WORKING PAPER

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1. Introduction

This paper provides an analysis of the actual structure and recent developments of the management of solid waste in Italy. Following Massarutto (2006), the main theoretical problem considered herein is the understanding of how the changing focus of waste management policy (from simple collection and removal to safe disposal and to the sustainable management of materials flow through the economy) has impacted on the economic nature of the industry, the public service obligations that characterize it and the opportunity to involve the private sector in a competitive market.

For this purpose we consider a value chain composed by three main activities (collection, disposal and recycling) and focus the attention on the governance of transactions along and among each phase.

After a short historical overview of the evolution during the last 30 years (par. 2), the paper will provide a background analysis of relevant figures (par. 3) of the institutional setting that frames the sector (par. 4) and of the key economic figures (par. 5). We move then to the focus of the paper, by discussing the industrial organization (par. 6), the micro-foundations of the regulatory framework and governance of transactions (par. 7) and the changing role of the private sector (par. 8). In the concluding section, we'll discuss the main emerging issue, that is in our view the "asymmetric regulation" needed in order to find a compromise between the public service obligations lying on the disposal operators with the necessary push towards recycling and valorization of waste flows.

For a better understanding of the paper, Appendix 1 provides some key figures and facts concerning the Italian administrative structure.

2. Historical evolution of waste management regimes

As in most other countries, MWM in Italy until the 70s was substantially concerned with collection and removal of waste from urban areas. Quantities were reasonably small, and the composition of waste was by far dominated by organic materials; disposal therefore was hardly perceived as a problem (Ascari et al., 1992).

The obligation for municipalities to organize garbage collection services was introduced in 1941; for this purpose they were allowed (but not obliged) to raise a levy calculated on a cost recovery base and scheduled in proportion of size and value of property. In case the revenues from the levy would not match the cost, municipalities would cover the difference through own budget.

Disposal was supplied quite straightforward by the local market. Landfills used to be little more than confined dumping sites realized in the areas previously occupied by quarries. In the phase of massive urban development that took place after WW2, available sites grew faster than waste, guaranteeing an abundance of supply for approx. 30 years.

In a few cases municipalities operated directly their sites when cheaper; but in most cases landfills were owned and operated by small local private companies, usually the same that developed the site for the extraction of building materials.

Collection services were typically low-skill labour-intensive activities, organized with a mixture of direct labour and contracting out to small local companies. However, especially in the urban centers of northern and central Italy, where the tradition of creating municipally-owned companies had been started since 1903, this management form was also often adopted for garbage collection as well as for gas, electricity, water and public transport. Until the 90s, municipal companies were little more than separated budgets within the local administration; however they were guaranteed at least some management continuity thanks to the possibility to develop a professional management structure and to generate cross-subsidies between different services. In the more fortunate cases, these management structures were also able to invest in technical systems and innovation, often taking advantage from the operation of different services.

The 70s can be identified as the period when the transition from this traditional model started. The transformation was prompted by the growth of waste quantity, the transformation of its composition, as well as the increasing difficulties faced by urban areas in finding landfills nearby. In the meanwhile, the EU started putting focus on the environmental consequences of waste dumping and disposal facilities begun to be regulated and controlled.

The first set of EU regulations was transposed with Dpr 915/82. This law continued to invest municipalities with the duty of organizing waste collection and to find an appropriate solution for its disposal. The law

introduced disciplines setting the minimum quality standards to be respected. Regions – newly introduced in the Italian administrative system – became responsible for planning, with the aim of ensuring that enough disposal capacity was put in place.

Regional plans had the aim of forecasting waste flows, set targets for separate collection and identify management solutions and disposal facilities to which each municipality would address their waste flows. Facilities would have to be realized by local authorities, ev. associated for the purpose, with Regions sometimes acting as catalysts of the process (Bertossi et al., 2000).

This top-down approach, in fact, generated a lot of studies and paperwork, but only in a few cases was able to produce concrete and timely solutions. In many cases, regional plans either remained on paper or promoted investment in technologies that would not performance as expected. This was especially the case of mechanical sorting and composting, that many plans adopted as a preferred option. In fact neither compost nor refuse-derived fuels (RDF) were ever easily marketed afterwards, and most of the outputs had thus to be landfilled anyway. Especially in the North of the country, where the siting of new landfills was becoming difficult, this gave origin to a consistent shipment of waste to other regions, where these materials could be exported thanks to the fact that treated waste could be considered as commercial waste. Regions were thus far from able to provide a long-term sustainable solution, and were actually forced to strive for emergency solutions, with a short term approach.

At an aggregate scale, the unsuccessful record of regional plans was patent. Despite the aims of DPR 915, still 90% of MW ended in landfill in 1995. The areas that were able to escape this situation were those in which waste management companies (mostly those created by municipalities, formerly organized as municipal enterprises under public law and in the 90s increasingly adopting legal status and private commercial profile) were able to integrate downwards and realize their own treatment facilities, later ratified by the plans. This occurred for example in a number of medium-large cities located in the North. These companies were often able to promote and realize treatment facilities and to promote innovative management practices enabling them to achieve a reasonable degree of self sufficiency. Evidence of the superiority of a management model inspired by integration of responsibility led municipal companies to achieve a sort of “cultural leadership” that still lasts today, and inspired the philosophy of the reform adopted in 1997 (Dlgs 22/97).

This was dominated by the idea of integrated management and industrial approach to MWM. Motivated by the need to transpose the package of EU directives approved in the 90s, introducing the priority ladder, extended producer responsibility, self sufficiency and polluter-pays principles as the cornerstones of MWM strategy (Cima and Sbandati, 1999).

Dlgs 22/97 transposed these principles by introducing the target of banning untreated waste landfilling, introducing mandatory targets for separate collection (35%, later elevated to 50% and 65%) and establishing a collective responsibility for municipalities within each district (*Provincia*) to achieve self sufficiency. The law also introduced a far-reaching reform of charging (Massarutto, 2001). The former waste collection tax was transformed into a charge aimed at compensating the provision of the service intended on a commercial base (although still mandatory). Together with the obligation to recover all costs through tariff revenues, responsible entities were also allowed to structure the charge schedule according to the quantity of waste and/or to the willingness to adopt virtuous practices (eg domestic composting, separate collection).

The approach to self-sufficiency was rigid, at least in the appearance; although, this rigidity applied basically to "raw" waste; exporting treated waste from one area to another continued to be practiced, more or less in an official way. In fact the boundary between municipal waste (belonging to the public service, and for which there is an established obligation to supply) and business waste remained permeable.

On the industry organization side, the reform is inspired by the idea of integrated industrial management. Municipalities are forced to find a cooperative solution, if not leading to the creation of a joint company, at least by fostering an integrated management system. While remaining responsible for the provision of service, municipalities thus delegate to own companies the task of operating it, adopting the technological and organizational choices and realizing investments. This model of separating (collective) municipal responsibility, as enacted by newly created intermunicipal agencies (so called "ATO", acronym for "ambito territorial ottimale", meaning "optimal territorial unit for managing services"), from operation (delegated to professional specialized commercial companies becoming responsible for the integrated service) was largely modeled on the parallel reform of water utilities, started in 1994 (Massarutto, 2002).

Dlgs 22 also provided for the establishment of collective systems aimed at implementing the EPR principle, with particular respect to packaging waste. The chosen approach, rather different than that adopted in other EU

countries, was that of creating a mandatory association, with the participation of industry producing and commercializing packaged goods and financed through a charge levied on raw packaging. A similar structure had been already experienced with good success in other fields such as used oils and batteries since the 80s.

The following reforms – and especially the reorganization of the whole environmental legislation with Dlgs 152/06 did not bring forward but marginal innovations to this general framework.

3. Waste management in Italy today

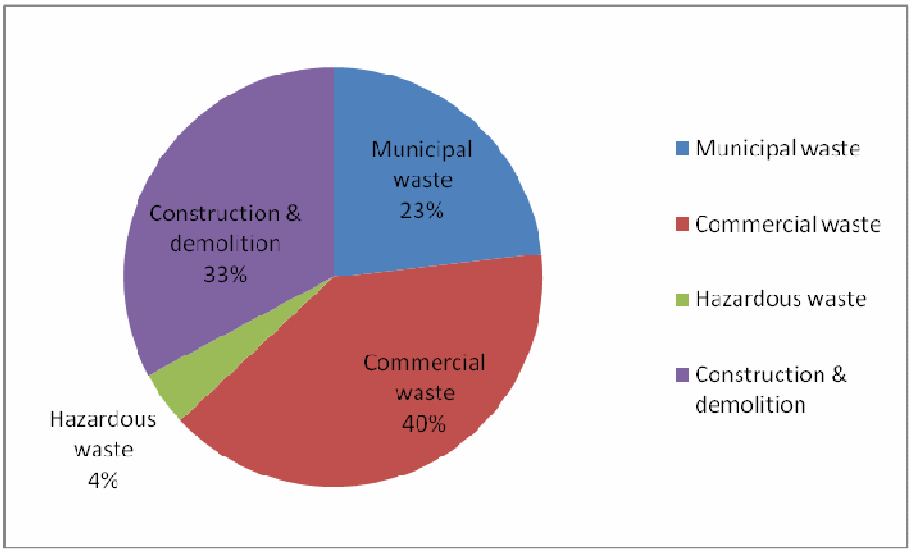
Table 1 summarizes some key figures concerning the generation of waste. For a better interpretation, one should take into account that the "municipal" waste flow also includes other categories of waste that are legally assimilated and collected by the public service, namely waste arising from public spaces and commercial waste that are compulsory associated to the public service. In turn, "commercial" waste also include flows that originate from public activities, namely sewage sludge and residuals from the treatment of municipal waste. There is then a small double counting (the same waste is counted as municipal waste first and later as commercial waste after treatment).

Table 1 – Generation of waste in Italy, 2007 (,000 tons)

	Municipal	Commercial	Hazardous	C&D		Total
North-West	8.275	15.782	2.483	14.094		40.634
North-East	6.327	17.583	1.751	15.034		40.695
Center	7.363	8.932	685	8.282		25.262
South	6.978	9.642	484	5.336		22.440
Islands	3.579	3.709	502	3.108		10.898
Italy	32.522	55.648	5.905	45.854		139.929

Source: Osservatorio nazionale rifiuti

Figure 1 – Composition of total waste flow, 2007



Source: our elaboration on Osservatorio nazionale rifiuti

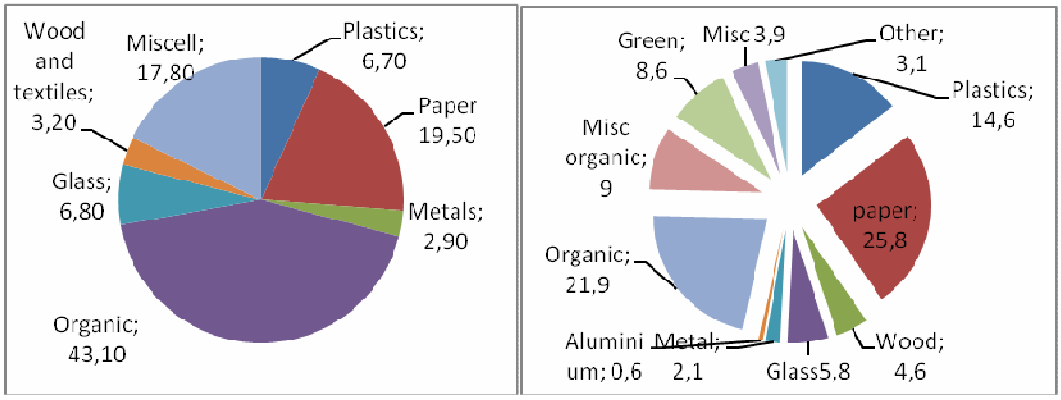
Focusing on MWM only, the quantity generated per capita ranges from 496 to 638 kg/year (average 560). A comparison is not straightforward, since municipal waste also includes waste arising from commercial activities that are included within the public service regime, which is often the case where small business and laboratories are present. While this explains the huge differences between different regions, it also suggests to be cautious as far as international comparisons are regarded. Italy seems to have a generation rate that is slightly below both the EU and Oecd average; in turn, it is also interesting to note that the intensity of waste on the GDP has increased between 2000 and 2005 from 24,5 to 25,5 kg per unit of GDP. During the same period, the indicator has been reducing for the OECD as a whole (from 26 to 24) and remarkably in countries like Germany (from 26,6 to 21,3) or Finland (from 19,4 to 16,4).

Composition of MW has fundamentally changed, assuming the typical mixture of developed countries, with a substantial reduction of organic materials and a rapid growth of plastics, especially because of the incidence of packaging waste (fig. 2).

Table 2 – Generation of municipal waste per capita (kg/year) in Italy and international comparison

North-West	529
North-East	565
Center	638
South	496
Islands	536
Italy	550
North America	660
Europe	560
EU15	570
OECD	580

Figure 2 – Composition of MW in Italy in 1975 (left) and 2005 (right)



Source: elaboration on Massarutto, 2009

Waste management practices are also interesting to compare. As we can see from table 3, Italy has made considerable progress: in the period 1995-2005 it shows the highest reduction in landfill quota within the Oecd (-39%); nonetheless, still 294 kg per capita/year are landfilled, almost half of which is untreated raw waste. The reduction is due to a significant increase in separate collection and recycling and a small progress in incineration, while most of the waste treated in mechanical sorting-composting plants is later landfilled.

Figure 4 provides a more detailed material balance showing the destination of waste flows, also clarifying the interrelation that the MWM market has with the commercial waste sector. It is also important to note that the

average national figure actually hides a high variety of solutions in the different parts of the country. While Southern Italy and the Islands still seem not to have changed significantly since the "all in the landfill" times, the situation in the NorthWest looks quite similar to the rest of continental Europe; Center and North-East, instead, have less incineration but compensate it with recycling and/or mechanical sorting.

Table 3 – Management of MWM in Oecd countries

	Recycled	Mech - biological treatment	Incineration	Landfill		Reduction of landfill quota 1995 – 2005
	%	%	%	%	kg/y per capita	%
USA	24%	8%	14%	54%	407	-3%
JPN	17%	0%	74%	3%	14	-8%
AUT	27%	45%	21%	7%	38	-30%
BEL	31%	23%	34%	12%	51	-36%
CZ	1%	3%	14%	80%	223	n.d.
DK	26%	15%	54%	5%	34	-12%
SF	30%	0%	10%	60%	273	-5%
FRA	16%	14%	34%	36%	195	-9%
D	33%	17%	25%	18%	104	n.d.
GRE	8%	0%	0%	92%	392	-1%
ITA	16%	23%	10%	51%	294	-39%
NL	25%	23%	32%	2%	11	-29%
NOR	34%	15%	25%	26%	98	n.d.
POR	9%	6%	21%	64%	301	n.d.
SPA	9%	33%	7%	52%	277	-29%
SWE	34%	10%	50%	5%	23	-30%
SUI	34%	16%	50%	1%	3	-12%
UK	17%	9%	8%	64%	373	-19%

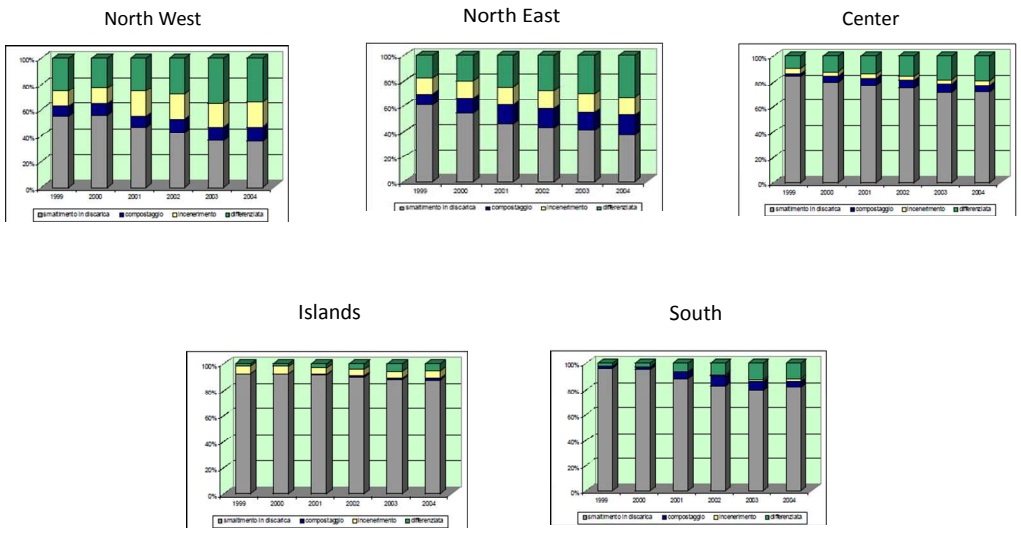
Source: Oecd and own elaboration

Still a lot remains to be done. Other EU countries, but also Japan, have managed to reduce to nearly zero the quantity of waste landfilled.

The relative underperformance of Italy can be partially explained by the dynamics of landfill prices. In the lack of an effective regulation, landfill prices have been subject to market evolution, jumping suddenly from the equivalent of a few Euros per ton to 100-150 at least in the most congested areas such as Lombardia. This sudden increase did not allow for an adjustment, since the far higher cost of alternatives had discouraged them

until the landfill price remained low. The explosion of prices in a very concentrated time, mostly due to the scarcity rent, determined the explosion of emergency crises. It took almost 10 years to Lombardia to come out with an integrated set of facilities, while other areas obtained similar results by investing strongly in separate collection. During the transition phase, as we argued earlier, waste from the North simply was "legally masked" in order to be landfilled in the South. The same stratagem was not available to Southern regions when it became their turn to face the emergency, and this is not a secondary reason behind the well-known crisis that affected the area of Naples during 2008.

Figure 3 – Waste management solutions in the different Italian sub-regions



Source: Osservatorio Nazionale Rifiuti, 2008

Table 4 – Waste packaging recovery: targets and 2008 result (%)

	Target	Result 2008	Diff.
Glass	60,0	61,4	1,4
Paper	60,0	70,6	10,6
Plastic	26,0	29,5	3,5
Wood	35,0	54,4	19,4
Steel	50,0	66,7	16,7
Aluminium	50,0	56,4	6,4
Total	55,0	57,7	2,7

Source: Conai

Therefore, it is apparent that neither planning authorities nor the market had been able to anticipate the scarcity of landfills, waiting until the very last moment for starting the transition.

The relative underperformance of MWM is somewhat compensated by the high degrees of recycling in the sector of commercial and business waste. In this field Italy – a country that is historically poor in terms of raw materials and domestic sources of energy – has developed a strong tradition in the recycling of many waste flows, as for metals and plastics. As a result, roughly 56% of business waste is recycled, while a further 5% is used for energy recovery.

This particular situation also can partially explain the relative success that has been obtained in the field of packaging waste, where the Italian system has outperformed the EU targets, but this good result compensates the (relative) poor performance in the urban waste field with the excellent results obtained in the commercial packaging field.

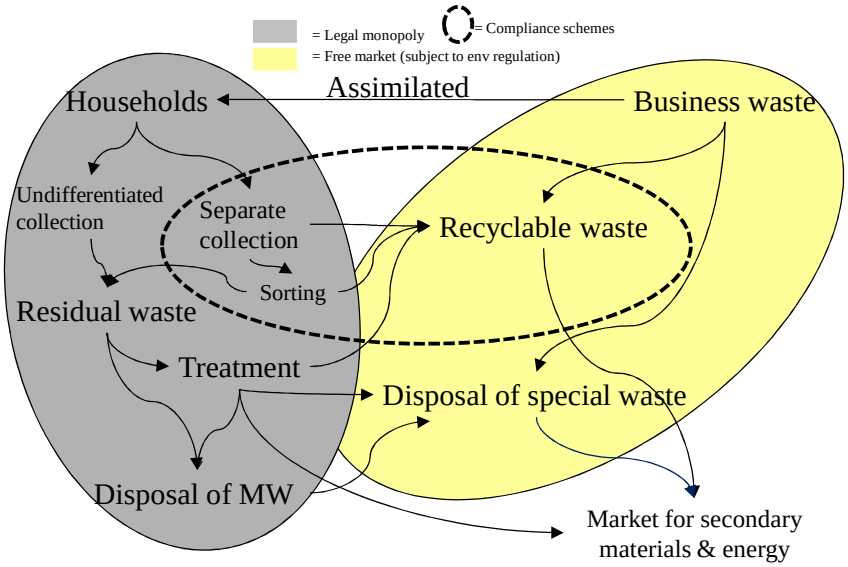
4. Institutional setting

Figure 4 outlines the institutional structure of waste management in Italy. We can distinguish 3 separate institutional regimes. The first one is the public service, which applies to household waste and assimilated waste flows. Here services are provided under the responsibility of local authorities on a compulsory base, and a legal monopoly arises. The second is the commercial and business waste, which is normally provided in a market regime, although the public sector provides quality regulations and entry in the market is subject to authorization and control. The third is the parallel regime that has been created for priority waste flows (packaging waste, used oil, batteries, electronic waste etc). The three markets are separate and operate with own rules, yet there are many links that in fact wrap the whole system together.

As far as *municipal waste* (MW) is concerned, local authorities have the *legal obligation* to provide collection systems and the corresponding right to impose a local tax aimed at cost recovery. Municipalities enjoy some freedom about how to fulfil this responsibility, although binding regulations and guidelines imposed by national and regional law and

implemented by regional plans dictate minimum targets to be achieved (eg for separate collection) and other quality and environmental standards.

Figure 4 – The three institutional regimes for waste management and their relations



The operators to which municipalities entrust the collection service become legally responsible for the waste they collect, and have to dispose of it according to the prescriptions of regional plans. In practice, this means that the plans single out the facilities to which primary waste flows have to be addressed. Waste that remains from treatment activities, all materials originating from it (eg compost and rdf), as well as materials that have been collected separately remain the responsibility of the operator, who has to ensure a proper destination (as well as any other producer of industrial waste). This means that these materials can either (i) be recycled or recovered in some way or (ii) become a part of the industrial waste flow.

Regional planning has the legal responsibility to ensure that all waste collected will find a destination. It must be stressed that this applies to "raw" waste only. For example, the plan might foresee that undifferentiated waste has to be addressed to an incineration plant, while ashes generated by the incinerator belong to the operator of the facility and will be disposed of as industrial waste. Plans normally should include a list of authorized facilities and ensure a proper destination to all waste collected by the public

service. In case the regional plan fails and an emergency occurs, the national government as a last resort can deprive the region of authority and appoint a commissioner; according to the difficulty of the case, the law concedes special powers to the commissioner and also may authorize him to derogate to the existing legislation.

Companies operating services under this first regime normally enjoy a legal monopoly, that is exploited in agreement with the municipality. Local authorities can use one of the management forms that are foreseen in the law, and are increasingly framed within the EU institutional setting. The Italian law used to identify "services having an industrial nature" (an expression that was not clearly defined, however), for which municipalities are obliged to choose among alternative kinds of commercial companies, either publicly or privately owned. Along time, this category is becoming close to what the EU now defines as "services of general economic interest". Until 2008, municipalities could freely choose among in-house delegation or tendering; law 112/2008 now obliges them to tender anyway, while publicly owned companies can participate to the tender. In-house delegation without tender remains as a last resort. As we'll see later on, however, this legislative provision is far from being fully implemented, and the praxis is quite different from the ideal setting foreseen in the law. This also occurs because legislation has evolved in quite a chaotic manner, repeatedly changing and contradicting itself and generating cases for exceptions, derogations and postponements immediately after a general law was approved.

For *business waste*, the regime is based on the legal responsibility of waste owners to dispose of them in an authorized way, namely (i) running their own treatment and disposal phases or more easily (ii) entrusting them to specialized operators. Companies providing these services operate on the national market under a regime of authorization. In all cases, in harmony with Eu waste legislation, the law foresees classification criteria, duties of care, technical prescriptions etc. Authorizations are subject to the possess of certain features and the provision of guarantees, but no special privileges are foreseen. As a result, waste management services dedicated to business waste can be assumed as a fairly competitive industry, as repeatedly certified by the Competition Authority. In this segment, a significant interexchange can also be detected. According to Fise-Assoambiente (2009), 1,3 million tons of non hazardous industrial waste (2% of total) and 0,5 million tons of hazardous waste (10% of total) are exported to other countries (90% in the EU), while 1,4 million are imported. A breakdown of this data shows that exported waste are mainly for disposal and treatment, while imported waste are for the largest part for recycling: this is a further

demonstration of the specialization of Italian industry in the recovery of materials, while treatment and disposal (especially for hazardous waste) is often purchased abroad, with Germany representing the destination of nearly the 50% of exported hazardous waste.

The legal definition of waste had to be harmonized with the EU and caused a lot of problems. The Italian definition in the past was focused on the intention of the owner of a certain thing to get rid of it (subjective), while the EU definition is more based on the nature of the material. According to the former Italian norm, a material intended for trading was excluded from the definition and could be mobilized with more freedom; this facilitated recovery of by-products – something that has been for long in the tradition of Italian industry – but also created the opportunity for abuses, for example by creating fake trading and processing just for avoiding regulations (Massarutto, 2009). After a long and complicated phase of harmonization, the national norm is now closer to the EU regime, even if there are still controversies.

The distinction between municipal (MW) and special waste (SW) is fundamental, although the boundary between the two regimes is permeable.

First of all, municipalities have the *right* to oblige certain categories of SW to join the collective service and pay the corresponding tax. Recently, national legislation has fixed a dimensional parameter (n. of employees and surface), above which waste producers have the right to be recognized as eligible customers. Municipalities have as well the *duty* to provide a last-resort service to business waste handlers if requested to do so; in this case they can charge the amount they prefer.

Second, as we just said, all waste that remains from treatment of the primary waste flows is legally a business waste. This means in practice that the waste owner becomes the company who runs the treatment facility; this is responsible to find a proper destination on the market. This also allows a legal way to “transform” household waste into business waste, and therefore escape the provision of the self-sufficiency principle. Here again the Italian regime had to be harmonized with the EU, where the crucial distinction is between disposal and recovery.

One last institutional regime, that crosses the boundary of the first two, is the one originating from the application of the extended producer responsibility over priority waste flows. The entities created for these purpose shared some typical features: creation of entities having legal status and responsibility over the target; compulsory adhesion by the

obliged subjects (companies and traders along the value chain), payment of a fee. Responsible entities have then some freedom to choose the preferred organization. They usually finance separate collection, coordinate the processing of materials on a contracting-out base, sell the resulting materials on the market or make settlements with recycling industries. Newly, in the case of electronic waste, a different model has been created, more open to competition.

5. Economics of municipal waste management in Italy

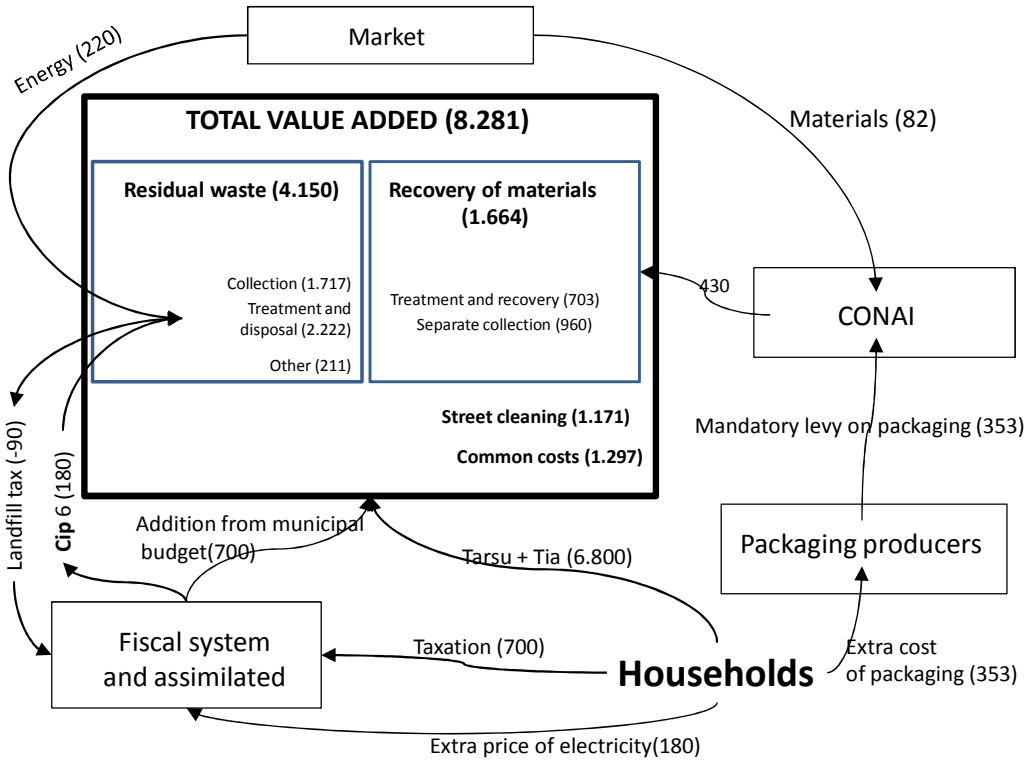
According to the detailed statistical surveys conducted by Istat, the total expenditure for waste management in Italy accounted to 21 billion € in 1997 (table 5); it was 11 billion in 1997.

Table 5 – Annual expenditure for waste management in Italy in 2007 (million of €)

Households	6.556	31%
Public administration	54	0,3%
Business	12.093	58%
Investments	2.317	11%
Total	21.020	

Source: Istat

Figure 5 – Main economic flows within the Italian MWM system in 2007 (million €)



Source: our elaboration

The economics of MWM can be described in greater detail, thanks to the documented economic statistics provided each year by the ONR. The annual cost in 2008 was approx. 8,3 billion €, corresponding to 257 €/t. This cost is a net figure, arising from the complex system of tariffs, charges and revenues for recovered materials. In fig. 5 we have tried to summarize the most important flows. While comparing this figure with table 1, one should consider that the public service also receives a certain amount of business waste.

As we can see, the total cost (8,3 billion) can be attributed to residual waste for roughly 50%; the remaining is due to the cycle of separate collection, processing and recycling (1,7 billion), street cleaning (1,1 billion) and common costs (1,2 billion). The recovery of this cost is fundamentally derived from the levy paid by households. Many MWM services, but still not the majority, have already implemented the tariff regime set up in 1997 (TIA). In these cases, the service is charged directly by operators, while

others still remain with the traditional municipal waste tax (TARSU), collected by municipalities and used for compensating the operators on a bulk base).

The residual remaining on local general budget has been substantially reducing after cost recovery has become compulsory. Important financial flows also originate from the packaging waste mandatory system (430 million, approx. 25% of total costs for separate collection and recovery). Another 180 million corresponds to the incentives provided to non fossil fuels above the market price of energy, that also include incineration of waste among the beneficiaries.

MWM costs have increased in real terms by 60% since 1994 (Utilitatis, 2006). Treatment (and especially landfill) costs are for a good deal responsible for this; disposal costs account now for more than a half of the cost of managing residual waste and roughly 25% of total costs, while it was only 5-10% or less in the early 90s (Ascari et al., 1992).

The use of economic instruments with an incentive purpose has been introduced during the 90s and has acquired some experience. Among the main economic instruments we can cite:

- Landfill tax. It is levied by Regions in proportion of the quantity landfilled. The rate varies among regions with a maximum of 25 €/t. Revenues are earmarked to the financing of regional environmental agencies (namely, the branches in charges with environmental control activities). Some Regions have introduced a penalty system, according to which the levy is higher in case a management unit is unable to achieve self sufficiency and requires supply of landfill capacity from other areas.
- Waste collection tax: as anticipated above, this tax was introduced with a pure cost recovery target since 1941, and was based on the size and value of properties, resulting in no effect at all in terms of incentive. Dlgs 22/97 provided for a transformation of the Garbage tax into a tariff, owed directly to the operator in charge of running the public service on a commercial base, although with some fiscal elements (compulsory charge, public enforcement etc). After 1997, municipalities that decided to implement the new tariff scheme were also allowed to structure the charge in order to promote separate collection and penalize undifferentiated waste. Although not all municipalities have adopted the new scheme yet, there is some diffusion especially in the North-East of incentive charging schemes, often based on a pay-per-bag system or similar arrangements. There is some evidence that this charging scheme has been quite effective

in accompanying the more demanding curbside collection schemes like those adopted in places where the separate collection rate has reached even 75-85%.

- Deposit-refunds and product taxes (such as the levy on plastic bags) have been popular in the past, but are now reserved especially to specific waste categories and generally absorbed within the EPR-based systems. The scheme adopted for exhausted oils, batteries and packaging is about being extended to other categories as well (eg. electronic equipment).

6. Industrial organization of MWM

During the last 15 year a significant evolution has taken place with regard to the industrial organization of MWM. Two main trends can be identified behind this evolution. The first is more generally linked with the transformation of local utilities, started with law 142/90, and is fundamentally dominated by corporatization of management units, increased private sector participation and more open recourse to contracts and tenders; the second is more related to the changing industrial nature of MWM, and regards the increasing complexity of the value chain, with extensive processes of outsourcing, specialization and vertical integration as well as an increasing role for the market especially in the field of waste recovery.

Table 6 provides a first overview documenting the clear trend towards a progressive abandonment of direct labour organizations, either with respect to the number of undertakings or to population. Most of the management systems that abandoned direct labour have opted for the creation of public limited companies or the integration with already existing ones.

The publicly owned limited company derives from an evolution started by law 142/90. Before that, as already said, municipal companies were separated organizations within the public administration, with a separate structure and budget but limited decisional autonomy and almost no capacity to operate on the market. Law 142 disciplined the possibility to create municipally owned corporate companies for managing industrial services, either under public law or under private commercial law; in both cases the company would acquire legal status and autonomy, and its relation with the parent municipality would be regulated by contracts. Later on, public law establishments were eliminated. Publicly-owned companies

started to be transformed into commercial companies, and this gave start to a process of transformation, still not concluded.

Table 6 – Evolution of management forms

	Municipalities				Population			
	1995		2005		1995		2005	
	n.	%	n.	%	ml	%	ml	%
Direct labour	3.629	45%	1.606	20%	19,3	34%	6,5	11%
Public company	2.536	31%	3.704	46%	22,8	40%	34,2	58%
Contracted out	1.936	24%	2.791	34%	14,8	26%	17,8	30%
Total	8.101	100%	8.101	100%	56,9	100%	58,5	100%

Source: Utilitatis, 2008

Among the most typical trends, we can cite mergers between nearby companies, partial privatization through quotation and/or selling of quotas to industrial partners, establishment of complex shareholding structures including local institutions (banks, public entities different from public administration, industrial associations, chambers of commerce).

Especially those companies that originated from municipal enterprises previously set up as multiutilities also operating in the energy field rapidly became leaders in this process. Among the leaders we can cite:

- A2A, resulting from the merger between ASM Brescia, AEM Milano and AMSA Milano, with a strong partnership with EDF through Edison;
- HERA, resulting from the creation of a holding owned by municipalities in the area surrounding Bologna, Modena and Ferrara;
- ENIA, similar structure but centered around Parma, Piacenza and Reggio Emilia;
- Acegas-APS, resulting from the merger of the municipal enterprises of Trieste and Padova.

These companies, besides operating in the home market of owner municipalities, also operate on the open market through the participation in PPPs with other municipalities.

Beside this process of concentration, mostly taking place through agreements and integration, what table 6 does not immediately show is the increasing complexity of the value chain. The quota of value added that principal operators produce within their own organization is changing as

well. Once focused on low-skill labour-intensive activities, municipal enterprises seem today much more focused on the integrated organization of the system. Labour intensive tasks are more and more often contracted out, while ownership of treatment facilities (ev. managed under project finance arrangements with private companies) in increasingly the rule especially for larger and more complex plants such as incinerators. The market of landfills still exhibits the presence of private companies (especially in the field of business waste, but we have argued before that this is also the destination of municipal waste, since after treatment they might acquire the legal status of commercial waste).

A representative example is offered by the CSR, a consortium serving 35 municipalities in the district of Udine, and approx. 125.000 inhabitants, with a peak demand in summer due to the large touristic area of Lignano. CSR handles approx. 40.000 t/year of waste that are collected and handled in the own treatment facility (mechanical sorting and composting plant). The whole structure employs only 6 people, with technical and administrative functions. All activities are contracted out through separate management contracts for undifferentiated collection, separate collection and treatment. For managing the treatment plant, a PPP has been developed with a private company running the facility and taking care of maintenance. Sale of marketable products is also outsourced to intermediaries, while disposal of residuals is supplied partly by a landfill that is co-owned with other public entities and partly by the market.

This evolution is important to understand, also considering the increasing integration of municipal and commercial waste flows. The territorial integration at the regional and multi-regional level makes it possible for managing companies to employ a network of facilities intended as part of an integrated system, de facto bypassing the strict requirements for self sufficiency in each management unit; in turn this allows more flexibility to the system and encourage market transactions.

Integration of commercial and municipal waste takes place in the field of recycling. Once the industry is structured with a focus on materials (rather than on the origin of waste), it makes sense to manage jointly flows of similar materials arising from different flows and to integrate them in order to achieve materials of definite chemical and physical characteristics. An example of the first case regards packaging waste – where in fact glass, paper and plastics are treated as such, regardless they derive from municipal or commercial waste; an example of the second case concerns for example the production of materials used as components of cements and bricks, or as a foundation for roadbeds, where municipal waste can be

mixed with other waste flows; or the production of RDF, where combustible materials contained in commercial waste flows is used in order to enhance the caloric power of materials arising from municipal waste. A further factor triggering integration arises from the destination of residues of processing and selection plants to incinerators.

As a result, around the main operators in charge of running the integrated system, an increasingly open market is developing. Trading of services as well as trading of materials create market opportunities for many specialized industrial actors, often SME, while major companies are also increasingly proposing themselves as competitors in specialized fields (eg waste to energy).

In table 7 we try to summarize the most important transactions that occur along the value chain and their most typical counterparts.

The most lively developments have nonetheless occurred in the field of recycling, around the dual systems established in order to implement the EPR principle. According to Bianchi (2008), the industry of recycling has experienced a formidable development since 1995: the number of units increased to 2.460 (+47%), employed persons to 12.600 (+42%). Value added amounts to 779 million (+86%) and total turnover to 4.183 (+124%); this development is particularly relevant considering that during the same period the Italian manufacturing industry has declined by 2%.

In more recent times, also as a result of the development of EU policies in the field of services of general economic interest (SGEI), the discipline regulating local public services and public enterprises has been repeatedly modified. It is quite difficult to summarize, since a lot of reforms have been announced, few of them also approved, other modified before the previous ones could produce effects. Regional legislation has often contributed to complicate the picture, sometimes integrating or anticipating, sometimes contradicting the national law. The resulting picture is leopard-skin and piecemeal.

The adoption of the EU framework based on the concept of in-house provision has repeatedly resulted in a clash with the pre-1997 regime: in particular, the possibility for public corporate companies to acquire services from other municipalities and to operate as competitors in the market (either the “core” market in which they traditionally operate or the many side activities that compose it) were challenged by private companies. As a matter of fact, the well known Teckal settlement of 1999, giving start to the whole process, took place in Emilia-Romagna and

regarded the entrustment of market services (concerning global maintenance) from a municipality to a public company, already operating in the same area for gas, waste and water services.

Table 7 – The most typical transactions in the waste management market

	Market / object of transaction	**Who is on the demand side**	**Leading operators**
1	Commercial waste	Industrial and commercial activities	Specialized private companies
2	Delegation of integrated MWM	Municipalities (ev. associated)	See table 6
3	Disposal of MW (if not integrated as in (2))	Companies collecting waste for municipalities (2)	Owners of disposal and treatment facilities (mostly public)
4	Collection and separate collection	Operators in charge for integrated management (2)	Specialized SME on a contracting-out base
5	Landfill of ultimate waste	Owners of treatment facilities (3)	Owners of landfill (mostly public, sometimes private especially in the south)
6	Treatment of commercial waste	Industrial and commercial activities, intermediaries	Specialized companies (more concentrated than (1)). Often publicly owned companies
7	Intermediation of commercial waste	Industrial and commercial activities	Specialized traders, brokers and consultants; often integrated with (1)
8	Processing of combustible waste in WTE facilities	Municipalities (ev. associated) Regional plan Owners of commercial waste	Main municipal companies Sometimes constructing companies operating facilities on BOT base
9	Processing of materials from separate collection	Responsible entities for EPR Intermediaries and collectors of SW (1-7)	Specialized SME (eg processing of plastics and paper; composting)
10	Recycling of materials	Responsible entities for EPR Processors (9)	Recyclers
11	BOT and similar	Municipal companies (2)	Specialized national and multinational companies often construction, engineering or large companies operating in other markets

National legislation did not limit itself to transposing this set of rules, but tried to impose a transition towards compulsory competitive tendering. Behind this strategy, a common discredit on the many in-house companies created out of the previous direct labour organizations.

In the original design, both private and public companies would compete for the market, abandoning progressively the direct in house delegation.

A further issue that caused clashes between Italy and the EU concerns mixed-venture companies and public-private partnerships. Mixed companies were already diffused in Italy in the 90s, and repeatedly met the criticism of the EU. When lastly the EU admitted PPPs as a convenient form of private sector involvement in local services, it also established the obligation to adopt competitive tendering and to avoid the creation of companies that would later be able to propose themselves as competitors on the market. The idea contained in the Green Book on PPPs is strongly focused on the concept of risk-sharing and typically considers partnerships in which the private sector supplies industrial, managerial and financial capabilities. On the contrary, Italian PPPs, as argued above, often start from pre-existing public companies already having industrial and managerial competencies, while the opening to private partners is searched as a strategy aimed at corporate growth, merger with nearby companies or creation of governance structures that involve local private subjects such as banks, industrial associations or private companies that own strategic assets. This sort of PPPs does not arise for the purpose of managing delegation contracts in an alternative way but rather for strengthening the market potential of already established companies or as a vehicle for stakeholder involvement.

7. Governance of transactions along the value chain

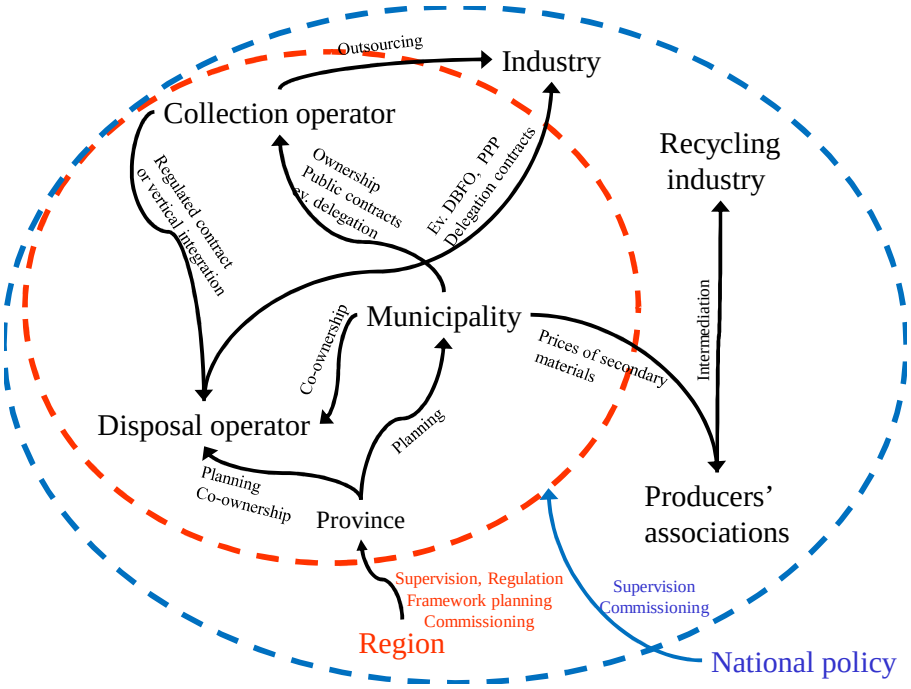
Figure 6 summarizes the structure of the industry and the main arrangements along the value chain.

The system is organized as a multiple layer chain. National government defines the rules, and the general targets, while regional government details rules and targets in a more specific way (eg identify the overall treatment capacity that is needed). Both regional and national government have the power to intervene as commissioners in case the local system fails to deliver – this has occurred for example in the area of Naples, where a State commissioner has been managing the system for the last years.

Provinces have the duty to organize the whole management system in order to comply with objectives imposed by State and Region, and with the ultimate responsibility of guaranteeing that all waste generated is appropriately managed. The responsibility to set up and operate collection services lies on municipalities, that arrange for service management according to the authorized management forms; these are at the moment dominated, as shown above, by in-house delegation in its various forms (ranging from 100% own companies to quoted multiutilities), with an approx. 30% of delegation to private companies on an outsourcing base. Management companies, even when publicly owned, frequently delegate operational tasks to private companies as well, especially labour-intensive activities.

Municipalities used to have some freedom in the choice of the extension of the public service to commercial and industrial activities. Sometimes, certain activities were compulsory included in the public service domain (thus, obliged to use the public service and pay the related charge), while in other cases they have the faculty (but not the obligation) to ask to be included in the public service. Recently, the law has put limits to this practice, by establishing a size threshold, over which business waste producers cannot be obliged to join the public service.

Figure 6 – The structure of the value chain of Italian MWM industry



The provincial plan should guarantee that all waste collected finds a proper destination. In practice, this takes place through various types of contractual arrangements between municipalities, collectors and disposal companies. There is an increasing trend towards vertical integration; in many cases, municipalities run their collection services individually and later confer waste to facilities whose ownership is shared with other municipalities; sometimes companies originally set up for collection have also invested for realizing their own treatment capacity. Provinces also sometimes have a direct role as co-owners or operators of disposal facilities, often with the creation of dedicated in-house companies. When facilities are privately owned (especially landfills) regional and provincial plans normally allocate waste flows to existing facilities and regulate prices.

For the construction and operation of treatment facilities there are also examples of PPPs with construction companies; this solution is in recent times preferred to the more traditional turnkey contracts.

Collection and disposal costs are supposed to be recovered through the waste collection charged levied on all resident households and commercial activities that rely on the public service. The law establishes that revenues

cover the costs, but does not put in place regulatory incentives aimed at promoting cost reduction. Despite the provision for adopting a price-cap mechanism, therefore, revenues of operators are currently determined on a cost-plus base. In the case of disposal, provincial plans are nominally empowered to determine maximum prices; however, the way this power is exercised is not overall clear nor homogeneous. Disposal prices result from a negotiation between planners, municipalities and owners of facilities; this negotiation is most of the times opaque and influenced by local politics as well as by the market power that owners of facilities exercise de facto.

As far as packaging waste and other specific waste flows are concerned, the law has established the creation of mandatory associations of producers, on which the responsibility to achieve targets is posed. In the case of packaging, for example, Conai (the national consortium) signs an agreement with municipalities fixing a negotiated price.

This price is established on a FOB base (transport to treatment facilities is a responsibility of the consortium); this is intended in order to minimize the total cost and let the consortium some freedom in the choice regarding both the location of sorting facilities and the areas where to concentrate efforts. In fact, the price results roughly from a national average and is aimed to compensate the differential cost between separate collection and undifferentiated collection and disposal. Since both the cost of disposal and the efficiency in separate collection are still very differentiated across the country, the convenience to engage in separate collection is therefore maximum in the areas where disposal is more costly and/or separate collection is cheaper. This can help to explain the reason why performance of separate collection has experienced so far huge differences between North and South.

After collection, Conai ensures that separately collected waste is addressed to sorting facilities and recycled. It does not own and operate directly; rather, there are a number of private companies operating under a complex range of contracts. Sometimes the ownership of materials and the economic risk of successive marketing remains on Conai, while private companies operate on a manufacturing account base; but it is also frequent that materials are transferred in a definitive way, with processing companies assuming also the risk of marketing.

8. Role of the private sector

Prior to 1990, the contribution of private sector to the MWM industry was fundamentally based on the supply of disposal capacity (mostly landfill) and on the contracting out of collection services, especially by small municipalities. In both cases, the market was mostly local. Landfill owners were typically arising from the quarrying industry, while contractors of collection services were local SME. Recycling was also supplied by the market, but in a residual way. Private collectors of scrap materials, diffused in the past, had been gradually fading out thanks to the economic growth and the increase of salaries; separate collection was limited to "easiest" materials such as paper, glass and metals, for which recycling market was already developed.

The first market shock was represented by the entry of the American multinational Waste Management International in 1989 (Bertossi et al., 2002). The strategy was based on the anticipation of a future market development driven by the need to comply with increasingly demanding environmental and quality standards; in order to acquire from the beginning a significant market share, WMI started an aggressive acquisition campaign that in a few years led it to control most of the private companies operating as contractors for municipalities as well as owners of landfills and treatment facilities, offering purchase prices much above the market value. WMI assumed that this premium price would be compensated in the medium run by an expected increase of the value added driven by the need to comply with stricter environmental and quality requirements; as the incumbent operator, WMI expected to gain a significant competitive advantage. WMI also started lobbying for introducing tighter regulations (with the aim of creating difficulties to unprofessional operators, including local authorities) and force the development of the market, proposing themselves as integrated operators, able to manage waste from the bin to the disposal plant.

This strategy was actually a failure, for many reasons. The development of quality standards was much slower than expected, especially in the South – where the critical point was represented by the incapacity to implement and enforce correctly the rules; thus operators supplying higher quality at higher costs were easily overcome by those offering quality below standard with poor control (Brusco et al., 19xy). But it was a failure also because once municipalities had to start innovating, they usually preferred to run and operate the system directly through the creation of public companies.

After a few years, WMI decided to retire from the Italian market by selling all assets separately – an indirect proof of the complete failure of the strategy, since it demonstrates that the perceived value of goodwill was negative.

The private companies that succeeded operating in the MWM were, instead, those able to propose themselves as contractual counterparts of public companies, rather than a competitor to them. Thus, the most remarkable successes have been obtained by companies operating as outsourcers of labour intensive activities or supplying specialized services such as treatment of specific waste flows such as plastics. At the same time, the increasing integration between the municipal and commercial waste market also favored opportunities to trade and cooperative agreements. Landfills for business waste have thus complemented the supply of disposal capacity especially for treated waste and unsold compost and RDF, while incinerators for MW have often treated residuals from sorting plants treating commercial and municipal packaging.

The increasing technical and industrial complexity has also favored the development of suppliers of equipment, machinery and specialized services.

An interesting market trend also shows the emerging market leaders in the field of MW (the partially privatized former municipal companies such as A2A and Hera) adopting an aggressive strategy for entering the business waste market. Thus A2A has acquired Ecodeco (the largest company operating in the field of business waste), while Hera also is very active in the field, also including hazardous waste.

Last but not least, the private sector is represented by companies that have developed management systems for their parent groups, and later have developed an autonomous capacity for proposing themselves on the market, such as Pirelli Ambiente, that started from the management of used tyres and is now active in the field of RDF; or Crabo, a medium company operating in the furniture industry, that starting from the management of wood and plastics originated by its productive cycles has developed innovative solutions for plastics recovery.

9. The changing boundary between public service and (regulated) market

Table 8 resumes the main characteristics of the MWM industry in Italy. The table is based on the analytical structure proposed in Massarutto, 2005 and divides the vertical value chain in three main activities: collection, disposal and recycling.

Reconsidering the historical overview presented in par. 2, we can identify different phases, in which the economic nature of the service has changed significantly. In the first phase, the public service obligation concerned collection only, while disposal was supplied by the local market and recycling was also a market activity, though playing a residual role.

Immediately after, the state started introducing and enforcing quality standards for disposal facilities; yet immediately after, the crisis exploded. The market became suddenly incapable of supplying new capacity meeting the more demanding targets, either because of the reaction of the public opinion or because of the "unfair competition" provided by existing low-quality facilities and/or illegal dumping.

In order to face the emergency created by the insufficient supply, disposal entered the perimeter of the regulated service when regional planning was established; the market failure that planning was supposed to overcome was the insufficient development of adequate supply and the emergence of monopoly rents.

The strategy that emerged during this phase was thus the creation of integrated monopolies having legal mandate over municipal – and in perspective also commercial and business waste. The self-sufficiency principle, in this perspective, could be interpreted as a way to guarantee the economic sustainability of waste disposal by creating a captive market for those facilities that would be individuated within the planning system. Facilities foreseen in the plan would enjoy a sort of legal monopoly on the waste allocated to them, and this was in principle the justification for regulating disposal prices.

However, regional planning could not accomplish this design. For some years, Italy lived in a sort of a two-faced system: on one side the official one, designed by legislation and supposed to be implemented by regional plans; on the other side the actual one, that was based on de facto arrangements emerging somewhere from the initiative of managing

companies, somewhere from stratagems and alliances with the commercial waste disposal sector, in other cases from irregular (if not illegal) solutions, derogations to standards and postponements.

The new regime created in 1997 introduces the innovative concept of integrated waste management. The public service obligation put on municipalities encompasses the destination of waste after collection; this encourages vertical integration between municipal collection services and disposal. Since the economies of scale entailed by both activities are rather different (the efficient scale is municipal or intermunicipal for collection, provincial or regional for disposal), this either favors the centralization of the integrated service in larger management units, or the creation of independent disposal companies participated by many municipal companies, each continuing to operate collection in their own zones.

Table 8 – Main features of MWM as a service of general economic interest

	Collection	Disposal	Recovery
Issues of general interest	Collect all waste for which a private responsibility cannot be properly identified or enforced Remove "orphan" waste from public spaces	Respect of quality and emission standards Reduction of landfilling Ensure that all residual waste is properly treated	Achieve recovery targets for priority flows Ensure that disposal is used as a last opportunity and recovery is maximized
Obligation to supply	Municipalities are obliged to receive waste from those who are legally bound to the public service	Regions: ensure that all waste finds a destination Provinces: individuate facilities and allocate waste flows Companies appointed by municipalities for collection have the duty to dispose correctly of waste within the framework established by regional planning	Mandatory syndicates have the obligation to receive separated collected waste under the conditions foreseen in national agreement w/ municipalities
Quality regulation	Achieve minimum quotas for separate collection Set up separate collection for specific waste flows	Emission and technological standards Site and typology of disposal facilities regulated by regional plans	Legal definition of recovery Regulation of shipments of waste
Self-sufficiency		Normally intended at the district level and for MW only Possible to use facilities in other districts but strictly regulated and normally penalized	
Legal monopoly	Domestic waste Business waste if assimilated	Undifferentiated waste from domestic origin and assimilated	
Eligible customers	Business waste	Business waste Treated municipal waste Separately collected waste when not recycled	Separately collected waste

The parallel development of recycling as an independent activity, prompted by incentives and by the adoption of EPR has created an original situation, in which the public service operates as a last resort opportunity, having the obligation to supply the service to all waste that is directed to it.

The emergence of the "dual" market in the recycling sector has changed the economics of the service, generating a permanent risk for operators on

which the public service obligation is put. These are obliged to put in place adequate supply, but are also exposed to the risk of developing excess capacity if the recovery records are higher than expected. A similar situation already occurred in Germany and in the Netherlands; in turn, the failure of the system to provide adequate solutions can generate a crisis such as the one experienced in Naples during 2008, and still being “solved” thanks to shipments of waste to Germany and use of landfills for raw waste.

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Appendix 1 – The Italian administrative structure

After the constitutional reforms occurred during the 90s, and in the view of further steps towards a further empowerment of regional and local governments, Italy defines itself as a "Republic, constituted by Central State, Regions, Provinces and Municipalities". All of the 4 main layers of government, therefore, are constitutionally recognized and have distinctive functions and powers guaranteed by the Constitution. Legislative power is shared between Central State and Regions in the matters of respective competence.
Following the Normalized units the Italian institutional system can be described as follows:

- Macro-aggregates (NUTS1): NorthWest (4 Regions); NorthEast (4 Regions); Center (4 Regions); South (6 Regions); Islands (2 Regions). They do not have any administrative relevance, but are often used as a reference for statistical purposes
- Regions (NUTS2): total of 20
- Provinces (NUTS3): total of 110
- Municipalities (Comuni): total of 8.100, ranging from metropolitan cities (up to 3 million inhabitants) to very small rural municipalities with a few hundreds of inhabitants.

The following table A1 resumes some key figures:

Table A1 – Key figures on the Italian administrative structure

Aggregates (NUTS1)	**Population**	**Surface**	**Density**	**Provinces**	**Municipalities**	**GDP**	**GDP/inhab**
Regions (NUTS2)	,000 inhab	,000 km²	(inhab/km²)	n.	n.	ml €	€
NORTH-WEST	**15.964**	**58**	**275**	**25**	**3.061**	**456**	**29.493**
Piemonte	4.440	25	174	8	1.206	115	26.582
Valle d'Aosta	127	3	39	1	74	3	28.537
Lombardia	9.781	24	408	12	1.546	298	31.618
Liguria	1.615	5	298	4	235	39	24.936
NORTH-EAST	**11.511**	**62**	**185**	**22**	**1.486**	**321**	**29.001**
Veneto	4.899	18	266	7	581	135	28.643
Trentino-Alto Adige	1.022	14	75	2	339	29	28,76
Friuli-Venezia Giulia	1.232	8	157	4	218	32	27.263
Emilia-Romagna	4.357	22	194	9	348	123	29.670

CENTER	**11.842**	**58**	**204**	**22**	**996**	**308**	**27.369**
Toscana	3.720	23	161	10	287	95	26.462
Marche	1.573	9	166	5	239	36	24.195
Umbria	897	8	106	2	92	19	22.817
Lazio	5.650	17	326	5	378	156	29.645
SOUTH	**14.150**	**73**	**193**	**24**	**1.790**	**227**	**16.119**
Campania	5.815	14	428	5	551	89	15.494
Abruzzo	1.338	11	124	4	305	25	19.723
Molise	320	4	72	2	136	5	17.997
Puglia	4.079	19	211	6	258	64	15.781
Basilicata	589	10	59	2	131	10	17.213
Calabria	2.007	15	133	5	409	31	15.641
ISLANDS	**6.708**	**50**	**135**	**17**	**767**	**109**	**18.636**
Sicilia	5.037	26	196	9	390	78	17.617
Sardegna	1.670	24	69	8	377	32.579	19.654
ITALY	**60.177**	**301**	**200**	**110**	**8.100**	**1.423**	**24.281**

Source: Istat

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2010/01 Municipal waste management in Italy
Antonio MASSARUTTO

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