The High-Tech Autonomous Bin Emptying System

Hero X Webinar

3rd of October 2024

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Robotic Innovation Lead
Innovation Team - Digital Emerging Technologies

Innovation Ecosystem Expert
Innovation Team - Ecosystem Unit

A2A Life company

The first Life Company, with a local heart and global ambitions

Born in Italy's, It's biggest multi-utility and with over 100 years of history. Taking care of essential services to satisfy the needs of today's lifestyles while respecting long-term sustainability goal

13.462
Employees

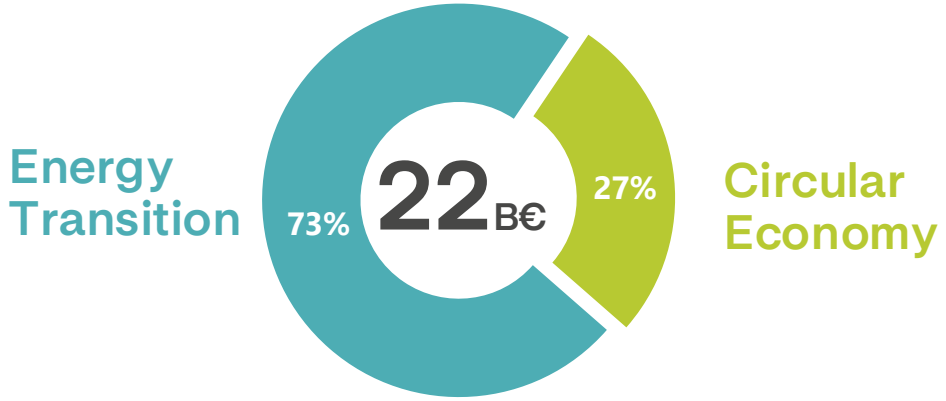
~2B€
Gross Income

2,6 GW
Installed Capacity

23,2B€
Revenues

A2A Strategic Plan 2024 - 2035

We will invest around 22 billion euros over 10 years on the strategic pillars on which our plan is based



3.5B€ **Investments already made between 2021-22**
in the first two years we accelerated infrastructure investments for the Country

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Our businesses

A2A covers a well balanced Business mix with strong synergies across the different BU

Energy

GENERATION	• Energy Generation • Wholesale & Trading
RETAIL	• Sale of electricity and gas • Energy Efficiency and VAS

Second player
In terms of RES installed capacity and by volume of electricity sold to end customers in Italy

Environment

COLLECTION	• Waste collection
TREATMENT	• Material Recovery • Energy Recovery

First Player
In the waste sector in Italy
In terms of tons of waste treated

Smart Infrastructures

GRIDS	• Electricity and gas distribution • Integrated Water Service
HEAT	• Cogeneration and heat recovery • District Heating
SERVICES	• Smart City • Public Lighting • E-mobility

Second Player
In electricity networks in Italy for the volume of electricity distributed

AMSA – the seeker

AMSA is the subsidiary company dedicated to waste collection and urban hygiene services.

372 km²
Geographical area covered

1.400
Vehicles for the cities

+800.000
Tons of Waste collected yearly

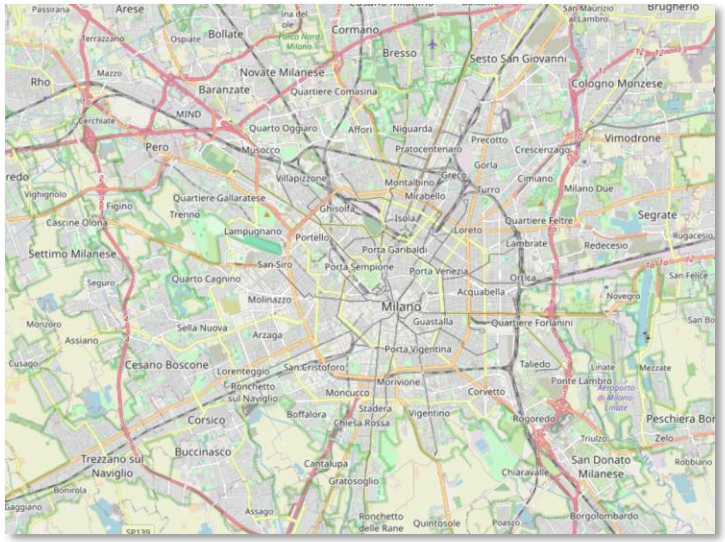
+1,8M
Citizens served 24/7

What does the problem entail?

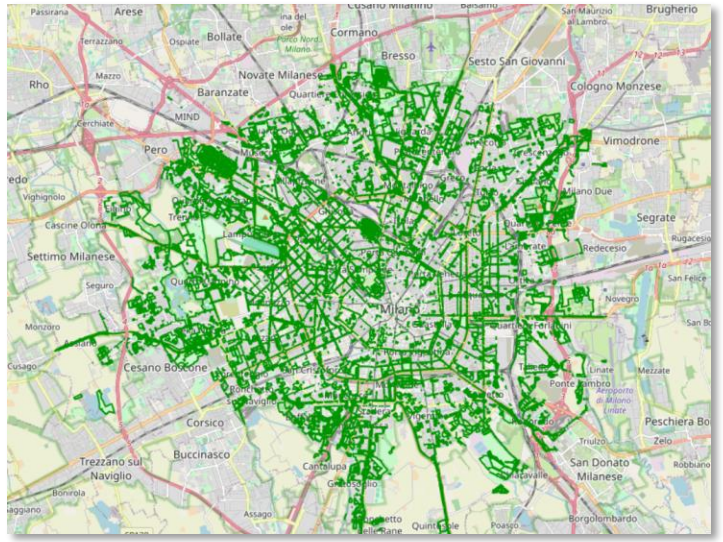
AMSA S.p.A. maintains high environmental standards, helping Milan achieve 64% waste separation and make the city clean

Citizens are also urged to use **urban bins**, while **AMSA teams manually clean and empty bins daily.**

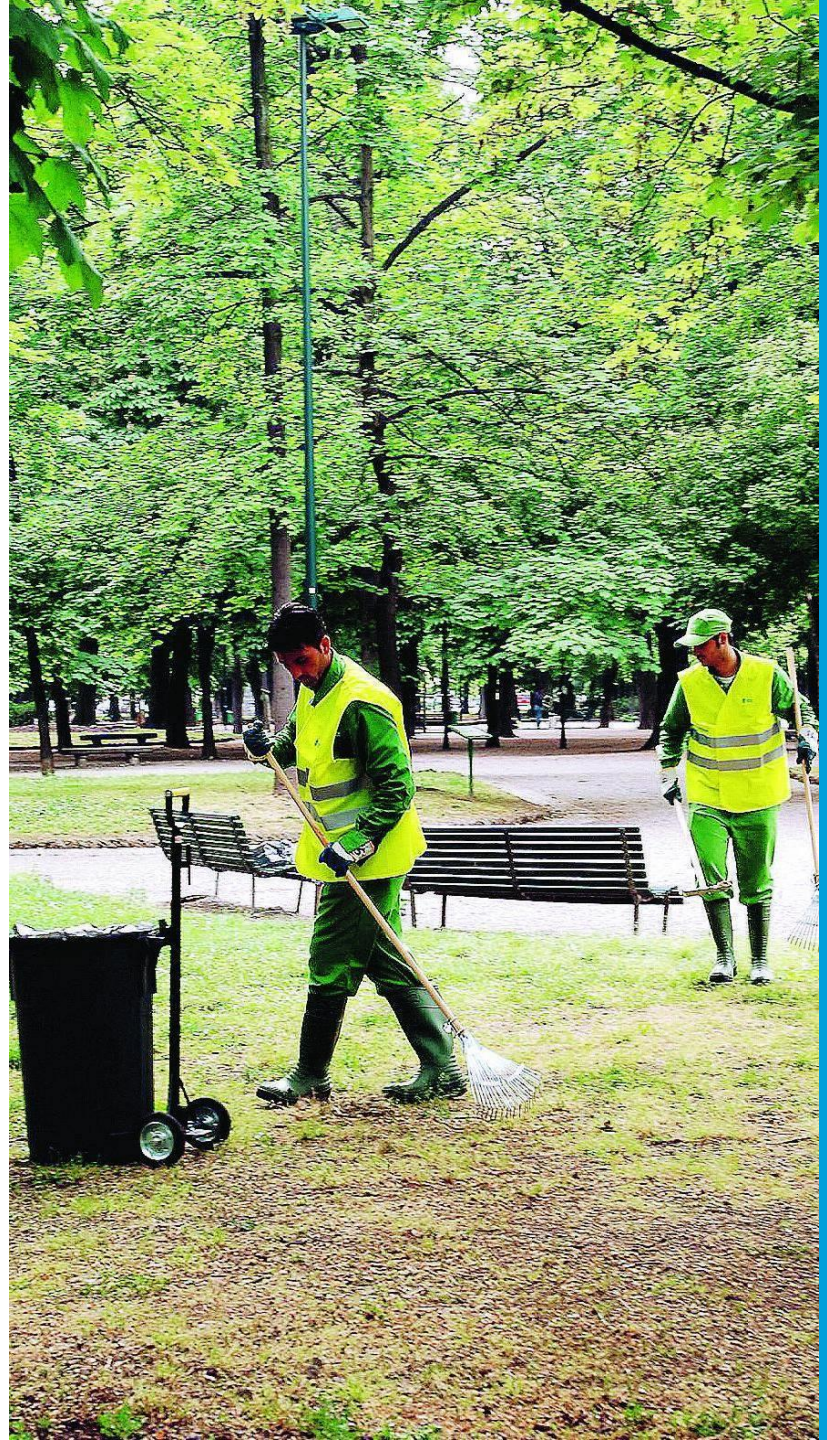
A huge number of bins are placed in parks and **ensuring clean parks in Milan means managing a huge number of operators and vehicle per day**.



Milan Urban Area



Milan Urban Green Area



What does it mean to empty bins in parks?

Empty bins it is simple but require lot of effort

01 - Parks

For **each large park**, a **team** of operators **is identified** who have the task of **cleaning** it on a **weekly basis**.

02 - Vehicles

A team is made up of **2 operators and 1 van.**

03 – Operators / Bins

Inside the park, the operators proceed on foot, **identifying** the **bins**, **removing** the **plastic bag containing** the **waste** and **throwing it onto the van.**

04 - Collecting

Once the tour of the entire park is completed, the **operators take all the waste to the collection centres.**

Focus of the Challenge

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The figures of the challenge today and the idea of tomorrow

- Teams of operators work daily in Milan's large parks, defined as over **75,000 m²**, to empty **over 2,500 bins** across **30 major parks**. These operations require significant **manual effort** to maintain cleanliness.
- Each park has **between 50 and 400 bins** always positioned in the same identified location
- Typically to serve all 30 "large" parks, in the **winter period are necessary from 13 to 23 teams/day and during the summer 17 to 26 teams/day.**
- Each bin takes around **3 minutes** to empty and replace the plastic bag.
- Parks are cleaned **4-9 times per week**, with extra interventions for events.

To find a new solution to significantly optimize the number of teams and vehicles currently used to empty bins every day and **centralize waste collection in one place**, focusing on a single dedicated area in each park to **avoid emptying each individual bin manually**.

The Challenge Breakthrough

Impactful Contextual Elements

- **Seasonal demand variability and team structure allocation:** the cleaning teams consist of two operators and a van, in summertime more teams are needed
- **Resource management:** different team sizes are required for summer and winter, complicating resource planning and allocation.
- **Manual labor dependency:** emptying bins and collecting waste in a van is a simple operation but it is labor-intensive.
- **Operational Efficiency:** manual operations might lead to inconsistent cleaning standards and increased operational costs.

Hurdles to consider

- Developing an automated solution for park waste management faces hurdles like **handling bins in open environments** and **integrating autonomous or automatic systems**.
- Seasonal demand, resource allocation, and labor-intensive operations complicate efficiency, especially during busy periods.
- While technologies like autonomous sweepers and smart bins exist, none can **autonomously empty bins** and **reduce reliance on operators and vehicles**.

Towards the Solution: Objective & Expectations

Solution Expectation

Design a cost-effective system capable of emptying the bins located in the parks, collecting the waste in a specific predetermined area within the park to significantly optimise the resources currently employed.

We expect a solution that has:

- **Operational Versatility**: Ability to operate in various environmental conditions (outdoors, summer/winter) and on different surface types (asphalt, dirt, gravel).
- **Autonomy and Automation**: Design a system that operates autonomously
- **Advanced Technology**: Integrate sensors to monitor fill levels and optimize collection routes, contributing to more efficient operational management.

Format Expectation

We expect a detailed document that describes the layout and characteristics of the proposed automated / autonomous system along with its components. The document must include description of physical components (sensors, accessories), of its operations and a user-friendly software interface for monitoring operations.

Key Success Factors

Must Have	Nice to Have	Things to Avoid
Must **optimise the use of personnel** (quantity and/or time necessary for cleaning) and motorized vehicle inside the park	Reporting and data collection	**Software-only platform** to optimize the routes of the operators within the parks or to optimize the frequency and rotation of the teams involved will not be considered for award in this Challenge.
An **autonomous/automatic solution**, if necessary, an operator must still be able to intervene manually in case of need or emergency situations	Accessibility and User-Friendliness	Standard “smart” bins or bins with compactor
Minimize exposure to risk for those who frequent the park and operate constantly throughout the week	API Integration	
It must be able to move not only on asphalt but also on dirt or **gravel roads**	Possibility for the solution proposed to be **implemented/extended out from the park** environment like bins on public sidewalks and squares.	Autonomous sweeper
Being able to **operate outdoors**, both in summer and winter and, possibly, even in the rain and must be easy to use and/or to program.	**Anti-theft alert**, reporting and reaction system is appreciated	

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The Challenge Award

To be eligible for an award, your proposal must, at minimum:

- Satisfy the Judging **Scorecard** requirements
- Thoughtfully address the **Submission Form** questions
- Be scored higher than your **competitors!**

Full Award

60.000$

- Total transfer of IP rights to A2A
- Meeting all judging criteria

Partial Award

$TBD

- Partial transfer of IP rights to A2A
- Unmet judging criteria

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Challenge Website

High-Tech Autonomous Bin Emptying System

Ensuring clean parks in Milan means managing +100 bins per day. How can a high-tech system help operators in the care of green areas?

Energy, Environment & Resources | Engineering | Technology | Powered By HeroX

Stage: **Enter**

Prize: **$60,000**

SOLVE THIS CHALLENGE

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Q&A