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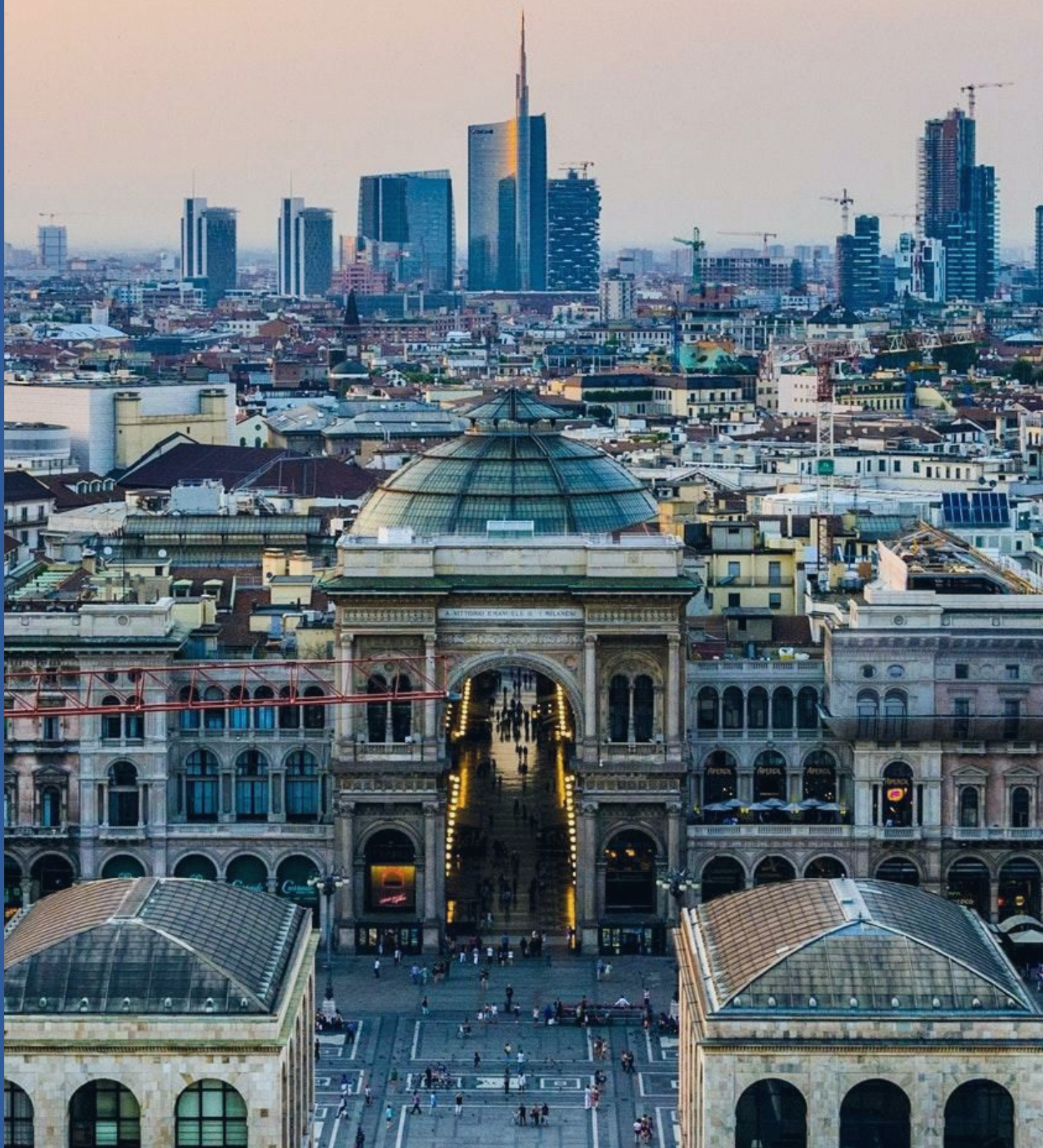
The Story of Milan

Successfully collecting food waste for over 1.4 million inhabitants



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In 2011, the city of Milan - densely populated with a population of 1.4 million inhabitants - took the decision to upgrade its waste management strategy by adopting a comprehensive approach to separately collect food waste.

Ten years later, after the first implementation phase starting in 2012, the city is one of the world leading examples regarding food waste collection, with 95 kilograms of food waste collected per inhabitant and an overall 62,6% waste collection rate, resulting in savings of approximately 9000 tonnes of CO_2 per year.

CONTEXT

Across the European Union, proper collection and recycling of bio-waste largely remains an untapped potential, with only 16% of the theoretical quantity being collected. The rest is incinerated or landfilled, therefore contributing to climate change via carbon or methane emissions. However, if properly collected and treated, it could positively contribute to benefit the environment through the creation and use of compost, as well as by reducing greenhouses gas emissions.

To incentivise this practice, the European Union has made bio-waste waste collection mandatory for all Member States by the end 2023. Even if the majority of countries are still lagging behind, many cities and regions have already started implementing food waste collection systems with great results. Among them, Italy leads by example with many good local practices including the city of Milan, which adopted ambitious measures on this matter 10 years ago.

According to the Waste Framework Directive (2008/98/EC), bio-waste is "biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food-processing plants". It means both food waste from households or restaurants (leftovers, peels or bones) and garden waste. In the case of Milan, the described system has been set-up for food waste.

In 2011 there were already several good examples of separate waste collection within the Lombardy region, where Milan is located, as well as several other small and medium sized Italian cities. However, with Italy's second largest population - 1.4 million inhabitants - which are densely populated together - 80% of the population living in high-rise buildings and a density of 7518 inhabitants per km² -, Milan's food waste waste collection rate was stuck around 35%.

After establishing a comprehensive food waste separate collection scheme through its waste management company AMSA, Milan is one of, if not the, best example regarding separate waste collection in big cities, with 110 kilograms of food waste collected per inhabitants in 2019, compared with an EU average of 18.84. The benefits of this system go beyond food waste collection only, as it positively impacts the whole waste collection system, with Milan's overall separate collection rate reaching 62.6% in 2020.

How did it all start?

After the 2011 municipal elections in Italy, the new government decided to adopt an ambitious separate collection scheme for the Milan area, with a specific focus on organic waste. At that time, Milan was collecting 28 kilograms of food waste per inhabitant in 2011 while the overall separate collection rate had increased by less than 8% between 1999 and 2012 - from 28,2% to 35% thus showing the need to improve the system.

Milan's new food waste collection system first started with the design of a comprehensive plan, spearheaded by an ordinance from the mayor but also including key logistical details for collection, a communication campaign for citizens and the delivery of kits - bins, bags and instructions - to households and businesses.

However, before the first roll-out phase, 2 pilots were organised in small areas of the city in 2008 and 2010. During that phase, workers were trained to collect food waste but also to teach citizens about the new collection stream.

It's only when all of the previous steps were completed that the implementation phase actually started, with a 2 month-long communication campaign including leaflets, posters and face-to-face communications with residents.

AMSA, the waste management company, then began the first roll-out phase in November 2012.

Over the next two years, the system was progressively implemented throughout the whole city - divided in 4 quadrants of around 300,000 inhabitants each. For each quadrant, a period of 6 months was foreseen with the last implementation phase ending in June 2014.

Collection of food waste

- 1997: Collection of food waste for commercial activities (canteens, restaurants and bars);
- 2008-2010: Pilot projects for household food waste collection;
- 2012-2014: Roll-out of the food waste collection system for households;
- 2017: Start collecting food waste fractions in market stands;
- 2018: food waste collection in markets is extended to the 94 markets of the city.

Implementing the food waste collection for a city of 1.4 million inhabitants was the main logistical challenge in the strategy. Therefore, a dedicated system has been put in place for three main categories, each of which require a slightly different collection approach:

1. Commercial activities such as canteens, bars and restaurants

Food waste collection for commercial activities has been in place since 1997, a long time before the 2012 comprehensive plan.

For these activities, which corresponds to around 25% of the total food waste that is collected within the city, the following criterias have been implemented:

- Door-to-door collection;
- The provision of 120 liter bins;
- Daily collection from Monday to Sunday at night.

2. Households

Food waste from households is the biggest part of collected food waste in Milan. To implement separate collection for this stream across the whole city, the following policies have been implemented:

- Curbside collection from households;
- The provision of either 120, 35 or 10 liter bins and compostable bags, to put in the bin. The smaller bins/bags are available on request for single houses;
- Collection twice a week in the early morning.

Picture 1: Household food waste bins

At first, during the workshop to inform inhabitants about the new system, citizens received a specific kit for food waste collection which was comprised of a 120 liters brown bin used for kerbside collection, the 10 liters small bins used for the collection of food scraps and 25 compostable bags (Complying with the European standard EN 13432).

The 10 liters bins are specifically designed to be vented, thus limiting the risks of odors and infections. Then, when people run out of compostable bags, they can either purchase them in stores or use the ones they get from buying fruits and vegetables in supermarkets.

3. Food waste fraction in open markets

Collection in open markets is the latest progress regarding food waste collection in Milan as it started in 2017, before covering all open markets by September 2018. In 2019, the system resulted in 2000 tons of food waste to be collected and then composted.

For open markets, the following criterias have been implemented:

- Special compostable bags with a bag holder;
- Collection everytime the market ends.

Transport and treatment of the collected food waste

Once the food waste is sorted and put in the proper bin, it is visually inspected by AMSA collection staff. If the inspection shows no sorting mistakes, the bags are then loaded onto the trucks and transferred to one of the two transfer stations in Milan before being sent to the treatment plant.

In the city center, collection is achieved by a truck with a 6 cubic meter capacity, without compaction and running on biodiesel or methane. In the outskirts of the city, which is less densely populated, larger trucks - with the ability to compact the waste they’re collecting - are operating.

Once the bags have been loaded, they are transported to either the west or the east transfer station, depending on the collection site, before being transferred, on the same day, to the Anaerobic Digestion plant of Montello where it is shredded and sorted before treatment.

The Montello plant produces both biogas - composed of 58% methane 42% carbon dioxide - from anaerobic digestion and compost from the digestate. Once food waste has been digested anaerobically to produce biogas, around 20% of the input can be mixed with green waste to be composted.

The plant is designed to treat 200,000 tons of food waste per year, with the potential of producing 16.000.000 m³ of biomethane and 40,000 tons of compost a year.

However, the plant has not reached its full potential yet, as in 2020 around 130,000 tons of food waste were treated in the plant. This allows for the production of 11,200,000 m³ of biogas - that can be used for AMSA vehicles running on biogas - and 26,000 tons of mature compost - of enough quality to be used on organic agricultural fields as 20% of the compost produced is distributed free of charge to households and farmers to promote its use while the rest is sold.

Picture 2: Organic Waste Collection

Communication and awareness-raising campaigns

As all the logistical details of the plan would have been rendered inefficient without the proper involvement of Milan's citizens, an important focus was given to communication,
awareness-raising and education. One of the most strategic parts was to develop the citizen facing materials as well as preparing the campaign during 6 months prior to the roll-out phase, sometimes using external experts.

First, before the roll-out phase in 2012, a specific communication campaign was made to communicate and educate the public on how the system for food waste collection will work. For each city quadrant, the campaign started 2 months before the beginning of the roll-out phase. Several communication tools were used such as letters sent to households, leaflets, stickers, posters in bus stops, newspaper articles and even television or radio advertisements. In addition to this, face-to-face meetings were organised with citizens and building managers to explain the new system, answer questions and deliver the composting kits containing the 10 liters bin, compostable bags and collection calendars.

However, even after the initial roll-out, active and constant education has remained necessary to maintain and improve the sorting habit. Therefore, AMSA's first communication campaign has been complemented with the following tools:
A free smartphone app PULIamo that provides an explanation and further details about food waste separate collection;

- A website where all the information and recent updates can be found. As Milan is a multicultural city, this information can be found in 10 different languages;
- The addition of the circular aspect of food waste in Milan in educational school programs;
- A 24/7 customer center that receives around 380,000 calls a year about the overall waste collection system.

In addition to this, financial penalties have also been introduced to encourage compliance with the system. For instance, when cleaners are inspecting the collected bins, fines can be given to households or businesses where there is too much impurities or contamination within the food waste that is collected separately.

Results of the strategy

Food Waste Collection

After 10 years of implementation, the food waste collection scheme in Milan shows great results. Between 2011 and 2015, the yearly quantity of collected food waste per capita rose from 28 kilograms to 95 kilograms, reaching 110 kilograms in 2019, almost 6 times higher than the EU average. In 2020, this number decreased to 91 kilograms due to the waste management system being heavily affected by the COVID-19 pandemic. In total, the latest years show an average of 130,000 tons of food waste being yearly transformed into biogas and composted afterwards.

In terms of quality, the system also shows positive results with an average impurity and contamination rate that remains below 5% - meaning at least 95% purity as deemed fully compatible with the subsequent treatment operations by the Italian Composting and Biogas Association (CIC). To measure contamination from non-compostable materials, analyses are carried out in the 4 quadrants every 6 months. However, in spite of the low contamination levels, most of it comes from problematic products such as plastic bags or nappies.

Waste Management

Furthermore, implementing and improving the food waste collection scheme cannot work in isolation and has an impact on waste collection as a whole. By collecting food waste, there is less of a need to collect residual waste - as the volume of this stream is reduced due to the fact it was composed mostly of food waste previously - hence a reduced collection frequency. Additionally, other dry recyclables streams are less likely to be contaminated by food scraps and therefore are of a higher quality, easier to recycle and are more likely to keep their value when placed on the recycling market.
Therefore, it can be observed that the overall separate waste collection has strongly increased after the introduction of the household food waste collection scheme.

Between 1999 and 2011, the separate collection rate rose by a bit less than 8% - from 28,2% to 35%.hereas between 2011 and 2015, when the food waste collection system was first rolled out, it rose by 17% - from 35% to 52% - and has since reached 62,6% in 2020, one of the most impressive rates in Europe for such a densely populated city. Therefore, we can see from the Milan experience that the impact of the successful food waste collection schemes go beyond just the organic stream, as it comprehensively affects the whole waste management system for the better.

Economic and environmental benefits

The new waste management system also has a positive economic impact for the city, as it contributed to diverting high quantities of food waste from landfills or incineration to be properly recycled instead, thus reducing the city's disposal fees. In Lombardy, it costs approximately 100 EUR to dispose of 1 ton of residual waste and 70 EUR for treating- anaerobic digestion and composting - 1 ton of food waste.
Between 2011, when 36,000 tons of food waste were collected, and 2019, when 130,000 tons of food waste were collected, it is 94,000 tons of food waste that have been diverted from disposal. By anaerobically digesting and composting these materials instead of relying on a disposal treatment, the city saves 30 euros per ton diverted from disposal. Therefore it can be estimated that in 2019, compared to the 2011 level of collected food waste, the city saved 282,000 euros in food waste treatment.

As for the environmental benefits, the proper treatment of 130,000 tons of food waste per year results in savings of around 8760 tons of CO_2 emissions, the equivalent of 4600 flights Paris-New York.
The production and use of biogas - 11,200,000 m³ per year - can be used as fuel for the 400 biogas waste. collection and transportation trucks belonging to AMSA.
In addition, the 26,000 tons of compost are of good enough quality - due to the low contamination rates - to be used for organic food production.

Next steps and lessons learned

Although Milan is one of the best examples for food waste collection in the EU, one next step the city can consider which would result in even higher collection rates, is to switch to a pay-as-you-throw (PAYT) system.

The decision to implement PAYT has already been made by the municipal council and studies are being carried out by AMSA. Another important step for the City of Milan would be to reduce its reliance on incineration, instead opting for a broader Zero Waste Strategy, crucially including a transitional solution for residual waste that is sustainable and aligns with the continent's long term vision for a circular economy and decarbonised society.

Among the many lessons that can be learned from Milan's journey, the two main ones are the logistical preparation and the alignment of the different stakeholders around the project.

First, the logistical work to run a food waste collection system for 1,4 million inhabitants is extremely complex and has been done through precise planning, study and analysis to ensure the right logistic and communicative material is used everywhere. Then, the alignment of all stakeholders behind the project was essential. Besides the close collaboration between the municipal council and the waste management company AMSA, the involvement of citizens was key and has been thoroughly done through ensuring the wide availability of key information and a more proactive approach to explain and inform citizens about the functioning of the system.

With a population of over 1,4 million inhabitants, most of which is densely-populated within a small geographic area, Milan is the best European example for food waste separate collection in a big city. After setting-up a comprehensive plan for food waste collection, the city achieved great results within 4 years, significantly improving the volume of food waste collected from households and businesses.

The achievements not only show that with a well-designed plan, high collection rate can be achieved in a densely populated city, but also that by focusing on food waste, the whole waste management system will benefit in the end. Indeed, after setting-up the food waste scheme, separate collection quickly rose beyond the EU 2020 recycling targets of 50% to reach 62,6% in 2019. In addition, such a system has also led to economic savings and great environmental results.

With the 1st January 2024 deadline for all EU Member States to be collecting bio-waste separately, the story of Milan shows how other cities across Europe can follow in their footsteps to effectively collect and manage food waste, even in the challenging circumstances that large, densely-populated cities provide.

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For more information please visit: zerowastecitie.eu

Pictures: AMSA

Zero Waste Europe is the European network of communities, local leaders, experts and change agents working towards the elimination of waste in our society. We empower communities to redesign their relationship with resources, and to adopt smarter lifestyles and sustainable consumption patterns in line with a circular economy.

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