



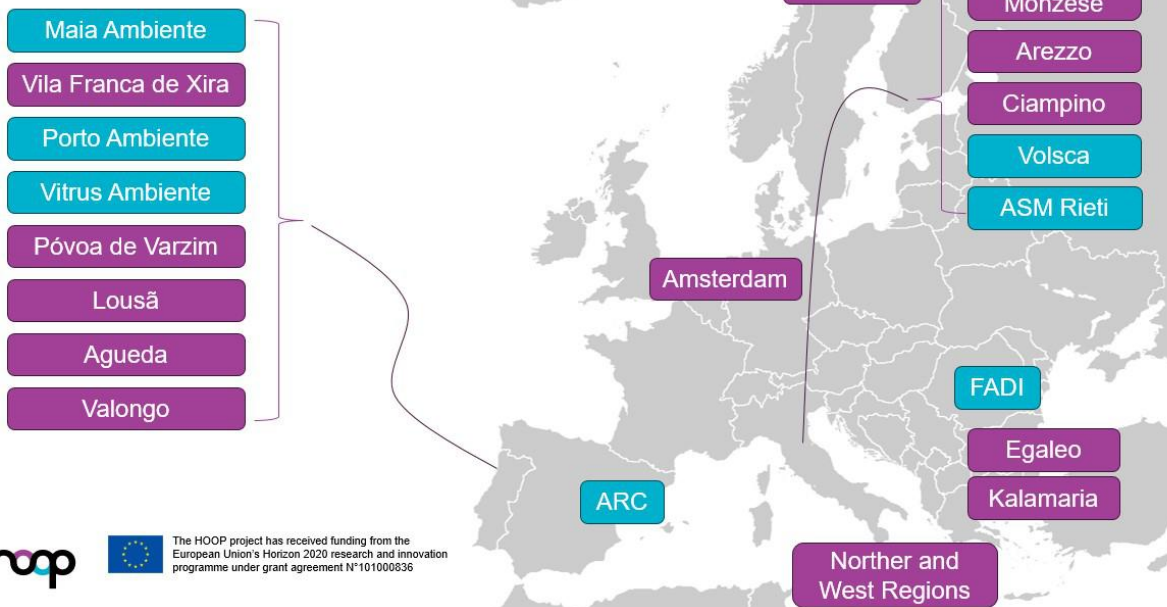
# HOOP Study Visit Florence

## Bio-waste collection in historical centres: engaging the HORECA sector

27 November 2024

The study visit on bio-waste collection in historical centres has been organised on 27 November 2024 by [ACR+](#) in collaboration with the HOOP Lighthouse Albano Laziale and the HOOP member City of Florence. It gathered 30 representatives of 21 members of the [HOOP Network of Cities and Regions](#) that could spend together a full day of learning, exchanging, field visits and inspirational talks.

### Which members are here today?



The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101000836





## PRESENTATIONS | Albano Laziale Strategy

### A cultural revolution in Albano Laziale

The morning was opened by the introductory speech of the mayor of **Albano Laziale**, Massimo Borelli, who stressed out the importance to constantly guide, involve, and support the citizens to reach high selective standards. The city of Albano Laziale launched the selective waste collection 11 years ago moving from street containers to a door-to-door system. This significant change has always been guided by a strong citizens' involvement that could stimulate a "cultural revolution". As a policy maker, being part of a project like HOOP gives the opportunity to identify innovative strategies and practices to implement.

### Challenges and results behind sorting rate

Between 2013 and 2021, Albano Laziale has reached outstanding results for its selective collection, both in terms of quality and quantity: becoming among the best Italian cities for its sorting rate. Nevertheless, the sorting rate decreased from 80% to 75% in the period 2021-2024. Thanks to its involvement in HOOP, the municipality could get insight on their difficulty in improving these results, connected to the lack of flexibility of services that did not consider the changes in the population and the emergence of new needs.. A constant analysis of the services, together with a strong and consistent engagement of citizens, are the ingredients used by Albano Laziale to keep following a path of innovation.

### The future plans of Albano Laziale

In particular, through the HOOP project, the city could learn more about the benefits coming from the valorisation of bio-waste. In fact, a biodigestion plant will soon be opened in the territory of Albano Laziale. Citizens keep being part of the city's decision-making process. The City hopes that the new plant will contribute to highlight the positive local benefits of citizens' sorting behaviours, both environmental and economic, and all their efforts in sharing and implementing the changes of the new bioeconomy strategy.

### Bio-waste collection in Albano Laziale

Andrea Vignoli, representing **ANCI Lazio and Albano Laziale**, presented the main results achieved by the city within the project and beyond, in terms of management and control of the quality of the municipal bio-waste. The path of Albano Laziale toward a circular bioeconomy strategy started in 2017 with the implementation of the door-to-door collection of 5 main fractions: paper and cardboard, glass and metal, plastic, organic waste, and residual waste. In order to facilitate the adaptation of citizens to the new system, a awareness-raising campaign has been implemented, guiding the citizens to change their habits. The new system integrated additional services such as collection on demand for nappies, punctual collection of used cooking oil and batteries, etc. In 2019, the municipality implemented a Pay-As-You-Throw system only for residential areas. This was then extended to the HORECA sector, but the covid pandemic put a brake on it. A key action was the continuous discussion with citizens to avoid the high risk of decreasing the quality of the separated streams. A strong awareness-raising campaign and regular quality checks allowed to mitigate this risk. The municipality





adopted the strategy of talking with citizens that did not respect the new rules: dialogue was preferred over economic penalties.

Albano Laziale has worked for years to reduce the amount of food waste per family, reaching 150 kg/year/household in 2021. The collected organic waste presented a very low impurity rate: 3.62% in 2021. The last analysis on the organic fraction has been made in July 2024, showing a small decrease in the quality. In fact, the organic fraction's quality reached 94,28%, compared to 96% beforehand. The impurities were mainly composed of diapers and non-biodegradable plastics. This has shown to the city that communication efforts must be continuous. The launch of the new anaerobic digestion plant will be a way to "reactivate" the participation of citizens, showing them the importance of their role to ensure high quality of the bio-waste collected.

### **SCALIBUR project to systematise mobility of the collection service**

Through the SCALIBUR project, the city analysed the mobility service related to the bio-waste collection. The collection was happening most of the time when the containers were only 15% full, and was organised 5 times per week for the HORECA sector. Volumetric sensors have been located inside individual bio-waste bins in 19 pilot users in order to evaluate when the collection was actually needed. After the experimentation, the collection frequency was reduced to once a week, drastically reducing the distances travelled by the trucks.

### **A new valorisation path for used cooking oils**

Within the project HOOP, Albano Laziale received a Project Development Assistance by several technical partners to identify the most suited bio-waste valorisation route. Thanks to this project, the city identified an interesting technology for the valorisation of used cooking oils (UCO). Albano Laziale, supported by ANCI Lazio and HOOP, with key stakeholders and interested investors, visited the Microbiological Laboratory of the NAFIGATE company to discover the management strategies of UCO waste and understand how to implement this in Italy. The technology, well described in this [factsheet](#), allows to produce a polymer that have many applications in the cosmetic industry.





Figure 1: Production capacity of the P3HB polymer production plant (from 175 t/year to 350 t/year of P3HB produced).

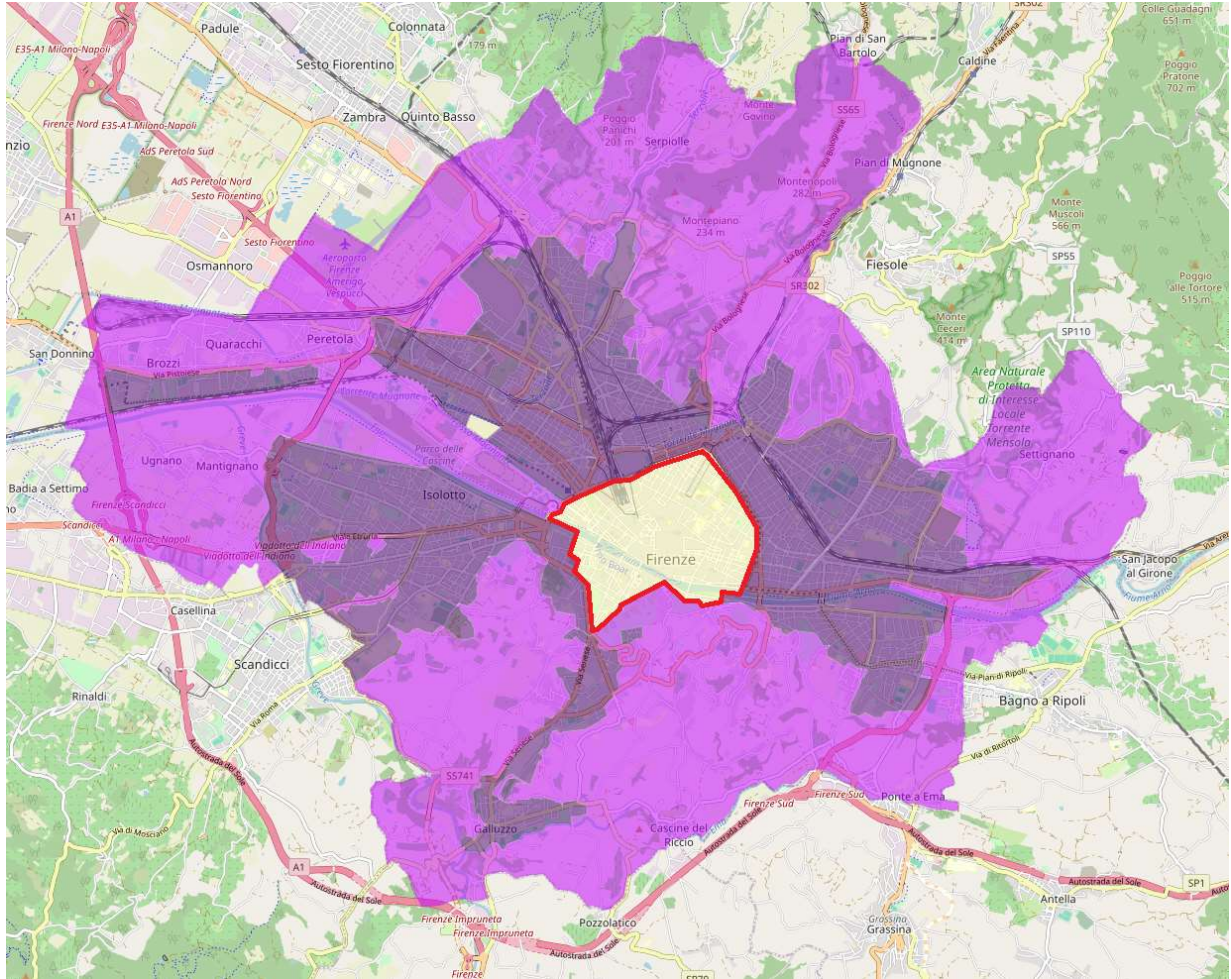
## PRESENTATIONS | Florence Strategy

### ALIA Multiutility to manage Florence's waste

Angelo Fazio, representing the local waste management company **ALIA Multiutility** managing municipal waste in the **city of Florence**, guided the participants through the different steps followed by to build the programme "Circular Florence". ALIA is the company in charge of the management of the integrated urban waste cycle in three provinces of the Tuscany Region. It serves 58 municipalities among which the cities of Florence, Prato and Pistoia. ALIA oversees the separate collection of paper, organic waste, glass, plastic, cans, bulky waste, and other complementary services, following the valorisation and recycling of these streams as well. Furthermore, ALIA collects and manages the residual waste of the three provinces. Organic waste constitutes 32% of the collected waste and is valorised through composting and anaerobic digestion plants.

### IT and innovation in the waste collection systems of Florence

The project "Firenze Città Circolare" aims at transforming the collection services adapting it to more than 350,000 residents, but with approximately 800,000 daily visitors in the city, as users (students, workers, and tourists), who produces almost 50,000 tonnes/year of waste only in the historic city centre area. Within the project, smart containers and a door-to-door system have been implemented in the urban area ,while the historical centre is served by the underground bins.



*Figure 2: Different collection systems implemented in Florence. The purple area is served by a door-to-door system, the dark purple area with smart above ground containers, and the area circled in red is the historical centre where underground containers are being implemented.*

ALIA seeks for innovative solutions through an open innovation project. The main activity that is changing in ALIA is the integrated collection system that starts from the containers on the territory, all equipped with proprietary technologies capable of producing and transmitting data related to collection and citizens behaviour. As mentioned above, different collection methods have been implemented, tailored to each territorial context. In addition, an integrated IT system has been implemented to optimize the collection and the management of the tariff system. Specific data collection sensors are applied to the waste containers allowing the recording of citizens' behaviour, in terms of frequency, and type and volume of waste brought. This allows to intervene with targeted information and corrective actions if necessary. On the other hand, data enable the introduction of criteria to reward the good behaviours. The sensors give a diagnostic of the state of the container, such as the

filling level. This information system also help to understand trends and patterns linked to the habits of citizens and the areas where the service is carried out at a larger scale.

As part of the new integrated collection system, ALIA implemented a georeferenced data collection with advanced GIS systems that can monitor:

- *Progress of Planned Services (comparison with what has been carried out);*
- *Requests for "on demand" services.*
- *Recovery of rescheduled services.*
- *Deliveries to recovery and disposal plants.*
- *Dynamic filling of road containers.*
- *Filling of collection vehicles in service.*
- *Impacts from events external to the service (from different sources).*
- *Creation of a maintenance order in the event of an anomaly in the sensors on the bins.*
- *Appointments and deliveries to the Eco-centres*

### The involvement of all the city users

The project extended the waste delivery tracking system to all the collection methods:

- *Underground containers placed in the historical centre: a smart key or an app is available for all the residents and city users in order to open the containers.*
- *Door-to-door: sensors are located both on the household bins and the trucks*
- *Smart road containers: sensors control and calculate the volume of the waste*



Figure 3: Smart key and container

Citizens are provided with a smart key to dispose of their waste in underground and above ground containers. To monitor the behaviour of all the city users (students, non-resident workers, and tourists), ALIA developed an app for smartphones that allows to open the digital containers without a badge. The containers are equipped with a volumetric sensor developed by ALIA. The sensor is based on multi-zone TOF (Time of Flight) technology, and it evaluate the volume of each individual waste brought and associate it with the user.



Figure 4: Volumetric sensors located in the containers

### The underground container system in the historical centre of Florence

The separate collection of paper and cardboard, in the historic center, is not collected with the underground containers, but is carried out with a door-to-door system for both domestic and non-domestic users. The quality of separate collection with underground containers is good for organic waste, but the quality is lower for light dry recyclable waste (plastic packaging and metal cans). This phenomenon is typical of areas with high tourist and non-resident attendance but does not affect the separate collection performance (close to 60%) and the impact on the historical architectural scenario of the city is kept under control.

The choice and adoption of the **underground container model** as a collection system for the historic center of Florence has been recognized as best practice by UNESCO. Currently, 60 sorting areas including underground containers for the different collected fractions have been built out of a fully operational total of 94. Due to the very important historical and archaeological role of the centre of Florence, a very strong and long collaboration has been built with the Regional Agency for the protection of Archaeological Sites, to identify the right locations for the underground containers.

### Innovative intelligent driver assistance for waste collection trucks

An additional element of the project has been the implementation of an intelligent driver assistance system into the waste collection trucks. The experimentation, in collaboration with the manufacturing company Mobileye – Intel Company and the University of Florence, has made it possible to develop a more high-performance system



that is particularly suited to critical driving conditions in hyper-used urban contexts. “Fisheye” is a driving assistance system based on computer vision technology that is part of ADAS (advanced driver assistance systems) devices, used on self-driving vehicles. The dynamic camera coverage system, which avoids blind spots, even on the cab front.

### The communication strategy of Circular Florence

The whole strategy has been supported by a massive communication campaign to build a one-to-one relationship with residents and city users and was described by Francesca Calonaci from **ALIA**. All the communication tools developed aim to engage, involve and get feedback from the community. For instance, the app gives the possibility to build an open dialogue with ALIA, as users can find information about sorting rules but also report problems with the system.

Furthermore, the website “[Firenze Città Circolare](#)” gives freely access to:

- *Basic information on how to sort*
- *Map to identify the collection system active in a specific location*
- *Calendar of door-to-door collection*
- *FAQs (for instance: lost smart keys, how to download the app, how to recycle a phone, etc.)*
- *Infographic available in many languages*

In addition to online activities, ALIA implemented many on-site actions to meet and discuss with residents and city users. A stand has been present to several public events. To reach the tourists, ALIA started several collaborations with key stakeholders such as the taxi drivers and hotel operators but also with Airbnb and Booking hosts.



## STUDY VISITS | The underground containers

From talks to practice, the participants joined ALIA to see the underground containers implemented in the historical centre, just few steps from Santa Maria del Fiore (Duomo), the most important cathedral of the city. The containers can be used through the smart key provided to the residents or the app that can be downloaded and used by the daily visitors and tourists. HOOP members could also witness the high-tech waste truck in the process of emptying the underground containers.



Figure 5. Underground containers placed next to the main cathedral in a very dense and touristic area

## STUDY VISITS | The new biowaste management plant

The second half of the day focused on the integrated anaerobic digestion plant where the digestate is then composted, recently inaugurated several kilometres from Florence, in a beautiful landscape of hills and vineyards. The plant will produce bio-methane and compost, valorising 160,000 tons/year of bio-waste and garden waste. The plant aims to produce 12 million cubic meters of bio-methane and 35,000 tonnes of compost. The area, where a composting plant was already located, have been fully redeveloped, including the architectonic project into the landscape.

The study visits in Florence generated many have been the questions and the discussions between participants and the hosts, and HOOP Members expressed a strong interest in the technologies, solutions and strategies described by Albano Laziale and Florence. In the next months, members will keep working together and using the HOOP tools and services to advance their plans and overcome barriers for a local circular bioeconomy.



*Figure 6. Presentation of the new anaerobic digestion plant*