkWASTE project** (https://rethinkwaste.eu/) was funded by the LIFE programme of the EU from 2020 to 2023.

The main objective was to rethink municipal tariff systems and to improve the urban waste governance through an innovative model based on pay-as-you-throw (PAYT) + **know-as-you-throw (KAYT) approach**.

KAYT is an innovative concept to reduce municipal waste and increase separate collection through a **knowledge & persuasion-driven approach**. The idea is that the habits of citizens towards separate collection can be improved by informing them in a continuous and convenient way, combining technology, gamification, one-to-one meetings with real informers and some economic and/or social benefits.

4 (+3) pilot areas:

- Spain: Sant Just Desvern, Santa Eulàlia de Rançana, Cardedeu, El Brull
- Italy: Bassano del Grappa, Varese, Bitetto.

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2. The objective and the approach

One of the objectives was to **quantify the environmental and economic footprint of KAYT actions to understand if and under which conditions such actions led to overall improvements in costs and environmental impacts**. The partner responsible for this objective was 2.-0 LCA consultants.

The approach was based on a Life Cycle Assessment and a Life Cycle Costing of the KAYT actions in 4 pilot areas.

- Hybrid LCA combining process-based and input-output inventory data
- Consequential LCA with substitution potentials by material
- 16 impact categories (Stepwise2006)
- Carbon footprint: Global warming (IPCC 2021)
- Life cycle costs with consistent currency, year, and price valuation.
- Baseline: 2019 data, waste collection and treatment, characterizations, costs/revenues, etc.
- KAYT: changes in (1) waste collection, (2) characterizations, and (3) additional inventories for KAYT actions (RFID, messaging platform, dissemination, prizes, human resources, etc.)

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2. The results: waste generation and KAYT costs

KAYT actions achieved a **significant reduction of unsorted waste** in the short term and in the implemented areas.

KAYT actions costed around **2,50 euro/capita** where PAYT with RFID infrastructure was already in place and around 13 euro/capita where new RFID infrastructure was needed.

	Sant Just	Bassano	Varese	Bitetto
Change in unsorted waste	-14.31%	-15.34%	-9.60%	-16.59%
Change in organic waste	1%	Not measured	Not measured	Not measured
Total KAYT spending (euro/capita)	13.41	2.50	2.76	2.30

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## 2. The results: carbon footprint and life cycle costs

The carbon footprint for total waste is notably reduced in all pilot areas, ranging from a 46% (Bassano) to 19% (Bitetto) reduction. This means that the additional impacts from KAYT actions are amply offset by impact reductions in other stages, mainly waste treatment. Such reductions in waste treatment stem largely from the sizeable decrease in unsorted waste in all pilot areas. **Life cycle costs increase slightly overall** in all pilots except Bitetto, with the relative differences ranging from 4.6% (Sant Just) to -0.4% (Bitetto).
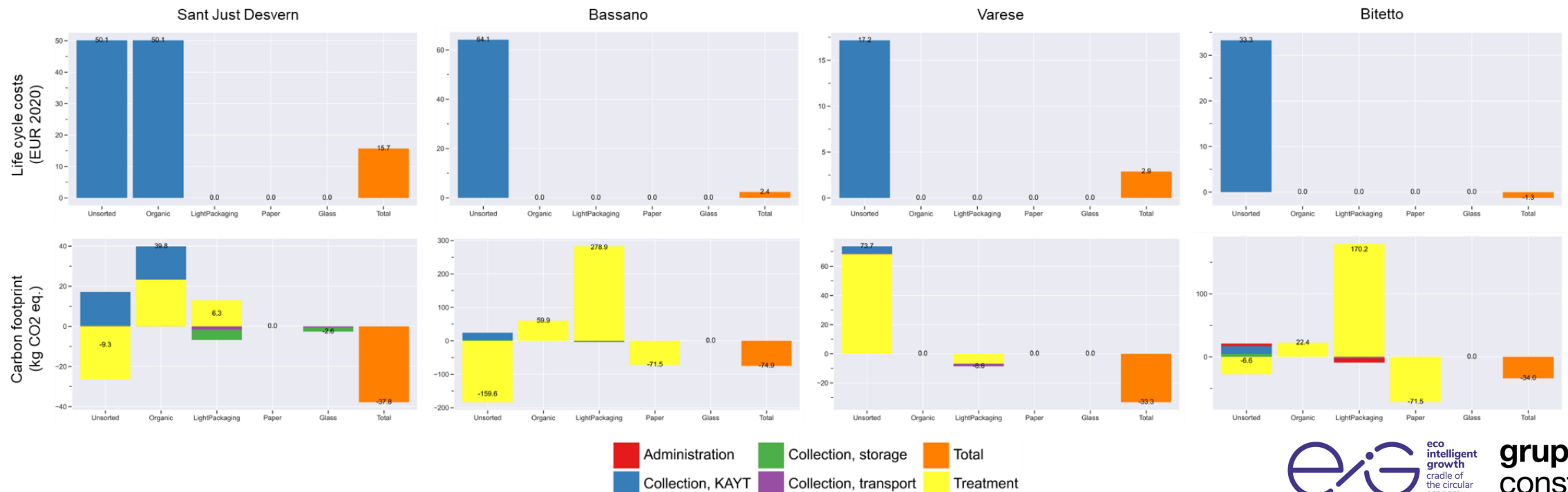
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2. The results: economic efficiency

Bassano is the pilot area with the highest economic efficiency as **one euro spent can reduce the carbon footprint by about 30 kg CO_2 eq. per inhabitant and per ton of total waste**. Such a high economic efficiency is the result of low implementation costs and high reduction in unsorted waste and subsequent decrease in the total carbon footprint. In contrast, Sant Just obtains the lowest economic efficiency with a reduction in the carbon footprint by about 3 kg CO_2 eq. per inhabitant and per ton of total waste (a factor 10 lower than that of Bassano). Such a low economic efficiency is the outcome of high KAYT implementation costs, largely due to the new RFID infrastructure and relatively low reduction in unsorted waste.
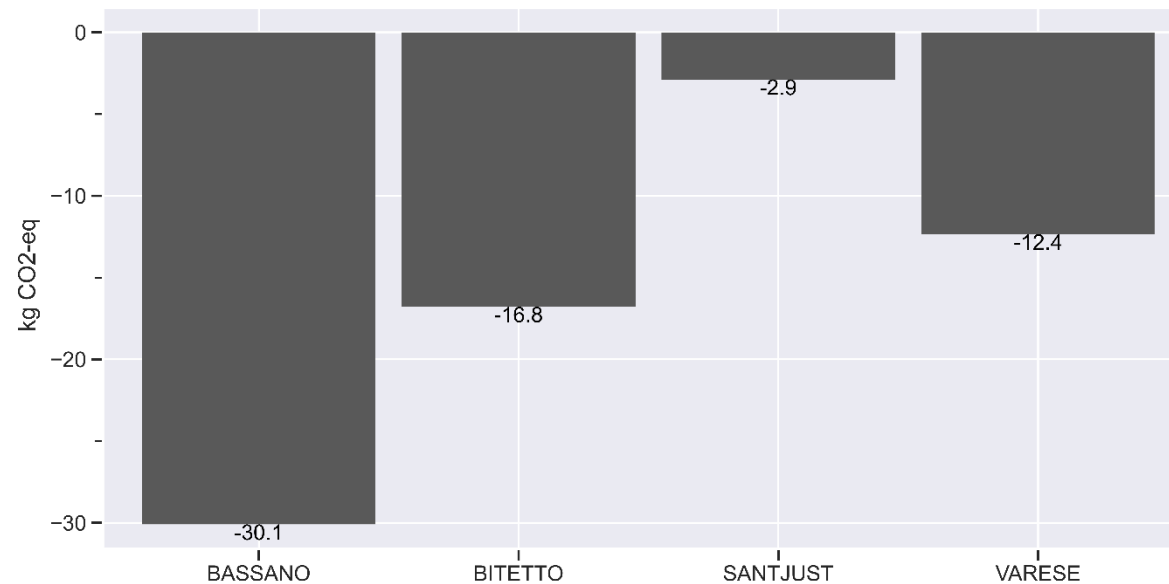
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3. The conclusions

- The results show the **potential of KAYT to notably reduce the carbon footprint of waste management systems with limited investment of economic resources.** In addition, the implementation of **KAYT requires little to no changes in waste collection schemes** and was **overall positively rated by participants** across pilot areas.

- PAYT and RFID infrastructure does not only lower implementation costs, but also provides valuable data which was used during KAYT implementation to better tailor the communications to participants.

- Limitations:

    - Self-selection bias: Were voluntary participants more prone to change their waste sorting habits?
    - Recency bias: Will the effect on waste sorting habits last?
    - Small sample
    - Modelling assumptions: uncertainty analysis shows some cases were carbon footprint increases.

- Notwithstanding the limitations, the results consistently show that the **additional carbon footprint from KAYT actions can be offset with less than a 5% reduction in unsorted waste, well below the observed range between 10 and 17% reduction across pilot areas**.

Thank you!

d.font@ecointelligentgrowth.net