Circular economy and waste management

[GRI 2-6, 2-23, 3-3, 306-1, 306-2, 306-3, 306-4, 306-5]

Iren Group manages its own waste and the waste managed on behalf of local communities with the aim of reducing its production and increasing recovery and production of energy from waste, according to the principles of prevention, sustainability and safety. Dialogue and a constant flow of information on the topic with Institutions and residents are essential, as is the training provided in collaboration with schools and universities.

Circular economy and waste management

Risks

- Failure to achieve the objectives and targets (economic-financial and ESG) set out in the Business Plan and consequent negative impacts (operating, economic, financial and reputational)
- Impacts inconsistent with circular economy directives or negative environmental, health and safety impacts with consequent negative reputational and economic impacts
- Chronic or extreme natural phenomena from climate change that may cause impacts on assets/ performance
- Non-/missed attainment of environmental authorisations
- Growing waste production and consequent insufficient treatment plants
- Incorrect handling of waste by employees or suppliers

Opportunities

- Favourable regulatory framework
- Growth opportunities in the domestic market
- Recovery of critical raw materials
- Increased consumer awareness

Management methods

- Planning and monitoring of business plan objectives and targets (economic/financial and ESG)
- Sustainable Financing Framework
- Code of Ethics
- Sustainability Policy
- Organisational Model 231 and information flows to the Supervisory Bodies
- MbO and LTI system with ESG objectives
- ERM system (Operational Risk Policy and Climate Change Risk Policy)
- Integrated Certified Management System (risk assessment, containment measures and third-party audits)
- EMAS Certification
- Adoption of best available technologies
- Procedures: Environmental analysis; Special waste management; Hazardous and non-hazardous waste management
- Environmental authorisations
- Requirements in the specifications for the tracing of waste and timely checks
- Qualification and monitoring of suppliers
- Audit of the most significant and potentially sensitive contracts concerning environmental protection

Waste produced by the Group

The Group's main waste-generating activities are:

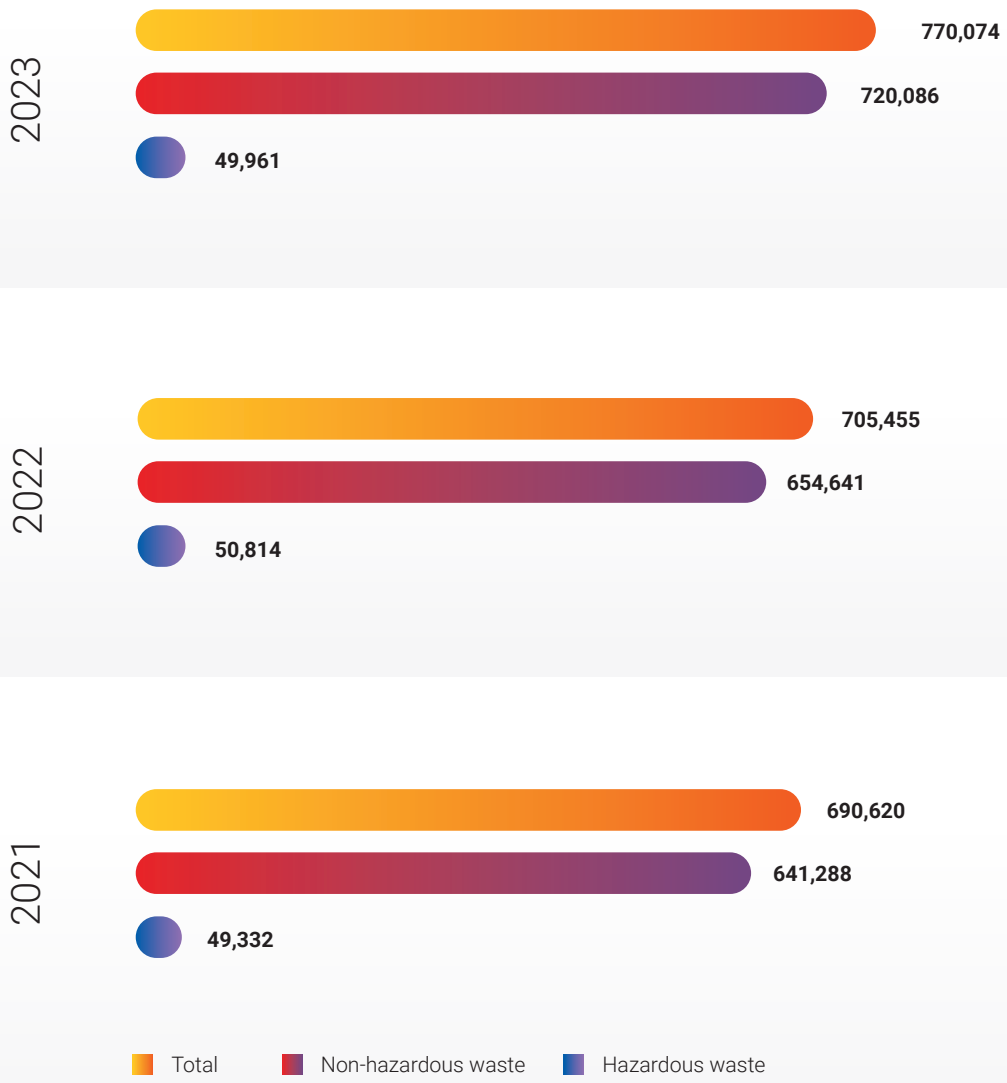
- processes for the **treatment and processing of waste**, urban and special, for communities and private bodies (e.g. leachate generated at landfills, ash and debris from waste-to-energy plants, etc.);
- the **treatment and purification of water** in the management of the integrated water service for the municipalities served (e.g. sludge, sand);
- operation and maintenance of heat and **energy production plants** and **electricity and gas distribution networks**.

The Group's attention to the environment is also reflected in the correct management of the waste produced in carrying out the activities, in accordance with the **principle of the waste hierarchy**, which aims to prevent the production and use the waste produced first of all as a material, through reuse and recycling, then as energy and, only in the residual phase, through disposal (art. 179 of Legislative Decree no. 152/2006).

The management of special hazardous and non-hazardous waste produced at the main production sites is carried out in compliance with the procedures laid down in ISO 14001 standard or EMAS registrations, for sites with such certifications, and in accordance with environmental regulations. The transport and recovery/disposal of waste produced by company processes is carried out, where possible, internally by the Waste Management Business Unit and, where it is necessary to use third parties, it is always entrusted to bodies registered with the Register of Environmental Managers. The quantities of waste produced are monitored periodically and communicated annually to the Chambers of Commerce through the MUD declaration.

Systems of sorted waste collection, aiming to increase material recycling, have been installed in all Group sites. Policies limiting the use of paper have also been drawn up and implemented through dematerialisation and computerisation of processes.

Waste produced by Group processes (t)



In 2023, the Group produced a little over 770,000 tonnes of waste, of which about 720,000 tonnes was non-hazardous. The increase over the previous year (about 9%) is due to the expansion of the company perimeter, the increase in operations in the reclamation sector, and the start of operation of the OFMSW biodigester in Reggio Emilia.

Waste generated by business and main materials (t) [1]	2023	2022	2021
Waste management services	620,188	547,391	532,610
of which non-hazardous	*570,615*	*497,109*	*483,653*
• Slags	178,225	178,292	169,701
• Leachate	81,955	73,229	84,756
• Sludge	12,719	15,757	15,647
• Sands	4,088	3,960	4,826
• Metals	11,539	8,096	8,898
• Other Waste	282,089	217,775	199,825
of which hazardous	*49,574*	*50,282*	*48,957*
Integrated water service	148,444	155,242	156,508
of which non-hazardous	*148,293*	*154,979*	*156,315*
• Sludge	136,959	136,425	131,752
• Sands	4,444	4,019	7,679
• Sieve/Muddle	4,580	4,914	5,394
• Other Waste	2,310	9,621	11,490
of which hazardous	*151*	*263*	*193*
Net energy output	863	975	1,027
of which non-hazardous	*744*	*748*	*864*
of which hazardous	*199*	*227*	*163*
Other non-hazardous waste	434	1,806	456
Other hazardous waste	117	41	19
TOTAL	770,047	705,455	690,620

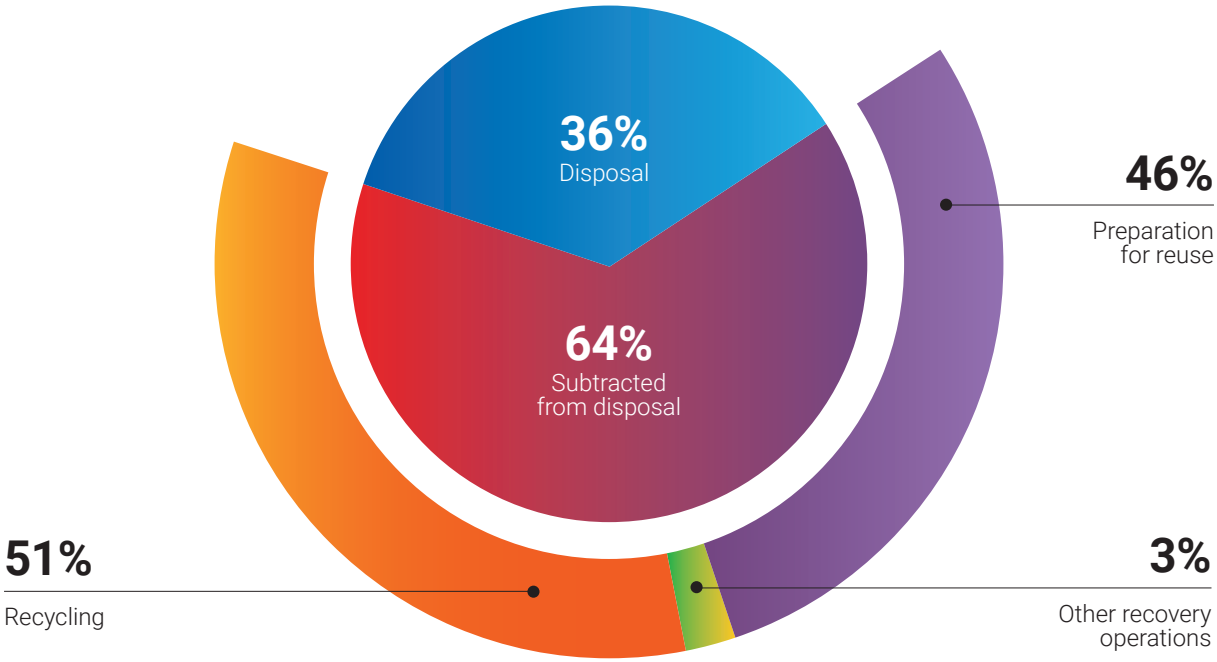
[1] The difference between waste generated and its destination (tables below) is mainly due to the amount of liquid waste used as fluidisers in the solid waste inerting process. It should be noted that the Group's activities do not produce any radioactive waste.

In addition to complying with the legislative framework, the waste cycle is closed with a particular focus on the enhancement of the waste resource (recycling, material recovery and preparation for re-use) with priority to the energy recovery of waste that cannot be usefully recovered, and only as a last resort to disposal.

DESTINATION OF WASTE PRODUCED

WASTE DIVERTED FROM DISPOSAL

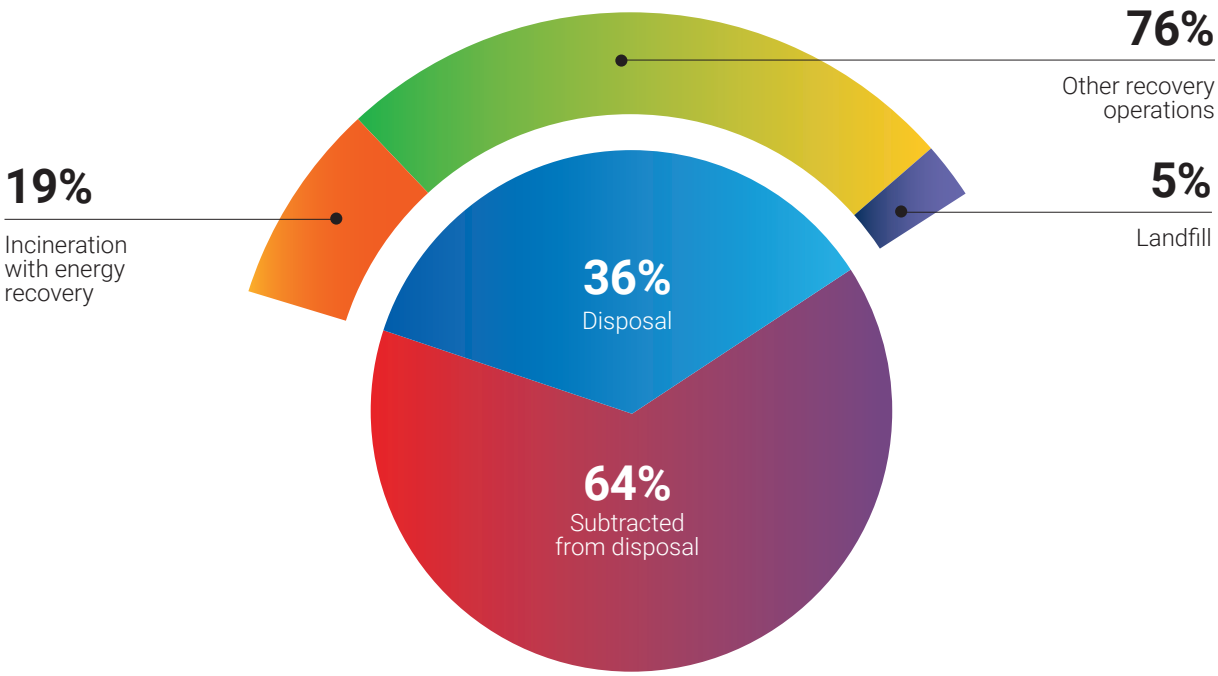
In 2023, approximately 64% of the waste produced by the Group was removed from disposal, continuing the growth trend over the last three years, through the start of the material recovery chain through recycling (51%), preparation for reuse (46%) or other to recovery operations (3%), in plants owned by the Group or third parties.



The details of the waste diverted from disposal are shown in the following table.

Waste diverted from disposal (t)	2023		2022		2021	
	Group plants	Third-party plants	Group plants	Third-party plants	Group plants	Third-party plants
Preparing for reuse	40,261	186,138	38,369	136,539	46,311	128,108
of which hazardous	*82*	*11,530*	*84*	*11,721*	*48*	*23,708*
Recycling	4,208	250,158	7,576	240,309	192	168,792
of which hazardous	-	*13,161*	*8*	*10,639*	-	*24,543*
Other recovery operations	2,645	13,154	2,549	11,414	47	13,123
of which hazardous	13	*296*	*11*	*67*	*13*	*275*
TOTAL	47,115	449,450	48,494	388,262	46,550	310,023

WASTE DISPOSED



The remaining share, equal to 36% of the waste produced, was destined for incineration with energy recovery (19%), landfill (5%) and other disposal operations (76%), in plants owned by the Group and third parties, in the quantities indicated in the following table.

Waste disposed (t)	2023		2022		2021	
	Group plants	Third-party plants	Group plants	Third-party plants	Group plants	Third-party plants
Incineration with energy recovery	50,898	26	39,876	746	46,254	195
of which hazardous	*4*	*1*	*4*	*0*	*64*	*0*
Landfill	7,372	6,859	6,780	8,389	14,784	20,814
of which hazardous	*5,925*	*22*	*6,650*	*3*	*7,267*	*105*
Other disposal operations [1]	135,897	72,392	123,007	88,412	120,319	70,788
of which hazardous	*12,987*	*5,944*	*14,261*	*7,323*	*15,440*	*5,711*
TOTAL	194,168	79,277	169,664	97,546	168,858	80,384

[1] Includes 3.056 tonnes of waste sent to incineration without energy recovery at third-party facilities.

Waste management services for communities

WASTE COLLECTION

Iren Group operates in the waste collection sector in a number of different capacities, depending on the agreements in place with service providers:

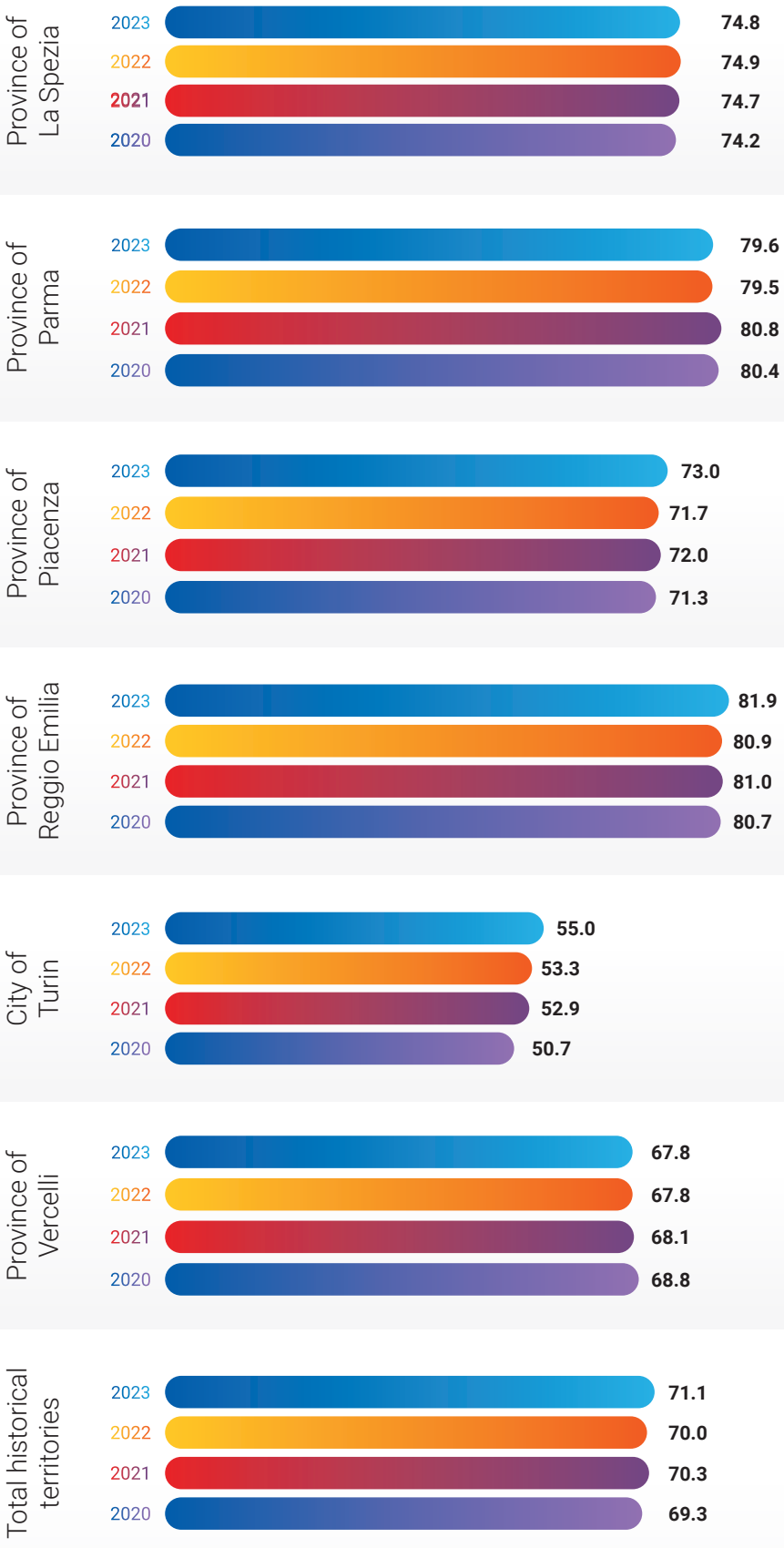
- as operator, on the basis of long-term agreements, in 281 municipalities in the provinces of Parma, Piacenza, Reggio Emilia (Iren Ambiente), La Spezia (Acam Ambiente), Vercelli (ASM Vercelli), in the city of Turin (Amiat) and, in the provinces of Arezzo, Grosseto, Siena and Livorno (Sei Toscana). In these contexts, the Group collaborates with the Regulatory Bodies to define targets and plan the collection systems;
- as a contractor, in the case of San Germano, with operational support to local authorities or other operators, in 155 other municipalities.

In 2023, the Group provided urban waste collection services in a catchment area of more than 3.8 million residents, where about 3 million tonnes of urban waste were managed.
Preventing generation, increasing sorted waste collection levels, and recycling waste are critical objectives of management policies, as they reduce disposal requirements and thus the overall environmental impact. To this end, Iren Group promotes awareness and information initiatives to disseminate culture, awareness and behaviour oriented towards reducing waste production, through communication to citizens and schools, the introduction of punctual pricing systems that create attention and responsibility towards consumption styles more oriented towards reducing waste and scrap, and incentives to use good practices such as family self-composting.
In addition to specific communication and information campaigns aimed at raising awareness among citizens to reduce waste production, Iren Group adopts advanced collection systems (door-to-door, ecological islands with user recognition, punctual pricing), which contribute to achieving excellent levels of sorted waste collection: in 2023, the Group reached **71.1% of sorted waste collection in the historic areas** (Emilia-Romagna, Liguria and Piedmont), compared to a national average of 65.2%.

In some areas, **levels of excellence are recorded**: around 82% in the province of Reggio Emilia, while the province of Parma reached almost 80%.

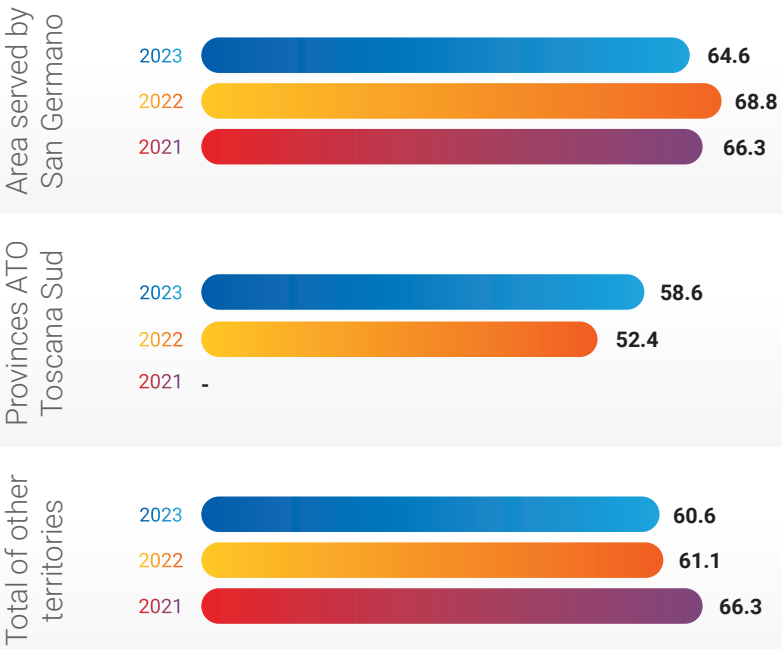
These excellent results are the result of the collaboration between Iren Group and the municipalities, but also of the commitment of the citizens, who show their awareness of the importance of this service with a view to protecting the territory.

SORTED WASTE COLLECTION IN HISTORICAL TERRITORIES (%)

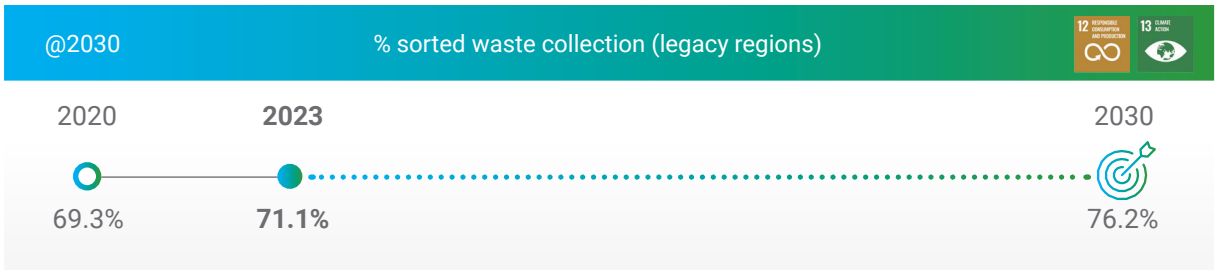


In the **other local areas** (ATO South Tuscany and areas served by San Germano), the sorted collection figure stands at 60.6%. The slight decrease compared to 2022 is related to the change in the contracts managed by San Germano in 2023, which saw the cessation of activities in territorial areas where high levels of sorted waste collection had been achieved, as well as the acquisition of management in new territories with lower levels than the average of the municipalities managed.

SORTED WASTE COLLECTION IN OTHER TERRITORIES (%)

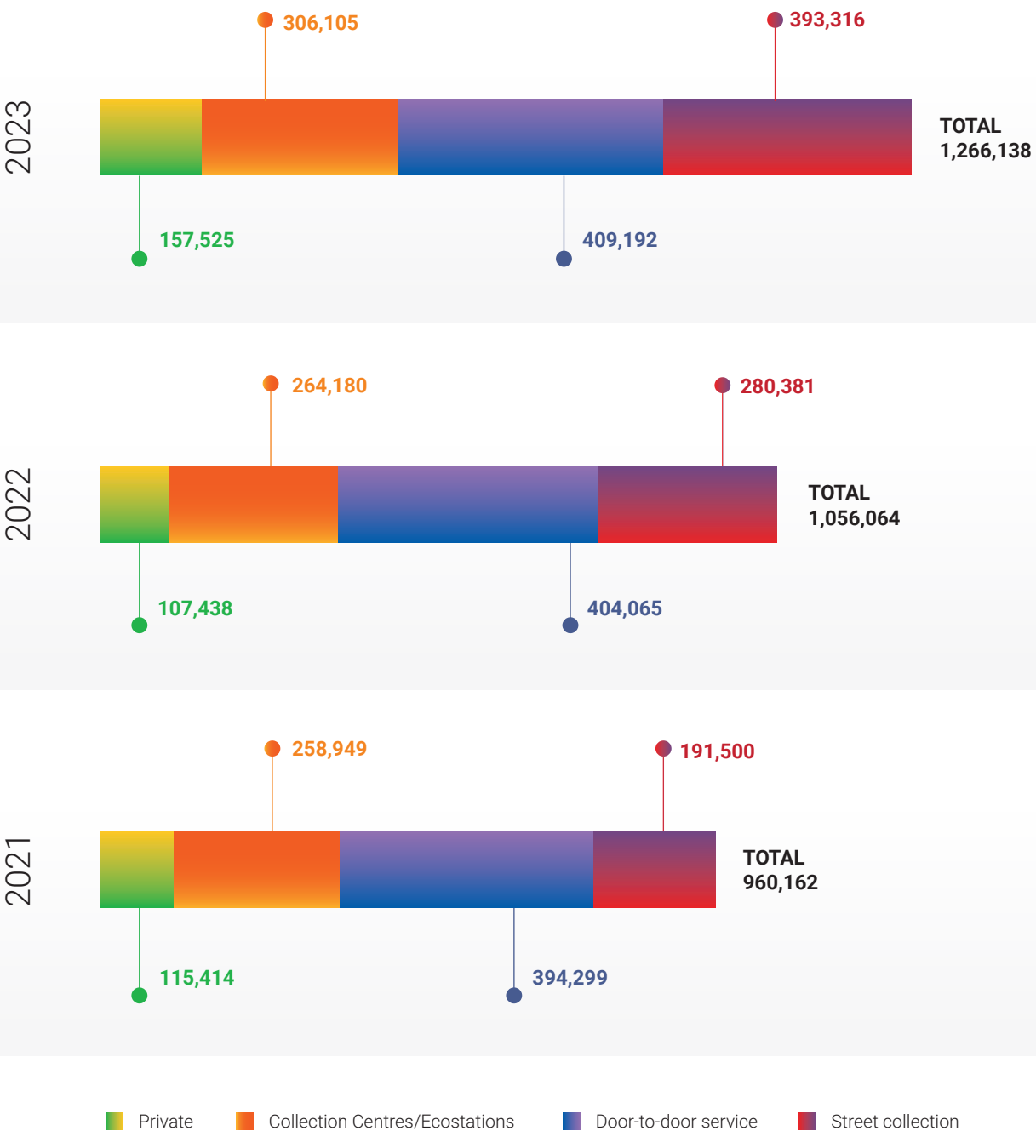


In the system offered to citizens to increase the results of sorted waste collection, the presence of 420 Collection Centres (181 in historical areas and 239 in other local areas) is particularly significant, where it is possible to freely confer the different types of waste inside large containers. The range of services is completed by collecting bulky waste at home and services dedicated to companies for the management of waste assimilated to urban waste.
Of the about 1.9 million tonnes of municipal waste collected in the territories in which the Group operates as manager (Emilia-Romagna, Liguria, Piedmont and Tuscany), about 1.3 million tonnes are sorted. Positive results were also recorded in the municipalities served under contract by San Germano, 241,000 tonnes of sorted urban waste collected, in line with the last two years.
In line with sector directives and territorial planning, the Group has confirmed in its Business Plan to 2030 its commitment to achieve further growth in sorted waste collection to reach, by 2030, 76.2% in the historical areas served and 75.3% in the other local areas, through the continuous development of proximity and home collection services and punctual tariff systems.



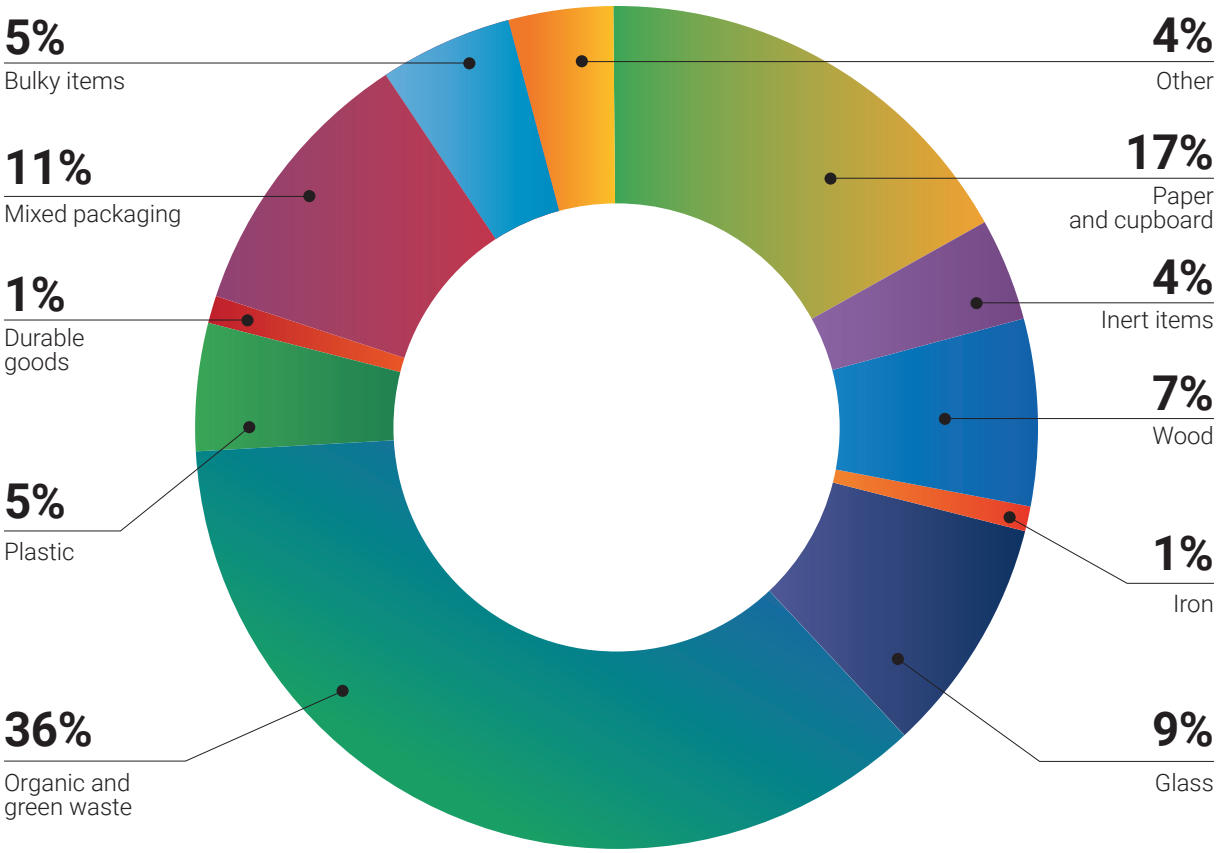
At the end of 2023, the inhabitants of the historical territories served by punctual measurement systems are 31% of the total.

SORTED WASTE COLLECTION BY METHOD (t)



The sorted waste collected, up overall by 20% compared to 2022, is sent for recovery in the Group's plants, through the specialised platforms and sector supply chains, thanks to the agreements in place with the consortia belonging to CONAI (National Packaging Consortium), or through private operators.

Sorted waste recovered by type (%)



For the development and increasingly efficient management of the service, the importance of the process computerisation is emphasised, which allows for important environmental benefits, thanks to optimisation of collection, waste delivery logistics, monitoring of services rendered in the local area, and extension of the punctual pricing method.

WASTE RECOVERY, TREATMENT AND DISPOSAL

In order to guarantee an effective management of the entire waste cycle, the Group is also committed to the treatment and disposal, the recovery of material and the exploitation of the resource waste for the generation of electricity, heat and biogas through a structured system of plants.

In 2023, the Group's plant park grew, thanks both to the construction of new plants and to the expansion of the corporate perimeter. In particular, a **plastics recovery and treatment** plant (Borgaro Torinese), which, with an authorised capacity of 100,000 tonnes per year, is the largest plant in Europe, and a **"Circular wood" regeneration** plant (Vercelli) came into operation.

CIRCOLAR WOOD

Iren Group has built Italy's first plant for the production of logistic supports from wood coming exclusively from **sorted waste collection**: it is the **Circular Wood in Vercelli**, inaugurated in June 2023. The plant, which covers an area of 50 thousand m2, employs 40 direct workers and is capable of processing up to **110,000 tonnes/year of wood waste** to produce up to **750,000 pallets and** about **135,000 cubic metres of pallet blocks** every year.

The waste wood **from sorted waste collection**, once received at the plant, is shredded and refined to allow the removal of any metal parts that may be present. Afterwards, it is cleaned, ground and chopped up before moving on to the drying stage. This is followed by resin moulding, which allows the product to be shaped: the material obtained is mixed with thickeners and additives, and then goes to the moulding press, which produces the final products, pallets and pallet blocks, destined for companies in the logistics sector, starting with those in the local area.

The pallets are marketed by Chimar, under the name of **Giott0**: **a zero-waste** solution, which comes from recycling and remains 100% recyclable, guaranteeing excellent performance in full compliance with the principles of the circular economy.

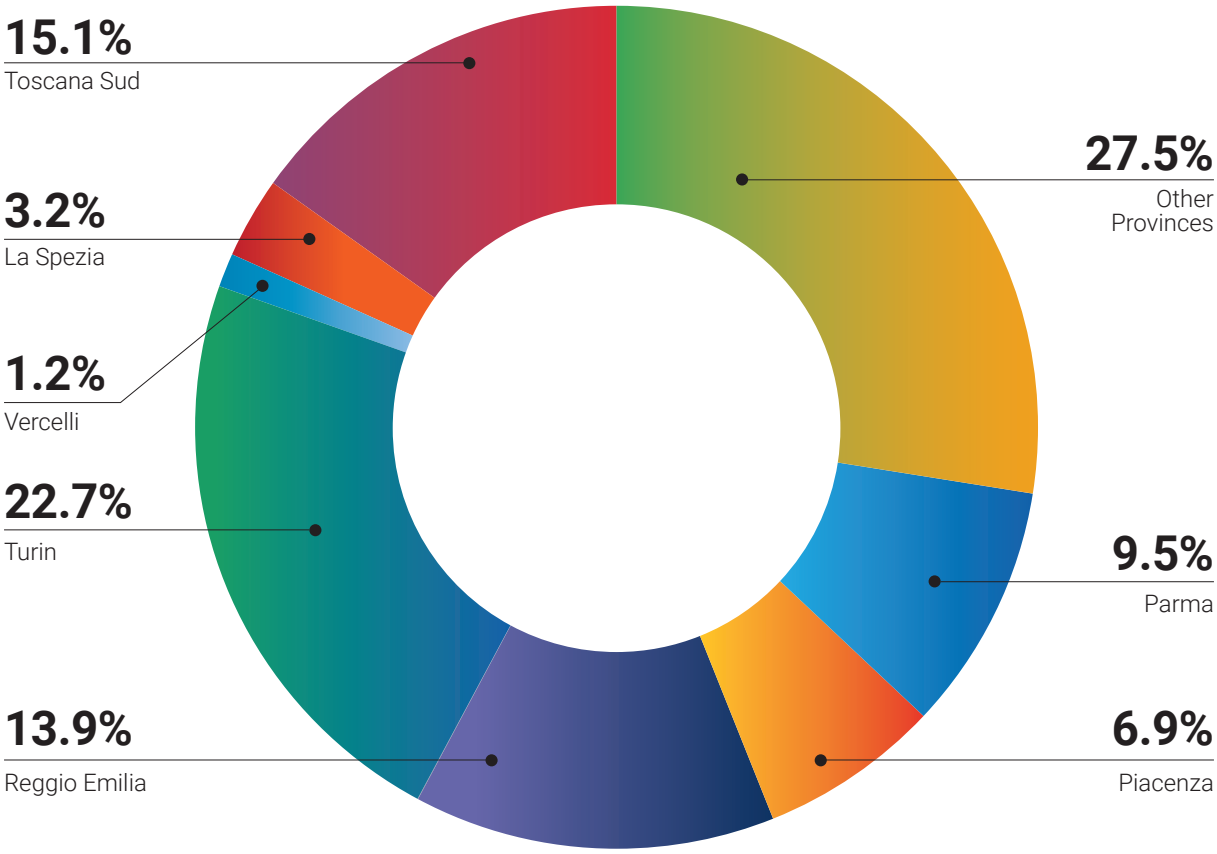
Circular Wood also hosts an **educational area** for visits by schools and citizens, intended for training and awareness-raising sessions on the conscious use of resources and the circular economy approach.

As far as new acquisitions are concerned, the Group has been enriched with **a plant for the valorisation of the polyurethane foam supply chain**, created by the start-up Re Mat, which recycles polyurethane waste from industrial processing, the automotive and furniture sectors, generating semi-finished products for mattresses, finished mattresses, sound-absorbing or heat-insulating panels, and padding for vehicles: 100% green products with technical performance comparable to that of new polyurethane. Re Mat operates in the context of a circular economy, whereby waste is processed, transformed, put on the market again and can subsequently be recycled, countless times.
The plants owned by Iren Group at 31/12/2023 are as follows:

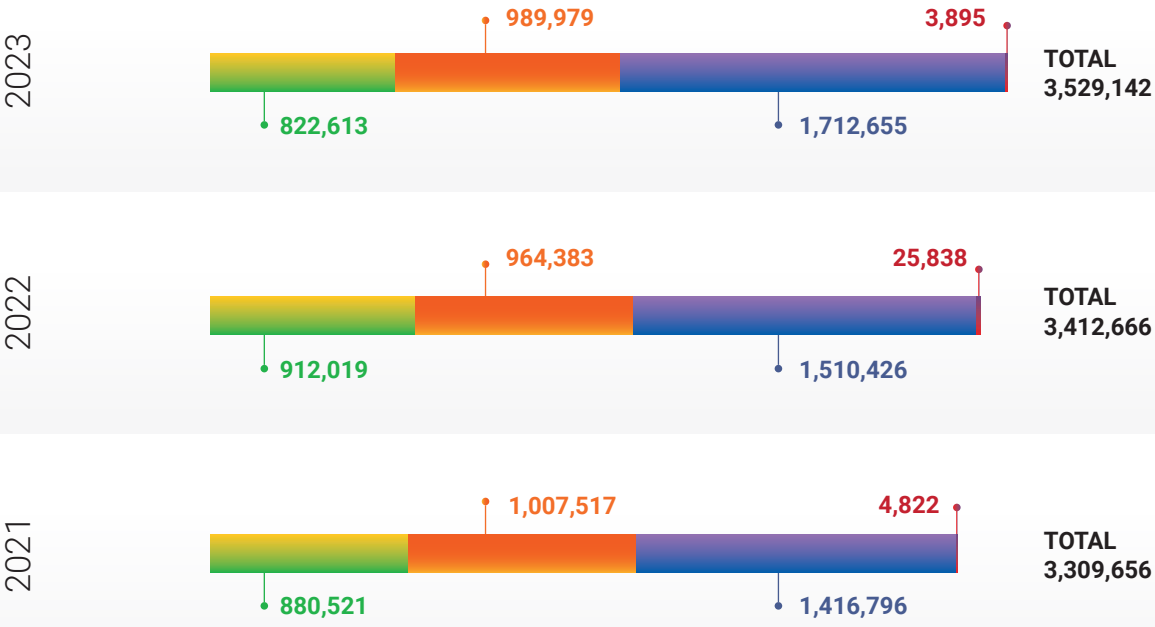
Plants	Number
Waste-to-energy plants	3
Operating landfills	4
Storage and transfer	22
Liquid waste treatment	6
Material recovery	18
Treatment and exploitation of organic waste	5
Mechanical-biological treatment	5

In 2023, a total of over 3.8 million tonnes of waste was managed, including a little over 404,000 collected by San Germano (not included in the breakdowns below).

Waste managed by area of origin (%)

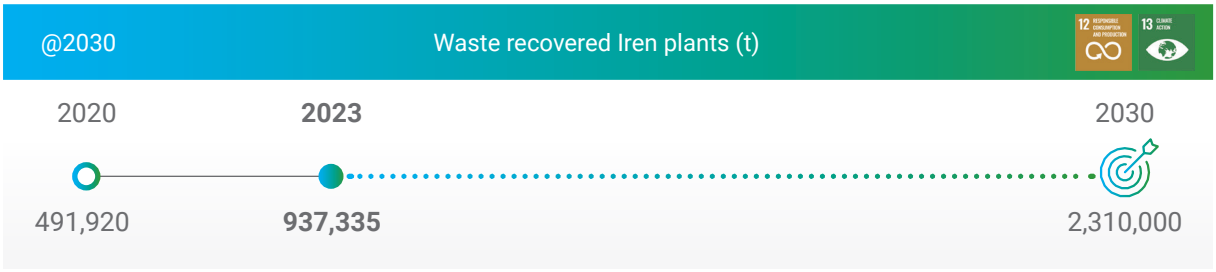


Waste managed by type (t)



The **sorted component** of waste is on the rise compared to 2022, thanks to the construction of new plants and the full operation of some plants activated in 2022, which led to a 12% increase in waste managed in the Group's material recovery plants.

As already highlighted above, in the Business Plan to 2030, the Group places the closure of the circular economy cycle at the centre of its strategy, envisaging huge investments in new plants for the recovery of the organic fraction - with the production of compost and biomethane - of paper, plastic and wood, with the production of materials that are reintroduced on the market: the goal is to reach 2.3 million tonnes of material recovery capacity from waste in owned plants.



CO_2 ZERO IMPACT

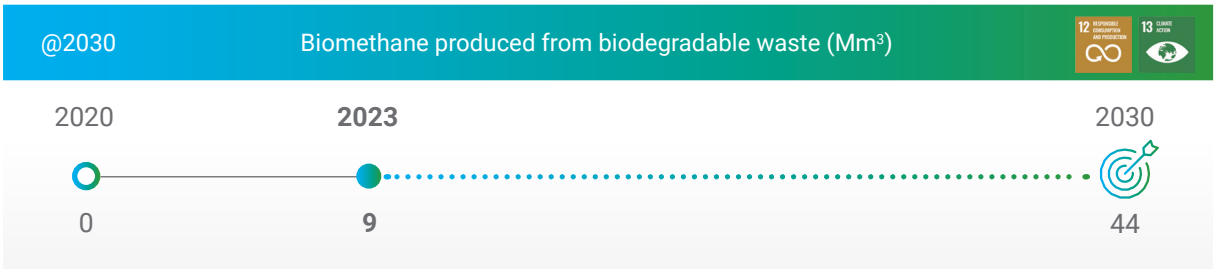
In 2023, Iren Group entered into a partnership with the Nippon Gases Italia Group for the management and marketing of biogenic CO_2 from the anaerobic digestion of the sorted organic fraction produced in the OFMSW plant in Reggio Emilia, which started operation in 2022.

The plant processes the sorted organic fraction of food residues and pruning clippings into important resources: quality compost, biomethane and biogenic CO_2. Thanks to an innovative process, biogenic CO_2 is purified and liquefied to the quality required for reuse in the food and beverage industry.

PRODUCTION OF BIOMETHANE

The OFMSW treatment and valorisation plants of Cairo Montenotte (SV), Santhià (VC) and Gavassa (RE) valorise organic waste and produce, in addition to quality compost, biomethane, a natural gas that derives from the refining and treatment of the biogas produced during the anaerobic digestion phase of organic waste and the green fraction.
The process, called upgrading, allows to increase the percentage of methane contained in the biogas, up to about 99%. In this way, the energy characteristics and uses of biomethane correspond to all effects to those of natural methane, with two substantial differences: it is not extracted from the bowels of the earth, and it is obtained from renewable raw materials.

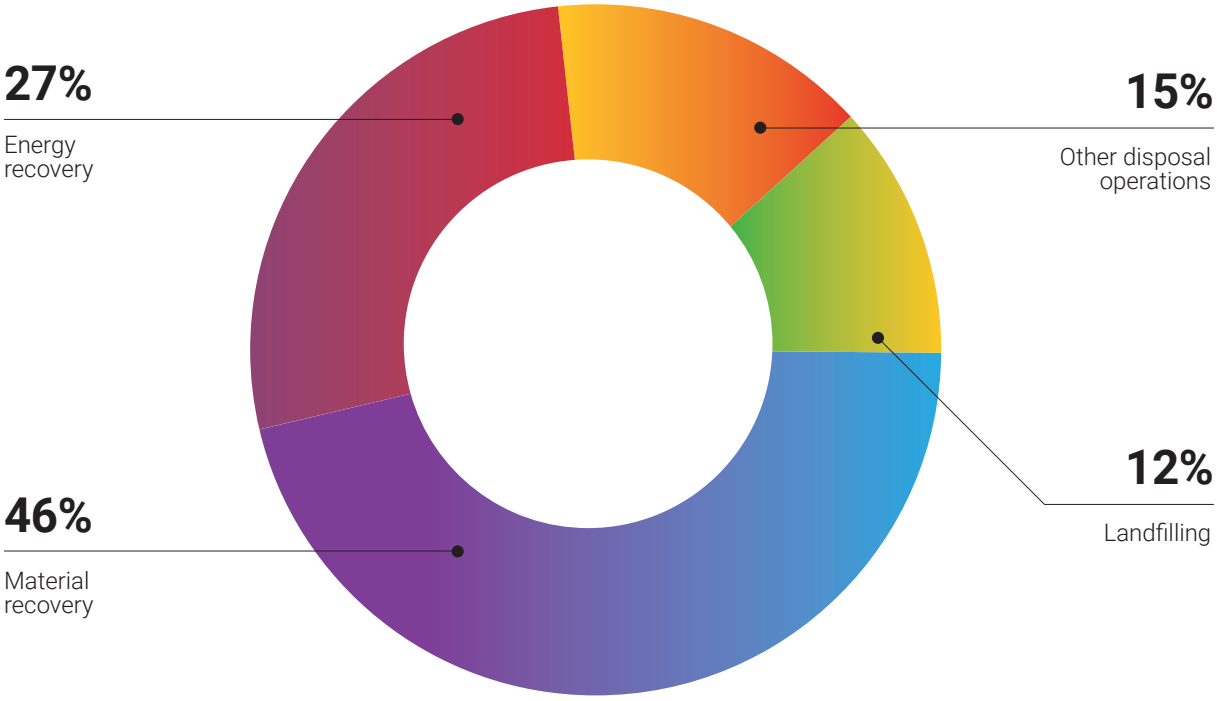
Biomethane is a renewable source of energy, an example of circular economy and an indispensable support for decarbonization, for example of the mobility sector, which contributes to reducing the use of fossil fuels, the main source of climate-changing gas emissions.
In 2023, Iren produced over 9 million cubic metres of biomethane, in line with the growth target of the Business Plan to 2030.



The **unsorted component** of the waste is destined for various disposal methods searching for the best use of the waste resource that sees energy recovery, through waste-to-energy, as the most effective solution from an environmental point of view.

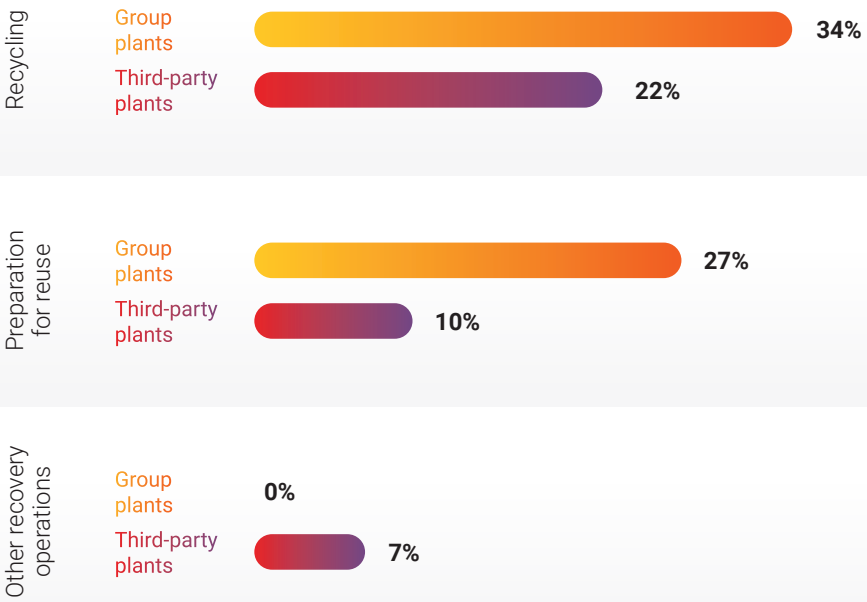
Disposal operations include mechanical-biological treatment (MBT), which, through the mechanical selection of unsorted waste, separates the organic fraction and stabilises it biologically for recovery. In 2023, approximately 273,500 tonnes of waste was processed at the Group's MBT.

Destination of managed waste (%)



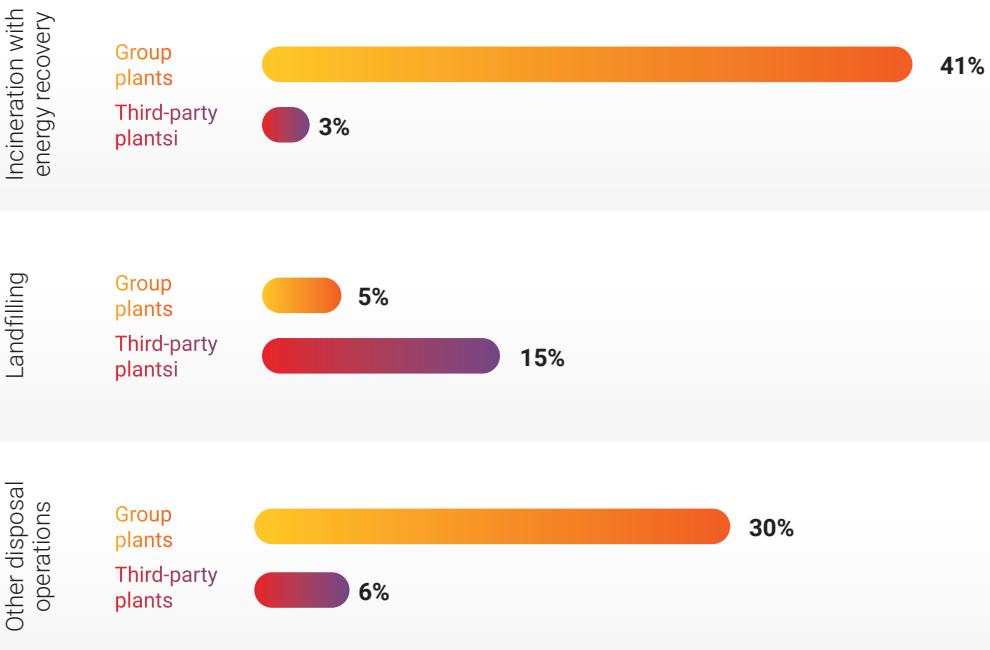
Of the total waste managed in 2023, 46% was destined for the material recovery chain (recycling, preparation for re-use and other recovery operations) in Group and third-party plants, as detailed in the graph below.

WASTE SENT FOR MATERIAL RECOVERY (%) [1]



Of the portion of waste that could not be recovered as a material (54% of the total), 44% was sent to energy recovery and the remainder to other disposal operations (36%) or to landfills. Almost all (99.96%) of the waste sent to landfill is special waste.
No waste has been sent for incineration without energy recovery. Compared to the total waste managed by the Group in 2023, only 3% is of hazardous type [1] (a little over 14,000 tonnes sent to material recovery and over 104,000 tonnes to disposal).

WASTE SENT FOR ENERGY RECOVERY AND DISPOSAL (%) [1]



[1] The Group does not handle radioactive waste. Specific management and control procedures are in place at the plants, which require that any waste with a radioactive load, intercepted through specific instruments placed prior to entering the plants (e.g. household/medical waste), is inspected by qualified experts, stored in special quarantine areas and sent for disposal only when the radioactive load has decayed.