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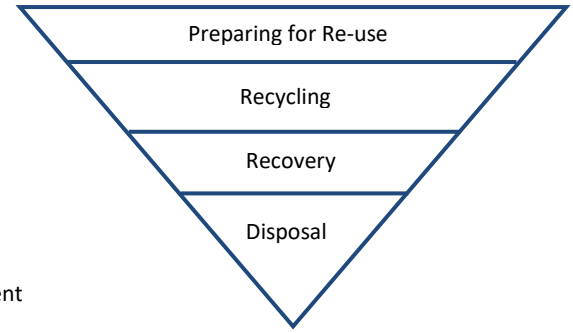
Municipal Waste Regulation in Europe: paving the road for upcoming challenges

1 Municipal waste management in Europe: what lies ahead?

Defined as waste from household and "from other sources, such as retail, administration, education, health services, accommodation and food services, and other services and activities, which is similar in nature and composition", municipal solid waste (MSW) only represents 10% of the total waste generated in the European Union (EU) (Eurostat, 2016). Nevertheless it is a highly political topic as local authorities are in charge of its collection and management, either directly or through an operator (public or private) and a financial sensitive issue as it requires large public investments. It is also a complex matter due to its dispersed generation (60% to 90% of total MSW comes from households, and the rest from commercial activities), to its diverse composition (which includes organic, plastic, metal, paper, glass, bulky items, batteries, exhaust oils/lubricants, light bulbs, etc.), and to the link it has with consumption behaviors and trends (coupling of economic growth and waste generation). MSW management is also crucial due its potential adverse effects on the environment and the human health.

Within this context, the EU has adopted a set of legislation, over the past two decades, aiming at reducing waste generation impacts by shifting MSW management from waste disposal to waste preparing for re-use and recycling, thus moving MSW management up in the "waste hierarchy[1]" (Figure 1).

Figure 1. Waste Hierarchy



Source: based on DG Environment

Within this set of legislation, four directives define specific and challenging targets for MSW collection and management. The *Landfill Directive* (LD), dated 1999, which aims at preventing or reducing as far as possible negative effects of waste landfilling on the environment and human health, forbids landfilling of separately collected waste by 2020 and limits to 10% the MSW generated that can be landfilled from 2035 onwards. In 2008, the revised version of the *Waste Framework Directive* (WFD) "lays down measures to protect the environment and human health by preventing or reducing the generation of waste"[2] and its adverse impacts. For instance, it prescribes the separate collection of specific waste materials, and sets ambitious targets for municipal waste recycling in an effort to boost the transition towards circular economy. More recently, in 2018, the *Single-Use Plastics Directive* (SUP), which originates from the Commission's Plastic Strategy and

[1] Article 4 of the Waste Framework Directive, or Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.

[2] Article 1 of the Waste Framework Directive.

intends to reduce marine litter, sets separate collection targets for plastic. The same year, the amended *Packaging and Packaging Waste Directive* (PPWD) which aims to prevent the generation of packaging waste and its environmental impact, promotes further recycling through recycling targets which vary depending on the packaging material. Still in 2018, the European Commission (EC) adopted the Circular Economy Package (CEP) which intends to accelerate and continue the transition towards a circular economy; thus seeking to maximize the value of waste materials, to minimize material and resources consumption, and prevent waste generation.

The targets for MSW management deriving from these various pieces of EU legislation are described in Table 1.

Table 1. MSW related targets deriving from EU waste legislation

Targets	2020	2025	2030	2035	Legislation
Municipal waste recycling	50%	55%	60%	65%	WFD
Municipal waste landfilling	No landfilling of separately collected waste			Max. 10% of total waste generated	LD
Hazardous waste		Set up separate collection schemes*			WFD
Biowaste collection		Set up separate collection schemes**			WFD
Textile collection		Set up separate collection schemes			WFD
Plastic bottles collection		77%	90%***		SUP
All packaging recycling		65%	70%		PPWD
Plastic packaging recycling		50%	55%		PPWD
Wood packaging recycling		25%	30%		PPWD
Ferrous metals packaging recycling		70%	80%		PPWD
Aluminum packaging recycling		50%	60%		PPWD
Glass packaging recycling		70%	75%		PPWD
Paper and cardboard packaging recycling		75%	85%		PPWD

*Deadline is 2022; ** Deadline is 2023, ***Deadline is 2029

The CEP and the recent revisions of waste-related Directives have laid down ambitious targets for MSW collection and recycling that will require massive investments in MSW management infrastructure, technologies, capacities and processes. An increase in both complexity and costs for consumers and local authorities is thus expected, at least in the medium term during the transitional period from linear to circular economy. These changes may induce important structural changes in the organization and governance of MSW management to face higher investment and operation costs while providing high level quality service. Taking stock of this context, this paper seeks to provide some key information on the municipal waste sector in terms of institutional setting, market characteristics, funding arrangements and current situation against MSW EU targets, highlighting recent waste generation and treatment trends. It then looks at the future capital and operational expenditure required to reach MSW EU targets and the associated financing options. It finally highlights key economic regulatory issues that will have to be addressed to ensure the sustainability and high quality standard of waste services while complying with EU waste legislation.

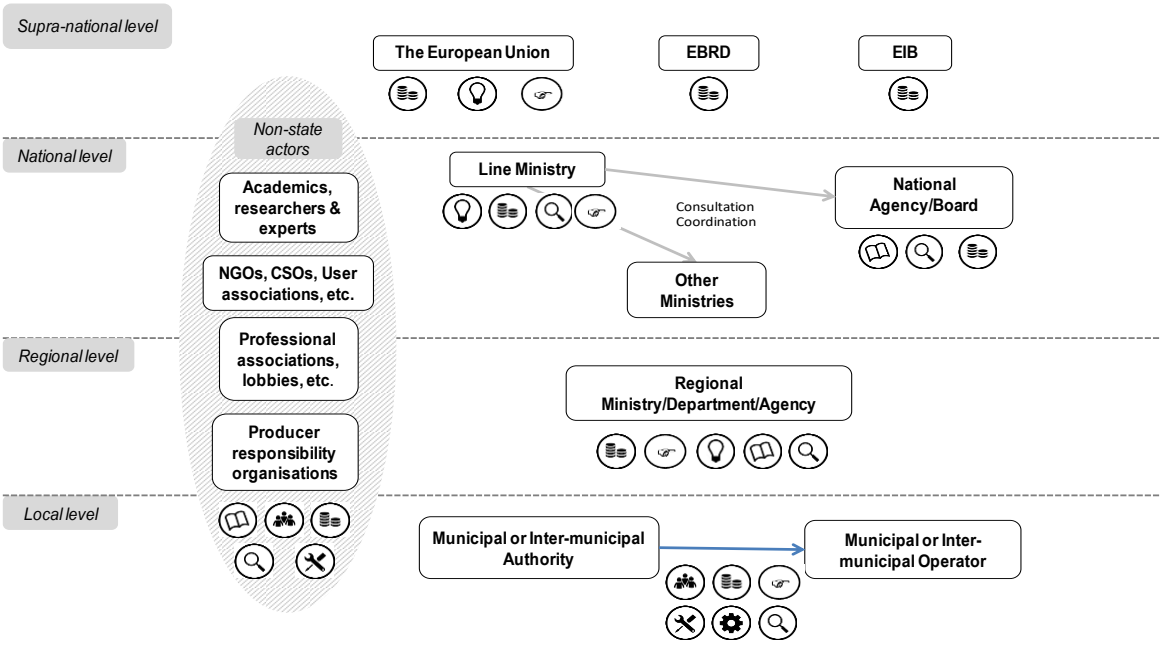
2 Municipal waste collection and management in Europe: state of play

The waste sector in Europe, although very different from one country to another, tends to share common features in terms of market fragmentation and low level of cost recovery. This situation raises concerns, especially in the view of the current status of EU countries with regard to MSW targets.

2.1 Three or four-tiered governance systems in the municipal waste sector

Despite a wide diversity of institutional settings across Europe, most countries tend to have a three-tiered or four-tiered governance system in their waste sector. Indeed, although municipal waste services are local public services, the sector involves many multi-level stakeholders. At supra-national level, the EU adopts Directives and Strategies which set binding legal objectives for Member States. It also provides grants for investments through several funding schemes (see section 2.3). Several European financial institutions (European Investment Bank, European Bank for Reconstruction and Development) also provide some funding for municipal waste projects in EU Member States. At national level, a line ministry and/or a national agency or board is in charge of policy planning, enforcement and sometimes financing. This line entity consults with other relevant national institutions, i.e. ministries of economy, health, agriculture, environment, etc. In Federal countries, regional level administration is often in charge of those functions, either through a regional line ministry or a regional agency. It should however be noted that even in Unitarian systems, regional authorities also tend to have an important role in waste management policy, planning, and financing. At local level, municipalities or inter-municipal bodies are responsible for service provision to users (a) either through municipal departments, (b) through municipally-owned waste management companies or (c) by outsourcing to (usually private) providers through procurement. In some countries, regulatory agencies have been set up to oversee waste services tariffs and quality (Figure 2).

Figure 2. Generic mapping of institutional setting for municipal solid waste in Europe

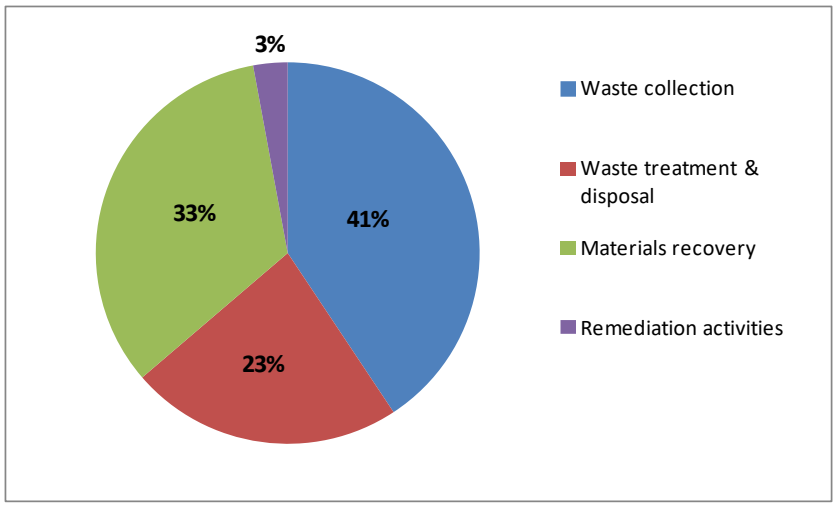


Source: based on the analytical framework developed by the OECD Water Governance Programme, (OECD, 2015)

2.2 A fragmented, dynamic and small-sized market with a few big players

According to Eurostat data (2018), there are about 47.700 waste operators (public and private) in EU28 representing an annual turnover of €184 billion with waste collection accounting for 41% of this turnover, materials recovery 33%, and waste treatment and disposal 23% (Figure 3). As such, the municipal waste market appears almost twice as much fragmented than to the water and wastewater sector which counts 27.000 operators across Europe (Eurostat, 2016).

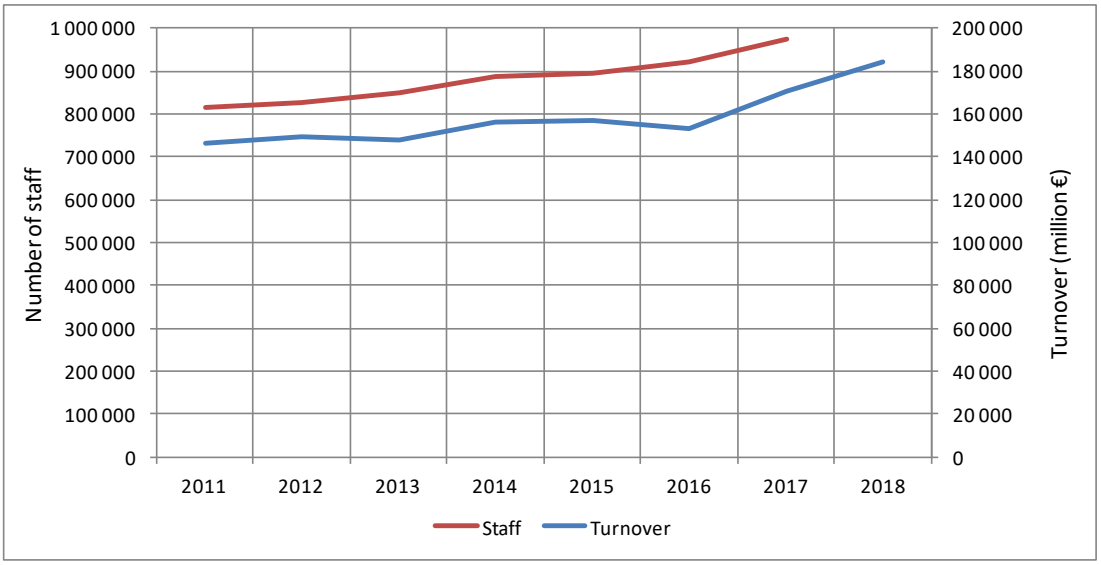
Figure 3. Composition of waste operators' turnover (2018)



Source: Eurostat, 2018

The municipal waste sector proves quite dynamic with a turnover increase of 26% from 2011 to 2017 compared to a 14% increase in the water and wastewater market over the same period (Eurostat). In the meantime, the number of municipal waste staff grew by 20% to reach approximately 975.000 employees in 2017 (Figure 4) while the number of water and wastewater employees only increased by 5% to reach 560.000 staff (Eurostat, 2017). Waste collection appears as the most labor intensive phase of waste management with 56% of total staff of the sector. Nevertheless employment in the recycling phase is expected to grow steadily with the progressive shift to circular economy.

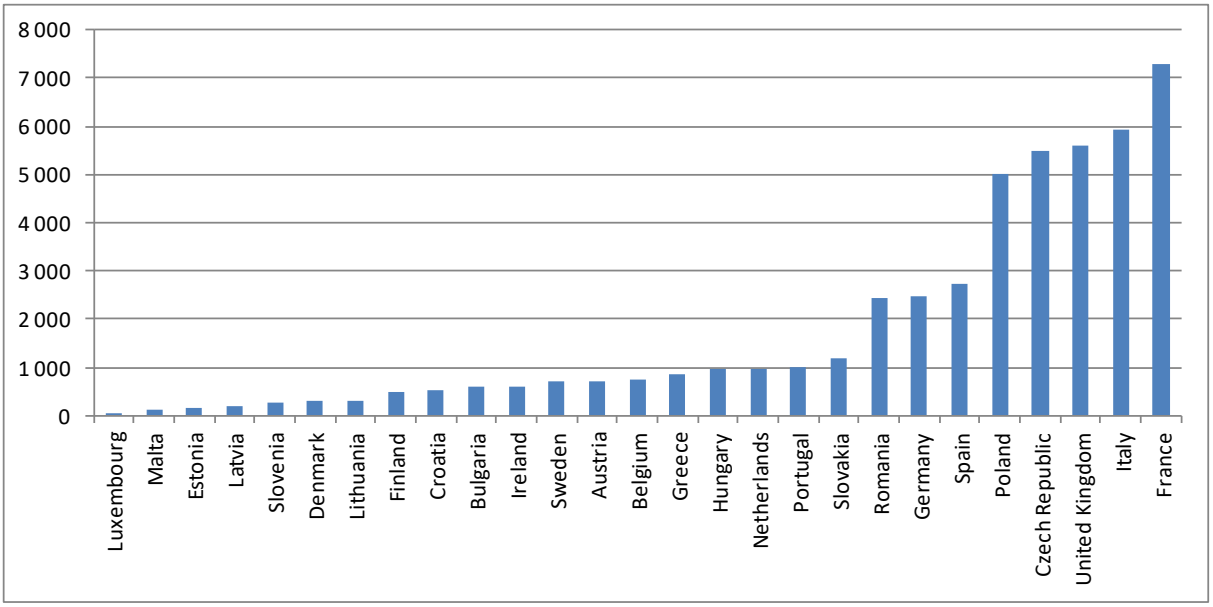
Figure 4. Evolution of staff and turnover of waste operators (2011-2018)



Source: Eurostat, 2018

Although the market structure varies from one country to another, thus reflecting different approaches at national, regional and local levels, the fragmentation of the waste market is more pronounced in the most populated European countries where a higher number of operators is observed, with the exception of Czech Republic (Figure 5).

Figure 5. Number of waste operators per country (2018)



Source: Eurostat, 2018

Approximately three quarters of the waste operators are micro companies[3] and 99.7% of them are Small and Medium Enterprises (SMEs) (Dri M., 2018), with the average number of staff per operator ranging from 6 in Czech Republic to 65 in Germany. Nevertheless, in this small-sized market, a few large operators play a considerable role as the 16 biggest private companies account for 40% of the

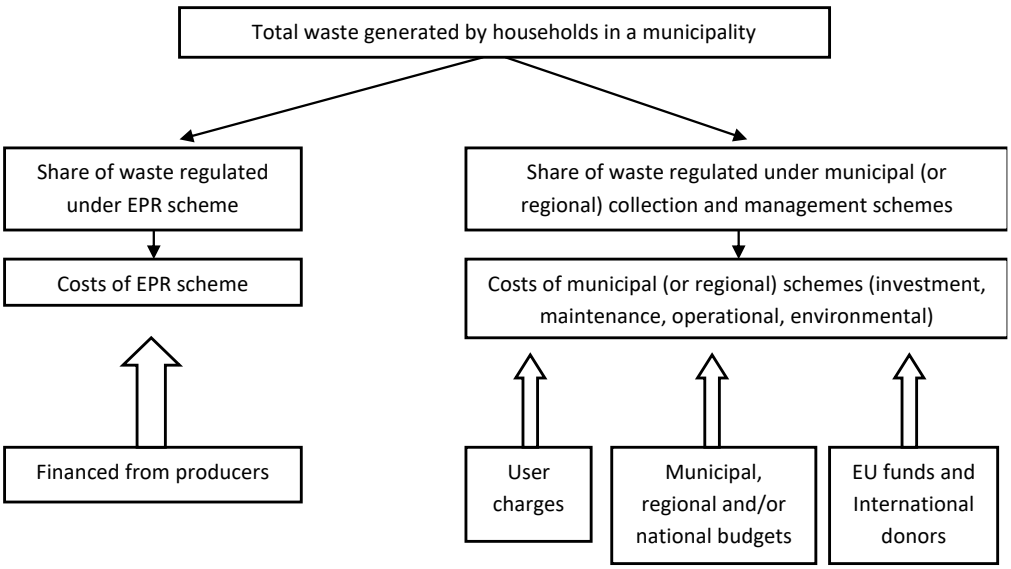
[3] Micro-companies have less than 10 staff and SMEs have less than 250 employees.

total revenue of the sector. Among them, 5 companies are international key players (Veolia, Suez, Remondis, FCC, Alba) (Dri M., 2018).

2.3 Funding sources and cost recovery concerns

The graph below (Figure 6) describes the various financing sources for MSW management. Funding can originate from fees paid by the users; from public funds (taxes) from national, regional and/or local budgets; from grants provided by the EU or European Financial Institutions. In addition, some funding can also derive from producers as part of an extended producer responsibility[4] (EPR) scheme.

Figure 6. Financing sources for MSW management



Source: (European Commission, Eunomia, Cowi, 2019)

2.3.1 User Fee

17 Member States have embedded into their legal framework the cost components that should be recovered through waste user fee (Table 2). While these costs always include maintenance costs (except for Latvia), only 4 countries have set up by law full cost recovery charge that include maintenance, operational, environmental and investment costs. Moreover only five countries consider environmental costs as part of user fees, and four countries tend to finance investments through user charges. As a result, the cost recovery level through tariff varies widely from one country to another and so does the associated financial viability of waste services.

[4] EPR is a policy tool seeking to internalise end-of-life costs into the products' price, thus incentivizing the producers to lower the environmental adverse effects of their products.

Table 2. Cost components to be included in user fees according to national legislation

Countries	Does legislation specify which cost should be included in user fees	Which cost are to be considered
Austria	Yes	Maintenance
Belgium (Flanders)	No	
Bulgaria	Yes	Operational, Maintenance
Cyprus	No	
Czech Republic	Yes	Operational, Maintenance
Denmark	Yes	Maintenance
Germany	No	
Estonia	Yes	Investment, Operational, Maintenance, Environmental
Spain	No	
Finland	Yes	Maintenance
France	Yes	Maintenance
Greece	Yes	Investment, Operational, Maintenance, Environmental
Hungary	Yes	Investment, Operational, Maintenance, Environmental
Croatia	Yes	Maintenance
Ireland	No	
Italy	Yes	Maintenance
Latvia	Yes	Environmental
Lithuania	Yes	Maintenance
Luxembourg	Yes	Maintenance
Malta	No	
Netherlands	N/A	N/A
Poland	No	
Romania	Yes	Maintenance
Slovenia	Yes	Investment, Operational, Maintenance, Environmental
Slovakia	No	
Sweden	Yes	Maintenance

Source: (European Commission, Eunomia, Cowi, 2019)

Furthermore, there is a great variety of tariff-setting methods among Member States which illustrates the heterogeneity and complexity of systems used at regional and/or municipal levels throughout the EU. A large number of countries are forming user charge based on the weight of waste collected, on the size of the waste bin and/or on the frequency of collection (Table 3), thus trying to provide incentives to households to reduce their waste.

Table 3. Overview of user charging systems in EU Member States

	Basis on which charges are formed:								
COUNTRIES	**weight of collected**	**waste size of bin**	**frequency of collection**	**per household**	**household size**	**(household) income**	**water or other utility bills**	**size of the property**	**property value**
Austria	X	X	X	X	X				
Belgium	X	X	X	X	X				
Bulgaria	X	X	X					X	X
Cyprus				X					
Czech Republic	X	X	X	X	X				
Denmark	X	X	X	X					
Germany	X	X	X	X	X		X		
Estonia	X	X	X	X	X				
Spain	X			X	X			X	
Finland		X	X	X	X				
France	X	X	X						X
Greece								X	
Hungary		X		X	X				
Croatia	X	X	X						
Ireland	X		X	X					
Italy	X	X			X			X	
Latvia		X	X	X	X				
Lithuania	X	X	X		X			X	
Luxembourg	X	X	X						
Malta						X			
Netherlands	X	X	X	X					
Poland					X		X	X	
Portugal							X		
Romania	X	X		X					
Slovenia	X	X	X						
Slovakia	X	X	X		X				
Sweden	X	X	X						
United Kingdom				X		X			X
	19	20	18	15	13	2	3	6	3

Source: (European Commission, Eunomia, Cowi, 2019)

2.3.2 Public funding

There are currently no data available at EU and Member State level to quantify public funding that finances the municipal waste sector. Further research to document those financial flows should be conducted to provide accurate information, evaluation and monitoring to policy decision-makers and strengthen the knowledge regarding the financial viability of the MSW sector. This would prove crucial especially in the view of the upcoming investments required to reach EU MSW targets.

2.3.3 European funding

From 2014 to 2018, the EU has allocated €6.4 billion to MSW investments through EU Cohesion funds (75.7%), European Funds for Strategic Investments (17.1%), Horizon 2020 (4.7%) and Life (2.5%) (European Commission, Eunomia, Cowi, 2019). This represents an annualized contribution of approximately €1.3 billion.

2.3.4 EPR Schemes

EPR schemes for the four mandatory waste streams (which include batteries and accumulators (B&A), electrical and electronic waste (WEEE), end-of-life vehicles (ELV), and packaging) have been set up in all Member States (European Commission, DG ENV, 2014). The level of cost recovery of EPR schemes varies a lot across schemes and across countries. At most, they recovery all the net costs related to the management of separately collected waste. These nets costs include the costs for collection and treatment, minus the revenues from the sales of recovered materials, and the administrative, reporting and communication costs related to the operation of collective schemes (European Commission, DG ENV, 2014). However, they hardly ever recover all the components of the full cost of the waste stream management which include:

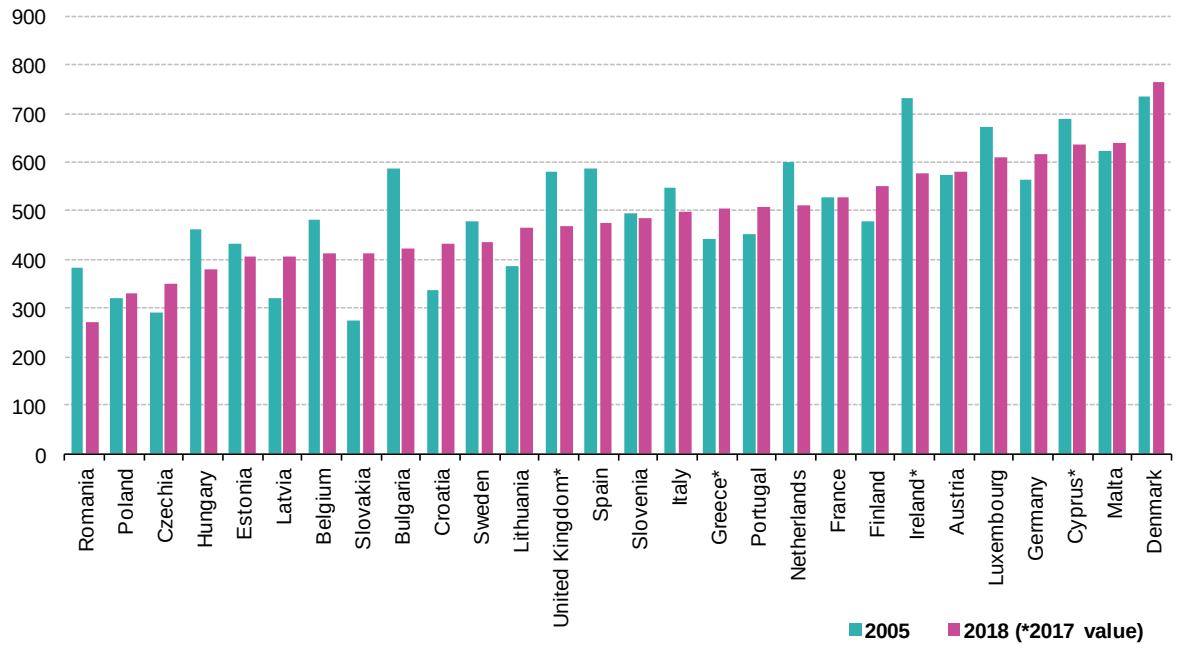
- "Collection, transport and treatment costs for non-separately collected waste (waste covered by EPR but not entering the separate collection channel, e.g. waste collected together with mixed municipal waste);
- Costs for public information and awareness raising (in addition to the Producer Responsibility Organisation 's own communication initiatives), to ensure participation of consumers with in the scheme (i.e. through separate collection);
- Costs related to waste prevention actions;
- Costs for litter prevention and management;
- Costs related to the enforcement and surveillance of the EPR system (including, auditing, measures against free riders, etc.)" (European Commission, DG ENV, 2014).

In a context of increased forthcoming recycling rates, the cost-recovery level of EPR schemes will need to be enhanced to ensure a better implementation of the polluter-pays-principle and to reduce cross-subsidies from users to producers.

2.4 Municipal waste generation and treatment

According to Eurostat data, 489kg of waste were generated on average by EU citizens in 2018, which represents a total amount of 251 million of tones. Compared to 2005, this represents a 5% decrease for the average waste generated by EU citizens and a 2% decrease for the total amount of MSW. From 2005 to 2018, 14 EU countries managed to reduce their MSW per capita ratio, thus succeeding in decoupling economic growth and MSW production, while 13 other witnessed an increase (Figure 7) and one remained stable. The observed differences between countries mainly reflect different consumption patterns and economic wealth as wealthier countries tend to generate more MSW per person, while tourism contributes to high generation rates in Cyprus and Malta (European Environment Agency, 2016). Nevertheless, these data should be looked at with cautious due to important discrepancies in definitions of municipal waste data collection methods across countries.

Figure 7. Municipal waste generated, 2005 and 2018 (kg per capita)



Source: Eurostat, 2018

In 2018, 30% of the MSW was recycled, 28% incinerated, 23% landfilled and 17% composted[5]. Although landfilling has steadily declined since 1995, dropping from 64% to 23%, it is still above the 2035 target of 10% in 19 EU Member States. Recycling and composting remains below 50% (MSW target for 2020) in 20 countries despite a continuous increase since 1995 from 17% to 47% (Figure 8 and Figure 9). This situation shows that important efforts to reach EU legislation compliance still lie ahead for a large majority of Member States.

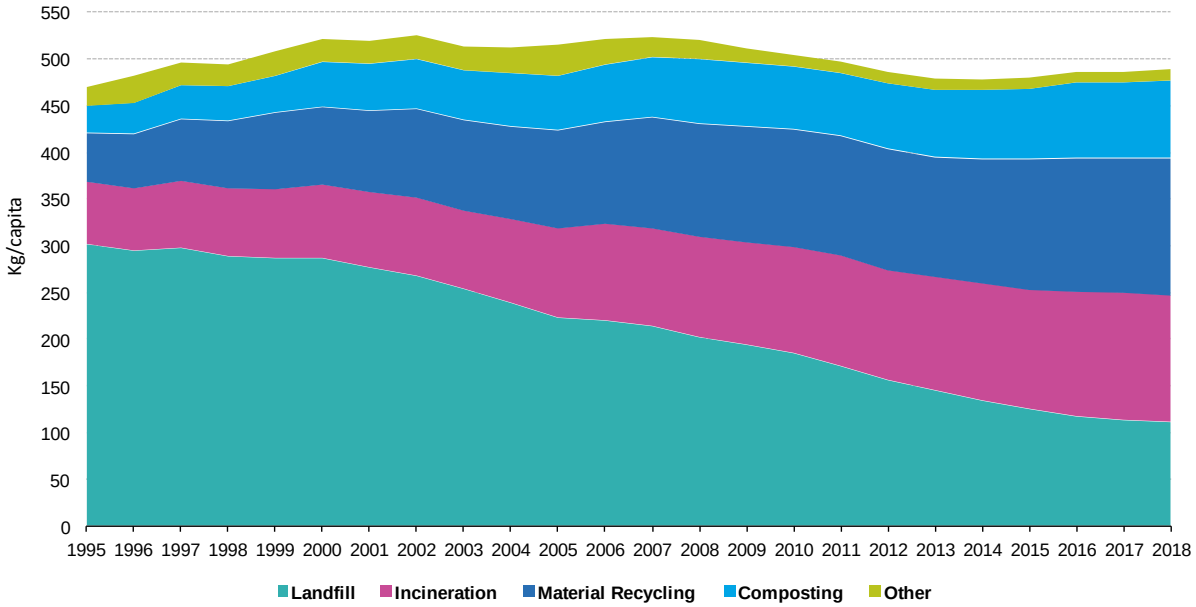
[5] The remaining 2% are declared as "Other" in Eurostat and correspond to the difference between the amount of waste generated and the amount of waste treated. This difference arises in countries that have to estimate waste generation in areas not covered by a municipal waste collection scheme and thus report more waste generated than treated. In addition, the "Other" category reflects the effects of import and export, weight losses, double-counting of secondary waste (e.g. landfilling and recycling of residues from incineration), differences due to time lags, temporary storage and, increasingly, the use of pre-treatment, such as mechanical biological treatment (MBT).

Figure 8. Municipal waste treatment in EU countries (2018)

Note: *data are 2017 values

Source: Eurostat, 2019

Figure 9. Evolution of municipal waste treatment from 1995 to 2018 in EU countries



Source: Eurostat, 2019

3 Asset and financial needs to meet EU requirements: bridging the gaps

Important investments will be required to achieve the various MSW collection and recycling targets as described in Table 1. In order to assess these efforts, the EU commissioned a study which uses a financial model to appraise the magnitude and nature of the upcoming capital and operational expenditure (CAPEX and OPEX) necessary to reach full compliance with EU requirements by 2035.

3.1 Capital Expenditure

The financial model focuses on the required changes in waste management between 2020 and 2035 by assessing the investment needs for each EU Member State to reach the recycling target of 55% for 2025, 60% for 2030 and 65% for 2035. It includes a limitation of 10% of municipal waste being landfilled by 2035. Requirements on separate collection for hazardous household waste (by 2022), biowaste (by 2023) and textiles (by 2025) are accounted for, and all packaging targets are considered met on time. The model assumes that all MSW targets for 2020 are met. The investment costs taken into account in the model are described in Table 4.

Table 4. Investment costs taken into account in the financial model

– Waste collection costs which include both vehicles and containers costs for Bring sites and Kerbside collection. It also accounts for costs associated with Civic Amenity sites
– Biowaste treatment facilities costs for new assets as well as for replacement of biowaste facilities that have reached end-of-life[6] during the period considered
– Sorting facilities costs which cover materials recovery facilities (MRFs) for the sorting of mixed recyclables
– Recycling reprocessing costs for major waste streams
– Sorting costs in residual treatment facilities which include the installation of plastics sorting equipment at incineration plants and Mechanical Biological Treatment (MBT) plants

Source: (European Commission, Eunomia, Cowi, 2019)

As a result of the modeling, it is estimated that the total investment costs from 2020 to 2035 to reach full compliance amount to €31.5 billion (€61/capita for EU 28), which represents an annual average capital expenditure of €2.1 billion (Table 5). The major financial effort would be directed towards waste collection representing 35% of the overall investment needs, followed by recycling and reprocessors (34%) and biowaste (24%) (Figure 10). Nevertheless, there is a wide diversity of situation among EU Member States with France facing a maximum investment need of €5 billion representing €75/capita, while it would be 100 times lower in Malta but representing €107/capita (Figure 11).

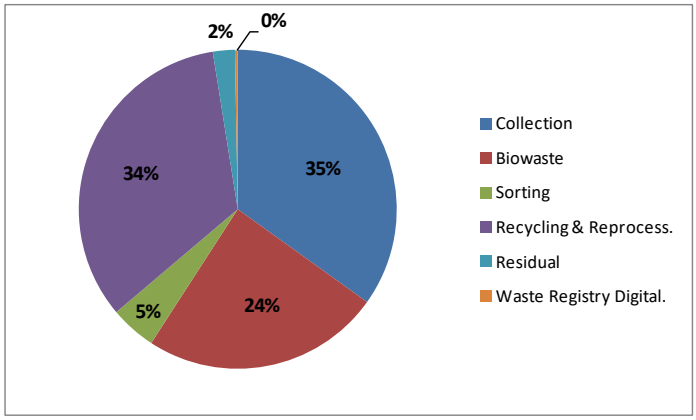
[6] Biowaste facilities are assumed to have a lifetime of 20 years.

Table 5. Investment needs to reach MSW EU targets by 2035 (million €)

	Collection			Biowaste				Recycling & Reprocess.		Residual				
COUNTRIES	Bring	Kerbside	CA sites	Open Air Compost.	In-Vessel Compost.	Anaerobic Digestion	**Sorting**	MSW & non MSW Plastic Packaging	Textiles	Front End Sorting on Incineration	Sorting Upgrading on MBT	**Waste Registry Digital.**	**Total**	**Total per capita (€/cap)**
Austria	€ 96,1	€ 54,0	€ 7,3	€ 3,5	€ 5,7	€ 7,4	€ 7,6	€ 164,0	€ 1,2	€ 11,0	€ 4,0	€ 0,0	**€ 362**	**€ 41**
Belgium	€ 33,1	€ 101,0	€ 14,0	€ 9,9	€ 1,2	€ 107,0	€ 0,0	€ 139,0	€ 0,9	€ 13,0	€ 1,2	€ 4,0	**€ 424**	**€ 37**
Bulgaria	€ 74,0	€ 42,0	€ 8,6	€ 15,8	€ 30,4	€ 60,0	€ 19,0	€ 75,0	€ 1,8	€ 0,5	€ 5,3	€ 4,0	**€ 336**	**€ 48**
Croatia	€ 35,0	€ 35,2	€ 15,0	€ 20,9	€ 0,0	€ 2,1	€ 14,0	€ 87,0	€ 7,3	€ 0,0	€ 4,0	€ 4,0	**€ 225**	**€ 55**
Cyprus	€ 6,2	€ 12,2	€ 7,9	€ 1,7	€ 8,4	€ 32,6	€ 4,0	€ 21,0	€ 6,6	€ 0,0	€ 1,9	€ 4,0	**€ 107**	**€ 122**
Czech Republic	€ 199,0	€ 51,0	€ 44,0	€ 16,6	€ 42,0	€ 32,3	€ 0,0	€ 125,0	€ 15,0	€ 9,5	€ 3,6	€ 4,0	**€ 542**	**€ 51**
Denmark	€ 68,0	€ 42,0	€ 22,0	€ 36,0	€ 54,0	€ 36,9	€ 31,0	€ 172,0	€ 0,0	€ 16,0	€ 0,0	€ 0,0	**€ 478**	**€ 82**
Estonia	€ 27,1	€ 4,8	€ 5,9	€ 0,9	€ 5,7	€ 0,0	€ 2,2	€ 43,0	€ 1,2	€ 1,4	€ 0,3	€ 4,0	**€ 97**	**€ 73**
Finland	€ 81,0	€ 29,0	€ 15,0	€ 1,7	€ 15,0	€ 178,0	€ 41,0	€ 38,0	€ 0,3	€ 5,9	€ 2,6	€ 4,0	**€ 412**	**€ 75**
France	€ 791,0	€ 488,6	€ 445,0	€ 0,0	€ 812,0	€ 35,0	€ 415,0	€ 1 784,0	€ 165,0	€ 72,0	€ 8,5	€ 4,0	**€ 5 020**	**€ 75**
Germany	€ 689,0	€ 609,0	€ 13,0	€ 61,0	€ 98,0	€ 500,0	€ 43,0	€ 1 240,0	€ 61,0	€ 119,0	€ 24,0	€ 0,0	**€ 3 457**	**€ 42**
Greece	€ 139,0	€ 123,0	€ 87,0	€ 7,1	€ 170,0	€ 0,0	€ 0,0	€ 112,0	€ 0,0	€ 0,0	€ 16,0	€ 4,0	**€ 658**	**€ 61**
Hungary	€ 100,0	€ 63,0	€ 66,0	€ 34,0	€ 36,0	€ 0,0	€ 0,0	€ 206,0	€ 14,0	€ 1,8	€ 13,0	€ 4,0	**€ 538**	**€ 55**
Ireland	€ 22,1	€ 39,5	€ 27,0	€ 22,5	€ 38,0	€ 11,9	€ 84,0	€ 226,0	€ 34,0	€ 5,8	€ 1,5	€ 4,0	**€ 516**	**€ 105**
Italy	€ 764,0	€ 590,1	€ 152,0	€ 59,0	€ 839,0	€ 894,0	€ 89,0	€ 1 138,0	€ 62,0	€ 58,0	€ 28,0	€ 4,0	**€ 4 677**	**€ 77**
Latvia	€ 30,8	€ 6,7	€ 2,3	€ 6,6	€ 0,0	€ 0,0	€ 8,8	€ 27,0	€ 0,4	€ 0,0	€ 2,7	€ 4,0	**€ 89**	**€ 47**
Lithuania	€ 60,0	€ 14,3	€ 25,0	€ 16,7	€ 8,2	€ 23,0	€ 13,0	€ 39,0	€ 10,0	€ 0,0	€ 3,5	€ 4,0	**€ 217**	**€ 78**
Luxembourg	€ 5,8	€ 4,8	€ 2,5	€ 1,7	€ 0,0	€ 8,2	€ 3,1	€ 21,0	€ 0,5	€ 0,9	€ 0,2	€ 4,0	**€ 53**	**€ 86**
Malta	€ 1,9	€ 5,5	€ 2,8	€ 0,1	€ 0,1	€ 21,0	€ 7,3	€ 7,7	€ 1,5	€ 0,0	€ 0,7	€ 4,0	**€ 53**	**€ 107**
Netherlands	€ 114,0	€ 139,0	€ 41,0	€ 10,8	€ 15,7	€ 26,7	€ 26,0	€ 181,0	€ 18,0	€ 18,0	€ 1,9	€ 4,0	**€ 596**	**€ 34**
Poland	€ 420,0	€ 179,0	€ 237,0	€ 146,0	€ 8,7	€ 178,0	€ 207,0	€ 765,0	€ 42,0	€ 4,4	€ 40,0	€ 0,0	**€ 2 227**	**€ 59**
Portugal	€ 102,0	€ 118,0	€ 78,0	€ 49,0	€ 79,0	€ 194,0	€ 95,0	€ 250,0	€ 24,0	€ 5,3	€ 1,8	€ 0,0	**€ 996**	**€ 97**
Romania	€ 211,0	€ 103,2	€ 104,0	€ 50,9	€ 7,7	€ 279,0	€ 7,5	€ 170,0	€ 4,0	€ 0,0	€ 6,3	€ 4,0	**€ 948**	**€ 49**
Slovakia	€ 70,0	€ 22,0	€ 10,0	€ 5,0	€ 0,0	€ 115,0	€ 16,0	€ 44,0	€ 4,7	€ 2,5	€ 0,9	€ 0,0	**€ 290**	**€ 53**
Slovenia	€ 20,3	€ 23,0	€ 4,6	€ 0,8	€ 4,9	€ 18,8	€ 5,6	€ 49,0	€ 2,3	€ 1,9	€ 1,5	€ 4,0	**€ 137**	**€ 66**
Spain	€ 750,0	€ 293,0	€ 122,0	€ 137,0	€ 39,0	€ 221,0	€ 38,0	€ 779,0	€ 14,0	€ 39,0	€ 23,0	€ 4,0	**€ 2 459**	**€ 52**
Sweden	€ 144,0	€ 82,0	€ 39,0	€ 22,4	€ 37,0	€ 172,0	€ 0,0	€ 165,0	€ 19,0	€ 20,0	€ 0,0	€ 4,0	**€ 704**	**€ 69**
United Kingdom	€ 268,0	€ 572,0	€ 223,0	€ 352,0	€ 304,0	€ 717,0	€ 295,0	€ 1 907,0	€ 118,0	€ 57,0	€ 42,0	€ 4,0	**€ 4 859**	**€ 73**
	€ 5 322	**€ 3 847**	**€ 1 821**	**€ 1 090**	**€ 2 660**	**€ 3 871**	**€ 1 472**	**€ 9 975**	**€ 629**	**€ 463**	**€ 238**	**€ 88**	**€ 31 475**	**€ 61**

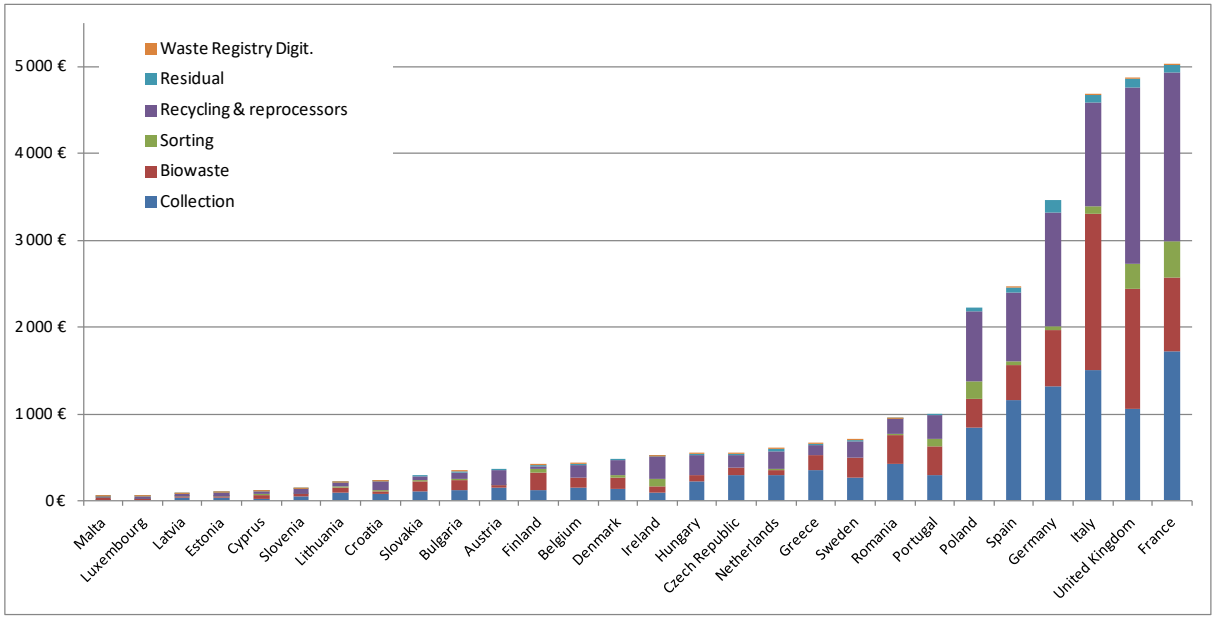
Source: (European Commission, Eunomia, Cowi, 2019)

Figure 10. Composition of investment needs to reach MSW targets by 2035



Source: based on (European Commission, Eunomia, Cowi, 2019)

Figure 11. Investment needs to reach MSW EU targets by 2035 (million €)



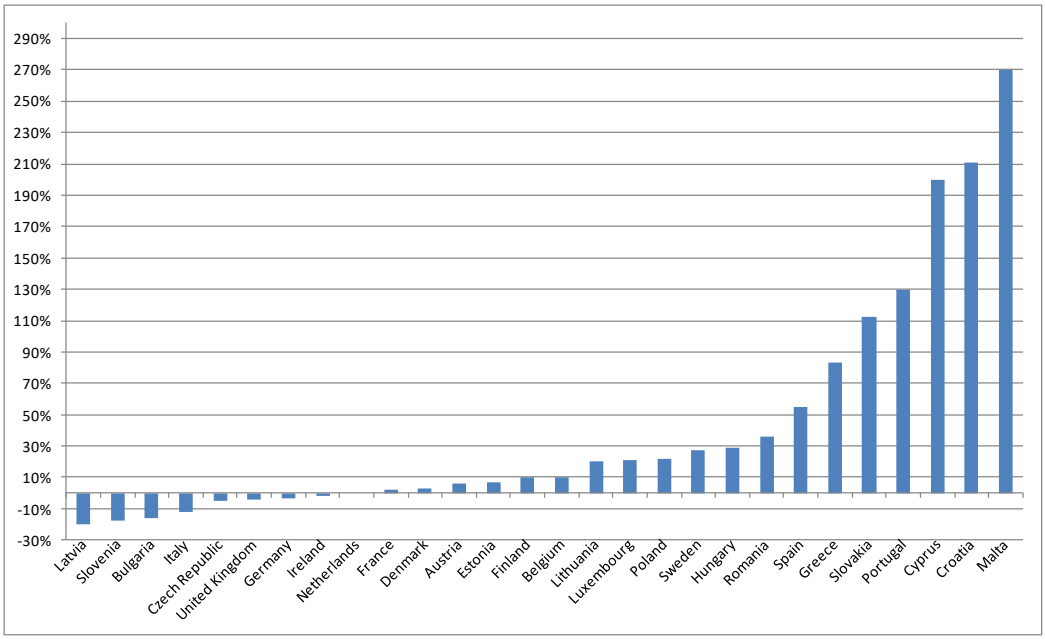
Source: (European Commission, Eunomia, Cowi, 2019)

The Commission's study is most welcome as this is the first sound attempt to evaluate the economic efforts required to achieve the circular economy objectives. However, some elements could be further refined and elaborated upon to strengthen the study's results. Firstly, the model assumes that all MSW 2020 targets are met which is not the case as pointed out in section 2.4. Secondly, new residual waste treatment facilities are not considered in the calculation, nor are the renewal costs of existing residual waste treatment facilities. Moreover, the lack of open, accessible and harmonized data for municipal waste is a key difficulty that needs to be addressed. As a result, more research is required to improve further the robustness of CAPEX needs assessment for the MSW sector to provide more accurate information to policy decision-makers and design sound sustainable long-term policies.

3.2 Operational Expenditure

In addition to the investment needs, the financial model was also used to quantify the projected OPEX associated with the new infrastructure. The operational costs accounted for include waste collection, sorting of dry recyclables, recycling revenues, biowaste treatment, and disposal (excluding disposal taxes). The graph below presents the expected evolution of MSW OPEX from 2014 to 2035 following the achievement of MSW EU targets (Figure 12). The OPEX are expected to vary from -20% for Latvia to +270% for Malta, and are likely to trigger tariff increases in 19 countries at least to avoid further deterioration of the cost-recovery level and financial viability of waste services.

Figure 12. Evolution of MSW OPEX due to full EU requirements compliance (from 2014 to 2035)

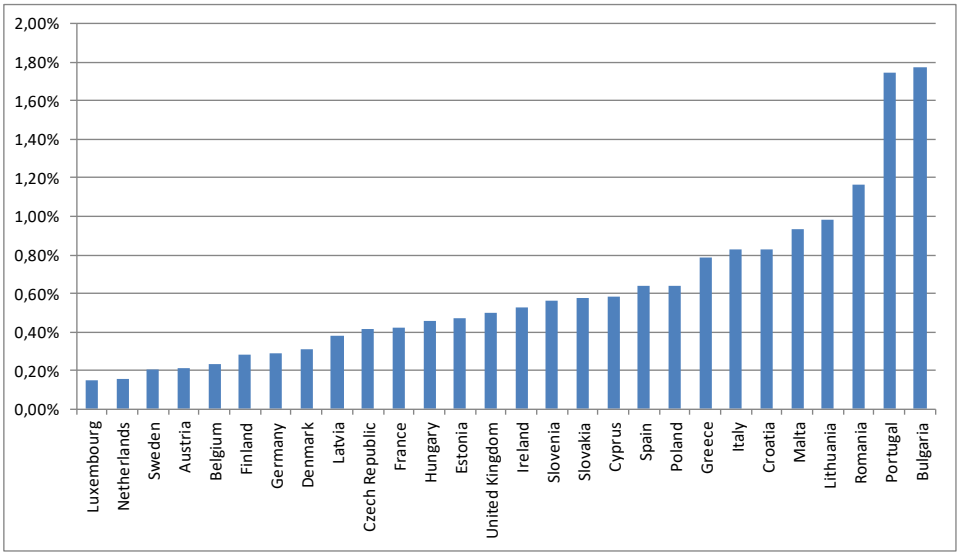


Source: based on (European Commission, Eunomia, Cowi, 2019)

3.3 Financial options to bridge the gaps

Based on the legal provisions with regard to cost reflexivity in EU Member States as previously described in Table 2, the above mentioned investment needs will most likely be funded through public funds for a large majority of European countries. When compared to the national GDP of each EU28 country, annual MSW CAPEX needs represent from 0.01% to 0.04%. When compared to annual public investments, annual MSW CAPEX needs account for 0.15% to 1.78% (Figure 13).

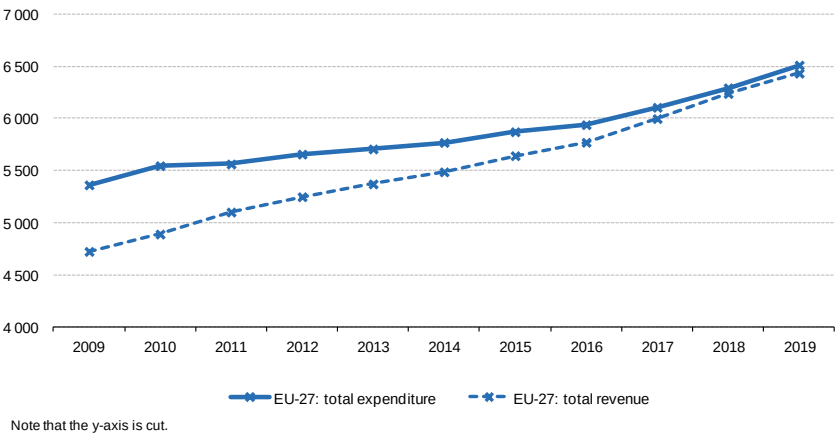
Figure 13. MSW annual CAPEX needs as share of annual public investments per country (2018)



Source: Eurostat, 2017

Although these proportions may not seem too burdensome (despite the likely underestimation of investment needs), the financial consequences of the covid-19 pandemic will strongly affect the fiscal capacity of European Member States in the coming years. Whereas EU countries had managed to recover from the 2008 financial crisis a decade later, they are currently forced to increase again their public spending to support and rescue their respective economies. As revenues have already increased by 36% over the last decade, there may not be much room to increase further public revenues (Figure 14). As a result, alternative financing options will have to be explored to reduce the MSW investment burden on public funding through a better cost-reflective tariff or a more stringent implementation of the polluter-pays-principle, for instance. In addition, a more robust assessment of the financial effort required to reach full compliance with EU MSW targets will have to be conducted by comparing future investments needs with current trends. As data are currently sparse and patchy, this could be an interesting research area to explore in the future.

Figure 14. Evolution of total public expenditure and revenue, 2009–2019 (Billion €)



Source: Eurostat, 2019

4 Key economic regulatory issues for municipal waste services

In the EU27, various arrangements for economic regulation of MSW services are in place. A large majority of European countries currently rely on self-regulation for their municipal solid waste services, with economic regulation functions being scattered across national, regional and/or municipal authorities. But in several Member States[7] economic regulators have established.

Taking stock of the current and upcoming challenges for the MSW sector, regulation will have a crucial role to play regardless of the regulatory institutional setting. In a context where important investment will have to be made to reach increasingly challenging recycling objectives; in a context where the MSW sector faces long-lasting structural issues, such as fragmented, small-sized and mostly local markets unlikely to generate sufficient financial resources to face massive investment needs; in a context of atomised institutional structure of MSW management that triggers governance and coordination issues; in such context, effective and efficient economic regulation is needed to:

- Strengthen the financial viability of MSW services through the promotion of cost-reflective tariffs and improvement of cost-recovery level (including for EPR schemes);
- Incentivize massive investment efforts in infrastructure, processes and technologies through sound economic regulation of the rate of return and thorough project selection criteria and assessment;
- Effectively use economic and policy instruments to steadily improve the technical and economic efficiency of municipal waste services;
- Ensure the set up of sound separate collection schemes with sufficient treatment capacity for each collected material, as well as sufficient market absorption capacity for materials from recycled waste;
- Enhance the quality of monitoring data through the establishment of open, harmonized, standardized, integrated, coordinated and continuously updated databases on waste production, destination, prices and trade.

Addressing these key regulatory issues can greatly contribute to pave the road for a better economic regulation of the MSW sector, and trigger the necessary reforms to successfully implement the EU Circular Economy Package.

[7] Waste regulators have been established in Hungary, Italy, Latvia, Lithuania, Portugal and the Azores, Romania. In Ireland, discussions are currently ongoing regarding the possible set up of a waste regulator.

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