









### COORDINATED BY

Francesca Mazzarella Luca Mariotto

#### WORK GROUP

Valeria Grippo

Andrea Di Piazza Samanta Meli Rita Mileno Carmen Monaco Andrei Orbu Bernardo Piccioli Fioroni Riccardo Viselli

#### In partnership with





#### With the participation of







#### **Contributors:**

Section 3.6 Daniele Gizzi (Albo Nazionale Gestori Ambientali)

Sections 5 and 6 Valeria Frittelloni, Andrea Massimiliano Lanz (ISPRA)

Paragraph 7.2 Enrico Zangirolami (CdC RAEE)

*Section 11.2* Roberta De Carolis, Martina Iorio, Maria Lucia Protopapa, Federica Forte, Cristian Chiavetta, Massimiliana Pietrantonio, Claudia Brunori (ENEA)

#### **Supporting Partners**















Graphics **GBPLACE** 

## KEY MESSAGES

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In 2022, national municipal waste production stood at 29.1 million tonnes, down 1.8% compared to 2021. Sorted waste collection has reached 65% of the overall national total (up 1.2 points compared to 2021). Compared to 2021, all macro-areas show a growth in sorted fraction collection. In particular, in the southern regions show an increase of 1.7 points, followed by the central regions (up 1.1 points) and the northern regions (up 0.8 points). Organic waste, measured as the assimilation of green waste and the Organic Fraction of Municipal Solid Waste (FORSU – Frazione Organica del Rifiuto Solido Urbano), remains the most relevant fraction (approximately 38% of the total), followed by paper and cardboard (19%), glass (12%) and plastic (9%).



European legislation established challenging targets for municipal waste recycling (50% by 2020, 55% by 2025, 60% by 2030, and 65% by 2035); the result achieved for these parameters in **2022** was **approximately 49%**. A wide gap between the sorted waste collection level and effective recycling rates continues to **persist**, albeit less markedly over **the past year**, **reflecting the fact that sorted waste collection**, although a major ongoing step, **must be performed with quality and combined with the availability of an adequate system of waste management plant facilities to select the recyclable ones from those that are not**.

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Investing in new plant capacity, especially for the treatment of the non-recyclable fraction fraction and waste from sorted collection, is necessary to ensure the closure of the cycle and reduce landfilling. Throughout Europe, we observe that the most virtuous countries in terms of landfill disposal have recorded substantial levels of incineration with energy recovery. Currently, Italy faces a significant gap in plant capacity for treating undifferentiated waste, which, in order to achieve the objectives set by the directives on the circular economy, has been estimated at around 2.5 million tons by 2035. However, for the organic fraction, the need by 2035 has been significantly reduced, thanks to the numerous facilities recently activated, under construction, or planned, also due to the funding provided by the PNRR.

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Southern Italy suffers from a deficit in plant infrastructure for the treatment of both organic and unsorted waste. This deficit prevents the proper closure of the waste cycle and consequently it involves their export, contributing to the gap in spending on urban hygiene services. In 2022, the South recorded the highest household municipal waste disposal charge (TARI – Tassa Rifiuti) at €378, while the North recorded an average of €284.

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In 2022, sector turnover (based on a sample of 439 companies) reached about €13 billion, equivalent to approximately 0.7% of national GDP, directly employing a workforce of more than 86,000 people. Plant facility management companies are the ones that achieve the best economic performance, as also confirmed by the data on added value per employee (€402,000 per employee), while collection management or integrated cycle companies record a lower level of productivity (€57,000 and €152,000 per employee, respectively). Similarly, companies with higher turnover (> €100 million) achieve the best economic and financial performance.

Despite significant progress, the **process of implementing local governance still remains incomplete in many areas.** Only 10 of the Italian "Regioni" have fully operational Local Regulatory Authorities (EGA – Ente di Governo d'Ambito) in all envisaged Local Environmental Service Coverage Areas (ATO – Ambito Territoriale Ottimale). The sector is also hampered by considerable **vertical and horizontal management fragmentation, especially in the central-southern areas of the country** where governance structures, for the most part, are renewed every year. Among the waste governance bodies operating nationally, the **National Register of Environmental Operators** is today the reference institution for about **170,000 micro-, small- and medium-sized enterprises, multinational groups and public multi-utilities**; it plays a fundamental **role** in the **regulatory** and **authorisation process for chains of companies operating in the sector in various capacities**.

An analysis of calls for tenders (2014–2023) confirms the **difficulties in standardising the size and timing** of urban sanitation services at national level. Today, 87% of all public contracts are tendered to award a service restricted to a single municipality (2,458 tenders). Examining the duration of the contracts, more than half are due to expire between 2023 and 2024, 75% of them in the South.

To support the **ecological transition**, demand for critical raw materials, crucial to European industry but **exposed to a higher risk of supply problems**, is expected to **increase exponentially in the coming years**. The development of supply chains for the recovery of critical and strategic raw materials is crucial to ensure safe access to resources: a **renewable energy generation installations** (PV plant, wind generators, and related storage systems), which will be decommissioned in the years to come (**around 400,000 tonnes of waste from PV alone by 2035**), a vast basin of recoverable material.

In 2023, the total countrywide collection of WEEE from households stood at over 349,000 tonnes (down 3.1% compared to 2022), equal to about 6 kg per resident. The 2022 collection rate is 34%, and according to data released by the plant facilities, about 96% of the household WEEE collected in Italy is managed within the system operated by the WEEE Coordination Centre. There is currently no need for additional plant capacity for the treatment of WEEE since, thanks also to depreciation and investments in technological development, the 49 plants approved for the treatment of WEEE at the end of 2023 were able to handle the volumes collected without any particular problems (up 18% from 2017 to 2023). However, collection levels are still far from EU targets (12 kg per inhabitant) and, as yet, cannot influence the cost-effectiveness of recovering critical raw materials. Given their strategic value and the difficulties in supplying these materials, it appears evident that collection must be boosted, the real driving force behind the development of the supply chain and ensuring the necessary investments for the optimal extraction of the value chain from this flow.

The growing demand for consumer goods and the need to efficiently use resources and materials in manufacturing highlight the importance of **recycling**, **recovering**, **and reusing Secondary Raw Materials**. The use of secondary rather than virgin raw materials is **advantageous in terms of energy efficiency and reduction of CO**<sub>2</sub> **emissions**, which, if properly quantified and **valued through the use of Exchangeable Energy Efficiency Credits (TEEC – Titoli di Efficienza Energetica Circolare) and C3 carbon credits**, will **guarantee greater market competitiveness and benefits for the entire supply chain**.

# EXECUTIVE SUMMARY

Waste management has evolved rapidly under the impetus of European and national legislation aimed at promoting the transition to a circular model based on reducing waste production and recovering materials and energy. In this evolution, waste management is no longer an issue related only to protecting public health and the environment but has become one of the key areas covered by policies that address energy and the efficient and sustainable use of resources.

In 2023, EU regulatory progress focused on updating the legislative process of specific measures (the Proposal for a European Regulation on Packaging and Packaging Waste and the Revision of the Waste Shipment Regulation) and reviewing new waste legislation amendment proposals.

On 24 April 2024, the European Parliament approved the new Regulation on Packaging and Packaging Waste. This measure introduces major innovations such as phased recyclability obligations and minimum post-consumer recycled content requirements (also on a phased basis) for plastic packaging, placing restrictions on the placing on the market for specific types of packaging (mainly single-use plastic), targets for the prevention of the generation of packaging waste, phased reuse targets for packaging, compostability requirements for specific types of packaging and, finally, the mandatory introduction of DRS (Deposit Return System) for countries that do not achieve 90% sorted collection of single-use plastic/metal bottles/containers up to 3 litres by 1 January 2029.

In addition, on 5 July 2023, the European Commission published a proposal to revise the Waste Framework Directive. The proposal essentially focuses on two aspects: reducing food waste and introducing extended producer responsibility for textiles. On 13 March 2024, a plenary session of the European Parliament voted and adopted without amendments the proposal for the revision of the Waste Framework Directive (WFD) that the ENVI Commission had adopted on 14 February 2024. Figure 1 summarises the main innovations included in the proposal (on which the Council has yet to express its views).

#### **FIGURE 1**

SUMMARY OF THE MAIN AMENDMENTS TO THE PROPOSAL FOR THE REVISION OF THE WASTE FRAMEWORK DIRECTIVE



Source: elaborated European legislation information

Finally, the text of the Waste Shipments Regulation was released on 30 April 2024.

At the national level, regulatory developments mainly concerned the enactment of Legislative Decree No. 213 of 23 December 2022, which introduced amendments, mainly of a formal nature, to Part IV of Legislative Decree No. 152 of 3 April 2006. Other significant developments concerned the publication of Decree No. 59 of 4 April 2023, regulating the waste traceability system and the national electronic waste traceability register (RENTRI – Registro Elettronico Nazionale per la Tracciabilità dei Rifiuti), a number of its implementing decrees, and, finally, the publication of Decree No. 119 of 10 July 2023, defining the simplified procedure conditions for implementing re-use activities.

NEW EUROPEAN GOALS FOR 2025 and 2030

THE EUROPEAN PARLIAMENT ADOPTS THE PROPOSED REVISION OF THE WASTE FRAMEWORK DIRECTIVE ON THE REDUCTION OF FOOD WASTE AND THE INTRODUCTION OF THE EPR (EXTENDED PRODUCER RESPONSIBILITY) ON TEXTILES

REGULATORY AND AUTHORISATION ROLE OF THE NATIONAL REGISTER OF ENVIRONMENTAL OPERATORS INWASTE MANAGEMENT

IN 2022 NATIONAL WASTE PRODUCTION WAS APPROXIMATELY 29.1 MILLION TONNES, DOWN 1.8% COMPARED TO 2021 Following the issuance of Ministerial Decree 59/2023 and in view of the upcoming deadlines for registration to the National Electronic Waste Traceability Register – RENTRI (starting in December 2024), the Ministry delegated the National Register of Environmental Operators to provide operational technical support for

- the management of relations with users, trade associations and associations of software manufacturers, including information and communication;
- functional and operational aspects of the digital traceability platform;
- preparation of the technical documentation relating to the functional specifications for the management and evolution of the RENTRI register.

The National Register of Environmental Operators, today the reference institution for about 170,000 micro-, small- and medium-sized enterprises, multinational groups and public multi-utilities, plays a fundamental role in the regulatory and authorisation process for chains of companies operating in the sector in various capacities. In particular, the Register deals with the issuing of permits and the definition of requirements for the issuing of authorisations to waste managers regarding collection and transport, reclamation, and intermediation.

In 2022, national municipal waste production stood at 29.1 million tonnes, down 1.8% compared to 2021.

#### **FIGURE 2**

TRENDS IN MUNICIPAL WASTE GENERATION IN ITALY [YEARS 2018-2022]



Source: ISPRA

In 2022, production per inhabitant was 494 kg, showing a negative percentage change of 1.6 % compared to 2021 (Fig. 3). It should be noted that, following the decline already seen in 2020–2021, the resident population declined further by 132,000 inhabitants (a drop of 0.2%). In the last five years, per capita waste produced was lower than the 500 kg recorded in 2022 and 2020 (the 1st pandemic crisis year).

#### **FIGURE 3**

PRODUCTION OF WASTE PER CAPITA BY GEOGRAPHICAL MACRO-AREA [YEARS 2018–2022; KG/RESIDENT/YEAR].



MUNICIPAL WASTE PRODUCTION IS DECLINING IN ALL GEOGRAPHIC MACRO-AREAS

Urban waste production decreased in all geographical macro-areas: the North recorded the largest percentage decrease (down 2.2%), followed by the Centre and the South (both down 1.5%).

The national average percentage of sorted waste collection is 65 % of production, an increase of 1.2 percentage points compared to 2021. In quantitative terms, aggregate waste collection stands at 18.9 million tonnes. At the geographical macro-area level, percentages were 72% for the North, 61% for the Centre and 57% for the South. Compared to 2021, all macro-areas show a growth in sorted collection rates: in the southern regions, the increase is 1.7 points; in the central regions, 1.1 points; and in the northern regions, 0.8 points (Fig. 4).

#### **FIGURE 4**

TREND IN SORTED WASTE COLLECTION BY GEOGRAPHICAL MACRO-AREA [YEARS 2018–2022; PERCENTAGE]



Source: ISPRA

Of all the sorted waste quantified, organic waste remains the most relevant fraction in Italy (38% of the total), followed by paper and cardboard with 19%, glass (12%) and plastic (9%). The latter fraction has less weight than the others, but obviously involves a greater volume-tric impact (Fig. 5).

#### **FIGURE 5**

BREAKDOWN OF SORTED WASTE COLLECTION BY MATERIAL FRACTION [YEAR 2022; PER-CENTAGE]



ORGANIC WA-STE REMAINS THE MOST RELEVANT FRACTION IN ITALY (38% OF THE TOTAL)

SORTED WASTE

PARED TO 2021)

COLLECTION IS 65% (UP 1.2 POITS COM-



On a regional scale, the highest percentage of sorted waste collection is achieved by Veneto, and Sardinia, both with around 76%, then Trentino-Alto Adige, Emilia-Romagna, Lombardy and Marche, which also exceed 70%. The outdated target of 65% is exceeded by Umbria, Friuli-Venezia Giulia, Piedmont, Valle d'Aosta and Tuscany, while Sicily exceeds the 50% threshold for the first time, an increase of 3.9 points over the 2021 percentage (47.5%) and a remarkable 22 points over the 2018 level.

The figure that emerges on a municipal scale is that almost 69% of municipalities will have achieved a sorted collection rate of more than 65% by 2022. Meanwhile, the share of municipalities with collection rates below 30% is continuously decreasing (3.4% of the total). Overall, 87% of the municipalities collected more than half of their municipal waste in a sorted manner (the percentage was 85% in 2021). With reference to municipalities with a population of more than 200,000 residents, the highest levels of sorted waste collection are observed in Padua, Bologna, Venice and Milan, with percentages exceeding 60%. Florence, Turin, Verona and Messina also exceed 50%. Up slightly compared to 2021, Rome stands at approximately 46%, while Genoa, Naples and Bari reach or slightly exceed 40%, respectively (Fig. 6).

#### **FIGURE 6**

SORTED COLLECTION IN MUNICIPALITIES WITH A POPULATION OF MORE THAN 200,000 RESI-DENTS AND COMPARISON WITH THE NATIONAL AVERAGE [YEAR 2021–2022; PERCENTAGE]



Source: ISPRA

With regard to the management of municipal waste, European legislation sets a municipal waste recycling target of 50% by weight to be achieved by 2020 (Article 11 of the Framework Directive) and targets for 2025 (55%), 2030 (60%) and 2035 (65%) as a result of the changes introduced by Directive 2018/851/EU (Article 11a). In 2022, the percentage of preparation for re-use and recycling stood at 49% of municipal waste production, showing a growth of 1.1 points compared to the percentage recorded in 2021. The organic fraction represents 41% of recycled waste, paper and cardboard 25%, glass 14%, wood 6% and plastic 5% (Fig. 7).

A wide gap between the sorted waste collection level and effective recycling rates continues to persist, albeit less markedly over the past year, reflecting the fact that sorted waste collection, although a major ongoing step, must be performed with quality and combined with the availability of an adequate system of waste management plant facilities to select the recyclable ones from those that are not.

#### **FIGURE 7**

TREND IN RECYCLING AND SORTED COLLECTION [YEARS 2010-2022; PERCENTAGE]



Source: ISPRA

IN 2022, THE RATE OF RECYCLING STANDS AT 49.2 (UP 1.1 POINTS COMPARED 2021) BUT THERE REMAINS A WIDE GAP BETWEEN THE SHARE OF SORTED WASTE COLLECTION AND RECYCLING RATES

**69% OF MUNICIPALITIES** 

HAVE ACHIEVED

**EXCEEDING 65%** 

A SORTED WASTE

COLLECTION SHARE

With regard to the breakdown of urban waste management (Fig. 8), it is noted that recovery applies to about 29% of the dry fraction material and to about 23% of the organic fraction from sorted collection, while about 18% is destined to incineration or lanfil. Exported material amounts to 3% of the total. More specifically, the last year saw a contraction of 132,000 tonnes (down 1.9%) in the treatment of the organic fraction (from almost 6.8 million tonnes to about 6.7 million tonnes). With a quantity of about 3 million tonnes, composting contributes 44% while the remaining 5% (just over 315,000 tonnes) is treated in anaerobic digestion plants.

Incinerated municipal waste counts for 5.3 million tonnes (down 1.9% compared to 2021). 71% of this waste is treated in the North, 9% in the Centre and 19% in the South. The bulk of plant facilities is mainly located in the northern regions (26 plants).

The total amount of municipal waste disposed of in landfill amounts to about 5.2 million tonnes, equivalent to 18% of national production.

#### **FIGURE 8**

BREAKDOWN OF URBAN WASTE MANAGEMENT [YEAR 2022; PERCENTAGE]

- RECOVERY OF MATERIAL
- INTERMEDIATE SELECTION AND BIOSTABILISATION TREATMENTS
- EXPORTS
- BIO-MECHANICAL TREATMENT OF THE ORGANIC FRACTION FROM SORTED COLLECTION
- HOME COMPOSTING
- LANDFILL COVERAGE
- INCINERATION
- CO-INCINERATION
- LANDFILL
- OTHER



#### Source: ISPRA

An analysis of the pool of plant facilities dedicated to organic fraction and residual urban waste (RUR - Rifiuto Urbano Residuo) treatment identifies 645 operational plants in 2022: 348 in the North, 117 in the Centre and 189 in the South. In particular, 358 plants are dedicated to the treatment of the organic fraction from sorted waste collection, 132 are mechanical or mechanical biological treatment plants, 117 are landfill plants, 36 are incineration plants and 11 are industrial plants for the co-incineration of municipal waste (Table 1).

#### TABLE 1

BREAKDOWN OF URBAN WASTE TREATMENT PLANT FACILITIES BY MACRO-AREA AND TYPE [YEAR 2022]



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654 PLANT FACILITIES FOR THE TREATMENT OF THE ORGANIC AND RESIDUAL URBAN WASTE FRACTIONS; OF WHICH 53% IN THE NORTH, 18% IN THE CENTRE AND 29% IN THE SOUTH

It should be noted that the increase in sorted waste collection has led to a growing demand for new treatment plants over the years. However, several regions have still not achieved sufficient plant capacity to process the quantities produced.

On 4 July 2018, four European directives, transposed in Italy by specific decrees, came into force, setting ambitious new targets for waste management. They focus on reducing recourse to landfills and increasing effective recycling, both of overall waste and specifically of packaging waste alone.

In particular, three goals have been set for 2035 and one for 2030:

- 65% effective recycling of municipal waste to be achieved by 2035;
- 70% recycling of packaging waste to be achieved by 2030;
- 10% maximum disposal of municipal waste in landfills to be achieved by 2035.

As things stand at present, it appears that Italy, although not very far from these goals, runs the risk of not being able to achieve them if we do not see an adequate development of the pool of plant facilities. This particularly concerns the treatment of the organic fraction, preferably with the construction of anaerobic digestion plants for the production of biomethane from the organic fraction of municipal solid waste (FORSU) and the construction of waste-to-energy plants to recover energy from fractions that cannot be otherwise recycled.

Indeed, while the north of the country (although not all regions) and Sardinia have a sufficient number of plant facilities, the centre, the southern peninsular and Sicily already suffer from a deficit that forces them to export waste to the north and abroad. This situation is likely to be exacerbated in the coming years with the expected development of sorted collection in areas that are lagging behind today, from which greater quantities of organic matter and greater quantities of waste will be generated, which, together with the residual fractions, will have to be treated exclusively in energy recovery plants in order to keep the use of landfill disposal below 10%.

In particular, the analysis shows that Italy, in 2035, will have a demand for about 1 million tonnes of organic waste, with some differences between the macro-areas. While the North will have a higher supply than demand (making it possible to make up part of the deficit of the other geographic macro-areas) and Sardinia will be self-sufficient, the Centre, the southern peninsular and Sicily will suffer from a plant deficit. As far as the treatment of the unsorted wasste fraction is concerned, the estimated scenario to 2035 shows that the country will need about 2.5 million tonnes and that all macro-areas will have a plant deficit (Fig. 9).

#### **FIGURE 9**

ESTIMATED PLANT NEEDS BY 2035

### AVAILABLE CAPACITY ORGANIC WASTE AVAILABLE CAPACITY UNSORTED WASTE ADDITIONAL REQUIREMENTS ORGANIC ADDITIONAL REQUIREMENTS UNSORTED WASTE



IN 2035, THE COUNTRY WILL HAVE A NEED FOR THE TREATMENT OF ORGANIC WASTE OF 1 MILLION TONNES IN CENTRE AND THE SOUTH AND 2.5 MILLION TONNES FOR TREATMENT OF UN-SORTED WASTE

**ITALY NEEDS** 

AN ADEQUATE

TREATMENT OF ORGANIC AND

FRACTIONS

**EXPANSION OF THE** 

**UN-SORTED WASTE** 

PLANT FACILITY POOL, ESPECIALLY FOR THE

Source: Utilitalia

Unlike the treatment of organic waste (for which, also thanks to NRP funds, a number of plants are being designed, built, tested, or recently put into operation, making it possible to reduce the current plant gap in 2035), as far as the energy recovery of non-recyclable residual waste is concerned, there are currently no major projects foreseen. The only exception is the plant in Rome, where the tender for the award of the construction and management works is currently underway. The projected capacity of this plant is 600,000 t/year, which would effectively halve the needs of the Central macro-region and about a quarter of the national needs.

However, the plant facility system must be subjected to appropriate governance and an operational approach. The overcoming of management fragmentation is of fundamental importance to achieve the objectives of cost efficiency and service effectiveness.

Currently, most of the regions have opted for a region-wide scope of coverage (65% of Italian regions) to better fulfil the principles of self-sufficiency and proximity for the disposal of residual urban waste as established by national legislation. However, there are several situations in which a supra-provincial, provincial, sub-provincial or mixed scope of coverage was chosen (e.g. Campania or Sicily have identified both provincial and sub-provincial areas). In several cases, in addition to referencing Local Environmental Service Coverage Areas (ATOs), Regional authorities have awarded service contracts extended to sub-areas. This results in a multi-level structure that sees the regional territory divided into assignment areas, sub-areas or basins that can also vary depending on the segment of the supply chain (Fig. 10). It is also noted that regions with large urban centres, characterised by large areas, high population density and high tourist and commuter flows, have planned basins coinciding with a single municipality. In other cases, the Regional Authorities have not set up service coverage on a local area basis. In fact, in compliance with the guidelines set out in Legislative Decree 152/2006, the latter "may adopt alternative models or exceptions to the Local Environmental Service Coverage Areas (ATO) model" (Article 200 of Legislative Decree 152/2006), and this has led to a natural fragmentation of environmental management systems.

#### FIGURE 10

SUBDIVISION OF THE NATIONAL TERRITORY INTO ATOS AND SUB-ATOS

#### **EXTENT OF THE ATOs**



**ENVISAGED SUB-ATOs** 

The implementation of existing legislation, reflected in different governance models, sometimes also depending on the various stages of the service, the simultaneous presence of derogations and the absence or inoperability of Area Government Agencies in some areas of the country, provides a clear picture of heterogeneous local governance. Although several governing bodies have become operational in the last two years, where regions have opted for local governance, the implementation process remains incomplete in many regions, and the organisation of the service according to Local Environmental Service Coverage Areas is only achieved in a few regions. To date, in 10 regions EGAs are operational in all the planned ATOs, while in the remaining areas, situations of partial operation or total inoperability are observed (Fig. 11). Excluding Lombardy, which avails itself of the possibility of adopting "alternative or derogation models to the Ambiti Territoriali Ottimali (AOTO) model", to date there are three regions that have not established any EGAs.

65% OF THE REGIONS OPTED FOR A REGIONAL SCOPE OF COVERAGE

THE LOCAL GOVERNANCE IMPLEMENTATION PROCESS IS INCOMPLETE IN VARIOUS PARTS OF THE COUNTRY

#### **FIGURE 11**

OPERATIONAL LEVEL OF THE LOCAL REGULATORY AUTHORITIES (EGAS)



Source: Utilitatis

The sector's territorial organization is still far from achieving the necessary rationalization and institutional uniformity outlined in Article 3-bis of Decree Law 138/2011. The sector's territorial organization is still far from achieving the necessary streamlining and institutional uniformity outlined in Article 3-bis of Decree Law 138/2011. Moreover, according to the findings of the ARERA report on the state of reorganisation of the sector's local organisation, in several areas of the country, such as Campania, Puglia and Veneto, the critical issues concerning the participation of local authorities in the relevant EGATOs have been positively resolved in recent years through the exercise of substitutive powers by the competent regional bodies.

At the management level, the sector is characterised both by a horizontal fragmentation of the service, still due to the high presence of managers that do not go beyond the municipal territory, especially in the central-southern areas of the country, and by a vertical fragmentation with regard to the stages that make up the supply chain, with only a few large managers able to close the cycle. Operators active in the collection segment and in the integrated cycle differ in terms of the size of the territory served and the level of integration of the phases that make up the municipal waste cycle. Such operators are also classifiable in terms of company structure and the manner in which they handle contract assignment.

According to the latest data provided by the Utilitatis database, from the point of view of company structure (Fig. 12), at the national level, the presence of wholly public operators prevails (39% in terms of inhabitants served), companies listed or controlled by publicly controlled companies cover an area corresponding to 16% of the inhabitants, while mixed companies, with public and private capital, account for 13% of the population. Overall, publicly owned operators serve 68% of the residents served. There is a noteworthy statistic regarding areas managed on a cost-reduction basis by private operators or specific municipalities: they represent a total of 22% of the national population, which is not negligible. Looking instead at service contract modes, those assigned in-house affect 35% of residents (Fig. 12), assignments to listed companies and joint enterprises each total (9%), while concessions to third parties represent 7%. A share of 32% of the population is served by companies who have secured service contracts through tenders, the relatively short duration of which results in frequent service management turnover scenarios.

AT MANAGEMENT LEVEL, THE SECTOR IS CHARACTERISED BY A FRAGMENTATION OF SERVICE THAT IS BOTH HORIZONTAL AND VERTICAL

#### FIGURE 12

TYPE OF CONTRACT AND TYPE OF SHAREHOLDING OF THE OPERATORS OF THE COL-LECTION AND INTEGRATED CYCLE [YEAR 2023]



LISTED COMPANIES AND SUBSIDIARIES OF LISTED COMPANIES

Source: Utilitatis

The assignment of the service is monitored by the Utilitatis Foundation, which in 2014 established an observatory for the analysis of tenders.

Out of the 2,816 tenders issued from 2014 to 2023 for the awarding of municipal waste management services, 58% are tenders for collection services, 23% concern the awarding of the entire integrated cycle, while 19% relate to the awarding of waste recovery or disposal services. In terms of size, 87% of the tenders analysed envisage the assignment of the service to a single Municipality.

Management fragmentation is also accompanied by a strong temporal discontinuity in the running of the service. At the national level, most of the tenders launched in the period 2014–2023 were for less than 5 years (1,795 tenders compared to 1,021 for more than 5 years), with the difference becoming more pronounced in certain parts of the country. In the south, in particular, service contracts assigned for less than five years account for 75% of cases. Analysing the calls for tenders by type of activity awarded, an average duration of about 4 years is noted for the collection phases, while for the recovery and disposal activities, the average duration is approximately 2 years.

Examining the expiration of contracts<sup>1</sup>, about 22% of the sample analysed (856 contracts) are due to expire in 2023 (3.9 million residents) and have not yet been renewed, while 23% of the sample total (201 contracts covering 2.6 million residents served) are due to expire in 2024, 75% of them in the South (150, corresponding to a population of over 1.6 million resi-

<sup>1</sup> The information regarding contract duration was obtained by analysing the service contracts entered into with the operators (for contracts involving 10.3 million residents) and the specifications of the tenders (for cases involving 18.3 million residents).

**GREATER PRESENCE OF WHOLLY PUBLIC OPERATORS (39%)** 

87% OF CALLS FOR TENDER COVER THE **NEEDS OF JUST ONE MUNICIPALITY** 

#### IN THE SOUTH, 75% OF TENDERED **CONTRACTS HAVE A DURATION OF LESS THAN 5 YEARS**

dents). This results in a sudden change of management in the areas which, in the absence of strong local governance and long-term planning, may affect the potential for improvement of service.

A total of 23 local area tenders have been launched in Italy, of which 20 have completed the procedure by identifying the chosen operator (Fig. 13). The remaining three were not awarded because they were revoked, cancelled or interrupted.

#### FIGURE 13

LOCAL AREA TENDERS IN ITALY [YEARS 2014-2023]



Source: Utilitatis calculations regarding tenders

In 2022, the waste sector generated a turnover of just over €13 billion, equivalent to about 0.7% of national GDP. The companies employ more than 86,000 direct workers, representing 0.34% of the total number of employees in Italy and 1.47% of those employed in the industrial sector.

The analysis conducted on single-utilities, which represent 80% of the total companies, shows that turnover ( $\in 10.8$  billion) is mainly generated by large companies that, despite being in the minority in numerical terms (4%) generate 40% of the sector's revenues while small companies that predominate numerically (51%) generate only 7% of sector revenues (Fig. 14).

#### **FIGURE 14**

DISTRIBUTION OF OPERATORS AND SECTOR TURNOVER BY SIZE CLASSES [YEAR 2022]



Source: Utilitatis calculation based on AIDA BvD data

13 BILLION IN TURNOVER: 0.7% OF GDP AND A WORKFORCE OF 86,000

INTEGRATED OPERATORS GENERATE 32% OF TOTAL TURNOVER The analysis shows that waste collection operators, which represent 53% of the total, account for 37% of the total revenues, occupying 58% of the sector's workforce (Fig. 15). On the other hand, integrated operators represent 17% of the total operators, generating 32% of the total turnover and occupying 32% of the total workforce. Complementarily, the category of plant facility operators forms the remaining 30% of companies in the sector and generates 31% of revenues by employing 10% of the workforce.

#### **FIGURE 15**

BREAKDOWN OF THE NUMBER OF OPERATORS, TURNOVER AND EMPLOYEES IN THE MUNICIPAL WASTE MANAGEMENT SECTOR BY TYPE OF ACTIVITY [YEAR 2022]



Source: Utilitatis calculation based on AIDA BvD data

The financial analysis also shows how both the type of business conducted and the company size influence the economic performance of the operators (Fig. 16). The breakdown by activity shows that the economic margins of service provision are higher for the operators who manage the plant facilities (EBITDA margin at 26%), while waste collection operators and integrated operators record a lower performance (EBITDA margin at 7% and 8%, respectively).

#### **FIGURE 16**

BREAKDOWN OF SINGLE-UTILITY SAMPLE MARGINS BY ACTIVITY [YEAR 2022]



Source: Utilitatis calculation based on AIDA BvD data

With reference to the economic performance of the operators (Fig.17), these seem to be particularly affected by the type of activity chosen, in particular the operators who manage plant facilities have values much higher than the average (ROE = 28%; ROI=10%; ROS=17%).

PLANT FACILITY OPERATORS YIELD GREATER FINANCIAL PERFORMANCE

#### **FIGURE 17**

PROFITABILITY RATIOS OF THE SINGLE-UTILITY SAMPLE BY ACTIVITY [YEAR 2022]



Source: Utilitatis calculation based on AIDA BvD data

With respect to the financial sustainability of the service, both on the household and non-household level, TARI (municipal waste disposal charge) expenditure takes on different values depending on the geographical areas of reference, maintaining a certain stability over time.

For a household of 3 people in a 100 sqm dwelling (Fig. 18), the average expenditure on the service in 2023 was  $\in$  328, with large regional differences between macro-areas:  $\in$  284 for the North,  $\in$  347 for the Centre and  $\in$  378 for the South. These differences have persisted over time: over a 10-year period (2014–2023), in the North, waste collection service expenditure remained at an average of  $\notin$  274, while in the Centre and the South, on the other hand, spending over the period was  $\notin$  334 and  $\notin$  360 respectively, i.e. higher than the national average figure for the period ( $\notin$  315).

#### **FIGURE 18**

TARI EXPENDITURE TREND FOR THE 3-COMPONENT 100 SQM UTILITY – GEOGRAPHICAL AREA [YEARS 2014–2023; €/YEAR]

|             |      |      |      |      | н 🔵 се | NTRE | SOUTH | •••• | AVERAGE |  |
|-------------|------|------|------|------|--------|------|-------|------|---------|--|
|             |      |      |      |      |        |      |       | 369  | 378     |  |
| 3 <u>56</u> | 355  | 352  | 358  | 356  | 359    | 356  | 359   |      |         |  |
| 338         | 225  | 332  |      |      |        |      | 338   | 225  | 347     |  |
| 550         | 330  | 333  | 330  | 326  | 325    | 333  | 220   | 335  | 328     |  |
| 312         | 313  | 310  | 312  | 311  | 312    | 313  | 320   | 320  |         |  |
|             |      |      |      |      |        |      |       |      |         |  |
| 266         | 270  | 269  | 270  | 271  | 273    | 273  | 283   | 278  | 284     |  |
|             |      |      |      |      |        |      |       |      |         |  |
| 2014        | 2015 | 2016 | 2017 | 2018 | 2019   | 2020 | 2021  | 2022 | 2023    |  |

Source: Utilitatis calculation based on TARI approval resolutions

Analysing the expenditure of households on TARI according to the population of their municipality of residence in the period from 2014 to 2023 (Fig. 19), observe that, for a family of 3 in a 100 sqm home, the most populous municipalities (> 200,000 residents) have the highest expenditure (€352 in 2023), the only one above the sample average (€328 in 2023).

The average growth rate of expenditure at the national level increased compared to both the previous year (up 2.7%) and 2014 (up 5.2%). In the medium-sized and medium-large municipalities, similar expenditure values are to be found in 2023 ( $\leq$ 318 and  $\leq$ 303, respectively), despite the fact that they have experienced markedly different growth rates over the years (up 14.1 and up 3.8% from 2014 to 2023, respectively). Smaller municipalities have the lowest average expenditure value ( $\leq$ 241 in 2023) and a negative expenditure growth rate (down 0.8% from 2014 to 2023).

TARI: SIGNIFICANT COUNTRYWIDE DIFFERENCES – FROM €378 IN THE SOUTH TO €284 IN THE NORTH

SMALLER MUNICIPALITIES HAVE THE LOWEST AVERAGE EXPENDITURE

#### **FIGURE 19**

TARI EXPENDITURE TREND FOR THE 3-COMPONENT 100 SQM UTILITY – MUNICIPALITY PO-PULATION CLASS [YEARS 2014–2023; €/YEAR]

| ● <=5      | 0.000         | 50.001 - 1             | .00.000                      | 100.001     | - 200.000                   | >200.0                      | 00                  | 4                   | AVERAGE    |
|------------|---------------|------------------------|------------------------------|-------------|-----------------------------|-----------------------------|---------------------|---------------------|------------|
| 339 —      | 337           | 335                    | 335                          | 335         | 336                         | 338                         | 347                 | 340                 | 352<br>328 |
| 312<br>292 | -313-<br>293  | <del>31</del> 0<br>291 | - <del>- 312-</del> -<br>294 | 311<br>293  | - <del>- 312</del> -<br>293 | - <del>- 313</del> -<br>292 | - <del>3</del> 20 - | - 320<br>295<br>314 | 318        |
| 279        | 291           | 293                    | 292                          | 291         | 291                         | 294                         | 301                 |                     | 303        |
| 243        | 232           | 225                    | 233                          | 226         | 229                         | 231                         | 234                 | 236                 | 241        |
| 2014       | 2015          | 2016                   | 2017                         | 2018        | 2019                        | 2020                        | 2021                | 2022                | 2023       |
| Source: Ut | ilitatis calc | ulation base           | ed on TARI a                 | nd ISTAT ap | proval reso                 | lutions                     |                     |                     |            |

It is well known that Law No. 205/2017 brought significant aspects of the municipal waste cycle under the independent regulation of ARERA. Since then, the main measures adopted by the Independent Regulator have primarily concerned the Tariff Method for the years 2018–2021 (known as the MTR) with Resolution 443/2019/R/Rif, the transparency of the service through Resolution 444/2019/R/rif, the Tariff Method for the years 2022–2025 (Resolution 363/2021/R/Idr) – containing the important introduction of criteria for updating tariffs not only for integrated operators, but also for certain categories of facilities – and finally, the quality of service, with Resolution 15/2022/R/rif.

Over the last year, the Regulator's intervention in the waste sector has covered both tariff issues and matters related to quality of the service, with an integrated approach that includes and correlates the two aspects. With regard to tariff aspects, ARERA has published the expected biennial update (2024–2025) of the Waste Tariff Method (MTR-2), referred to in resolution no.389/2023/R/rif, introducing elements of flexibility to allow management to address the effects of the inflationary dynamics that have emerged since the second half of 2021. The purpose of the interventions in this direction was threefold, the intent being to guarantee continuity of service while securing the operator's financial solidity and the sustainability of the tariff. The same measure also introduced two indicators – Ha and R1 – concerning, respectively, the monitoring of the progressive improvement of the costs pertaining to sorted waste collection (Ha) and the effectiveness of the recycling of waste fractions subject to extended producer responsibility obligations (R1). Moreover, these indicators should be read and interpreted from a systemic perspective that includes quality aspects. Quality regulation has also been supplemented with aspects concerning the efficiency, quality and effectiveness of separate collection and the efficiency, continuity and commercial quality of the treatment service (Resolutions 387/2024/R/rif and 389/2023/R/rif).

During 2023, the treatment regulation included in MTR-2 was affected by several disputes that culminated at the end of the year with Council of State rulings Nos. 10548, 10550 and 10775. This resulted in the postponement of the application of the regulation applied to treatment plants as from 2024 and the introduction of explicit references to the necessary consistency that must exist between the identification of "minimum configuration" plant facilities and the criteria indicated by the National Waste Management Programme (PNGR – Programma Nazionale di Gestione dei Rifiuti). See Resolutions 7/2024/R/rif and 72/2024/R/rif.

Lastly, the standard service contract template was introduced to regulate relations between awarding bodies and contractors. Among other aspects, it regulates the procedures and methods for alternating operators, the measures to promote the financial solidity underlying the operations, and the obligations of the parties with respect to operator reliability (Resolution 385/2023/R/rif).

The challenge of meeting climate targets and decarbonising the economy is increasingly pushing Europe and the world towards producing and trading critical and strategic raw materials (CRMs), which are needed to transform the global economy from one based on fossil fuels to one driven by renewable energy technologies. These technologies generally make more intensive use of minerals than their fossil fuel-fuelled counterparts. Thus, while the

ELEMENTS OF FLEXIBILITY IN THE TWO-YEAR UPDATE (2024–2025) OF THE WASTE COLLECTION CHARGE METHOD (MTR-2) TO ADDRESS INFLATION EFFECTS

CRITICAL RAW MATERIALS: LIMITED RESOURCES WITH HIGH GEOGRAPHICAL CONCENTRATION

green transition will reduce global dependence on fossil fuels, it will increase pressure on the production and efficient international exchange of other raw materials. It is essential, therefore, to properly manage supply risks by defining strategies capable of reducing risk and minimising emerging dependencies on critical materials. The recovery and recycling of these materials is therefore of strategic importance for countries, which, like many European ones, are lacking in them.

Currently, China is the main global supplier of CRMs (65%), followed by South Africa (10%) and then, at a minority level, by other countries such as Australia, the United States and the Democratic Republic of the Congo (Fig. 20).

#### **FIGURE 20**

COUNTRIES SUPPLYING CRITICAL RAW MATERIALS [YEAR 2023; PERCENTAGE]



Source: Utilitatis calculation based on data from European House Ambrosetti

If we look specifically at imported strategic raw materials imported by the EU, we observe that the current main CRM supplier is China, from which Europe imports 8 of the 17 materials deemed strategic (i.e. 47%), and of which, for certain critical raw materials, it is the exclusive exporter (Fig. 21):

- China provides the EU with 100% of its heavy rare earth elements procurement;
- Turkey provides 99% of the EU's boron supply;
- South Africa provides 71% of the EU's platinum needs.

#### **FIGURE 21**

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STRATEGIC RAW MATERIALS BY EU SUPPLIER COUNTRY



Source: Utilitatis calculation based on data from European House Ambrosetti

CHINA IS THE MAIN EU SUPPLIER OF CRITICAL AND STRATEGIC RAW MATERIALS

RECYCLING OF CRITICAL RAW MATERIALS TO REDUCE DEPENDENCE FROM ABROAD

PROMOTE WEE COLLECTION TO INCENTIVISE CRM RECOVERY PLANT FACILITIES

RENEWABLE ENERGY GENERATION PLANT AND STORAGE SYSTEMS ARE VALUABLE SOURCES OF CRMS The supply of CRMs is, therefore, a European security issue, and to guarantee security and reduce the risk of dependence on third countries, the EU has set "Critical Raw Materials Regulation" targets for 2030, namely:

- EXTRACTIONS WITHIN THE EU: at least 10% of the EU's annual consumption must come from extractions within the EU;
- TRANSFORMATION WITHIN THE EU: at least 40% of the EU's annual consumption must come from transformation within the EU;
- RECYCLING WITHIN THE EU: at least 25% of the EU's annual consumption must come from internal recycling;
- EXTERNAL SOURCES: no more than 65% of the Union's annual consumption of each strategic raw material at any relevant stage of processing may come from a single third country.

In addition to the diversification of supplier countries and investment in the search for domestic deposits, special attention is paid to urban mining and the recovery of CRMs through the recycling of currently used materials. Indeed, the circular economy can make an important contribution to mitigating the supply-demand mismatch.

The WEEE system can play an important role in the recovery of CRMs. In 2023, the total countrywide collection of WEEE from households stood at over 349,000 tonnes (down 3.1% compared to 2022), equal to a little under 6 kg per resident. According to the latest available data, the 2022 collection rate is 34%, and according to data released by the plant facilities, about 96% of household WEEE collected in Italy is managed within the system operated by the WEEE Coordination Centre.

From a WEEE treatment perspective, there is currently no need for additional specific treatment plant capacity since, thanks also to upgrading and technological development investments, the 49 plants approved for the treatment of WEEE at the end of 2023 were able to handle the volumes collected without any particular problems (up 18% from 2017 to 2023). However, it should be emphasised that these are so-called first-level plant facilities, i.e. systems whose first goals are to prepare for re-use, secure and treat waste to produce "fractions" of homogeneous materials, and which do not necessarily go as far as refining individual components and recovering CRMs. This phenomenon is mainly due to market reasons: in order to be economically viable and profitable, certain types of processes and treatments require significant economies of scale, which can only be achieved with large processing volumes. The volumes collected in Italy are not such as to encourage the establishment of companies that invest in this phase of processing. It is more convenient and competitive to send the obtained fractions abroad, where a number of large groups are already present and require fractions for processing due to the size of their plants. When the collection in Italy grows significantly, the market itself will lead companies and entrepreneurs to invest in dedicated lines, which would thus become economically competitive solutions also with respect to the activity carried out abroad. In fact, collection figures are still off the targets set by Europe (12 kg per resident) and, given the strategic value of WEEE and the difficulties in supplying critical raw materials, it is imperative to boost collection, which seems to be the real driving force behind the development of the sector.

Photovoltaic systems are a verified source of critical and strategic materials such as aluminium, nickel, boron, germanium, silicon, copper and gallium (European Commission, 2023). Wind farms, on the other hand, contain critical and strategic materials such as, for example, rare earths (Pietrantonio et al., 2022).

Furthermore, considering that the storage systems connected to both types of generation systems are predominantly based on lithium iron phosphate technology, we must also add phosphorus, which forms part of the cathode and electrolyte materials, to the above mix.

Given the commitments undertaken by the EU, a progressive increase in renewable installations in Italy and Europe is expected in the medium term (by 2030) and the long term (by 2050). Consequently, we must also consider their related constituent raw materials. While this will lead to an increase in demand for CRMs, we must also consider that much renewable plant, especially first-generation systems, are close to decommissioning and this

will push Europe, as well as Italy, to develop recycling supply chain development plans. Thus, renewable plant will offer great opportunities for recovering part of the necessary CRMs.

Among recoverable CRMs, end-of-life permanent magnets (NdFeB) contained in wind farm turbines are an important secondary CRM source, particularly rare earths, for which Europe is heavily dependent on China. Considering, for example, currently installed wind power capacity and the potential of plants to be installed to meet climate targets, we can estimate the potential of critical raw materials recoverable from their disposal (Table 1).

#### TABLE 1

QUANTITY OF RARE EARTHS POTENTIALLY EXTRACTABLE FROM PLANT FACILITIES UNDER-GOING DECOMMISSIONING ASSUMING MAXIMUM CONCENTRATION (30%)

| SCENARIOS FOR 2030                | TURBINE WEIGHT<br>(TONNES) | PERMANENT METALS<br>(TONNES) <sup>2</sup> | RARE EARTHS<br>(TONNES) <sup>3</sup> |
|-----------------------------------|----------------------------|---|--------------------------------------|
| VESTAS V90 TURBINE – 2.0 MW       | 267                        | 1,34                                      | 0,34                                 |
| ITALY – DECOMMISSIONING OF 7.6 GW | 1.014.600                  | 5.073                                     | 1.521                                |
| EUROPE – DECOMMISSIONING OF 52 GW | 6.942.000                  | 34.710                                    | 10.413                               |

Source: ENEA

Globally, the recovery of rare earths is less than 1% due to technological problems, low collection rates and lack of incentives<sup>4</sup>. Enhancing the value of the market for secondary raw materials and incentivising their recovery is, therefore, essential to ensure the development of new recovery chains and guarantee security of supply.

The growing demand for consumer goods and the need to efficiently use resources and materials in manufacturing highlight the importance of recycling, recovering, and reusing Secondary Raw Materials. The use of secondary rather than virgin raw materials is advantageous in terms of energy efficiency and reduction of CO2 emissions, which, if properly quantified and valued through the use of Exchangeable Energy Efficiency Credits (TEEC – Titoli di Efficienza Energetica Circolare) and C3 carbon credits, will guarantee greater market competitiveness and benefits for the entire supply chain.

The growing demand for consumer goods and the need to optimize the use of resources and materials in production highlight the importance of recycling, recovery, and reuse of Secondary Raw Materials (SRMs). In this regard, Utilitalia and Enea have developed a project to evaluate the energy savings associated with the use of SRMs compared to virgin raw materials. The LCA analysis, conducted according to the "from cradle to market" approach (Fig. 22), demonstrated that the use of SRMs provides an advantage in terms of energy efficiency and CO2 emission reduction.

EXCHANGEABLE ENERGY EFFICIENCY CREDITS SUSTAIN THE MARKET FOR SECONDARY RAW MATERIALS

<sup>&</sup>lt;sup>2</sup> Corresponds to 0.5% of the weight of the turbine.

<sup>&</sup>lt;sup>3</sup> Extractable from permanent metals assuming a concentration of 30%.

<sup>&</sup>lt;sup>4</sup> Xiao, F., Hu, X., Zhao, J., Zhu, H. (2023). Technologies of recycling REEs and iron from NdFeB scrap. Metals, 13:779. https://doi. org/10.3390/met13040779

#### **FIGURE 22**

SYSTEM BOUNDARIES FOR THE ANALYSIS OF THE USE OF VIRGIN RAW MATERIALS OR SECONDARY RAW MATERIALS



#### Source: Utilitalia

The valorization of energy savings and emissions through Circular Energy Efficiency Certificates (CEEC) and carbon credits (3C) would make SRMs more competitive, incentivizing a more efficient demand for materials and improving waste collection and recycling. By stimulating the creation of a proper market for SRMs and leveraging environmental benefits, this mechanism could also promote industrial infrastructure development, pushing companies towards virtuous procurement models.



Promote knowledge, innovation and best practices when managing Local Public Services.

The Utilitatis Foundation is the fruit of a journey that began in 1995 with the establishment of the Istituto di ricerca sui servizi pubblici/Italian public services research institute, the then Proaqua, at the behest of Federgasacqua (now Utilitalia). Since its inception, it has taken the form of a non-profit consortium aimed at study and research activities of a technical-economic nature, as well as assistance to administrations or companies involved in service reorganisation processes.

In 1999, the institute expanded its research activities, at first focusing exclusively on the integrated water service, to other local public services, such as the natural gas distribution service and the municipal waste management service, transforming itself into the CRS-PROAQUA public utilities research centre. In 2006 the Research Centre took on its current name, UTILITATIS pro acqua energia e ambiente.

In May 2011, the consortium was transformed into a Foundation, strengthening its mission as an entity oriented towards promoting the culture of local public service management and the dissemination of legal, economic and technical content.

In 2021, the Founder Promoter, Utilitalia, supported the functional redesign of the Foundation, relaunching its study and research activities, increasing its scientific standing and, at the same time, developing its business activities with regard to both training and consultancy, also outside the federal sphere.

The Foundation's aim is to promote knowledge, innovation and best practices in the management of Local Public Services, improving their quality and efficiency as well as their economic, social and environmental sustainability, orienting the business model towards sustainable success, i.e. the stable creation of long-term value for its shareholders, in a form shared with the relevant stakeholders.

The Foundation's activities focus on drafting periodical industry-related publications such as the Blue Book and the Green Book, monographs dealing with technical, economic and governance aspects of the water and waste service, which contain proprietary data of the managers; the Orange Book, dedicated to innovation in public utilities; the Utilities Sustainability Report, which collects the extra-financial performance of Utilitalia's members; and on collaboration in study and research projects with other Italian and foreign research centres and foundations.



