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1. Introduction

Spain has not met European pro-environment waste reduction objectives. In fact, waste generation has continued to increase alongside economic activity and per capita income. Moreover, although reuse and recycling rates began to improve from the 1990s, there has been a backwards trend over the last decade. The available data indicates that Spain lags behind other European countries in this area (Eurostat), although there is significant variation between different regions within the country (INE).

The vast amount of waste generated, in some cases combined with poor management, has serious negative effects on the quality of the soil we grow our food in, the water we drink, and the air we breathe. It also presents a serious danger to our biodiversity and represents a misuse of scarce natural resources. A common response to this problem, the exportation of waste overseas, primarily to South-East Asia, simply shifts these issues to third countries (UN Comtrade Database).

Although the lack of detailed data on waste management does not facilitate research, the information available demonstrates a compelling need for significant changes in ways that waste is produced, collected and treated. We believe that changes in this area would receive widespread social support, given that Spanish citizens, according to the European Barometer (European Commission, 2017), are among the most concerned in Europe with respect to environmental issues. This is especially true with respect to climate change, water shortages and air pollution. Increasing levels of environmental awareness over recent years could be linked to the momentum created by Greta Thunberg-led “Fridays for Future” youth movement.

This research focuses on the collection stage of municipal waste, including both household and small business waste. On the one hand, this is because collection is the most visible form of waste management for the general public. Popular awareness and engagement is essential for processes designed by policymakers to work in practice. Conversely, citizens can influence incumbent politicians to pursue more ambitious and
sustainable policies in this area. On the other hand, collection is a root cause of several other problems. This means that changing practices, regulations and the distribution of costs around the collection of urban waste can incentivise agents all along the waste management chain. While focusing on collection, it cannot be forgotten that waste disposal chain is an integrated process and other areas must also be addressed.

The objective of this report is twofold. First, we aim to raise citizen awareness with respect to the challenges that the current model of consumption poses. Second, we want to encourage policymakers to take a stand and pursue a more ambitious approach when it comes to environmental issues. We have structured this report as follows. First, the report analyses the Integrated Management System (IMS) which became the general system in Spain after the 1997 Packaging Waste Law came into force, together with the legal framework that governs the Spanish urban waste management system. Secondly, describe the systems used by some of best European performers in this area, paying particular attention to decentralized solutions that could be adapted by Spanish institutions. Specifically, we look at the Belgian Door-to-Door (DtD) and Pay as You Throw (PAYT) models, the Swiss plastic waste management scheme, and the German Dual system (DSD) and Deposit-Return (DRS) systems. We also look into some cases where similar measures have been trialled in Spain and assess their effectiveness. Finally, we propose a model for Spain accompanied by a set of policy recommendations.
2. Diagnosis of waste Management in Spain

2.1 Goals and Data

Spain´s urban waste management system is governed by the 1997 Packaging Law and the 2011 Waste Law, within the regulations of the National Strategic Framework and different regional adaptations. These legal instruments reflect European Directives, the 2008 Waste Directive being the most pertinent to this issue. This latter was amended in 2018 to include updated policy goals and a shift away from “waste management” towards “sustainable materials management”.

Two main concepts underpin the system. Firstly, “producers´ extended responsibility” aims to ensure that waste is properly collected and treated by holding producers responsible. Secondly, the “waste management hierarchy” sets the priority order of waste management: prevention, reuse, recycling, valorization and disposal. Waste disposal should be used only as last resort, in the case that other alternatives are not feasible.

Many readers of this report would remember how glass and cardboard collectors got paid by the kilo at collection sites. Maybe they even got paid themselves in exchange for these materials. This system, a rudimentary version of the Deposit-Return System (DRS), currently in place in Germany and The Netherlands, was dismantled during the 90s. The 1997 the Packaging Law made it legal for Spanish packaging companies to self-organize Integrated Management Systems (IMS) as an alternative means to take responsibility for the waste they produced. The vast majority of producers opted to switch from deposit to IMS systems, which are currently the dominant model in Spain.

In these systems, packaging producers need to pay a fee per package or according to a volume/weight pricing formula into their IMS. This fee is destined to cover the cost of future waste management. Payment is verified by an icon (a Green Dot) printed on product labels. The fee varies depending on the material used. Glass, cardboard and metal packaging are subject to much cheaper tariffs than plastic-based packages including PET and tetra paks (Ecoembes, 2020), which are more difficult to reuse and recycle. As is also the case in other European countries, the largest IMSs in Spain covers
multinational firms from the food and beverages industry. Even where their statutes define them as commercial entities, IMSs are categorised as non-profit organisation as profits are dedicated to environmental issues.

In accordance with the legal framework defined above, part of the money IMSs collect from packaging companies is passed on to local councils to fund local waste collection. In Spain, as opposed to Belgium, France, Germany or Sweden, the amount paid does not cover total collection costs (Hogg, 2002). Moreover, those agreements are made by individual councils and so there are significant local variations and no transparent means to compare cases or evaluate the impact of this funding structure on local finances. Municipalities can opt out of these agreements and arrange their own waste management systems in coordination with regional authorities. IMS income not passed on to other institutions covers administration costs and is invested in consciousness-raising campaigns and research activities.

Following this brief explanation of the Spanish waste management system, we now look more closely at the available data in order to assess Spain’s performance as compared to other European countries. Hazardous waste is not addressed in this analysis. This is because it represents a very small proportion of total waste (4.13% out of total EU waste at EU-28 in 2018 according to Eurostat, and 2.34% in Spain), and presents special challenges. Additionally, this kind of waste is rarely generated by households and businesses in urban centres (services, hospitality industry and stores). For the above reasons, local councils are not responsible for managing waste of this kind.
With respect to non-hazardous waste, for the EU-28 (including the UK), waste generated per capita has remained stable, with the exception of the 2008 recession where the figure declined. In Spain, the decrease was more pronounced as the crisis was more severe. As it can be observed in Figure 1, Spain, together with Italy, generates the lowest amount of non-hazardous waste per capita among the selected European countries, far below the EU-28 average. This data confirms the correlation between income level and waste generation identified in the literature (Abu Qdais et al., 1997). The extremely high figures with respect to Sweden are due to mineral waste. Escaping the trade-off between sustainability and growth is one of the main objectives of EU policy (European Commission, 2010). There has been some success in this area with respect to energy consumption (EEA, 2019).
Spain and Italy perform worse when it comes to assessing the share of waste generated by households and services (municipal waste). These sectors produce around the 20% of non-hazardous waste, 7 percentage points above the EU-28 average. Mining and quarrying, industry and construction generate the remainder. This means that a reform of municipal waste management would have a higher relative impact in Italy and Spain. Moreover, a large proportion of household and service waste is simply unnecessary (Greenpeace, 2019). It could be reduced by adopting more responsible consumption habits and improving the design of products and their packaging (European Commission, 2010). By contrast, reducing industrial waste can be more difficult as waste is sometimes intrinsic to the production processes.

As to urban waste treatment, when the IMS model was introduced in the late 90’s, Spain recycled around 8% of waste generated by households and services. This figure was low in comparison to the European average but comparable to Italian performance. During the initial years of IMSs, Spain more than tripled its recycling rates, a phenomenon that
can be considered a great success. Since then, however, there has been no further improvement and even a distinct negative trend during the 2008-recession period. Recovery began in 2012, but in 2018 the urban waste recycling rate was 36%, below the 2008 figure and the worst result as compared with a selection of comparable countries. During this period, Belgian municipalities gradually introduced DtD waste collection and PAYT systems (EEA, 2016) which, among other factors, pushed the recycling rate from 20% to the 50% over a five-year period. As for Germany, it is still Europe’s best performer, as was already the case in 1995.

Figure 3. Share of municipal waste recycled, composted or digested (%)

In order to achieve high municipal waste recycling rates, waste managers work in two main areas. One area is the separation of different materials. This can be carried out before pick up, by enforcing separate collection (usually in street containers or through DtD systems), or at destination, when collected waste arrives to treatment plants. The former option requires active citizen participation, but is by far the cheapest option. The
other area covers the technology and infrastructure which is needed to efficiently process materials so they can be reused. A lot of valuable metals in particular are lost because processes to separate them are not implemented (REWARD, 2009).

If we take Figure 3 and Figure 4 together, the reason for poor Spanish municipal waste recycling data becomes evident. Excluding the UK, where the proportion of mixed waste has dramatically declined since 2004, Spain is the country in the sample that generated the largest amount of per capita mixed urban waste in 2016. Although Spain produces relatively little municipal waste per inhabitant overall, it is at top of the rankings for unsorted waste. This mixed waste is largely produced by households (403 kg/pc in 2016), as the amount of mixed waste produced by the service sector has sharply declined from 65 kg/pc in 2004 to just 24 kg/pc in 2016.

Figure 4. Urban waste generated in 2004 vs. 2016 (kg/pc)

Figure by the authors based on Eurostat data
It is interesting to note that Spain recycles more urban waste than the specifically recyclable (sorted) urban waste than it collects. This means that a share of the waste that is thrown into mixed containers is also recycled. In fact, more than a third of recycled materials do not come from dedicated recyclable material collection (2016). This data suggests that post-collection urban waste treatment works relatively well and it is not responsible for the low recycling rates observed. The main issue is the large amount of urban waste that is collected unsorted. This makes recycling more difficult and costly.

The issue of organic waste also deserves special attention. On paper, Spain produces the smallest per capita amount of animal and plant based waste, only 40kg/pct in 2016 versus the 89kg/pct EU-28 average. Although these figures supposedly describe municipal waste generation, they actually only represent collection as this is the only data source available. Waste that stays out of formal collection systems, including that thrown directly into illegal landfills, is not included in the data. Similarly, a large share of mixed waste is actually organic waste. Since it is not collected separately, organic waste is not registered as such. The higher proportion of organic waste and lower proportion of mixed waste recorded in Belgium, Germany and even Italy, where organic waste collection for composting and digestion has been fostered over recent decades, confirm this analysis. Due to poor separation rates, as well as organic material, Spanish mixed waste must also include plastic, glass, paper and other recyclable materials.

Incineration (also known as energetic valorization) has gained popularity in Europe for the treatment of urban waste over the last two decades. By contrast, Spain still relies heavily on landfill, which is severely restricted in The Netherlands, Denmark, Belgium, Austria and Germany (Dri et al., 2018). Other jurisdictions charge landfill taxes in order to disincentivise this method of waste disposal. On paper, Belgium exports very large per capita volumes and values of cardboard, paper and plastics. However, these figures are overstated since the country operates as a hub, and thus a large share of these exports comes from the re-exportation of imports from other countries (UN Comtrade). The export of waste from Europe, mainly to developing countries, represents a problem. As a consequence, EU policy (Regulation 1013/2006) mandates that member states’ waste management policies should consider this issue when imposing restrictions or taxes on landfilling and incineration.
To summarize, Spanish performance with respect to illegal landfill, waste reduction, separate municipal waste collection and recycling rates has dramatically improved over the last couple of decades. However, a clear relationship between global waste generation and the business cycle can be identified. With respect to households, there is a contradiction associated with increased engagement with separate collection. In 2006, 56.5% of people surveyed declared that they usually sorted their garbage (CIS, February 2006). In January 2020 the rate had climbed to 82.7%, but despite this recycling rates stagnated over the same period. Moreover, data shows that there is still significant room for improvement with respect to the use of landfill for the disposal of municipal waste. This can be achieved by reducing households’ mixed waste generation and improving separate collection of recyclable and organic materials. Composting of organics can also be expanded.

Spain lags behind other European countries in the sample, with the exception of the worrying performance of the UK. Italy, which had similarly poor performance in 1995, has steadily improved its results. If we consider the income level of these countries, Spanish industry shows a consistent volume of waste generation, while households do not. The
2008/98/EC EU Directive set a 50% rate of municipal recycling as an objective for 2020. However, as anticipated by the European Commission through the early warning report of 2018, Spain did not achieve this result. Furthermore, the Directive was updated in 2018, and raised the goal to 55% for 2025; 60% for 2030 and 65% for 2035. A more ambitious approach is demanded at a national level in order to meet these binding objectives. This is also true of the objectives contained in the Circular Economy Transition Strategy, intended to protect the environment and create high quality employment (European Commission, 2020). We believe that the new legislation around waste management currently being negotiated in the Spanish National Parliament should take into account the problems and opportunities identified in this report.

2.2 Regional Variation

Waste collection is locally managed almost everywhere, and this is also the case in Spain, a heavily decentralized state. Although Congress and the Senate have transposed EU legislation at a national level and established the overall Framework for Waste Reduction and Management, each region has developed its own strategy. Allowing for variations in the Statutes of Autonomy which are particular to each region, regional authorities can legislate and manage policy in this area. The 1997 Packaging Waste Law also grants jurisdiction to regional authorities to draft policy in pursuit of goals established by the central government and confers them the ability to authorize the creation of IMSs. Finally, local institutions collect, transport and treat urban waste. The “new regime model” described by Hafkamp (2002) means that collection services are usually organized at the supra-municipal level (associations of municipalities or province-level institutions) due to the advantages derived from economies of scale.

The need for a local approach remains clear when looking at the heterogeneous data gathered by the INE (Spanish Statistical Institute) on regional per capita urban waste collection and on the rate of separated collection in Spain. There are two main conclusions that can be extracted from the data illustrated in Figure 6. On the one hand, tourism-intensive regions produce the highest amount of waste per capita, partly due to a statistical effect. The two regions with the worst results are the Balears and Canary Islands, where tourism has boomed over the last decade. On the other hand, there is a
A generalized decrease in waste production from 2010 to 2018 (most recent data). However, part of this decrease was caused by the fall in overall economic activity, and thus of income. This tendency was reversed after the minimum per capita urban waste collected was reached in 2014. Only 3 out of 17 regions (no data for Ceuta and Melilla) reduced their per capita urban waste generation between 2017 and 2018. Interestingly, there is no evident correlation between regional average income and the amount urban waste collected. This contradicts models confirmed by empirical evidence at an EU level.

Figure 6. Per capita urban waste collection (kg/pc)

As can be observed in Figure 7, there are also large differences when it comes to the percentage of urban waste collected separately between regions. Navarra, Euskadi and Catalunya are the only regions close to compliance with European goals. These regions, together with Aragon and the Balearic Islands (where we observe the highest rate of improvement over the period), are the only regions achieving above 20% for separated urban waste collection. The most worrying phenomenon is the negative trend in regions such as Murcia that were already poor performers in 2010. The results for the Canarias and Andalucía are also disturbing, if we take into account both the lower separate collection rate and their high ranking for municipal waste production.
Some environmental organizations argue that the major problem with waste management in Spain is the IMS model. However, IMSs have been implemented across the country with very heterogeneous results in different regions. The IMS system might be one of the reasons why the three best performers do not do even better, but it is more difficult to attribute to them the bad results in other regions. In Euskadi, Navarra, Catalunya, Asturias and the Balearic Islands, organic collection is more widespread than in the rest of the country. For example, in 2010 Catalunya became the first region to make sorting household waste into a “fifth category” (organic waste) compulsory (Law 6/1993 Catalan Waste Law, modified by Law 9/2008), even though federal legislation from 2015 only mandated four separate categories (Law 22/2011). Other innovations implemented in these regions have included DtD programs together with Pay as You Throw (PAYT) models to incentivise citizens and promote separate collection. Some these initiatives will be explored in the following sections of this report. It must also be recognised that other regions have begun to implement initiatives along these lines in recent years. However, due to a lack of more recent data, we are unable to assess their impact at the time of writing this report.

Finally, as mentioned above, the success of separate collection systems relies heavily on citizen engagement. Popular awareness and knowledge are key elements. We have used data from the CIS Barometer in order to look into regional differences on this variable.
Due to the small sample size of the survey (around 3000 respondents), any conclusions should be taken cautiously. There is, in fact, no consistency between actual figures for separate collection and answers from the survey. Interestingly, it emerges from the data that respondents with higher levels of education living in larger cities are more likely to report separating their garbage. Further, a majority of respondents who did not sort their garbage reported that they would be willing to do so. This suggests that some regions, including Andalucía, Asturias and Galicia, one problem might be a lack of appropriate infrastructure for waste treatment, possibly due the large proportion of the population in these regions living in small, scattered municipalities.

**Figure 8.** Do you separate your garbage?

*Figure by the authors based on CIS Barometer January 2020.*
3. Selective collection and PAYT schemes

One important factor to take into account when it comes to separated urban waste collection is the system used to implement the service. As already explained, central and regional regulations allow local government authorities (and supra-municipal entities) to decide how to provide waste collection services. Two main collection methods cover most municipal waste. The traditional and most widespread system is based on large bins in public areas. The main alternative is the Door-to-Door system (DtD). Other alternatives, such as pneumatic collection, also demand active citizen engagement. Parallel or complimentary services based on mobile collection points and “green centres” deal with specific kinds of waste, including oil, electronics and bulky items. In this section we introduce some success and failures witnessed in the case of DtD systems, in order to extract some policy recommendations.

3.1 Flanders, Belgium

The approach to waste management implemented in the Belgian region of Flanders over the last couple of decades has become a key point of reference throughout Europe. Green parties, environmentalist and research groups (Wille, 2018) have all remarked the effectiveness of the strategy applied in the northern Belgian region. Since the first Regional Decree on Waste was passed in 1981, new environmental objectives for both municipalities and the whole region, have been set and achieved every five years. Most municipal areas collect waste through a combination of DtD with the traditional street bin system (EEA, 2016).

We use the city of Leuven as an example to explain how this model works. Leuven is a beautiful university city, located near Brussels with about 100.000 inhabitants. As with other Flemish municipalities, waste is separated into seven categories prior to collection:
As depicted in the figure above, while glass is collected in street containers, remaining municipal waste is collected through a DtD scheme. Glass is excluded because it has traditionally been the most recycled waste product. As well as being easily sorted by citizens, it maintains its proprieties after the recycling and can thus be reprocessed many times.

The citizens of Leuven follow a defined calendar for DtD collection and leave their garbage on their front of their doorstep on the morning it is to be collected. Biodegradable material and unsorted waste are collected once a week. Plastic and light packaging is only collected once every two weeks. With the exception of paper and cardboard, garbage needs to be deposited in “official” bags sold in most supermarkets. Bags are sold in 20 to 30-unit packs. Garbage is only collected if official bags are properly used, and fines can be issued for non-compliance. This “Pay as you throw” (PAYT) system is the most interesting feature of the waste collection system.

Inhabitants of Leuven pay a yearly flat fee to fund the local garbage collection service. Additionally, they pay a fee for each bag of garbage they throw out. This provides a strong incentive to reduce waste generation. Sorting is also incentivised, as brown bags for unsorted waste are, by far, the most expensive. Green bags for organic waste are cheaper, but still relatively expensive. This is justified by two arguments. First, biodegradable waste makes up the single largest proportion of municipal waste by volume. It represents around a quarter of household and small business waste in
Flanders. Secondly, regional and local authorities want to encourage local composting and the use of this material by citizens for gardening, horticulture and agriculture. Given that urban landscape in Flanders is very low density with few tall buildings, it this can be understood as a viable policy. It is also a key factor in explaining the effectiveness of DtD collection even in relatively large cities in this region.

**Figure 9.** Share of municipal waste collected separately in Flanders (kg/pct)

*Figure by the authors based on OVAM (Regional Environmental Agency) and Flanders Regional Government data.*
The waste management policy described above, combined with awareness raising campaigns and measures to promote the repair of durable goods including bicycles and electronic equipment, has helped achieve the outstanding results shown in charts 9 and 10. Since July 2013, every local administration has been legally obliged to charge for the collection of bulky waste (Flanders Regional Government, 2019). Thanks to this measure, the per capita amount of bulky waste has halved in just five years. Two periods can be observed. First, there was a very sharp improvement in the share of municipal waste that was separated. Unsorted waste was substituted for sorted waste. Between 2002 and 2007 the system stabilized and, in a second period, overall municipal waste volumes started to gradually decrease.
Thanks to strict regulation and pricing of waste management, 65% of municipal waste in Flanders in 2018 was recycled or composting. This means that the region has already achieved the European target for 2035. Interestingly, according to Figure 11, almost all the waste recycled or composted came from selective collection and only a tiny fraction was derived from post-treatment of mixed collection waste. Most of non-sorted waste is incinerated or disposed in landfills, which are less desirable alternatives. This case study demonstrates the importance of establishing an efficient and effective selective collection system.

![Figure 11. Treatment of municipal waste in Flanders in 2018.](image)

Source: Flemish Regional Government, based on OVAM data. Translated by the authors.

Although the Dutch speaking Belgian region has developed one of the most sustainable waste collection systems in Europe, there are still some challenges to address. First, the region has one of the highest per capita rates of textile waste generation in the EU. Secondly, the country as a whole is one of the main exporters of cardboard, paper and
plastic waste (UN Comtrade). Even if this is a statistical effect caused by the Antwerp port hub -most of exports are actually re-exports- it is a very serious concern with respect to waste management policy.

3.2 Spain: DtD system in Gipuzkoa

Although DtD and PAYT schemes are not as broadly implemented in Spain as in Belgium, there have been some interesting experiments. Their successes can be used as models, while problems can be analysed to provide a better understanding of what should be avoided. This section will mainly focus on one programme in the Basque historic territory of Gipuzkoa.

Between 2009 and 2011, four municipalities in Gipuzkoa introduced a DtD system. Usurbil was the first town to implement a system very similar to the one used in Leuven described above, although waste was divided into a smaller number of categories. The basis of this decision was that a larger number of categories could be confusing for users and result in a worse overall quality of sorting due to an increased complexity (André and Cerdá, 2006). Furthermore, including less categories allowed for more flexibility in terms of collection frequency. Plastics were collected twice a week and organic waste three times a week. As in Flanders, glass was collected in street containers. As to economic incentives, households were charged 1€ for each 10L bag of separated waste collected. For bags of mixed, unsorted waste the fee was increased to 3€ (Usurbilgo Udala, 2020). The fees were higher for businesses. In contrast with the Flemish system, PtD charges were paid together with the yearly flat local fee, which was reduced by 40% for households that composted their own organic waste. Instead of bags, small bins were used. These bins were individually QR coded and were left on specially designed collection posts installed in the town streets.
PAYT schemes are not widespread in Spain. According to a report by the Fundació ENT (Puig et al., 2018), large cities are more likely to apply variable waste collection fees. In most cases, however, the fee varies in response to socioeconomic variables and acts as a redistributive device. Only few cities, including Donostia, Barcelona, Girona and Oviedo, include environmental criteria. Barcelona and Girona offer reductions if green points are used more than a certain amount of times. Also Barcelona and the Mancommunity of Pamplona index their flat waste fee according to global sorting results in different jurisdictions. For instance, Campanet (Illes Balears) follows a reduced version of the Flemish “official” bag for mixed waste. Although PAYT incentives are often introduced together with DtD schemes, it is theoretically possible to implement user identification with smart street containers that can measure the weight or volume of users’ waste. However, this kind of technology is still very expensive.

In the case of Gipuzkao, separate collection rates increased dramatically in the first four municipalities to implement DtD systems. The implementation of these systems expanded to include other local council areas in which Bildu- a left wing Basque nationalism political party- had won absolute majorities the 2011 local council elections. This included 40 of 88 local government areas in in Gipuzkao. The change in waste collection did attract vocal popular resistance, spurred on by opposition political forces. This attracted a lot of attention from the Basque media. In some municipalities, including Zarautz and Ordizia, popular committees engaged in what became known as “The Waste
War.” These organising groups encouraged townspeople to hang garbage from their balconies as a sign of protest, and demanded a popular referendum on the change in the waste management model. Three main arguments were used to oppose DtD. The first was based on concerns about the danger full rubbish bins on collection poles posed to public health, as well as the aesthetic impact. In theory, respecting the collection schedule should have minimised this problem. A second argument was based on the right to privacy, supposedly threatened by individually identified bins. In practice, the opaque bins were identified only by codes, meaning that it was actually difficult to identify the owner of an individual bin and even more so its contents. The final argument was based on the high economic cost of the system. Public expenditure data shows that collection cost was higher in comparison to the traditional street container system. This is consistent also with literature, since overall, DtD schemes appear to be more expensive (Hogg, 2002). This said, potential savings in post collection treatment costs should not be ignored (Association of Catalan Municipalities for the DtD).

**Figure 12.** Municipal waste collected separately (%)

*Figure by the authors based on data from the INE and the Usurbilgo local council.*
This said, higher collection costs could be justified by the remarkable results obtained. In 2008, before the DtD scheme was introduced, in Usurbil just 30% municipal waste was sorted before collection, a rate comparable to that of neighbouring towns. Just one year after the implementation of DtD, this figure rocketed up to 71%. The overall results for Gipuzkoa also improved as the system expanded. Two further issues should be addressed at this point. First, the large positive impact of the DtD schemes could be overstated as its introduction coincided in many cases, including that of Usurbil, with the introduction of the organic waste category. This could explain a majority of the impact on separate collection rates. Second, after 2015 local elections, the Bildu coalition lost 36 out of 63 local councils it had won in 2011, and the DtD scheme was largely eliminated in Gipuzkoa. However, this electoral shift and consequent change in waste management did not have a very negative impact on the rate of separated waste collection in Gipuzkoa. While the rate did decrease, it remained higher than before 2012. This would suggest that a portion of the results achieved could be explained by training and awareness raised by the campaign accompanying the introduction of DtD and the fact that separate collection of organic waste through the so called “fifth container” continued. It should be acknowledged that the quality of organic waste collected through DtD is higher than the quality achieved by street bins dedicated to organic waste. In Usurbil in 2019, contamination of organic waste was reduced to almost 1%. For these reasons, despite
some reservations, DtD is included among the Environmental Management Best Practices recommended by researchers working for the European Commission (Dri et al., 2018).

**Figure 14.** DtD local councils in Gipuzkoa before the 2015 local elections and before the 2019 elections.

It is also worth noting that the so-called “Waste War” played out in a specific context. Political debate at a regional level around the model of waste treatment became a key campaign issue. During its term in office, new regional government of Gipuzkoa, led by the Bildu coalition, suspended the construction of an incinerator in Zubieta that had been sponsored by the outgoing administration. The issue of the incinerator eventually reached the Spanish Supreme Court. The fact that during the period in which DtD was implemented the proportion of sorted waste collected almost doubled demonstrates that the environmental impact of the policy was clearly positive. Nevertheless, after subsequent elections, DtD disappeared in most Gipuzkoan municipalities.

This case study provides some important lessons with respect to waste management policymaking. Good environmental results are not the only criteria by which to assess the success of policy. Although the DtD system was incredibly good at increasing waste sorting rates, the scheme was repealed in many municipalities after a very short period. Locals felt that the policy had been imposed, and demanded referendums to have their say on the issue. In addition, opposition political parties successfully leveraged this issue as a key electoral campaign point. According to estimates, the main opposition party increased their vote by 12 percentage points in the 2015 local elections in towns where
the DtD had been introduced, as compared with other municipalities in Gipuzkoa (Montes-Nebreda, unpublished).

Experts from the Usurbil local council and the European Research Project WASTE4think consulted for this report commented that popular engagement and evidence-based approaches are key. These, rather than the politicisation of waste management, are the most important ingredients in the success of DtD and PAYT schemes. This is also the opinion of the Association of Catalan Municipalities for DtD, which includes 206 Catalan local government areas (2020). In marked contrast to the case of Gipuzkoa, since three towns introduced DtD in 2000, DtD has expanded sustainably throughout Cataluña. The number of participating administrations was at a historic high of 63 in 2018. Future challenges for administrations willing to innovative with respect to waste management policy include finding ways to improve the collection and treatment of diapers, and to find solutions for the treatment of animal-origin bio-waste as recyclable organic material.
4. Switzerland

Switzerland produces around 24 million tonnes of waste per year, of which 75% is municipal waste. This implies that the levels of waste production are incredibly high when compared to other European countries. As an illustration, total municipal waste increased from 603-kg per capita in 1990 to 729-kg per capita in 2014 (Federal Office for Environment (FOE, 2016). One possible explanation might be the quality of life and the higher levels of consumption that are illustrated in Figure 15. Interestingly, between 2000 and 2018, Switzerland was characterized by the highest rate of consumption per capita which accompanied a total increase of 10.1%.

Luckily, to counterbalance this phenomenon, recycling rates are very high. Notably, according to SwissRecycling\(^1\), the recycling rate in Switzerland reached the 52% in 2016. Nonetheless, it is important to stress that there is not a common definition of recycling across nations (Haupt et al., 2017). National statistics in many cases refer to the amount of material input into the recycling system, which does not reflect the secondary material produced (output). As we pointed out before, this is a major statistical problem that hinders evaluation of waste management policy.

![Figure 15. Household consumption/pc (constant 2010 US$)](image)

\(^1\) Association representing the interest of the recycling industry
The Swiss waste management system is currently focused on three strategies: avoidance, reuse and recycling. In other words, when possible, these strategies are prioritized over other measures including incineration (Jaligot & Chenal, 2018). However, this latter system still represents an important treatment process when dealing with waste. Indeed, half of all waste ends up in incineration plants for energy recovery, part of the so-called waste-to-plan energy system (funded by public capital from local or regional public authorities), that creates energy through thermal valorisation. The major downside of this system is the emission of CO\textsubscript{2}, which is a clear environmental negative (Federal office of the environment, 2016). (Federal office of the environment, 2016). As in Flanders, Switzerland introduced a waste landfilling ban in 2000, thereby generating a shift towards incineration as well as recycling (EEA, 2013).

The Ordinance on Waste Management, (OLED, art. 3 (a)), which came into force in 2006, defines municipal waste as waste generated by households and businesses with less than 250 full-time employees. Waste management is in the hands of a publicly owned monopoly (OLED, art. 3 (a)). Switzerland has a federal system and, as such, power is shared between the cantons (26) and the Federal Government. Article. 31b, para. 1, of the EPA\textsuperscript{2} stipulates that cantons are responsible for municipal waste disposal. Disposal covers both preliminary stages of collection—transport, interim storage and treatment—and recovery or final disposal of waste (Art. 7, para. 6bis EPA). Cantons have authority to delegate this task to other public authorities (e.g. local councils, associations) or private individuals (Art. 43 EPA), as is also the case in Spain. Drop-off centres are available in all densely populated areas and many rural municipalities.

Recycling is organised through separate collection and is managed by individual recycling organizations. Seven of these organisations are coordinated under the umbrella organisation Swiss Recycling: FERRO-Recycling (tin cans), IGORA (household aluminium), INOBAT (household batteries), PET-Recycling Switzerland (PET beverage bottles), the SENS Foundation (electrical and electronic equipment), TEXAID (textiles) and VetroSwiss.

\textsuperscript{2} Federal Act on the Protection of the Environment
(glass). Figure 16 shows that recycling rates increased between 1985 and 2005, and have since plateaued out.

![Figure 16. Recycling rates (%)](image)

As mentioned, although recycling is a widely adopted practice it addresses a limited number of materials including PET, glass and paper. Other materials are difficult to recycle due to their complex compositions. This increases recycling costs and demands more advanced technology. This is particularly true for plastic materials, with the exception of PET.

It must also be noted that recycling has its downsides. Notably, recycling often engenders a loss in quality of materials, or “decycling”. This phenomenon is quite worrying, since it severely constrains the reuse of the material and is ultimately an impediment to achieving the Circular Economy ideal which is one of the main objectives of the European policy agenda. Despite this limitation, PET plays a key role in the recycling system in Switzerland, so we will go into detail as to its operation in the next section.
4.1 The PET system

The collection and energy recovery of PET began in 1992 following an agreement between the Federal Government and PET producers. It is based on the Ordinance on Beverage Packaging (EPO; SR 814.621). This agreement made PET producers and importers responsible for both the collection and disposal of this waste.

Interestingly, art.8.1 of this ordinance established a minimum recycling rate: “The recycling level for beverage containers made from glass, PET and aluminium shall be a minimum of 75% for each material. The recycling rate of any packaging material is the percentage by weight of containers recycled during a calendar year compared with the total weight of non-refillable containers of the material”. As illustrated in Table 2, the recycling rate has exceeded this 75% threshold for at least the last five years.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycled quantity</td>
<td>35,668 tons</td>
<td>38,294 tons</td>
<td>37,451 tons</td>
<td>37,298 tons</td>
<td>38,661 tons</td>
</tr>
<tr>
<td>Valorization rate</td>
<td>tba.</td>
<td>82 %</td>
<td>83 %</td>
<td>82 %</td>
<td>83 %</td>
</tr>
</tbody>
</table>

Based on data from the PET-Recycling Schweiz

As can be observed in Figure 17, PET-bottle recycling rates have increased significantly, especially given that in 1985 only 40 % of PET bottles were recycled. Interestingly, from 2009, recycling rates for the four materials in the table stabilized in a range between 80 and 100%. As we discuss below, no structured system exists for the recycling of other plastics and thus the majority of these are still incinerated.
The body in charge of PET-recycling — set up through a voluntary system, as IMSs in Spain— included 113 members from the private sector in 2019, including the main packaging producers. In an interview the director of the organisation asserted that the organisation focuses mainly on recycling, collection, and sorting. They no longer engage in packaging production.

Today PET collection points are everywhere in the country: train stations, schools, workplaces and groceries shops. They numbered 56,409 in 2019 and the recycling rate was 83 per cent (FOEN, 2016). A new collection point can be established simply by ordering an official container online. PET-Recycling provides a free collection service for five or more full official collection bags issued by PET-Recycling Schweiz. They explain that the more collection points are available, the more the consumer tend to place PET plastic bottles in the appropriate container. Suppliers of PET plastic bottles clarify that although retailers can do their part, they have some limits. Local councils have greater powers and capabilities and as such can create larger networks.
According to PET-Recycling Switzerland, between 40% and 50% of new PET plastic bottles are produced using recycled PET. This is well above the EU average of 10%. The higher rate in Switzerland is an important step towards closing the loop and creating a circular economy for PET plastic bottles, although it is clearly acknowledged that there is still a long way to go before achieving this goal. PET-Recycling Switzerland also argues that PET collection systems in Europe are still rudimentary, achieving much lower recycling rates. They further asserted that a greater conformity of PET-plastics standards between the EU and Switzerland is needed to improve recycling rates. These factors represented limits to PET recycling.

We asked about the main challenges involved in the collection and the recycling of plastic packages in general. In Switzerland, except for PET, the recycling rate for plastics is very poor. The Confederation affirmed that one important factor is that, although there are several types of PET products, only beverage bottles are suitable for recycling (FOEN, 2016). They also stated that at an international level, the main problem is the non-recyclability of plastic packages, often due to the use of a number of different types of plastics. For this reason, they advocate for improvements in the design of plastics and packaging.

PET-Recycling Switzerland believes that the recycling of plastic in general will increase in coming years, as the private sector recognises opportunities in this area. They stated “we think that voluntary initiatives are best practice for dealing with recycling issues and increasing recycling rates”.

**Figure 18.** PET collection points in a train station

*Source: SBB web page*
PET-recycling Switzerland argues that plastic packaging is still a good option when compared to other materials. For instance, they argue that glass recycling is more energy intensive than plastic recycling. In opposition, environmental organisations take a more critical view of packaging. Greenpeace argues that plastic packaging, including PET plastic bottles, can only be recycled once, and thus they inevitably end up being incinerated. They support the alternatives of refilling, reusing and decreasing the use of plastic packages. The newspaper *Le temps* reported a statement from Greenpeace asserting that "to put an end to the current crisis, we have to stop producing plastic unnecessarily and adopt new supply systems" (Richterich, 16/01/2020). Interestingly, Greenpeace clarify that Deposit systems might also represent a viable alternative, in the cases where systems with a large number of collection point are not feasible to set up.

In conclusion, the rate if PET-bottle recycling in Switzerland is very high and the infrastructure network continues to expand. Moreover, the strategy of having a large number of collection points has encouraged consumers to throw more bottles into the appropriate container. Nonetheless, there are still some drawbacks. The most significant is that recycled PET plastic bottles are not of the same quality as new ones (Barradas, 2009). Furthermore, PET plastic bottles represent only a small proportion of the plastic waste produced in Switzerland.

This report does argue for a move towards better rates of separate collection and recycling as opposed to landfill and incineration. However, the most important objective remains the reduction of waste production along with the use of materials designed for sustainability.
4.2 Drop-off collection and the pay-as-you-throw (PAYT)

The increase in waste generation during the 90’s mentioned above led to a decision to deploy economic instruments as part of environmental policy. In order to reduce the volume of waste generated by households and to raise awareness among the general public, several Swiss cantons began to roll out pay-as-you-throw (PAYT) schemes—effectively a tax on urban waste disposal. The idea underlying this waste management system is that households have to pay a fee on the waste they discard: the higher the volume, the higher the costs. By varying fees based on waste type, this system incentivises both reduction and separation, thus improving recycling rates (Folz and Giles, 2002).

By 2000, most German-speaking cantons had already implemented PAYT systems, while French and Italian-speaking cantons resisted. This regional variation was sustained by the local jurisdiction over waste management recognised by the central state. However, a Federal Court decision in 2001 opened the way to apply the polluter pays principle for the collection of urban waste at a national level. Specifically, this decision was based on Article 2 of the Environmental Protection Act, (EPA) “any person who causes measures to be taken under this act must bear the costs.” Today, Geneva is the only remaining canton that refuses to implement a PAYT scheme.

In the system, official bags are distributed by local governments. These are available in different sizes, and costs per litre of content vary; the price in Bellinzona is set at 0.033 €/litre, for example. These bags are used for urban waste collection and authorities sanction illegal waste disposal. The applies to littering and dumping waste in public places. As it can be observed, the system is very similar to that used in Flanders, with different pricing schemes in each case. It needs to be stated, that in some cantons the tax varies in accordance to the municipality, which means that the costs are jeopardized.

The legal basis of the system is article 32 of the Environmental Protection Act (EPA), which remains unaltered since coming into force in 1997. This law states that “The holder of waste bears the cost of its disposal, except for waste which the Federal Council regulates the bearing of cost in some other way.” In other words, this system enshrines the polluter pays principle. This idea is based on Pigou’s theory, which proposed making negative
externalities harmful to the environment explicit by setting a price on them (Vetter, 2013).

The impact of PAYT has been widely debated (Folz and Giles, 2002). Experts in favour claim that it ensures financing for an efficient and environmentally friendly urban waste disposal system, and that it encourages authorities and other inter-municipal agents to organise their activities in the most economical way possible. They also argue that the introduction of PAYT facilitated the optimization of waste collection logistics.

The “Cahiers de l’environnement” (2003) analysed the implementation of the polluter pays principle by comparing 13 municipalities, of which nine applied a rubbish disposal tax. They discovered that the introduction of the PAYT was likely to have positive effects. First of all, citizens showed a greater awareness of environmental issues. Secondly, the amount of waste recycled increased by almost 30%. However, the rate of recycling also increased in areas that did not implement the tax. This might indicate that an increase in recycling rates can explained by other variables, including the deployment of recycling collections points and the intensification of educational campaigns.

Carratini et al. (2016) showed that the application of PAYT in the canton of Vaud reduced the incineration of waste by 40%. They also investigated public perceptions of the effectiveness and fairness of this tax policy, concluding that there is a substantial difference between the pre and post implementation scenarios. While the tax is seen as useless before implementation, the opposite is true once the system is in operation. Along the same lines, a paper by Manni et. al (2013) also concluded that, as a result of the PAYT, there was a decline in collection costs and in the volume of municipal waste. These results are confirmed by research in other European countries, which has asserted that this policy instrument does produce a reduction in municipal waste production and an increase in recycling rates (Jan Reichenbach, 2008).

Despite these benefits, this policy is still the subject of debate in Switzerland. Indeed, opinions are somewhat divided on the tax. For politicians from several parties including the FDP, Liberals, UDC and Ensemble à gauche, it is a fixed tax imposed at the very end of the chain of production. As such, it can overburden individuals, while ignoring the
responsibility of other agents including retailers and producers who in some cases put too much packaging on the shelves.

Another problem stems from the fact that this tax varies depending on the municipality. This has led to the phenomenon of so-called waste tourism, where households dispose of their garbage in municipalities that have lower PAYT fees. One solution could be the standardization of pricing across municipalities. Literature suggests that waste tourism mainly depends on the composition of neighbouring municipalities - i.e. distances between PAYT and non-PAYT municipalities- (Dijkgraaf and Gradus, 2003). On top of this, as explained by Carattini et al. (2016), voters can be sceptical about the effectiveness and the fairness of this model. The specific concern is that PAYT might pose a higher burden for low-income households. In conclusion, although waste disposal Switzerland has strong foundations and has succeeded in implementing a successful waste management strategy, acting at the source of the problem (preventing waste production) remains a key area to tackle in the future.
5. The German Dual System

As is Switzerland, Germany is a federal republic encompassing 16 regions (Länder). Responsibility for the development and implementation of waste management policies is divided among the federal government, the regions and the local government areas. General directives are provided at a national level, while the federal States adapt regulations to regional conditions. Finally, local councils are responsible for waste disposal. Both public and private waste management companies are involved in collection, recovery and disposal. Public institutions manage bio waste and residual waste (organic waste, paper waste and bulky waste), while private companies are responsible for the rest of waste that is recycled.

In Germany levels of consumption per capita are generally considerably higher when compared with other European countries. This fuels the production of greater amounts of municipal waste. As seen in Figure 19, although until 2007 the amount of Solid Municipal Waste (SMW) fell sharply, the trend was subsequently reversed. For this reason, the federal government increased its efforts to find effective waste management solutions.

Figure 19. Total amount of municipal waste (millions of tonnes)

*Figure by the authors based on data from Umwelt Bundesamt*
The Law on Closed Cycle Management and Waste (KrWG) -section 6-, which is based on the EU Waste Framework Directive, establishes a hierarchy amongst several approaches to waste management:

1. Prevention
2. Preparation for re-use
3. Recycling
4. Other means of recovery, including energy recovery and backfilling operations
5. Disposal

We present the main characteristics of these five approaches in order to better understand German waste management policy. As it can be seen, waste reduction is top priority. This goal, however, is difficult to attain given the negative economic effects that a reduction in consumption might cause. Governments are sceptical about implementing policies in this direction.

Reuse is in second place in the hierarchy. Several refill and reuse packaging systems are available on the market. These systems are normally based on small scale private initiatives, for example implementation by a single retailer. Germany has also implemented a mandatory-single use beverage deposit system. This means that consumers have to bring beverage packaging to collection points in retail outlets in order to receive a refund. The German “pfand” system does result in the effective collection of packages, which in turn produces high sorted collection and recycling rates. The deposit paid on drink containers in Germany is relatively high, as is the remarkable 98.5 % return rate for this category of waste.

As it illustrated in the graph below, recycling rates in Germany have increased steadily over the last couple of decades, reaching a threshold of over 60%, surpassing the 55% target set by the European Union. This result makes Germany the leading European nation with respect to recycling. This might be partly explained by the emphasis placed on recycling over recent decades.
Moving onto incineration, there are currently 68 waste incineration plants across the country. This means that incineration is among the most important methods of waste disposal. In 1990 the ordinance on the Implementation of the Federal Emission Control Act restricted the emissions of SMW. The emission limits established by this ordinance remain amongst the most stringent worldwide. Interestingly, waste incineration is currently an important source of energy, producing both electricity and heat and supplying of 3.7% of German energy consumption (Weber et. al 2020). Generating energy through the burning of waste has been positively received, since it reduces the use of fossil fuels. Traditionally, municipal waste was put into landfill without further processing. This has been forbidden since 2005. Methane emissions from landfill sites have therefore declined significantly. Finally, around 14% of raw materials used by German industry are recovered waste. This has also contributed to a reduction in the extraction of raw materials and the related environmental impact.

Several regulations shape municipal waste management. From 1990, Germany began to roll out policy aimed at increase recycling rates and discouraging landfill. Verpackungsverordnung (VerpackV), came into force in 1991. This recognised producer responsibility for packaging waste. In 1999, Germany established the recovery of 100% of municipal waste as an objective for 2020 (EEA, 2009). The Circular Economy Act (KrWG), which came into force in 2012, established the basis for a nationwide recycling system.
As stated in the “Waste Management in Germany 2018” report, the waste management sector has become a dynamic economic sector employing a labour force of 270,000 and generating an annual turnover of about 40 billion euros. The recycling sector is of particular interest and the German Duales System Deutschland (DSD) will be further discussed in the next section.

In general, separate waste streams are sorted and deposited by citizens into waste disposal containers located at their residential buildings. This collection system is referred to as a kerbside system. There are separate bins for paper and cardboard (blue), lightweight packaging (yellow bin/bag) and organic waste (usually brown). Reusable waste can also be left at central collection points. By contrast, the so-called “bring system” is mainly used for glass packaging (separated into green, brown and white glass and old textiles 55%) (Nassour et al, 2017). As in Switzerland, several retailers have voluntarily began to charge for plastic bags, leading to a considerable reduction in their use: from 72% to 38 % (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2018). In Spain, since 2018 it has been compulsory for retailers to charge customers for plastic bags.

Another of dynamic of interest to this research project was the use of awareness campaigns in Germany around reuse, recycling and waste separation. These campaigns have included workshops, brochures, media campaigns and education in schools. A study published by the German Federal Environment Ministry and the Federal Environment Agency (UBA) reported that 91% of people were concerned about protection of the environment, a figure which demonstrates the success of these campaigns.

In the next section, we narrow our focus to the two national policy instruments that are most relevant to our analysis: The Packaging Ordinance (VerpackV), which was the basis of the DSD system, and the Deposit-Refund system. It should be noted that other national policies have also impacted on the recycling of packaging waste and municipal waste management in general. Although it is impossible so strictly delineate the effects of different factors, we decided to focus on abovementioned elements as they fit best with the overall objectives of our project.
5.1 German DSD system

The German Duales System Deutschland AG (DSD AG, or DSD for short) has received significant international recognition. The peak body was a single association of participants in the German packaging industry. It was founded in 1990’s with the purpose of collecting, sorting and recycling packaging waste. Specifically, it was established following a period characterised by both economic growth and a spike in consumption coupled with a dramatic increase in household waste- between 1975 and 1990 the amount of waste produced rose 75% (Wacker-Theodorakopoulos, 2000). According to Wacker-Theodorakopoulos (2000), attempts to control waste through voluntary agreements with the packaging industry, beverage producers and retailers did not prove effective. Increasing public awareness of the problem set the stage for the introduction of new regulation for the prevention of packaging waste: The Packaging Ordinance (VerpackV).

This regulation became the basis of Produktwerantvortung, a system that makes producers, retailers and importers responsible for packaging waste. They are required to internalize the cost of collection and recycling or disposal of packaging waste. This regulatory framework led to the creation of a voluntary agreement between different private sector agents involved in the packaging industry. As explained by Neumayer (2000) “this was the only means for the industry to escape the individual duty of every producer and distributor of packages to collect used good packages from the consumer and recycle them”.

In the DSD system, businesses that introduce packaged products into the market must pay a determined amount to cover the costs of collection and recycling of the resulting packaging waste. In this way, producers comply with European Extended Producer Responsibility. When the initiative was first put into operation, prices were calculated only on the basis of volume and the weight. This changed in 1993 as the relative costs of processing different materials became apparent. Today, the amount paid by a business depends on its annual packaging use and is calculated according to formula that takes into account material, weight and volume. As described by Lehmann (1999) “the history of the DSD pricing scheme for the “green dot” is one of increasing differentiation and
material specific price corrections, where high-cost materials (especially plastics) have been subject to several price increases”. Interestingly, the list of prices (PRO-Europe, 2020) identifies plastic as the waste product attracting the highest management fees, in line with the fees explained for the Spanish case.

Table 3. List of fees for “Der Grüne Punkt” certification

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>EURO/TON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>1</td>
</tr>
<tr>
<td>Paper/cardboard</td>
<td>3</td>
</tr>
<tr>
<td>Tin</td>
<td>5</td>
</tr>
<tr>
<td>Aluminium</td>
<td>13</td>
</tr>
<tr>
<td>Plastics</td>
<td>17</td>
</tr>
<tr>
<td>Composite carton</td>
<td>13</td>
</tr>
<tr>
<td>Miscellaneous Composites</td>
<td>13</td>
</tr>
<tr>
<td>Organic Materials</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 21. The DSD system

Figure by the authors
Another change in from 2003 was the use of “Green Dot” certification. Producers who pay into a DSD system are licenced to place the registered “Grüne Punkt,” Green Dot trademark icon on their packaging. For consumers, this symbol is a means by which to identify recyclable packaging and choose certified products over others. DSD certification is visible on cans, yoghurt cups and milk cartons and other types of food packaging.

**Figure 22.** The “Grüne Punkt” Symbol

The German Packaging Ordinance also establishes targets with respect to the proportion of packaging that must be recovered and recycled. To give an example, 40% incineration is the limit currently in place for plastics. These targets are set by the federal government, not the private sector. The ordinance contains several indicators by which to assess compliance. For example, article 8 of the Ordinance establishes that the proportion of reusable beverage packages must not drop below 72%. If this target is not met over 12-month period, then the federal government can introduce a specific, compulsory deposit-refund system for the category of waste where the target was missed. The underlying logic is that the threat of a mandatory deposit system incentivises the private sector to at least meet the target, because the introduction of a new deposit system would be very expensive. However, given the lower rates of the quota during the first period, it was loosened in 1998 to 40%. More precisely, they organize the packaging collection by contracting private and municipal waste management companies (PRO-Europe, 2010).

In compliance with VerpackV legislation, producers are ultimately responsible for delivering separated packaging waste to appropriate processing facilities. Consumers are incentivised to separate packaging materials on disposal in different ways. First, collection is performed through convenient in yellow bins and yellow bags specific to the collection
of lightweight packaging including plastics, and cans, etc. For used glass and paper, containers are available in the streets. Finally, citizens save money through waste disposal.

The Packaging Ordinance, now understood as a successful piece of legislation, almost failed several times in the early years of its application. It was a pilot project for product responsibility, which was comprehensively regulated in the subsequent Closed Substance Cycle Waste Management Act (KrW-/AbfG) - from 1996 onwards. The Packaging Ordinance was repeatedly amended, one modification leading to the abolition of a DSD's monopoly. In 2019 the new German Packaging Act (VerpackG) replaced the German Packaging ordinance. This new regulation laid the foundation of the Central Packaging Registry as an organization and control institution. This means that all packaging entering the Germany market needs to be registered. This allows the government to check whether mandatory targets are being met. The act also stipulates more ambitious goals for packaging waste recycling. DSD AG is a private enterprise which coordinates several business dealing in packaging, including producers and retailers. The private firms are therefore directly involved in waste management policy, although they have to respect the legally established goals.

Following a vote in favour by a shareholder majority, businesses from the industry groups mentioned above can become co-owners of a DSD at any time. Today, DSD is collectively owned by 584 firms (DSD annual report) and continues to remain open for new co-owners. Shares held by a single firm are restricted by statute to exactly DM 5,000 (approx. $ 2,850). Shares are issued to a specific owner and cannot be transferred without the prior consent of a shareholder assembly (vinkulierte Namensaktien). The shares are not traded on the stock market and the DSD does not pay dividends. The same pricing scheme for “green dot” licencing applies to both owners and non-owners. Being a co-owner does not grant other economic privileges.

A widespread critique of this system was that DSD AG was a monopoly organisation, and it was the only entity to manage this field. As discussed below, this ceased to be the case in 2004. The current system is ultimately very similar to the one currently in place in
Spain. The German system, however, appears to be stricter in terms of setting and achieving recycling targets.

i. Analysis: criticism and achievements

DSD has been the subject of criticism since its establishment (Neumayer, 2000). Considering its importance in our analysis, a discussion of these concerns and improvements made in response is elaborated in the following lines. First, free rider agents have impacted on the system from the outset (Bundeskartellamt 2012). In early stages, the amount of packaging entering the market without paying for environmental compliance was high. The introduction of the “Green Dot” label in 2003 has attenuated this problem, although its recognised that this icon does not affect the choices of all consumers. Some studies argue that the negative effect of free-riding on the efficiency of the dual system, while perhaps aggravating, should not be overestimated (Bundeskartellamt 2012, Schulze 2013). To sum up, a clear-cut solution is not in sight and the problem of free-riding needs to be closely monitored.

A second issue emerged from the fact that waste management infrastructure, especially waste treatment facilities, is very expensive and as a result monopolies tend to emerge. This in turn can result in exorbitant price levels for waste management services. During the 90’s the DSD controlled over 90% of packaging recycling. In response to their market power, the European Commission decided in 2001-under Article 82 of the EC Treaty- that the DSD AG had a dominant position within the German recycling market. The commission asserted that the company was restricting the entrance of other competitors in this field and thus posed a threat to fair competition. Put it differently, according to the Commission, the kind of payment system used by DSD was detrimental to its customers. For this reason, the Commission determined that “DSD may therefore no longer charge a fee in Germany for that part of packaging bearing the "Green Dot" for which it can be shown that the take-back and recovery obligation, as set out in the German packaging ordinance, has been properly fulfilled by another party, be that a competing system or a self- management solution”³. In response to this decision, from 2004 onwards other compliance schemes entered into the market leading to higher levels

³ Commission acts against Duales System Deutschland AG (Green Dot) for the abuse of a dominant position(2001).
of competitiveness (Rasek and Smuda, 2017). Rasek and Smuda (2017) found that the market share of DSD AG halved over 10 years, decreasing from 80% in 2001 to 44% in 2011. Currently, there are 10 companies operating in the dual system.

A separate critique is based on the fact that several life cycle assessment studies have concluded that the Green Dot system has not achieved the best ecological result (Wacker-Theodorakopoulos, 2000). Neumayer (2000) claims that, although some energy can be recovered from packaging recycling, a considerable amount is lost during the collection, sorting and recycling stages. He argues that a drastic reduction in packaging is in fact more desirable than effective recycling. The “green dot” might even work against this objective. As observed da Cruz et al. (2014) since most packaging is recycled, citizens become less concerned by the creation of waste.

Although Figure 23 shows that shortly after the introduction of the packaging ordinance consumption declined, from 2008, this trend was reversed. Reasons not directly ascribable to the “Grüne punkt” could be driving this phenomenon. Increasing volumes of packaging in Germany might be strictly correlated with increasing levels of consumption. An increase in so-called “out-of-home” consumption might also be a factor. Either way, the increasing amount of packaging is worrying. The German Packaging Act states that “packaging must be reduced to the minimum that protects the integrity and hygiene of a product. 12, para. 2, of the VerpackV states that packaging material should be designed in such a way that reuse and recovery is possible and that negative environmental impacts are minimized. Beyond recycling, one of the main goals of DSD is the reduction of plastic packaging waste and this goal is not currently being realized effectively.

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4 § 12, para. 1, of the VerpackV
Despite the inefficiencies of the system described above, the DSD system can be credited with a number of achievements. One example is cost reduction, due to technical advances in the field of waste recycling, in particular a switch to automatic sorting. In general, the total cost of dual systems has declined between 1995 and 2008, stabilizing at approximately one billion euros per year since 2008. This can be understood as an indicator of efficiency. The basic idea of shifting responsibility for packaging waste from the consumer to the producer, enshrined in legislation in the 1990s, represented a clear turning point in the field of waste management.

Increasing investment in recycling has had a major positive impact on employment rates and technological progress, both of which have produced significant economic benefits. Finally, the system has achieved results. The minimum recovery rate of 60% has been met or exceeded for most packaging types since 1997. Meeting the target for plastic packaging was more difficult, and was not achieved until 2007. Figure 24 shows that over the last 10 years, packaging recovery rates have been high and consistent (Gandenberger, 2014). Ganderber et al. (2014) indicate that this last achievement might be the result of increasing use of the thermal valorisation, or incineration.
It is important to underline the fact that the term “recovery” covers several different waste management options: recycling, thermal recovery and incineration. The term therefore creates an equivalence between processes at different points on the hierarchy of desirability for waste management. The minimum recycling quota established in VerpackV was met between 2003 and 2010 (Gandenberger, 2014). Notwithstanding, this targets was criticised for being too low, and in 2019 more ambitious objectives were established. The new targets are shown in the figure below.

A key shift in 2019 was the implementation of the new German Packaging Act (VerpackG), which replaced the German Packaging Ordinance. As well as increasing targets, this new regulation set the stage for establishment of the Central Packaging Registry as an organization and control institution for legally compliant distribution and recovery of packaging, as well as high-quality recycling. In other words, all packaging sold in Germany needs to be registered. Overall, the DSD system has made very positive contributions, but several important limitations continue to undermine its positive environmental impact.
Table 4. Changes in recycling targets

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>INITIAL</th>
<th>FROM 2019</th>
<th>FROM 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>75%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>Paper and cardboard</td>
<td>70%</td>
<td>85%</td>
<td>90%</td>
</tr>
<tr>
<td>Ferrous metals</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>Aluminium</td>
<td>60%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>Beverage carton packaging</td>
<td>60%</td>
<td>75%</td>
<td>80%</td>
</tr>
<tr>
<td>Other composite packaging</td>
<td>60%</td>
<td>55%</td>
<td>70%</td>
</tr>
<tr>
<td>Plastics (material recycling)</td>
<td>36%</td>
<td>58.5%</td>
<td>63%</td>
</tr>
</tbody>
</table>

5.2 “Pfand” system

Based on extended producer responsibility (EPR), the deposit system is an economic instrument that seeks to incentivize the reuse and recycling of certain products, primarily beverage packaging. Customers pay a deposit each container purchased. This can be reclaimed by returning containers to a retail store (Walls, 2011). If a consumer disposes of the container outside the system they lose the deposit, which thus becomes a tax on waste.

As stated by Walls (2011), this kind of tax has several advantages as compared to pigouvian taxes. When waste is taxed directly, citizens are incentivised to dump illegally. By comparison, rewarding consumers for returning bottles mitigates these practices. Second, this kind of system enhances the quality of monitoring, without the need for surveillance infrastructure. Finally, tax evasion is not a major problem when compared to the pigouvian taxes. Several studies have confirmed these positive characteristics (Fullerton and Kinnaman 1995; Linderhof et al., 2019).
Table 5. Comparison of different deposit-refund systems

<table>
<thead>
<tr>
<th></th>
<th>Reverse Logistics</th>
<th>Retail Recycling</th>
<th>Repo Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Producer burden</strong></td>
<td>Highest</td>
<td>Average</td>
<td>Average</td>
</tr>
<tr>
<td><strong>Consumer burden</strong></td>
<td>Guaranteed to a certain extent</td>
<td>Guaranteed to a certain extent</td>
<td>Depends on the distance from the collection sites</td>
</tr>
<tr>
<td><strong>Retailer burden</strong></td>
<td>Highest but can increase</td>
<td>Average and can increase</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Collection sites</strong></td>
<td>Not required</td>
<td>Required but the number can be relatively small</td>
<td>Required and the number needs to be sufficient</td>
</tr>
<tr>
<td><strong>Transportation burden</strong></td>
<td>Low (Existing logistics can be used)</td>
<td>Highest</td>
<td>Average</td>
</tr>
<tr>
<td><strong>Regulatory burden</strong></td>
<td>Highest</td>
<td>Average</td>
<td>Average</td>
</tr>
</tbody>
</table>

Source: Zhou et al. (2019)

Below, we analyse the German case specifically. Deposit-refund systems are, however, currently in operation in 40 countries. As observed by Carr, et al. (2019) “interest in deposit-refund schemes has revived in the wake of concerns over the environmental issues caused by packaging waste”.

The German system first began to operate in 2003 on the basis of legislation that imposed a deposit on single use beverage packaging. This legislation shifted the burden for processing and recycling packaging from consumers to manufactures (Tasaki et al., 2010).

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5 The ordinance is defines reusable packaging a that intended for reused several times for the same purpose. Single use packaging is packaging that is not reusable (Packaging ordinance).
Following the introduction of this legislation, the DPG (Deutsche Pfandsystem GmbH) was founded in 2005 by the beverage industry. The underlying idea was to create the organisational and legal basis for implementing a nationwide deposit and return system for non-refillable beverage containers in Germany. The main aim was to incentivize producers to supply multi-use bottles, either in plastic or in glass, that could be refilled. The members of the DPG must not only operationalize the conditions and standards set out in the Packaging Ordinance, but also ensure that the obligations are met.

How does this system work? First, retailers pay a deposit for beverage packaging to producers, and this deposit is in turn paid by the consumers, in the form of a “surcharge” on beverage products. Finally, when consumers return empty bottles to a retail store, this deposit is refunded. Most retail stores contain reverse vending machines that can identify the packaging for which the consumer is entitled to a refund. These machines reduce transport costs and decrease the volume of bottles by compressing them. In this deposit-refund system retailers also act as collectors. The basic objective of this system is the creation of a closed loop which enables a reduction in the bottle production, which in turn reduces CO₂ emissions.

The price of deposits varies according to the material of the container. Plastic bottles, which are mainly non reusable single-use bottles, are charged more (0.25 €), while the deposit amount for glass bottles, mostly reusable, ranges from €0.8 to €0.15. The rationale is that this dissuades consumers from buying plastic, in favour of glass which is less detrimental to the environment. Some research indicates that an increase in the deposit amount is strongly correlated to an increase in recovery rates (Consulting and Reloop, 2016). This said, excessively high deposits can cause consumers to boycott a product altogether, an undesirable outcome from an economic perspective. Careful management of deposit amounts is therefore demanded.

In order to take part in the German deposit-return system, beverage producers must sign a contract with the DPG and pay a membership fee. DPG, which is a non-profit organisation, is thus financed by these enterprises. The beverage packaging of the DPG members can be recognised through a DPG logo (the so-called security mark). The technology involved in this certification logo is sophisticated, in order to prevent other
industries outside the system free riding on the infrastructure. Overall, the system works in a similar way to the older Spanish system that some readers might remember. German scheme, however, not only takes advantage of new technology in order to increase efficiency, but it is also organized around a centralized non-profit institution. The DPG plays a role analogous to that of the IMS in the Spanish system.

Ferrara (2008) observes that deposit refund schemes are generally understood as amongst the most effective options to improve recycling rates, and they have been successfully applied to beverage containers in a number of cases. He thus considers them to be best practice for environmental management. Zhou et al. (2019) explains that in Germany this system has demonstrated a high level of effectiveness. In 2014 the total recovery rate was of 97% overall: 98% for PET bottles and 96% for cans. These results far exceed the minimum targets that were set in the German Packaging Ordinance for non-beverage packaging (DSD AG).

The results above show that recycling and the reuse of beverage containers is being managed effectively (Consulting and Reloop, 2016). It seems evident that a direct financial incentive encourages people to return empty containers to retail stores. As mentioned, this also mitigates illegal dumping and reduces littering. The costs associated with this system are relatively low. This is due to the fact that consumers bring packaging pick up points in retail stores, dramatically reducing sorting and collection costs. Lastly, reverse vending machines monitor products, evaluate their recyclability and generate valuable data (Carr, 2019).

Despite incredible results, there drawbacks to the deposit-refund system. Firstly, drop off collection places demands on individual consumers. The fact that reserve vending machine can be found very easily works to mitigate this problem. Secondly, this system doesn’t provide sufficient incentives to increase eco-friendly design of beverage packaging (Tsung-hsiu Tsai, 2014). A clear illustration of this phenomenon is that since the introduction of the scheme, the overall percentage of reusable bottles has decreased from 80 % to 50 %. This downward trend applies across all beverages except beer-breweries seem to prefer reusable bottles. Philip Oltermann wrote in The Guardian in 2018 that German discount giants including Aldi and Lidl shifted to non-reusable bottles
made out of polyethylene terephthalate (PET) for many of their products to minimise handling costs. The capital investment needed for reusable packaging systems is much higher than that for single-use packaging, partially because of the low cost of raw materials for single use plastics. From a consumer perspective, PET bottles also have some advantages. They are lighter to carry when compared to glass bottles, and can be returned at any retailer with a RVM, not just the original point of purchase.

In 2019 the trend towards single use packaging was addressed though a revision of the Packaging Ordinance. Retailers are now obliged to distinguish between single-use and reusable packaging. Consumers can now easily distinguish between these two options and buy accordingly. Notwithstanding, it can be argued that even with this change to much responsibility is placed on consumers.

In the case of reusable containers, the additional requirements in Germany for reuse including sorting, filling, and logistics creates jobs, especially where regional beverage manufacturers are concerned. In comparison, the filling of single use containers is heavily automated. A conversion from reusable to single use containers does result in job losses, a negative social impact.

Figure 25. Drinks in reusable packaging, 2004 to 2017 (%)
Another limitation to the deposit system is that it does not cover the entire range of beverage containers. The Packaging Ordinance exempts the following materials: carton packaging (tetra bricks, gable-top cartons), packaging in the form of polyethylene and stand-up bags. Notably, juice, milk and several spirits are sold in plastic, glass or other materials that are considered to be less environmentally friendly.

An interesting social phenomenon that has emerged alongside the deposit system is *pfandsammler*, marginalised people who gather bottles in order to claim the deposit (Haid, C. 2015). In 2014 the sociologist Moser conducted preliminary research into this phenomenon. He discovered that, aside from the obvious financial incentive, this way to survive was understood as “good behaviour” (Ashenmiller, B., 2011). Barnosky et al. (2019) assert that deposit systems increase overall commitment to and trust in the waste management system.

Without doubt, looking at German experience with the RDD is very valuable for Spain. Given the very poor Spanish results for separate collection and recycling, the RDD system has recently come back into the public focus. A new set of waste management legislation currently before parliament would allow the government to impose an RDD system in those cases where environmental goals are not met by producers, as recently happened in The Netherlands (NOS, 24/04/2020). RDD has already been tested in some regions, including Valencia where the model was abandoned due to lack of political support. In Navarra and the Baleares, pilot studies are currently in progress. However, due to market unity factors and the issue of tourism mentioned earlier, national or supranational (EU) implementation seems to make the most administrative sense.
6. Reducing packaging in the retail industry. “Don’t take it home”

One of the main conclusions that can be drawn from an analysis of alternative systems of urban waste collection across European countries is that all of them share an excessive reliance on consumer behaviour in order to achieve their environmental goals. In most Spanish municipalities, waste collection systems rely on goodwill alone without the support of financial incentives that could lead to higher separate collection rates. Citizen engagement is of key importance in obtaining pro-environmental outcomes. However, the waste generation chain includes a variety of other actors that should all be involved in order to address the problem on several fronts. We have seen that Extended Producers Responsibility, applied in diverse ways, makes packaging producers responsible for part of the costs of waste management. Legislators appear to have forgotten about intermediaries, such as retailers. Distribution is almost unaffected by the measures examined in this research, as they just pass on the costs of packaging and waste management from producers to consumers. As for the Value Added Tax (VAT), they are just intermediaries, and thus fully neutral to this issue.

From our point of view this is a serious problem, as this omission means that retailers, including supermarkets, do not have strong incentives to pursue packaging reduction goals. It is true that more recently retailers, and especially packaging producers, have adopted some environmentally friendly design solutions, motivated by cost reduction and corporate social responsibility (CSR). There are several cases in which measures by retailers can achieve dramatic impacts. One clear example is the initiative to eliminate plastic bags. This said, we have not observed a clear and unambiguous shift towards a Circular Economy: a clearly stated goal of the European Union.

One of the few regulations that has tackled the environmental responsibility of large retail firms in Spain is the Tax on Shopping Malls. In 2020 this was in place in four regions (Aragón, Asturias, Navarre and Catalonia), after the EU Court of Justice declared it legal. One of the arguments that justifies this tax is precisely the negative environmental
externalities of these infrastructures, mainly due to pollution derived from transportation, since they are usually located outside the city centre. These levies also aim to protect small businesses. However, they do not directly and explicitly target waste.

The distribution market in Spain is quite particular. Although it is very atomized market, the biggest firm accounts for one quarter of sales. Large retail companies have shown in the past that they hold considerable power over producers. In 2017, a controversy exploded due to the widely extended use of palm oil in a large variety of products sold by major retail corporations. As a result, some of these banned this ingredient from being used in their in-house branded products. Considering that in house brands account for almost 40% of the food market in Spain (Statista, 2018), this decision had a significant impact. This is just one example that makes the power that retailers exert on producers evident. This is why we consider that the proposal we present below could significantly increase separate collection rates. Concretely, we suggest that separate collection points should be available at the exits of every retail store larger than 700 square metres—minimum size of a standard supermarket. At these point consumers could leave useless packaging in the shop instead of “taking it home”. This would be combined with PAYT schemes both for households and retailers. This system would incentivise consumers not only to reduce the amount of waste they threw out home, but also to separate waste properly. It would also motivate retailers pressure producers to reduce packaging and find new innovative solutions in order to minimise the costs of the PAYT scheme.

We acknowledge that PAYT systems often result in retailers simply passing higher costs onto consumers, which can be especially burdensome for low-income households and also smaller retailers. However, it is also true that retailers do not hold a larger marge of manoeuvring on consumers as they do over many of their own brand producers, which hinders the extent of the cost translation phenomenon to take place. By applying this policy to retail premises over 700m², small retailers would not bear the costs of a “don’t take it home” policy disproportionally and could remain competitive. Large retailers conducting reach into better eco-friendly design for packaging reduction could be granted reductions on their PAYT bills. Finally, an analogous solution would have to be
found for online retailers, as these also produce a vast amount of extra waste due to delivery packaging.

7. Policy recommendations

Finally, we would like to present a series of policy recommendations on the basis of the research presented thus far. Our aim is to contribute to policy making on waste collection by applying the conclusions drawn from the systematic comparison of different waste management solutions carried out in this research. Spain should apply well considered policies not only in order to achieve higher environmental standards with respect to waste management, but also to recover the credibility lost as result of a failure to comply with existing commitments.

1. **Improve data collection and transparency.** As with any other policy, waste collection and management should be subjected to regular and rigorous evaluation. Effective evaluation demands more data of higher quality. As a case in point, this research has been limited by a lack of detailed and comparable data. This hinders the ability of researchers and policymakers to provide more insightful recommendations, and means that citizens are unable scrutinize the performance of public institutions and other actors. The Spanish federal government is currently in the process of approving a new Law on Waste. While this would include the creation of a registry of waste, it does not stipulate a new database addressing financial relationships between producers, IMSs and municipalities, which could help to correct several problems. The Balearic Islands represent a case in point. Although the regional government of the archipelago has been particularly active in promoting better waste management, tourism has played a key role in creating an even larger amount of waste. Information on financial agreements between municipalities and IMSs is key to understanding how producers (through IMSs) contribute to funding for urban waste collection and how this revenue source varies between municipalities.

2. **Define obtainable objectives, and apply policies to achieve them.** New regulations should not only define clear environmental objectives, guided by those established in
European Directives. They should also define concrete strategies and measures to achieve these goals. Put differently, new regulations should clearly state who should bear costs and through what mechanisms. Stronger incentives schemes should be established. In a context of a climate emergency, now formally declared by the legislator, action is needed more than words.

3. **Create a systematic and rigorous inspection and control system for IMSs.** Unlike several environmentalist groups, we do not believe that IMSs are incapable of achieving high rates of separate collection and recycling. As documented above, similar IMS-centred system in Spain achieve very different results in different regions, and even within regions. This is also the case in Germany, the “Grüne Punkt” being very similar to the Spanish “Green Dot” system. Territorial heterogeneities indicate that other variables impact effectiveness. These include social awareness and engagement and the specifics of municipal collection systems. On the basis of our analysis, we recommend that new regulation should include more rigorous controls over IMS organizations, particularly in those regions where results are particularly bad. These are among the main differences we identified between the Spanish and German system.

We believe that policy makers should consider introducing a minimum licencing fee for the “green dot” to further incentivise manufacturers to reduce the waste generated by their products once consumed. Consequently, IMSs would have more funds available to support local separate collection by municipalities, carry out new research, improve the efficiency of these systems, and to conduct more effective awareness raising campaigns.

4. **Find alternatives to motivate effective waste management practices.** As we have explained in this document, the current system of separate waste collection relies completely on the goodwill of consumers and householders to achieve results. While important, this should not be entire foundation of the system. We argue that waste management policy should also target other actors to achieve better results. Additionally, have found that financial incentives are powerful instruments when it comes to motivating citizens to not only reduce waste production but also to put more effort into using separate collection. That is why we consider that the adoption of RDD and PAYT systems should be seriously contemplated, as they have proven to be efficient in Belgium, Switzerland, Germany, and even in some Spanish municipalities.
5. **Engage with all actors in the waste chain.** As pointed out in the paragraph above, we have identified that there are other actors in the waste management system who should be more involved in achieving environmental goals. The German case in particular demonstrates that large retailers can play a role in waste separation. Applying an instrument such as the “don´t take it home” proposal would represent an incentive to contribute to waste reduction and improve separate collection. Early pilot programmes could be implemented in those regions with the worst separate collection rates in order to test whether this approach is successful or not, also providing an adjustment for other retailers. In terms of identifying underperforming regions, according to the data collected, the engagement of local administrations is very uneven. This is one reason for large heterogeneities in separate collection rates across the country. This is why we support the idea that compliance with environmental goals should be assessed depending on the local institution´s funding.

6. **Support waste reduction policies.** A basic measure is combating programmed obsolescence, especially when this is caused by the unavailability of software updates. As is well-known in the European panorama, France considers this practice unlawful. Moreover, in line with art. 31. H, we suggest that consumers should be clearly and explicitly informed about the cost of treating the waste created by products they buy. This constitutes a behavioural nudge similar to the nutritional information labels on food products, or even the graphic images on tobacco packages. We also encourage EU policymakers to continue working on extending compulsory minimum warranty periods (from 2 to 5 years) for a series of products.

In the event that initiatives such as “don´t take it home” do not work, legislators should go a step further and forbid superfluous packaging, following the example of the Balearic Islands. A pragmatic idea might be to ask eco-designers to elaborate a list of “tolerable packaging”. Furthermore, we advocate for a share of new European Union funding (Next Generation EU) to be dedicated to supporting eco-design related innovation projects aimed at reducing packaging. This would foster reuse and recycling along with the development of new technologies. Research into new sustainable materials, a field in which Spanish research groups have had some success, should be prioritized. As a matter of fact, reducing the cost of recycling (via better separation and more efficient processes)
can discourage the use of less desirable methods such as valorisation (incineration) and waste export to third countries.

7. **Support the separate collection of organic waste.** As explained above, the lack of separate collection of organic waste is one of the main reasons why most Spanish regions register such poor results for recycling in comparison with Switzerland, Germany and Belgium. The current Law on Waste set 2020 as the target year by which the separate collection of organics had to be implemented. This target has not been met. In addition, we need to stress that minimal implementation alone is not enough: whether through a “fifth container” or Door to Door systems, the quality of this collection is of key importance. There must be minimal contamination by “non-organic” waste. This is complicated as the accepted composition of organic waste varies across regions. Some collection schemes do not accept animal origin waste, which hinders the overall collection. This is one reason why there are large differences between separate collection rates between municipalities in provinces where organic collection is currently in place.

Overall, the Door to Door system has proved to be more effective in achieving both higher separate collection rates and higher quality, in terms of levels of improper material mixed into the organic fraction. Furthermore, in places where DtD is in place, separate collection rates are higher even for materials, such as glass, which is not actually collected door to door. This suggests that when households separate waste, they generally do so thoroughly. There are some disadvantages to this system. On the one hand, it requires more public space and, on the other hand, considerable engagement by citizens. There is some evidence that collection costs are a higher. However, this could be offset by lower costs at subsequent stages of the waste management process. It is also important to take lessons from the Basque province of Gipuzkoa. Due to the regional political context and lack of popular support, DtD was partially abandoned despite its effectiveness. Therefore, we recommend actively including citizens in the implementation of these schemes. It is of particular interest to explore this option in regions where separate collection rates are already acceptable, which indicates that citizens are concerned by environmental issues.

In general, institutions should continue to look for creative ways to encourage separate collection. One interesting example is the local currency introduced in Irati (Navarra) (El País, 26/02/2020), although these initiatives often suffer from scalability issues. We
acknowledge that for cities with more than 50,000 inhabitants it could be difficult for such a system to be implemented. We need to remember that even though Spain is one of the least densely populated countries in Europe, its cities and metropolitan areas represent some of the most densely populated urban areas. This geographic distribution of population makes it more difficult and costly to implement waste collection schemes. Indeed, there is a general lack of space for placing household-specific containers in cities. By contrast, in Door to Door schemes can be used unproblematically in cities with over than 100,000 inhabitants in Flanders, as these contain more proportionately more houses than apartment buildings. This is why in some municipalities, such as the capital, where density is higher, building rather than individual bins are available. Given Spanish reality, we propose a similar system and the creation of economic incentives (tax breaks and PAYT schemes) for buildings located in large cities in order to encourage compliance with separate collection. Municipalities of less than 50,000 inhabitants could implement individual bin systems.

8. Create a new incentive scheme. As stressed several times in this research, in Spain there is a dependence on goodwill without supporting material incentives. The EU Packaging Directive, Article 15 (6.1), prescribes the use of economic instruments to encourage packaging reuse and recycling. Financial instruments are effective. In the spirit of this regulation, we propose either raising prices for one-way packaging or offering discounted prices for making use of reused packaging. By so doing, consumers would redirect their preferences, providing a certain degree of circularity to the system.

Waste reduction is at the top of the hierarchy for European waste management objectives. The new Law on Waste before parliament should set a deadline for the introduction PAYT schemes in all local government areas. This should not be later than 2025. Local authorities do need to be able to adapt systems according to local conditions and preferences (door to door systems, bag-based systems, card-based systems...). Ultimately, however, the amount paid by individual households for waste management should reflect amount, type and sorting of the waste they produce.

As anticipated in the current draft of the Law of Waste and already implemented in the Netherlands, credible minimum targets for separate collection should be set. In the event
that these are not met, a DDR system should be put into practice, particularly for plastics and similar materials.

The abovementioned economic incentives should be implemented with some caveats. The impact of a PAYT system on low income households can be disproportionate and this must be addressed. Another threat is that retailers in the “don’t take it home” initiatives might, instead of internalising costs, simply pass them on to consumers. Figure 26 shows the three alternative scenarios on cost translation in the context of a RDD system. To address the above issues, we propose that local governments and social services as a whole establish a series of policies in order to protect more vulnerable citizens from prices increases resulting from the application of PAYT. Low income households could be eligible for a partial refund when complying with specific collection targets.

**Figure 26. Cost translation in alternative waste collection systems.**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Cost Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SIG system</td>
<td>Producer → Consumer, No incentives to separate</td>
</tr>
<tr>
<td>2. RDD scheme</td>
<td>Producer → Consumer, No incentives to separate, but possible welfare loss if producers translate the full cost through prices (depends on market power)</td>
</tr>
<tr>
<td>3. Renewed RDD scheme</td>
<td>Producer → Consumer, Public Sector, Neutrality for the producer, Combined with PAYT or alternative Pigouvian tax.</td>
</tr>
</tbody>
</table>

If Spain is genuinely willing to take steps towards achieving a circular economy, all these policies should be part of the general waste reduction strategy. It is true that some Spanish regions, including the Basque Country and Navarre, have achieved good separate collection rates without RDD, meaning that existing collection management coupled with social concern has an important influence on results. However, no region has achieved results comparable to German standards attained through the RDD and the Grüne Punkt, or Belgian results, achieved via DtD schemes. Advances in recycling are very positive, but
as recent analysis has pointed out, success in this field should not occult the real challenges posed by “throw-away” consumer culture. The real challenge is to reduce the amount of waste we produce.

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http://www.duh.de/fileadmin/user_upload/download/Projektinformation/Kreislaufwirtschaft/PwC-Study_reading_version.pdf


Web of Associació de Municipis Catalans per a la recollida porta a porta: https://portaaporta.cat/es/index.php


30/03/2018 The Guardian. Has Germany hit the jackpot of recycling? The jury’s still out
Legislation

https://www.boe.es/eli/es-ct/l/2008/07/10/9 (not into force anymore)

Central Framework for Waste Management (2016-2022):  

https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/planes-y-estrategias/Programa%20de%20prevencion%20aprobado%20actualizado%20ANFABRA%202011%202002%202014_tcm30-192127.pdf


Law 11/1997, of 24 of April, of Packaging and Packaging Waste:  

Law 22/2011, of 28 of July, of Waste and Polluted Soils:  


Royal Decree 782/1998, of 30 of April, that passes Regulation for the Development and Execution of Law 11/1997, of 24 of April, of Packaging and Packaging Waste:  

Databases

CIS:  
http://www.analisis.cis.es/cisdb.jsp

Eurostat:  
https://ec.europa.eu/eurostat/web/waste/data/database

INE:  

UN Comtrade: https://comtrade.un.org/data/
Appendix | The Leuven Municipality separate collection guide for international students

2020

All garbage bags have to be put outside on the right day between 6 and 7 am on the edge of the wall without hindering traffic.

PLASTIC BOTTLES AND FLASKS, METAL PACKAGING, DRINK CARTONS (PET/MI)

PLASTIC BOTTLES AND FLASKS
- Pet bottles, nurdles, glass jars, and glass jars with plastic lids
- PET bottles (for example: water bottles)

METAL PACKAGING
- Tin cans and metal food containers, empty spray cans, and aerosol spray cans
- Cans of soft drinks, fruit juice, and fruit soups
- Aluminum foil

DRINK CARTONS
- Plastic juice boxes, milk, etc.

If other types of soft plastics have to be put in the pink ‘Excella’ bag!

MEAT, BONE, AND CARRIAGE
- Bones, bones, and blood
- Fish and fish organs

If other types of soft plastics have to be put in the pink ‘Excella’ bag!

LARGE DOMESTIC WASTE

All domestic garbage that cannot be put into a regular garbage bag without it not being noticeable.

How?
- Put it in a regular garbage bag and push it into a bin of more than 100 liters.

If you are using a regular garbage bag, put it in a bin of more than 100 liters.

If you need a garbage bag, you can find it in your local supermarket.

SML DANGEROUS WASTE (HAKS)

Paint, ink, glues, cleaning solutions, solvents, metal working products, motor oil, and any other hazardous waste.

How?
- Paint, ink, glues, cleaning solutions, solvents, metal working products, motor oil, and any other hazardous waste.

If you need a garbage bag, you can find it in your local supermarket.

WOOD WASTE (HOOP)

Only those waste materials that are disposed of by the city are allowed.

WASTE (MOB)

Only those waste materials that are disposed of by the city are allowed.

DYNO & RECYCLABLE REUSABLE SOREs

You can put metal and glass containers of glass and metal containers of glass for free at the warehouse of the municipality.

GLASS (WHITE AND GREEN CONTAINERS)

If you are using a regular garbage bag, put it in a bin of more than 100 liters.

REGULAR RUBBAGE (SUB-(SUB))

Fruit, vegetables, tinned food, meat, cheese, and bread.

SOFT BOTTLE (ZAGIGhoot PLASTI)

Bags, plastic, and tin foil.

CITY SHOP

All garbage bags, kitchen waste, and waste from the city shop.

CITI E HARMONY

Caudaline waste, organic waste, and waste from the city shop.

VEGETABLE, FRUIT, AND GARDEN WASTE (OFZ)

Leaves, fruit, vegetable peels, and waste from the city shop.

GUARDIAN CONTAINER PARKS

What is allowed?
- Paper and cardboard, glass, metal.

WOOD CONTAINER PARKS

What is allowed?
- Paint, ink, glues, cleaning solutions, solvents, metal working products, motor oil, and any other hazardous waste.

ELECTRIC AND ELETRONIC DEVICES

Flotation, copper, and aluminum.

TEXTILE (TEXTILE)

Garment, and clothing.

REPAIR DUTY

All info and data on www.municipaliteitleuven.be.