# DIGITAL WASTE

Redesigning, digitalising and optimising the whole waste management process through the new technologies.

ENGINEERING
THE DIGITAL TRANSFORMATION COMPANY

# WHAT ARE WE DISCUSSING?

# AUTHORS


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Stefano has more than 25 years in managing the income of Local Authorities. He began his career as an official in one of Lombardy's administrative centres. Since 2002 he has been a member of the Engineering Group and therefore of Municipia. He has gained extensive experience in the management of evasion and collection recovery activities, acting as project manager for one of Municipia's most important clients. His expertise in mastering the subjects he deals with as well as the experience he had acquired have allowed him to "do school" within the company. Since 2017 he has been acting as a Consultant to support the engineering of the product range and the value proposition of Municipia, following the legislative and regulatory developments of the TARI and urban hygiene services. Since 2022 he has been in charge of the Urban Hygiene Business Unit dedicated to Municipia solutions for Digital Waste Management.


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Part of the Engineering Group for 35 years, Alessandro has held various executive positions in various Group companies. He has worked mainly in the Commercial Department, initially beginning within the field of Central Public Administration, until he became Commercial Director of the Local Public Administrative and Health Department. For three years he then oversaw the Group's activities in the South American market as CEO of the subsidiary Engineering do Brasil. Subsequently, he was the Director of the Training Department, tasked with ensuring that the proficiency of the Group's 12,000 resources were constantly updated. Since 2019 he has been involved in business development for Municipia.


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## Mauro Bertoli

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Mauro has over 35 years of professional experience, 10 of which were spent in the management and administration of companies, including those listed on the regulated market, operating in the management of local public services and waste. He personally oversaw the merger of a number of Emilia Romagna's Multiutility companies for the creation of Enia Spa and participated in the process of its listing on the Italian Stock Exchange.
In 2012 he began his consulting activities by collaborating on important projects for the merger and aggregation of companies operating in waste management, including the creation of Sei Toscana (waste management ATO Toscana Sud), in which he also held the role of Sales Manager. He is currently working on technical/commercial development projects and ERP software for companies operating in the waste management sector and, since 2012, has been collaborating with Ekovision srl, a company that develops ERP SW for companies operating in the waste sector.


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# WHAT IS DIGITAL WASTE MANAGEMENT??

Local governments are paying increasing attention to environmental issues, with the aim of ensuring an effective improvement in people's quality of life. It is a real Smart Environment strategy that involves the use of innovative instruments and strategic and eco-sustainable urban planning, according to the model of the Augmented City: a city that is technological, resilient and at the service of citizens.

Progress has been made in this direction both in Italy and in other countries. One crucial issue, has remained, however: namely that of the entire waste management process. It is precisely on this issue that many governments see their political choices, their credibility and in some cases even their stability being challenged.

It is clearly essential to be able to intervene efficiently, without having to manage the emergency, but anticipating and preventing critical issues.

This is in fact an articulated supply chain that requires tools, such as ERP - Enterprise Resource Planning - and smart technologies, able to guarantee a complete integration between administrative, financial and control functions with operational and planning activities.

This is in fact a complex supply chain that requires capability to innovate and to view from a new perspective, tools (e.g. **ERP - Enterprise Resource Planning), and smart technologies**, to guarantee a complete integration between administrative, financial and control functions with operational and planning activities.

In this context, new technologies make the difference, turning the waste problem into an opportunity for local Public Authorities, Multi-utility service providers and companies operating the sector.

The qualitative leap, now necessary and no longer postponable, is called **Digital Waste Management**. Through the integration of tools and technologies it is possible to optimise the entire waste management process, reducing the costs of the entire supply chain: from the collection service (vehicle management) to the disposal and recovery of the separable parts of waste (taken directly to the waste disposal plant), to pricing (determination and collection of the due amount) up to the search for tax evasion and the reduction of the outstanding amounts..

This means producing added value for the territory, overcoming any inefficiencies of the service, **generating positive spin-offs and reducing the economic**, environmental and social costs that Authorities and citizens have to face.

# 2

# OUR APPROACH

# DIGITAL WASTE

Town Councils represent the foundations of our society and the institution in which citizens place their expectations, confident that the commitments promised by the Directors will be fulfilled. For this reason, we manage services for the authorities and the citizens alike by achieving greater levels of efficiency, efficacy, transparency and sustainability (including economic sustainability) through digital technology and supporting formulas such as public-private partnerships and service concessions.

In the field of Digital Waste Management, **we support the Public Administration authorities by sharing efforts and benefits, enhancing the quality of service**, improving the safety of the territory, optimising management and at the same time reducing costs.

There are **eight key points** through which our value creation process unfolds, in full compliance with the relevant regulations and related obligations:

**1**

### PLANNING

Detailed planning of waste collection with innovative door-to-door and neighbourhood systems with smart containers equipped with IoT technology.

**2**

### CONSTRUCTION OF FORECAST MODELS

To support management choices and create services that are more in line with users' needs.

**3**

### CONTROL AND REDUCTION OF WASTE COLLECTION AND PAYMENT COLLECTION COSTS

Reduction of the costs of waste collection and disposal also through a new type of service that can also be used by those who do not live in the area, without any red tape.

## 4 IMPROVEMENT OF ENVIRONMENTAL STANDARDS - REDUCTION OF CO2 EMISSIONS

Reduction in the amount of non-differentiated waste per capita and increase in the recovery of materials from waste. Support for a circular economy based on environmental sustainability through the promotion of waste separation processes. Intelligent and dynamic optimisation of collection planning: less collection traffic and containers that are always available.

## 5 REDUCTION OF OUTSTANDING PAYMENTS

Optimised management of collection processes, making them more efficient and attentive to people's needs. This translates into greater equity because more users are paying (the due amounts) with real benefits for all.

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## REDUCTION IN EVASION

Added value is generated by optimising processes and maximising the value of the evasion recovered. At the same time, it is implemented by broadening the base of citizens who will be paying for the service in future years, with a consequent reduction in per capita costs.

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## SAFETY

Increase the safety of citizens, improve the quality and liveability of the area, reduce episodes of petty crime and increase the control of specific areas particularly at risk. Intelligent monitoring of events in the vicinity of the refuse container for real-time activation of the interventions necessary to minimise the impact of foolish actions.

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## EFFECTIVE AND EFFICIENT MANAGEMENT

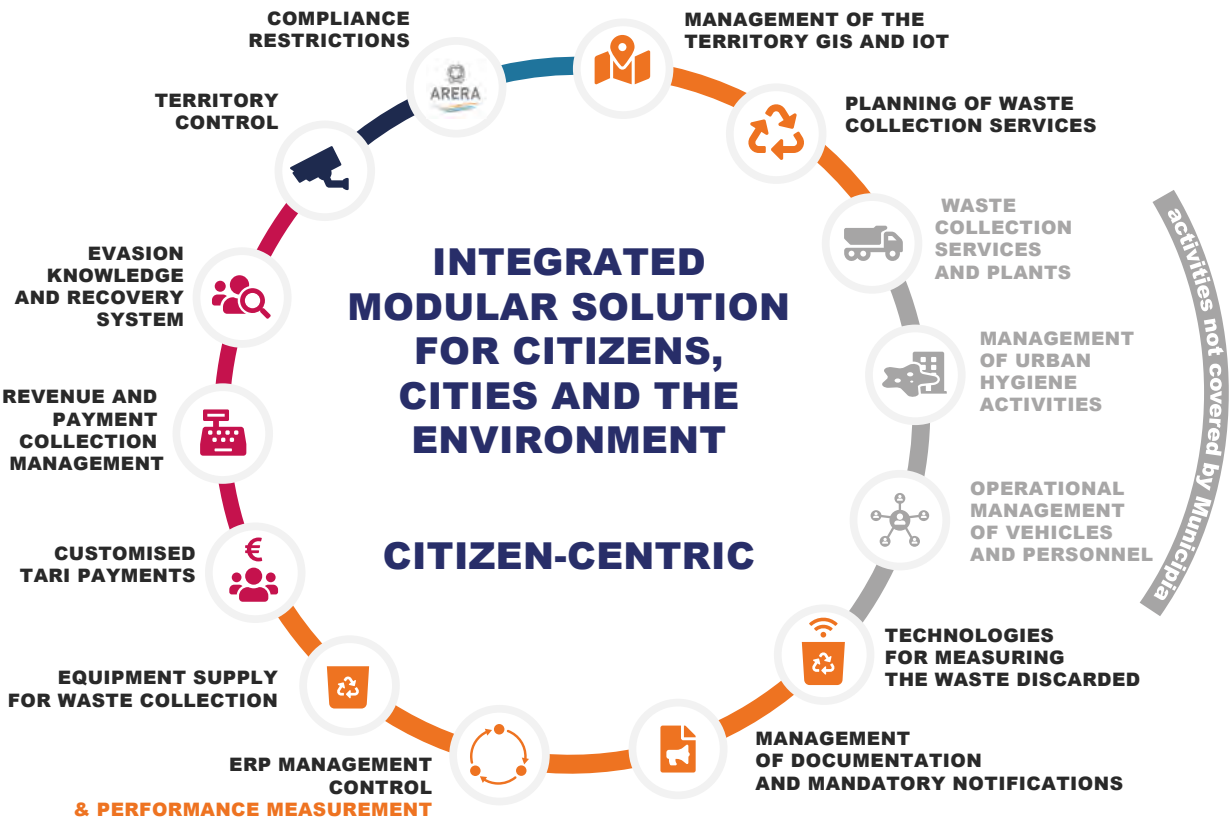
An availability charge, supplemented by a fee proportional to the performance obtained from the management of collection, evasion recovery and cost reduction, leads to effective and efficient management.

3

# OUR INTEGRATED MODULAR SOLUTION FOR CITIZENS, CITIES AND THE ENVIRONMENT

Applying technology to processes means efficiency, an increase in economic resources to be reinvested in the territory, concrete results that are also visible to citizens. All this in a complex and constantly evolving context such as that of environmental hygiene.

Municipia's vision consists in an integrated approach: the planning and management of waste collection and urban hygiene services, hardware and software solutions for the management of waste collection and disposal services (supplemented with the ordinary and extraordinary management of the waste tax/ fees), innovative video surveillance components and image analysis to improve public safety. 552The remuneration of the project can also be determined on the basis of the results actually achieved and makes use of the provisions of the Procurement Code for Project Financing (Law 50/2016, art. 183(15).



## In detail

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| **COMPLIANCE WITH ARERA RESTRICTIONS** | Satisfy all requirements and mandatory notifications relating to analytical accounting and other ARERA obligations, maintain data and processes for any subsequent control checks by the Authority itself. |
| **PLANNING OF WASTE COLLECTION SERVICES** | Detailed planning of waste collection services with innovative door-to-door and neighbourhood waste collection systems using smart containers. |
| **WASTE COLLECTION SERVICES AND PLANTS** | Management of all waste collection and disposal activities through qualified partners with over ten years' experience in the sector. Thanks to an extremely advanced software, it is possible to guarantee the control of all processes involved in the discarding, treatment and disposal of waste, including plant maintenance activities. All supported by an advanced cost control system. |
| **MANAGEMENT OF URBAN HYGIENE ACTIVITIES** | Effective and efficient management of road sweeping operations, emptying waste bins and the washing of streets and market areas, etc.. |
| **OPERATIONAL MANAGEMENT OF VEHICLES AND PERSONNEL** | Effective and efficient management based on flexible and adaptive planning. |
| **EQUIPMENT SUPPLY FOR WASTE COLLECTION** | This means the support of innovative devices and technologies for the waste collection service. These tools allow the emptying of bins to be read automatically via RFID reader antennas or manually using a special App on certified mobile devices. A single app for deliveries, pick-ups and alerts. |
| **TECHNOLOGIES FOR MEASURING THE WASTE DISCARDED** | It is possible to generate added value by optimising processes and maximising the value of recovered evasion and punctually allocating costs according to the European "polluter pays principle". |
| **ROUTE MANAGEMENT** | It is possible to manage vehicles, plan and schedule routes and related activities, and to monitor loading and unloading operations. Delivery operations are assigned to counter operators (Web) and on the territory (App) through the issue of worksheets. The route to be taken can also be visualised on maps with intuitive and easy-to-use indicators. |
| **PREDICTIVE VEHICLE MAINTENANCE** | It is possible to optimise maintenance and reduce downtime during the performance of services. In fact, it is possible to reduce inefficiencies due to vehicle breakdowns by estimating the moment when intervention is required, anticipating breakages, breakdowns and wear and tear (and consequently minimising machine downtime). |
| **MANAGEMENT OF DOCUMENTATION AND MANDATORY NOTIFICATIONS** | Complete and digitised management - including alternative archiving - of all documentation and notifications to users and Authorities. |
| **TRANSPARENCY IN THE MANAGEMENT OF ACTIVITIES** | Through a special Web Portal the control authorities can check the activities carried out in real time and citizens can check their own situation by interacting with the service provider. |
| **ERP MANAGEMENT CONTROL** | Registration and management of all waste pick-ups and waste taken to the treatment plants according to the latest ARERA regulations. The containers on the territory automatically transmit to the ERP the data relating to waste discarded by users, and to the emptying of the containers, by means of state-of-the-art data transmission protocols. |

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| **CUSTOMISED TARI PAYMENTS** | Use of existing systems designed to manage the payment of waste disposal services, known as TARI, which can be paid using either an F24 form or a simple postal payment slip. This makes it possible to manage user databases and update every administrative step in real time, in a fair and precise manner. |
| **REVENUE AND PAYMENT COLLECTION MANAGEMENT** | Management of the revenue relating to the service in terms of financial planning, assistance in determining tariffs, effective management of payment collection, including enforced collection (debt collection) assisted by the knowledge system. |
| **EVASION KNOWLEDGE AND RECOVERY SYSTEM** | Collection and management of data from all available sources to transform data into information, information into knowledge and knowledge into awareness. All this allows the technical and administrative department to integrate and assist with the recovery of evasion, to make better decisions, and enables politicians to choose the right approaches. |
| **EVASION RECOVERY** | The knowledge system perfectly supports the structure dedicated to evasion recovery because, with regard to the TARI, "pay everyone to pay less" is not a slogan but a mathematical rule (reinforced also by the new ARERA method). |
| **TERRITORY CONTROL** | Support in the management of roads, the environment, security, through active video surveillance systems, which are able to interpret the streaming of the video cameras to detect and report to the authorities any illegal actions (vandalism, discarding of unlawful waste, crimes against individuals etc.). |
| **INFORMED USERS - VIDEO BILLS AND ELECTRONIC PAYMENTS** | A web portal that allows each user to check the emptied containers accounted for and registered. Furthermore, it is possible to book services such as the collection of bulky waste. For each request, a ticket ID is assigned with which it is possible to track the progress of the request.<br>Finally, it is also possible to take advantage of innovative channels such as that of the video bill. This is a video clip customised to the individual user in which all the information contained in a TARI payment notice is illustrated and can be accessed using a QR Code on the printed notice.<br>By following the instructions on the video bill action or a QR Code on the paper notice, you can also link to a web page where you can pay your pre-compiled F24 form. The solution speeds up payment transactions at the counter thanks to a web service interfaced with the information system. |

All this can additionally be integrated with additional IoT (Internet of Things) elements. Here are a few practical examples:

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| **MONITORED RECYCLING STATIONS** | Renovation and/or construction and management of recycling stations also monitored with IoT. |
| **SMART REFUSE CONTAINERS AND WASTE BINS** | Underground and above ground to meet the needs of urban decoration and cost reductions but also to meet the needs of urban decoration and hygiene in tourist resorts. |
| **SMART WASTE TREATMENT PLANTS** | Creation and management, in partnership with the holders of environmental authorizations and the Authorities involved, of waste treatment plants for a more direct control of the quality of the processing. |

# MUNICIPIA

Municipia is part of the Engineering Group, the largest Italian Digital Transformation company, with 12,000 employees worldwide, 65 offices and more than a billion Euros in annual revenues.

Municipia supports cities of all sizes in the Digital Transformation process, managing services for Local Administrations and for their citizens, enabling them to achieve greater levels of efficiency, effectiveness, transparency and sustainability through digital technology. Municipia also intervenes with public-private partnership formulas and project financing, with investments and risks borne by the same and the relative sharing of benefits resulting from the increase in revenues and the decrease in costs. Municipia capitalises on existing investments and technologies, making the Engineering Group's experience and technological solutions available to customers. The company relies on both vertical initiatives and transversal projects to improve the quality of city life and simplify the relationship between Public Administrations and citizens.
Municipia continues to drive forward the Augmented City project, the technological, resilient and inclusive city, at the service of people, leveraging the five pillars of a single technological ecosystem: financial and environmental sustainability, security, mobility, welfare and interactivity.

# ENGINEERING

Engineering is one of the main players in the field of Digital Transformation of public and private companies and organizations, offering an innovative offer targeted at the main market segments. Together with its subsidiaries, the Engineering Group is committed to pushing the envelope as regards the application of emerging technologies. It also works in the area of system implementation and integration and on redefining processes in order to promote innovation for the benefit of businesses and Public Administrations.

With around 12,000 professionals in 65 locations spread across Italy, Belgium, Germany, Norway, Republic of Serbia, Spain, Sweden, Switzerland, Argentina, Brazil and the USA, Engineering manages projects in over 20 countries, supporting customers in the business areas where digitalization is having the biggest impact. Its products and services cover all strategic sectors, including Digital Finance, Smart Government & E-Health, Augmented Cities, Digital Industry, Smart Energy & Utilities, Digital Media & Communication. The group aims to help change the way in which the world lives and works, by combining technological infrastructures organized in a single hybrid multicloud, the capability to interpret new business models and specialist competences in all next-generation technologies: AI & Advanced Analytics, Cybersecurity, RPA, Digital Twin, IoT, Blockchain. With significant investments in R&D, Engineering plays a leading role in research, by coordinating national and international projects thanks to its team of 450 researchers and data scientists and a network of academic partners and universities throughout Europe. One of the group's key strategic assets is its carefully considered staff training policy. Engineering, since 1999, has had its own dedicated multidisciplinary training academy, the "Enrico Della Valle" School of IT & Management. With 300 certified trainers and hundreds of courses, the School has delivered more than 19,000 days of technical, methodological and process training during the last year.

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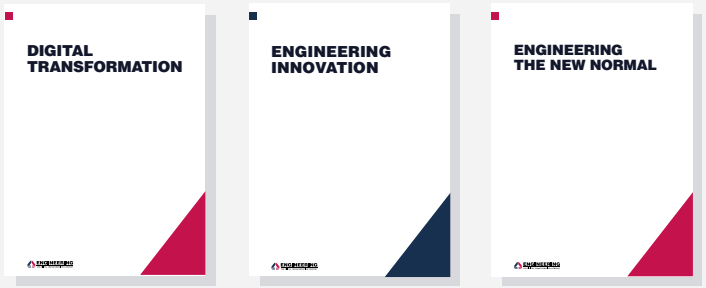
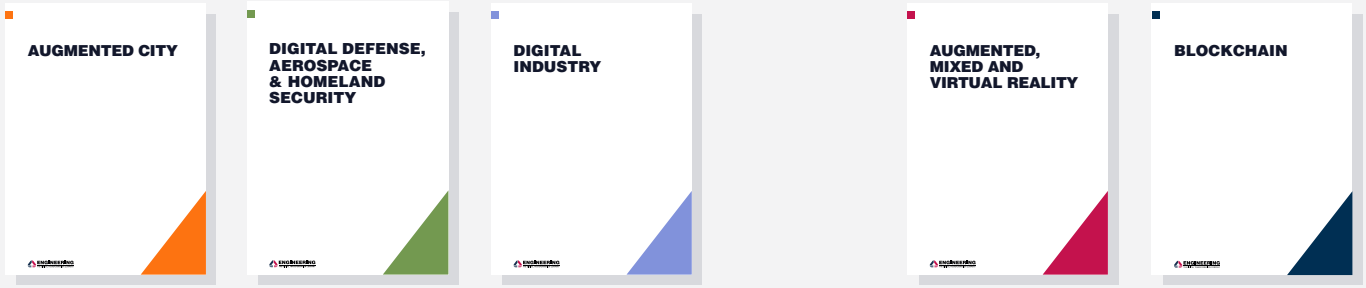
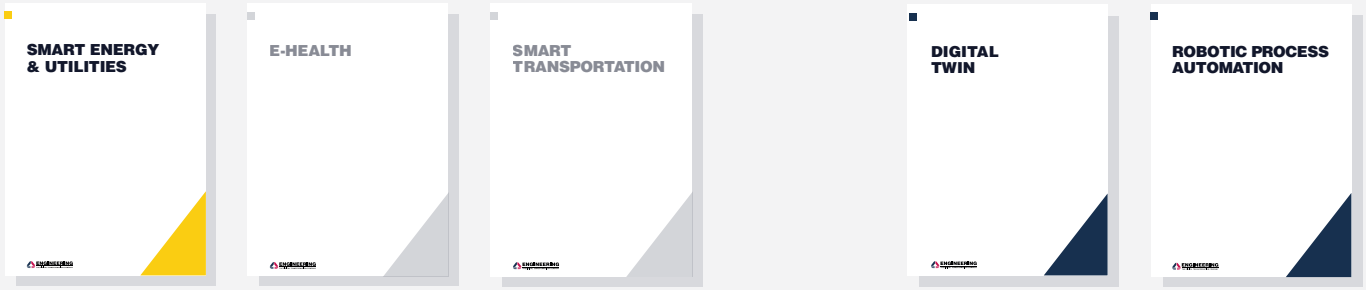
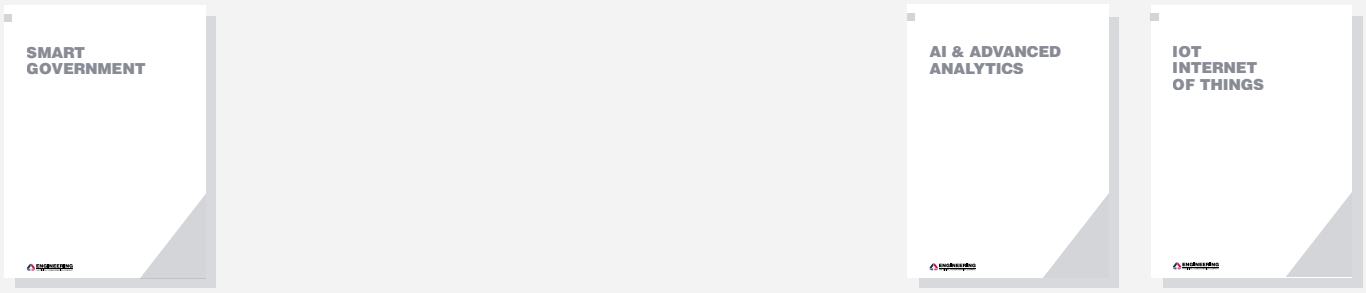
# Our point of view on









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