ZERO WASTE EUROPE

Bio-waste generation in the EU: Current capture levels and future potential

Bio-based Industries Consortium

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Executive Summary

This report estimates the current and future availability of bio-waste in the EU28. Bio-waste as defined in EU regulations (the revised Waste Framework Directive), there are two major types of bio-waste: garden and food waste. This report focuses on food waste in particular, although calculations also cover bio-waste as a whole.

The first chapter briefly outlines the EU policy drivers for the management of bio-waste, one of which will be the new Waste Framework Directive (WFD), which mandates bio-waste collection from 1 January 2024 onwards. Other drivers from environmental policies are also mentioned.

In the second chapter, the methodology of the report is outlined. The report builds on public information and national data from the 27 Member States + UK and Norway[1] for bio-waste generation, making a number of assumptions on how to calculate the current capture of bio-waste in the EU27+ and the theoretical potential.

The third chapter presents the results. In the EU27+, current capture of food waste is 9,520,091 tonnes per year, just 16% of the theoretical potential, estimated at 59,938,718 tonnes. It must be noted that the latter number is indeed only theoretical. Every type of collection aims at maximising capture, but will never reach 100%. With that in mind, the report defines a target capture level, the 'operational potential', of around 85% of the theoretical potential, so as to calculate how much food waste, currently left in mixed waste, may actually be still recovered.

The fourth chapter provides some best practices in bio-waste management. This includes the case of Milan, an outstanding example of how residential food waste collection has been implemented. Catalonia's landfill tax is also described, where economic instruments aim to promote the collection of bio-waste. Another best practice is in France, where some municipalities were pioneers in promoting the separate collection of bio-waste. BBI JU funded projects are also included as examples of best practices for sustainably valorising bio-waste to provide new bio-based compounds for the chemicals, food-packaging and agricultural sectors.

Finally, the report includes country-specific factsheets that provide calculations for various countries, and other specific information that is relevant to bio-waste management strategies and perspectives in that specific country.

About BIC and ZWE

The Bio-based Industries Consortium (BIC)

- BIC is Europe's leading industry association, putting circularity, innovation and sustainability at the heart of the European bioeconomy and the private partner in the €3.7 billion public-private partnership with the EU - the Bio-based Industries Joint Undertaking (BBI JU) .
- BIC's membership includes 200+ industry members covering the whole value chain, from primary production to the market, across multiple and diverse sectors including agriculture & agri-food, aquaculture & marine, chemicals and materials, including bio-based fibres and bioplastics, forest and forest-based sectors, market sectors, technology providers and waste management & treatment.
- BIC also has over 200 associate members representing academia, research organisations, trade associations, etc.
- BIC's mission is to build new circular bio-based value chains and to create a favorable business and policy climate to accelerate market uptake.

On Zero Waste Europe (ZWE)

Zero Waste Europe (zerowasteeurope.eu) is the European network of communities, local leaders, businesses, experts, and change agents working towards the same vision: phasing out waste from our society. ZWE wants to empower communities to redesign their relationship with resources, to adopt smarter lifestyles and sustainable consumption patterns, and to think circular.

[1] EU27 + UK and Norway are defined as "EU27+" throughout the Report

1. Introduction

This report includes all findings from the survey on *Potential generation of bio-waste from EU Member States, the UK and Norway*; a Country Fact Sheet is included for each EU Member State, the UK and Norway.

The survey is specifically focussed on the theoretical potential, current capture and subsequent potential expansion of collection of **food** waste. The calculation of total production and current capture levels for bio-waste (i.e. both food and garden waste) was also calculated.

1.1 EU policy drivers

The policy drivers for management of bio-waste at EU level, may be summed up as follows:

1. European Directive (EU) 2018/851, commonly known as the New Waste Framework Directive (WFD), included in the 'Circular Economy Package', mandates the introduction of separate collection of bio-waste as of 1 Jan 2024. Updating art. 22 of the WFD, it stipulates an obligation at the EU level to implement bio-waste collection.
2. Quality recycling is a key issue. The calculation of recycling rates to assess compliance with EU targets (65% "preparation for reuse and recycling", i.e. net recycling including organic recycling, by 2035) will have to subtract rejects, which are closely related to impurities included in separated fractions; this puts the emphasis on collection schemes that can ensure high quality of collected materials.
3. Other environmental drivers, aside from the Circular Economy vision and strategy, are propelling interest in separation, processing and recovery of bio-waste; in summary, they are:

    3.1 Europe's soils are losing organic matter at an unsustainable rate due to land use changes, modern agricultural practices and climate change. It is estimated that almost half of European soil has low organic matter content, which reduces its ability to retain water and nutrients, and to store carbon. Crucially, this reduces the productivity of the land and farmers' ability to grow crops. Collected bio-waste generates compost, which may be a useful source of stable organic matter. This process results in a mixture of organic carbon compounds that contribute to the soil's carbon pool.

    3.2 Repeated applications of compost can increase soil organic matter content and help improve soil functions, such as structure, microbial diversity and water retention capacity. These factors are important in both the long and the short term, and may prevent erosion, eutrophication, desertification:

    3.3 Strategies to tackle climate change in the past few years have also emphasised the potential 'sequestration' of carbon in soils connected to use of soil improvers. At the EU level, the report 'Soils and climate change'[2] has drawn attention to the key role of carbon pools in soils in the global carbon balance, and the potential for sequestration to mitigate climate change. In one of its latest reports[3], the IPCC echoed these arguments, drawing policymakers' attention to the need to preserve and increase soil organic matter (through measures that include organic fertilisation).

    3.4 The revised WFD and other regulations require EU Member States to promote the use of materials produced from bio-waste. This material contains valuable compounds that can serve as feedstock for the bio-based industry. Utilising these bio-waste streams as feedstock and conversion into value-added applications is only in the early stages of development.

All of this points toward increased emphasis at the global level on separation, processing and recovery of bio-waste. This generates a 'potential bio-waste tonnage' which may become available for subsequent processing, and which is mostly untapped at present. The following sections will provide calculations of such 'untapped potential' at the EU level, besides country-specific calculations.

[2] https://ec.europa.eu/environment/soil/review_en.htm

[3] https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf

2. Methodology

Numerous national reports, and datasets from the EU27+ level, have been collected and considered for the survey.

The survey builds on the national results on food waste generation and treatment which are most valid and reliable in the relevant national resources; data have been filtered, and supplemented by assumptions taken from sectoral evidence and expertise, so as to estimate:

- the specific generation of bio-waste and, more specifically, food waste
- current separate collection of food waste, as a part of the larger bio-waste stream (i.e. food and garden waste).

2.1 Evidence from existing operational models

Existing operational models for collection of bio-waste (with specific regard to food waste/kitchen waste) have been taken into consideration, with particular reference to performance in terms of capture, backed by evidence and sectoral studies.

A review of operational experience shows different approaches to bio-waste collection, which may be grouped as follows:

- In some countries, such as most of Denmark[4], many areas in the Baltic countries and most of France, barely any food waste is collected separately for composting or digestion, although garden waste is collected separately by municipalities.
- In Belgium, the Netherlands, Austria, Germany, all of which traditionally rank amongst the lead performers for both bio-waste collection and recycling in general, separate collection of bio-waste takes place using *biobins*, or *biotonnen,* typically wheeled bins where garden and food waste are collected commingled.
    - In some countries – notably Belgium (Flanders) and the Netherlands – 'VGF waste collection' (vegetable, fruit and garden waste) is targeted, i.e. generally excluding meat and fish. This tends to leave a large part of food scraps in residual waste, which is also demonstrated by the high percentages of organics in residual waste.
    - In Germany and Austria, all food waste materials (Küchenabfälle) are targeted. Households are typically provided with kitchen caddies for temporary collection/storage in the kitchen.

The typical "Biotonne" scheme to collect commingled garden and food waste in place in Germany and most countries in central – northern Europe.

In terms of performance, commingled schemes for bio-waste (food + garden waste) without the use of compostable bags as a liner for food waste (which tend to make the system more user-friendly, thereby maximising capture) usually capture **10-30 kg per capita per year**. Table 1 shows a summary excerpted from a detailed investigation in Germany[5]. Despite the broad reach of separate collection schemes for bio-waste, in 2017 only 34 to 42% of food waste was captured through the municipal separate collection scheme (Biotonne); only about 30% of the collected bio-waste was food waste, with the remaining 70% being garden waste.

[4] with the exception of e.g. the National Capital Copenhagen, which recently rolled out separate collection of food scraps, based on models implemented in Southern Europe.

[5] Source https://www.bmel.de/SharedDocs/Downloads/DE/_Ernaehrung/Lebensmittelverschwendung/TI-Studie2019_Lebensmittelabfaelle_Deutschland-Langfassung.pdf?__blob=publicationFile&v=3

Table 1: distribution of food waste across different streams in Germany, summary findings (Schmidt et al.)

	FOOD WASTE IN MASS %	
	(Gusia, 2012)	(Hübsch and Adlwarth, 2017)
Residual waste	37	33
Biobin	42	34
Home composting	9	9
Feeding	4	6
Sewerage	8	14
Others		3

- In many areas in Norway, Italy, certain parts of the UK (e.g. Wales) and Spain (e.g. Catalonia, the Basque Country) the common collection scheme focuses mainly on food waste, leaving garden waste as a separate fraction to be collected at civic amenity sites or with specific collection rounds (at reduced frequency of collection so as to promote home composting to the largest possible extent). The basic concept is to seek to avoid drawing excess garden waste into the collection system by offering small containers to households for the collection of food waste only. Households are given caddies with liners of either paper or EN-13432 certified compostable bags. Also, to increase user friendliness, the caddies are typically vented to promote evaporation of excess moisture and make the contents more manageable. On account of the higher density of food scraps, the material is typically collected in non-compacting (thus less expensive) trucks, with a higher frequency of collection, which in turn maximises participation in the scheme. Such schemes typically allow collection of **60-100 kg per capita** per year of food waste.

The common separate collection scheme aimed at high capture of food waste

Star performers include:

  - the city of Milan (1.37 million people, the largest city in Europe to cover 100% of the population with a food waste collection scheme, capturing 103 kg per capita) as an example of implementation of a scheme in densely populated areas
  - many other Catalan, Welsh and Italian areas, as shown in the following map. According to 2018 data, in Italy around 5,000 municipalities (46 million people, 76% of the population) captured more than 60 kg per capita of food waste.

Figure 1: Food waste capture in Italy, kg per capita (kg/ca), 2018. Source: ISPRA

2.2 Assumptions and calculations

On account of the broad range of conditions in bio-waste management, and large differences in collection models, an estimate based on common EU-wide parameters would not be appropriate. Therefore, data for the EU27+ were calculated based on country-specific calculations.

2.2.1 Estimated total generation of Bio-waste (theoretical potential)

The calculation of the theoretical potential was based on a set of public reports and national data, defining bio-waste as the sum of food waste and garden waste, with the following assumptions:

The reference data is a study[6] published in 2014 showing the generation of municipal food waste (households + food service). These data are country-specific and closely in line with the estimates provided by the EU-funded project FUSIONS, which get to an EU average of 113 ± 12 kg per capita. In any case, *whenever more specific and reliable estimates have been found at the national level, those estimates have been used.* The adopted values are reported in Table 3.

Table 3: Adopted unit values for generation of food waste

EU 27+	**116.7**	FRANCE	122.3	NETHERLANDS	111.8
AUSTRIA	118.5	GERMANY	94.4	NORWAY	78.8
BELGIUM	105.7	GREECE	142.7	POLAND	112.0
BULGARIA	80.2	HUNGARY	110.0	PORTUGAL	12.,2
CROATIA	84.4	IRELAND	118.2	ROMANIA	127.7
CYPRUS	79.8	ITALY	127.7	SLOVAKIA	84.4
CZECHIA	93.7	LATVIA	107.4	SLOVENIA	108.4
DENMARK	103.5	LITHUANIA	121.4	SPAIN	144.0
ESTONIA	111.8	LUXEMBOURG	118.3	SWEDEN	105.7
FINLAND	102.0	MALTA	113.3	UK	118.1

The potential maximum generation was calculated according to the following table, taking into account the percentage of the population living in cities, suburbs and rural areas (from EUROSTAT). *Specific national data have been considered and adopted, though, whenever they diverged significantly from the results of this calculation.*

[6] Bräutigam, K.-R., Jörissen, J., Priefer, C. T*he extent of food waste generation across EU-27: Different calculation methods and the reliability of their results* (2014) *Waste Management and Research*, 32 (8), pp. 683-694.

Table 4: Assumed unit values (kg/person.year) for generation of garden waste in various housing/climatic conditions

	NORTHERN AND CONTINENTAL CLIMATE	MEDITERRANEAN CLIMATE
CITIES	40	10
TOWNS AND SUBURBS	160	50
RURAL	200	100

These parameters were then applied to the following distribution of the population in various countries, so as to estimate the contribution of garden waste to total bio-waste theoretical potential.

Table 5: Population breakdown by country

	TOTAL POPULATION (MIL.)	% CITIES	% TOWNS AND SUBURBS	% RURAL		TOTAL POPULATION (MIL.)	% CITIES	% TOWNS AND SUBURBS	% RURAL
AUSTRIA	8.86	31%	31%	38%	LATVIA	1.92	43%	19%	37%
BELGIUM	11.47	28%	54%	18%	LITHUANIA	2.79	44%	2%	54%
BULGARIA	7.00	45%	23%	32%	LUXEMBOURG	0.61	15%	44%	41%
CROATIA	4.08	29%	32%	38%	MALTA	0.49	90%	10%	0%
CYPRUS	0.88	51%	32%	18%	NETHERLANDS	17.28	56%	33%	11%
CZECHIA	10.65	30%	34%	36%	NORWAY	5.33	29%	39%	32%
DENMARK	5.81	33%	34%	33%	POLAND	37.97	34%	24%	41%
ESTONIA	1.32	60%	8%	32%	PORTUGAL	10.98	45%	29%	26%
FINLAND	5.52	39%	33%	29%	ROMANIA	19.40	29%	25%	46%
FRANCE	67.03	48%	19%	33%	SLOVAKIA	5.45	22%	36%	42%
GERMANY	83.02	36%	41%	23%	SLOVENIA	2.08	19%	35%	46%
GREECE	10.72	40%	31%	29%	SPAIN	46.93	51%	23%	26%
HUNGARY	9.77	33%	34%	33%	SWEDEN	10.23	40%	40%	20%
IRELAND	4.90	46%	22%	31%	UK	66.65	59%	28%	13%
ITALY	60.36	34%	41%	25%					

2.2.2 Current captures

In order to estimate current capture, detailed national data were investigated. While EUROSTAT data provided a starting point, they were supplemented by a comprehensive review and analysis of all national statistical reports on waste collection. Table 6 lists the sources.

Table 6: List of sources.

	REFERENCE YEAR	SOURCE (NAME + LINK)	SOURCE SUMMARY PAGE
AUSTRIA	2017	Federal Waste Management plan. Status report 2019	https://www.bmnt.gv.at/
BELGIUM	2016	Statistics Office	https://statbel.fgov.be/
BULGARIA	2017	State of the Environment 2017	https://infostat.nsi.bg
CROATIA	2017	Statistics Office	
CYPRUS	2017	Statistics Office	https://www.mof.gov.cy/
CZECHIA	2016	Statistics Office	https://vdb.czso.cz/
DENMARK	2017	Statistics Office	https://mst.dk
ESTONIA	2018	Statistics Office	https://jats.keskkonnainfo.ee/
FINLAND	2017	Statistics Office	https://www.stat.fi/
FRANCE	2018	Environmental Protection Agency Report	https://www.insee.fr/
GERMANY	2017	Ministry of Environment	https://www.umweltbundesamt.de/
GREECE	2014	Statistics Office	https://www.statistics.gr/
HUNGARY	2017	Statistics Office	http://web.okir.hu/
IRELAND	2016	Statistics Office	
ITALY	2017	Environmental Protection Agency data	https://www.catasto-rifiuti.isprambiente.it/
LATVIA	2018	Latvian Environment, Geology and Meteorology center	https://www.meteo.lv/
LITHUANIA	2017	Environmental Protection Agency data	http://atliekos.gamta.lt/
LUXEMBOURG	2017	Statistics Office	https://data.public.lu/
MALTA	2018	Statistics Office	https://nso.gov.mt/
NETHERLANDS	2017	Statistics Office	https://www.afvalcirculair.nl/
NORWAY	2017	Statistics Office	https://www.ssb.no/
POLAND	2018	Statistics Office	https://stat.gov.pl/
PORTUGAL	2018	Statistics Office	https://www.ine.pt/
ROMANIA		No Data	
SLOVAKIA	2017	Statistics Office	http://datacube.statistics.sk/
SLOVENIA		No Data	
SPAIN	2017	Statistics Office	https://www.ine.es/
SWEDEN	2018	Avfallsverige	
UK	2016	Statistics Office	https://www.gov.uk/

National data were subsequently compared to EUROSTAT data, revealing significant differences in some cases. For certain countries, EUROSTAT includes mixed MSW composting sites as bio-waste treated, though they are outside scope of this survey and may be better defined as 'Mechanical-Biological Treatment' (MBT, which the EU will cease to consider 'recycling' starting from 2028).

[7] Some sources even refer to national statistics as being biased. See e.g. https://podcrto.si/kako-slovenija-napihuje-statistike-o-ucinkovitosti-ravnanja-z-odpadki/

Table 7: Reported capture of bio-waste

	TOTAL POTENTIAL GENERATION OF BIO-WASTE (FOOD + GARDEN) Kgs/person/year, see methodology	CURRENT CAPTURE PER NATIONAL DATA 2017 OR 2018 Kgs/person/year
EU 27+	**222**	**71**
AUSTRIA	257	114
BELGIUM	239	82
BULGARIA	199	34
CROATIA	225	7
CYPRUS	118	19
CZECHIA	232	45
DENMARK	273	226
ESTONIA	213	16
FINLAND	227	77
FRANCE	238	128
GERMANY	220	125
GREECE	192	30
HUNGARY	244	27
IRELAND	235	47
ITALY	176	98
LATVIA	230	23
LITHUANIA	251	35
LUXEMBOURG	277	80
MALTA	128	24
NETHERLANDS	209	85
NORWAY	216	64
POLAND	247	27
PORTUGAL	244	11
ROMANIA	271	N.A.
SLOVAKIA	235	39
SLOVENIA	264	N.A.
SPAIN	187	19
SWEDEN	226	72
UK	212	74

Estimates of captured food waste were the most challenging assumption, as most countries report bio-waste or 'organic waste': the sum of both food and garden waste.

The following assumptions were therefore made, based on the performance of various collection schemes and the related composition of bio-waste (see section 2.1):

- Countries with mostly commingled schemes: 20% of collected bio-waste assumed to be food waste.
- Countries where no food waste collection is in place e.g. Bulgaria: 0% of collected bio-waste assumed to be food waste.
- Countries starting separate food waste collection in 2018 in large areas e.g. Denmark: 10% of collected bio-waste assumed to be food waste.
- Countries with data available for the two separate streams (Italy, Norway): national data on collected food waste used.

3. Results

These assumptions and calculations led to the final estimation of total ***theoretical potential generation of food waste in the EU27+***, and finally, ***a comparison to current capture***, as shown in the Tables 8-10 and Figure 2.

Table 8: Theoretical potential generation of food waste EU27+

		FOOD WASTE GENERATION (THEORETICAL POTENTIAL)		BIO-WASTE GENERATION (THEORETICAL POTENTIAL)
	POPULATION, JAN 2019 (EUROSTAT)	ADOPTED UNIT VALUE Kgs/person/year	TONNAGE	BIO-WASTE (tonnes)
EU 27+	**513,481,690**	**116.7**	**59,938,718**	**113,816,770**
AUSTRIA	8,858,775	118.5	1,049,986	2,273,206
BELGIUM	11,467,923	105.7	1,212,159	2,745,650
BULGARIA	7,000,039	80.2	561,368	1,390,173
CROATIA	4,076,246	84.4	344,151	915,478
CYPRUS	875,898	79.8	69,901	103,728
CZECHIA	10,649,800	93.7	998,355	2,472,287
DENMARK	5,806,081	103.5	600,929	1,587,929
ESTONIA	1,324,820	111.8	148,153	1,587,929
FINLAND	5,517,919	102.0	562,898	1,251,314
FRANCE	67,028,048	122.3	8,199,668	15,982,965
GERMANY	83,019,213	94.4	7,834,000	18,264,534
GREECE	10,722,287	142.7	1,530,315	2,053,670
HUNGARY	9,772,756	110.0	1,075,121	2,383,107
IRELAND	4,904,226	118.2	579,621	1,153,415
ITALY	60,359,546	127.7	7,707,443	10,636,692
LATVIA	1,919,968	107.4	206,142	441,914

LITHUANIA	2,794,184	121.4	339,217	701,567
LUXEMBOURG	613,894	118.4	72,636	169,852
MALTA	493,559	55.934	55,934	62,933
NETHERLANDS	17,282,163	111.8	1,932,858	3,605,080
NORWAY	5,328,212	78.8	419,863	1,153,451
POLAND	37,972,812	112.0	4,251,877	9,378,206
PORTUGAL	10,276,617	127.2	1,307,414	2,510,189
ROMANIA	19,401,658	127.7	2,477,413	5,263,491
SLOVAKIA	5,450,421	84.4	460,170	1,279,042
SLOVENIA	2,080,908	108.4	225,520	548,644
SPAIN	46,934,632	144.0	6,758,587	8,761,288
SWEDEN	10,230,185	105.7	1,081,360	2,309,392
UK	66,647,112	118.21	7,873,663	14135,826

Table 9: Calculation of collected food waste, kg/person

	TOTAL BIO-WASTE COLLECTED kgs/person	% OF FOOD WASTE IN COLLECTED BIO-WASTE	CALCULATED FOOD WASTE COLLECTED kgs/person		TOTAL BIO-WASTE COLLECTED (CHOSEN VALUE) kgs/person	% FOOD WASTE IN COLLECTED BIO-WASTE	FOOD WASTE COLLECTED kgs/person
EU 27+	**71**	**26%**	**18.84**	ITALY	98	62%	60.63
AUSTRIA	114	20%	22.80	LATVIA	23	20%	4.54
BELGIUM	82	20%	16.40	LITHUANIA	35	20%	6.94
BULGARIA	34	0%	-	LUXEMBOURG	80	20%	15,93
CROATIA	7	20%	1.48	MALTA	24	20%	4.74
CYPRUS	19	20%	3.77	NETHERLANDS	85	20%	17.00
CZECHIA	45	10%	9.05	NORWAY	64	55%	35.20
DENMARK	226	10%	22.58	POLAND	27	20%	5.35
ESTONIA	16	20%	3.28	PORTUGAL	11	20%	2.19
FINLAND	77	20%	15.32	ROMANIA	18	20%	3.60
FRANCE	128	20%	25.66	SLOVAKIA	39	20%	7.89
GERMANY	125	20%	25.02	SLOVENIA	73	20%	14.60
GREECE	30	20%	6.07	SPAIN	19	20%	3.74
HUNGARY	27	20%	5.48	SWEDEN	72	20%	14.49
IRELAND	47	20%	9.40	UK	74	20%	14.88

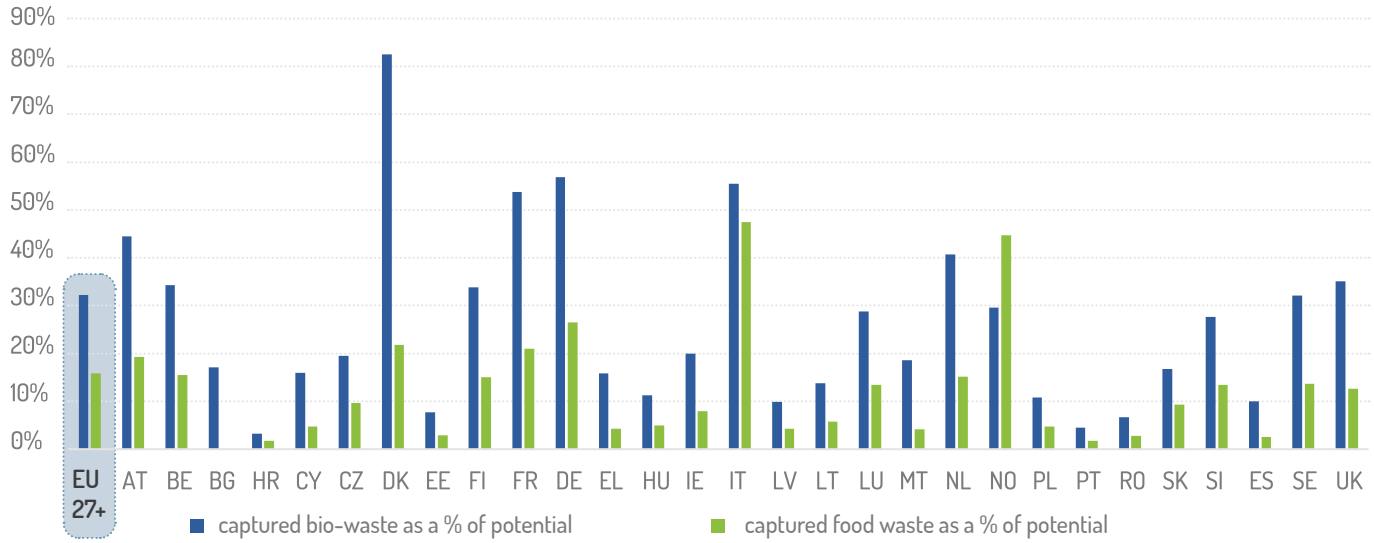
Finally, Table 10 and Figure 2 compare current capture of food waste and bio-waste (the latter providing a snapshot of current implementation of EU bio-waste strategies) with the theoretical potential, showing the current 'untapped potential'. The numbers show that current capture tends to be higher as a percentage of potential capture for bio-waste than for food waste, demonstrating that collection of food waste is, on average, in earlier stages than that of garden waste (and bio-waste as a whole, which is driven by garden waste in early stages of implementation).

Thus, the implementation of strategies and practice to collect food waste will be one of the main drivers to increase overall recycling rates in the near future.

Table 10: Comparison theoretical potential / currently collected (food waste and bio-waste)

	ESTIMATE FOOD WASTE COLLECTED / POTENTIAL GENERATION	ESTIMATE BIO-WASTE COLLECTED (FOOD + GARDEN) / POTENTIAL GENERATION		ESTIMATE FOOD WASTE COLLECTED / POTENTIAL GENERATION	ESTIMATE BIO-WASTE COLLECTED (FOOD + GARDEN) / POTENTIAL GENERATION
EU 27+	**16%**	**32%**	ITALY	47%	55%
AUSTRIA	19%	44%	LATVIA	4%	10%
BELGIUM	16%	34%	LITHUANIA	6%	14%
BULGARIA	0%	17%	LUXEMBOURG	13%	29%
CROATIA	2%	3%	MALTA	4%	19%
CYPRUS	5%	16%	NETHERLANDS	15%	41%
CZECHIA	10%	19%	NORWAY	45%	30%
DENMARK	22%	83%	POLAND	5%	11%
ESTONIA	3%	8%	PORTUGAL	2%	4%
FINLAND	15%	34%	ROMANIA	3%	7%
FRANCE	21%	54%	SLOVAKIA	9%	17%
GERMANY	27%	57%	SLOVENIA	13%	28%
GREECE	4%	16%	SPAIN	3%	10%
HUNGARY	5%	11%	SWEDEN	14%	32%
IRELAND	8%	20%	UK	13%	35%

Figure 2: comparison theoretical potential / currently collected (food waste and bio-waste)



3.1 Further calculations on food waste: operational potential and a comparison to current captures

With specific regard to food waste, which is the key focus of this survey, it must be noted that the theoretical potential (potential generation) is only a *theoretical goal*. Every type of separate collection aims at maximising captures, but never get as high as 100% of the targeted material. This is sensibly expected, and for food waste it depends on:

- Errors/confusion in behaviour of households and other waste producers: this is a component that should be continuously targeted with information and communication, building on the composition of e.g. residual waste to inform people what types of materials are most often wrongly sorted (e.g. bones or shells, meat, food still attached to packaging).
- Errors in the design and rollout of the collection scheme: e.g. households leaving the city, who cannot wait until the next collection round is planned. Much as this may be addressed by ancillary actions (e.g. drop-off sites at Municipal Recycling Centres), the situations may be difficult, so capture shortfalls must be accepted to some extent.
- Adoption of practices such as home composting (which may be promoted to a larger extent in the near future). Because 100% capture will never be achieved, we considered a more sensible goal, defining a targeted 'operational potential' in line with best practices. Based on data from long-standing and well-functioning schemes, in both villages and cities, this may be fixed at around 85% of the theoretical potential[8]. Finally, we compared current capture of food scraps with the 'operational potential', to define how much room there is for improvement in capturing food waste.

We took a different approach to garden waste, because municipal collection services for it should aim at a lower capture rate. The basic assumption is that if households generate garden waste, at least some of it can be managed in their own gardens by home composting, which should be encouraged by specific campaigns. Meanwhile, kitchen waste cannot be taken care of completely through home composting schemes, especially in urban areas, which is why we set the 85% collection target.

Table 11 shows the shortfall between current food waste capture and operational potential: the amount of food waste that currently goes to mixed or residual waste, which can be reduced by implementing dedicated schemes or optimising current ones.

[8] 1674 municipalities in Italy have collected in 2018 more than 108 kg/capita of food waste, which represents 85% of the estimated generation according to the literature assumptions referenced. Amongst them, 408 are medium-large cities with more than 10,000 inhabitants and notably the city of Milan (1.4 M inhabitants) is very close to that target, collecting 103 kg/capita/year. Some other regions are catching up by replicating the same scheme, based on door-to-door collection. In Catalonia, 61 municipalities are achieving similar results, including some medium-sized cities such as Argentona or Sant Sadurní d'Anoia.

Table 11: Comparison of theoretical potential food waste, operational potential, current capture and shortfall.

	THEORETICAL FOOD WASTE GENERATION PER CAPITA	THEORETICAL POTENTIAL (TONNES) (See Table 8)	POTENTIAL CAPTURE WITH OPTIMISED COLLECTION SCHEMES (operational potential, 85% of theoretical potential), tonnes	CURRENT CAPTURE (TONNES)	SHORTFALL (TONNES)
EU 27+	**116.7**	**59,938,718**	**50,947,910**	**9,520,091**	**41,427,819**
AUSTRIA	118.5	1,049,986	892,488	201,980	690,508
BELGIUM	105.7	1,212,159	1,030,336	188,074	690,508
BULGARIA	80.2	561,368	477,163	-	477,163
CROATIA	84.4	344,151	292,528	6,022	286,507
CYPRUS	79.8	69,901	59,416	3,300	56,116
CZECHIA	93.7	998,355	848,602	96,394	752,207
DENMARK	103.5	600,929	510,790	131,100	379,690
ESTONIA	111.8	148,153	125,930	4,341	121,589
FINLAND	102.0	562,898	478,464	84,554	393,910
FRANCE	122.3	8,199,668	6,969,718	1,720,000	5,249,718
GERMANY	94.4	7,834,000	6,658,900	2,077,200	4,581,700
GREECE	142.7	1,530,315	1,300,768	65,041	1,235,727
HUNGARY	110.0	1,075,121	913,853	53,550	860,303
IRELAND	118.2	579,621	492,678	46,123	446,554
ITALY	127.7	7,707,443	6,551,327	3,659,595	2,891,731
LATVIA	107.4	206,142	175,220	8,720	166,500
LITHUANIA	121.4	339,217	288,335	19,385	268,950
LUXEMBOURG	118.3	72,636	61,741	9,780	51,961
MALTA	113.3	55,934	47,544	2,339	45,205
NETHERLANDS	111.8	1,932,858	1,642,929	293,800	1,349,129
NORWAY	78.8	419,863	356,884	187,550	169,334
POLAND	112.0	4,251,877	3,614,095	203,075	3,411,020
PORTUGAL	127.2	1,307,414	1,111,302	22,529	1,088,772
ROMANIA	127.7	2,477,413	2,105,801	69,846	2,035,955
SLOVAKIA	84.4	460,170	391,145	43,003	348,142
SLOVENIA	108.4	225,520	191,692	30,381	161,311
SPAIN	144.0	6,758,587	5,744,799	175,360	5,569,439
SWEDEN	105.7	1,081,360	919,156	148,222	770,934
UK	118.1	7,873,663	6,692,614	991,970	5,700,644

4. Best practices

In the following pages we present examples of best practices in bio-waste management, backed by evidence of results focusing on the quality/quantity of food waste captured.

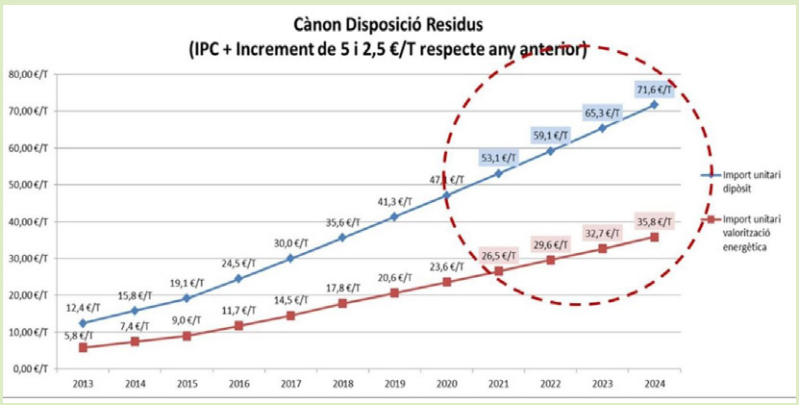
4.1 Milan: Door-to-door food waste collection in a large and dense city

Milan is an outstanding example of how residential food waste collection has been implemented in a large and densely populated city. With 1.4 million residents, more than 80% living in multifamily buildings, and with a population density of more than 7,000 people/km^2, it's now a beacon for other cities around the world when it comes to capturing food waste.
According to the latest data (2019), Milan is capturing about 105 kg per capita per year of food waste alone. This is astonishing, considering that the estimated total generation of food waste is around 120 kg per capita.

Residential food waste collection was rolled out in Milan in 2014, with an information campaign reaching every household and delivering a 10-litre vented kitchen bin along with a roll of 25 compostable bags. In addition to quantity, quality is assessed quarterly and results show a low level of contamination, around 5%. One of the key factors in the successful implementation of separate collection was that Milan represented the last 'blank spot' on the map, i.e. the last municipality without bio-waste collection in an area where separation of food waste had been implemented for many years in almost all surrounding municipalities. Citizens were already prepared for the change, accepting the additional effort of using the vented kitchen caddy and delivering food waste in compostable bags in the 'waste storage' room or area inside their building. A dedicated service by caretakers is needed to set out the bins and bags just a couple of hours before the collection and to retrieve them, but this extra cost proved to be acceptable. A door-to-door scheme with transparent bags for residual waste and plastic packaging allows visual inspections by a dedicated crew, who can issue fines to a building for improper sorting.

4.2 Economic instruments to encourage separate collection of food waste: the landfill tax in Catalonia

The landfill tax and refund scheme in Catalonia is an impressive example of how a public authority can promote separate collection of bio-waste in a structured and continuous way.
Despite not having a national landfill tax, Article 16 of the Spanish Waste Act allows waste authorities from autonomous communities (regions) to apply economic incentives, to promote waste prevention and separate collection. Catalonia set up an incentive scheme managed by the Waste Agency of Catalonia (ARC), based on the idea that bio-waste collection and treatment costs must be made cheaper than disposal into landfill or incineration. At least 50% of the revenue generated by the disposal tax must be allocated to biological treatment of bio-waste and mechanical-biological treatment of residual



Trend of the Landfill (in blue) and incineration tax (in red) established in Catalonia over time and foreseen increase up to 2024. Chart taken from ARC - Waste Agency of Catalonia

waste, while the remaining revenue is refunded to local authorities according to their performance on separate collection of bio-waste. This includes coefficients to account for the quality of bio-waste collected, hence a mandatory set of waste composition analyses are carried out, using part of the funds from the landfill tax.
The tax is increasing (for landfill it is €47.1/t in 2020, planned to increase to €70/t in 2024) to encourage separate collection of bio-waste; municipalities that don't present an implementation plan pay a higher tax. Practically all municipalities have implemented separate collection of bio-waste, and the target for the near future is to address quality (contamination level <10%) and quantity, as well as experimenting with new collection schemes.

4.3 Networking to promote food waste collection in France: Reseau Compost Plus

Reseau Compost Plus (compostplus.org) is a network of municipalities promoting separate collection of bio-waste in France, where this practice was neglected for many years on account of the large diffusion of mixed waste composting sites. Since 2007, the network has brought together pioneer communities in the separate collection of bio-waste.
The association was created in 2011, at the initiative of six communities wishing to strengthen the sector's visibility at the national level. Today it brings together 28 agglomerations, with around 9 million inhabitants. Some of its members, such as the agglomeration of Lorient (25 municipalities, 207,000 inhabitants), introduced food waste collection in early 2002 with good results, with around 40 kg per capita of food waste collected each year. Another example of best practice is Le Syndicat Mixte de Thann-Cernay, which has achieved 66 kg per capita of food waste separated. Reseau Compost Plus is active in disseminating public information, recently publishing guidelines including very good recommendations and cost assessments. The network manages a Quality Assurance Scheme for compost (ASQA label) to certify compliance with high standards, and organises local events to promote best practices in separate collection.

Guideline for separate collection aimed at high capture of food waste, published by Reseau Compost Plus (France)

4.4 Innovation to tackle the food waste problem

Private and public partners are already funding projects to tackle the issue of food waste. For example, several projects funded by the Bio-based Industries Joint Undertaking (BBI JU), a public-private partnership between the European Commission and BIC, are centred around food waste.
The **Agrimax project** (agrimax-project.eu) is not focused on household food waste, but it shows how several high-value products can be made from crop and food-processing organic waste.
Second-generation sugars are readily available also from sources such as municipal solid waste (MSW), composed of either mixed domestic residual waste or waste rejected from sorting and recycling processes, which often contains significant quantities of paper- or cardboard-based (lignocellulosic) materials.
The **VAMOS project** (vamosbbi.com) aims to showcase, on a demonstration scale, the feasibility of producing and valorising second-generation sugars from the organic fraction of MSW. The sugar will be used in the production of three bio-based products for non-food contact applications, delivering competitive, sustainable, affordable and high-performance bio-based materials from these low-value residual waste sugars. In so doing, the VAMOS project will revolutionise the sector by creating a new value chain.
The URBIOFIN project (urbiofin.eu) will demonstrate the technical, commercial and environmental viability of converting the organic fraction of MSW on a semi-industrial scale. It will create chemical building blocks, biopolymers and additives by applying an urban biorefinery concept to bio-waste. Ultimately, URBIOFIN will offer a new, more sustainable alternative to the current treatment of organic fraction of municipal waste.

Country Factsheets

AUSTRIA

TOTAL POPULATION (MILLION): **8.86**

% CITIES: **31.0%**

% TOWNS AND SUBURBS: **30.8%**

% RURAL: **38.2%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **118,5**

POTENTIAL GENERATION (T): **1,049,986**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **892,488**

CURRENT CAPTURE (T): **201,980**

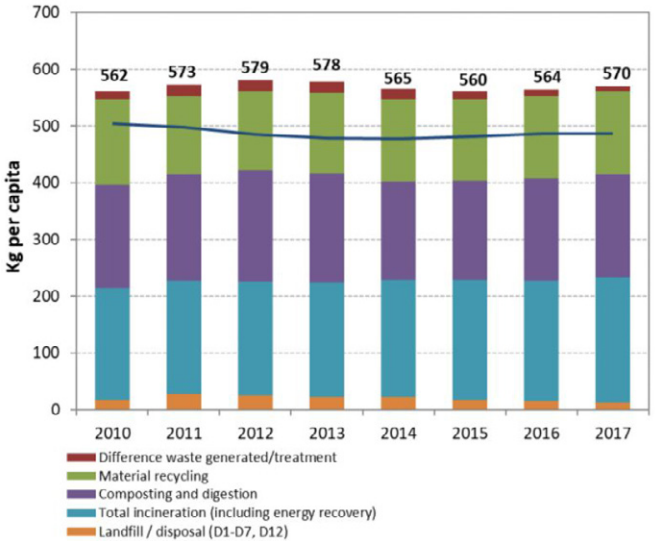
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **19%**

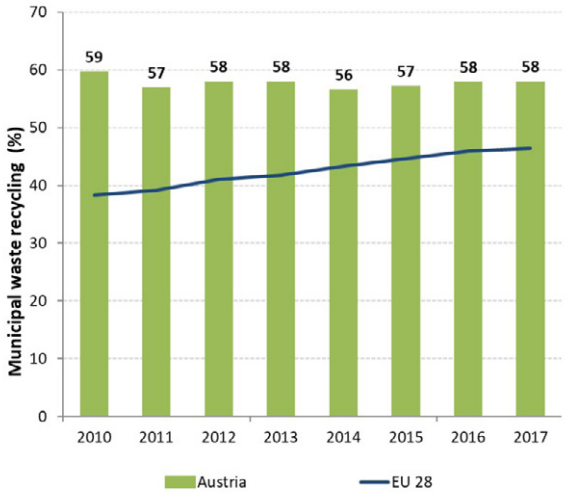
AMOUNT STILL TO BE CAPTURED (T): **690,508**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **44%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Austria has successfully implemented the proximity principle in bio-waste management. The country's strategy followed the premise: "As much home composting as possible – brown bin offered wherever home composting is not possible – as much decentralised agricultural (on-farm) composting as possible":

- door-to-door separate collection of bio-waste (organic kitchen waste, plant residues and biodegradable waste from home gardens) has been established throughout Austria as the predominant collection system; separate collection of e.g. leftover raw meat scraps from kitchens varies from region to region, depending on further treatment.
- bring system (civic amenity site): mainly for prunings and grass cuttings from home gardens.

PLANS AND PROPOSALS:

A ban on the landfilling of biodegradable municipal waste was introduced in 2009. In December 2017 Austria adopted a new federal waste management plan, updating its 2011 plan.

Decentralised small-scale composting plant.
Photo: © Hildebrandt - Amlinger

RECENT UPDATE - CASE STUDY

The Austrian compost and biogas association, KBVÖ (Kompost- und Biogasverband Österreich), reported that 80-90% of impurities in the organic waste collected from households are conventional, non-biodegradable bags. To tackle this problem and reduce impurities, KBVÖ launched an initiative to market only single-use carrier bags in Austria that are compostable according to the European standard for industrial composting EN 13432. Combined with a consumer information campaign, the compostable bags are intended to be re-used to collect and dispose organic kitchen waste. This way more bio-waste will be separately collected and diverted from other recycling streams, while reducing contamination of ordinary plastics in organic waste.

BELGIUM

TOTAL POPULATION (MILLION): **11.47**

% CITIES: **27.9%**

% TOWNS AND SUBURBS: **53.6%**

% RURAL: **18.4%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **105.7**

POTENTIAL GENERATION (T): **1,212,159**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **1,030,336**

CURRENT CAPTURE (T): **188,074**

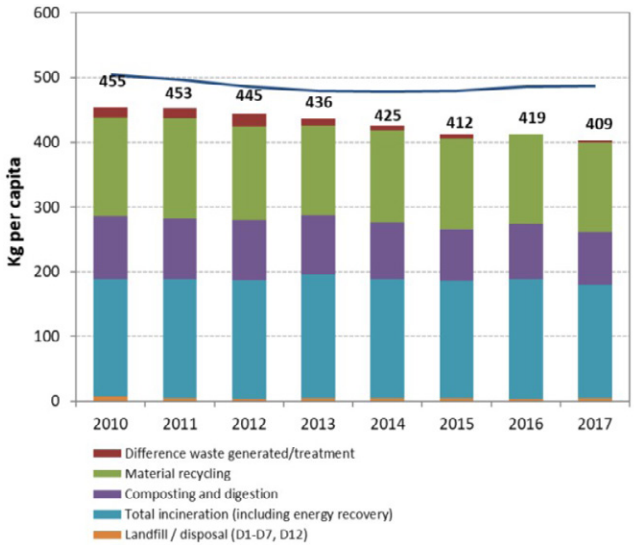
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **16%**

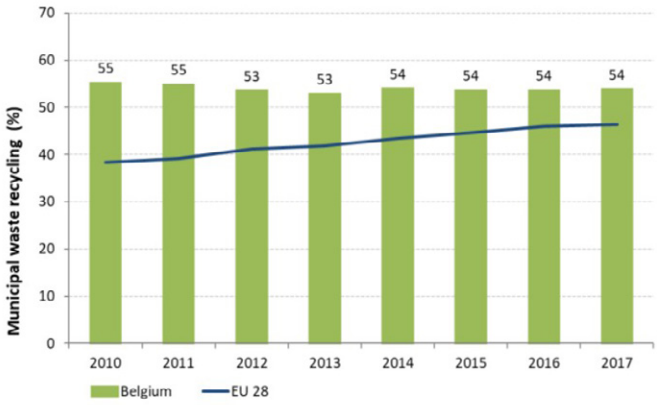
AMOUNT STILL TO BE CAPTURED (T): **842,262**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **34%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Belgium has already met the 50% recycling target for 2020 and has eliminated landfilling of biodegradable waste.
Flanders: The separate collection of bio-waste and green garden waste with subsequent bio-treatment was already implemented in 1991. The collection is limited to VGF (Vegetable, Garden, Fruit), avoiding meat and cooked food leftovers. In 2002 the highest ever level of 145.08 kg per capita of separately collected bio-waste was reached [BE EEA 2013], which decreased steadily to 110.4 kg/person in 2013, mainly due to encouragement of home-composting and introduction of the pay-as-you-throw taxation system. Fortnightly, separate door-to-door collection of bio-waste (garden and kitchen) in 2/3 of Flemish municipalities. Wallonia: in 2012, there was still significant room for improvement as regards organic kitchen waste. Separate collection of organic waste was implemented in only 25% of Walloon municipalities; progress was made in this respect over the past few years.

PLANS AND PROPOSALS:

The Walloon Waste-Resources Plan was adopted by the Walloon Government on 22 March 2018. It includes a target to extend separate collection of bio-waste to all municipalities by 2025, preferably door to door, using bring banks only in dense urban centres. In 2017 the Brussels region extended separate collection to include voluntary collection of kitchen waste in an attempt to improve its recycling rate. Furthermore, all three regions recently banned the use of lightweight plastic bags.

One of the many publications by VLACO.

RECENT UPDATE - CASE STUDY

VLACO is an NPO founded in 1992 to support and implement bio-waste policy (green waste; vegetable, fruit and garden waste; and industrial bio-waste). It is a membership organisation with representation of both the Flemish government and the private sector. All its activities support a sustainable bio-waste cycle, emphasising the quality of recycling bio-waste (both at home on small scale, and professionally on a large scale). VLACO is a member of the European Compost Network (ECN).
Source: **vlaco.be**

BULGARIA

TOTAL POPULATION (MILLION): **7**

% CITIES: **45.3%**

% TOWNS AND SUBURBS: **22.8%**

% RURAL: **31.9%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **80.2**

POTENTIAL GENERATION (T): **561,368**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **477,163**

CURRENT CAPTURE (T): **-**

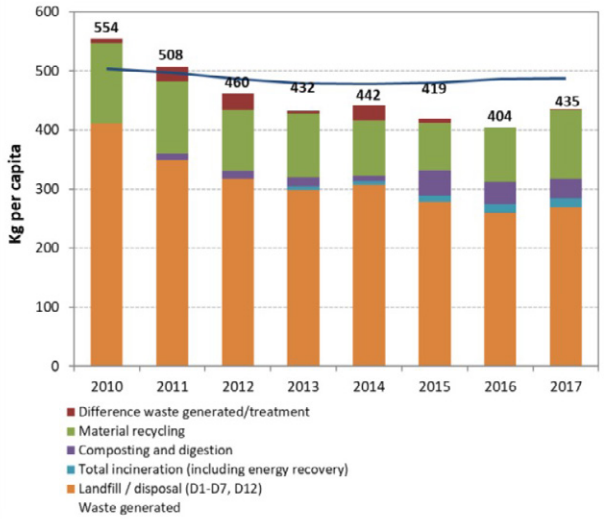
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **0%**

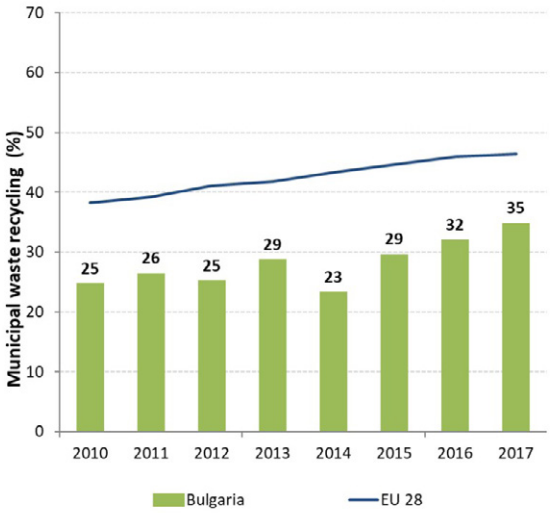
AMOUNT STILL TO BE CAPTURED (T): **477,163**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **17%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Separate collection of bio-waste in Bulgaria is in its early infancy, with only a few pilot projects in place. In Sofia, there is some separate collection of bio-waste from kindergartens. Since 2013 the Ministry of Environment has published bylaws and guidelines on bio-waste separate collection and treatment of bio-waste, prepared with the help of international experts.

PLANS AND PROPOSALS:

The National Waste Management Plan for 2014-2020 and a new ordinance on separate collection and treatment of bio-waste adopted in early 2017 set a target for the end of 2020: not less than 50% of the amount of municipal bio-waste generated in 2014 to be separately collected (75% by the end of 2025). The ordinance requires separate collection and composting of biodegradable waste from the maintenance of parks, gardens and other public areas, and the amount of landfilled bio-waste must not exceed 109 kg per capita by 2020. The landfill tax is set to rise progressively to EUR 48.6 per tonne by 2020. There is an incentive scheme for municipalities linked to this tax: those that meet their recycling target will not have to pay the landfill tax. This should stimulate the market if the measure is enforced. The construction of composting and anaerobic digestion installations with a total annual capacity of 654,000 tonnes is planned on the national level.

Bio-waste collection in multi-unit buildings in Sofia. ©24chasa.bg

RECENT UPDATE - CASE STUDY

In the city of Sofia a trial of separate collection of bio-waste started in 2019 with 3,200 households in three buildings of the Hope district. Bins for the five main fractions were provided at civic amenity points, and the containers have a filling level sensor.
Copied from: **24chasa.bg**

CROATIA

TOTAL POPULATION (MILLION): **4.08**

% CITIES: **29.2%**

% TOWNS AND SUBURBS: **32.3%**

% RURAL: **38.4%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **84.4**

POTENTIAL GENERATION (T): **344,151**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **292,528**

CURRENT CAPTURE (T): **6,022**

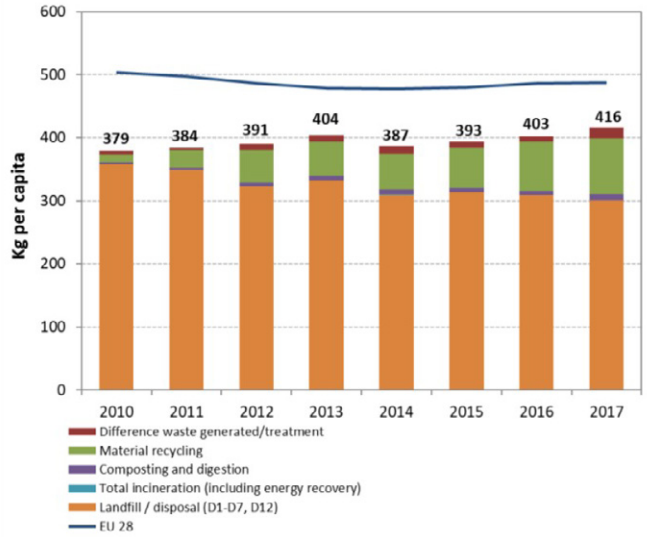
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **2%**

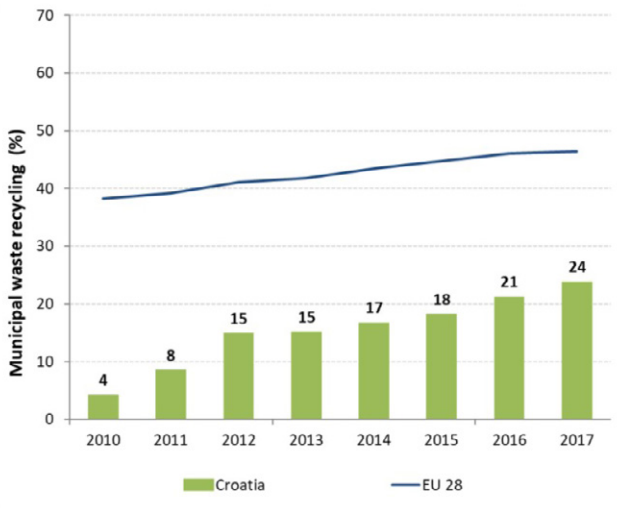
AMOUNT STILL TO BE CAPTURED (T): **286,507**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **3%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Separate collection of bio-waste in Croatia is at an early stage. In 2016 only 17% of local authorities had implemented it, mostly addressing waste from public gardens and parks. The quantity of separately collected bio-waste from households is negligible. The city of Zagreb started implementation with brown containers for 6,000 households in 2014, expanding it to the entire city in February 2019. Households received 26 free biodegradable 30L bags, with weekly collection.

PLANS AND PROPOSALS:

According to the 2017-2021 National Waste Management Plan, despite the requirement that local authorities ensure separate waste collection, the effects for bio-waste are very small on the national level. A few aerobic and anaerobic facilities exist. The Plan proposes a goal of reducing landfilled biodegradable waste and separately collecting 40% of bio-waste in municipal waste. In 2015 a total of 1,318,740 tonnes of municipal waste was landfilled, including 828,564 tonnes of biodegradable waste (63%).

Bins for separate collection in Zagreb.
Photo: Ranko Šuvar / CROPIX

RECENT UPDATE - CASE STUDY

Velika Gorica is the first municipality to introduce door-to-door separate collection of bio-waste. After a public consultation, an act was approved introducing a requirement for this, together with a 'Pay As You Throw' scheme based on the volume of bins provided to the building. Bio-waste collection costs less than residual waste (whose collection is reduced to every two weeks). The pilot was launched in February 2019 with 700 users, delivering good results; it will be expanded in 2020.
Source: **cityportal.hr**

CYPRUS

TOTAL POPULATION (MILLION): **0.88**

% CITIES: **50.7%**

% TOWNS AND SUBURBS: **31.5%**

% RURAL: **17.8%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **79.8**

POTENTIAL GENERATION (T): **69,901**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **59,416**

CURRENT CAPTURE (T): **3,300**

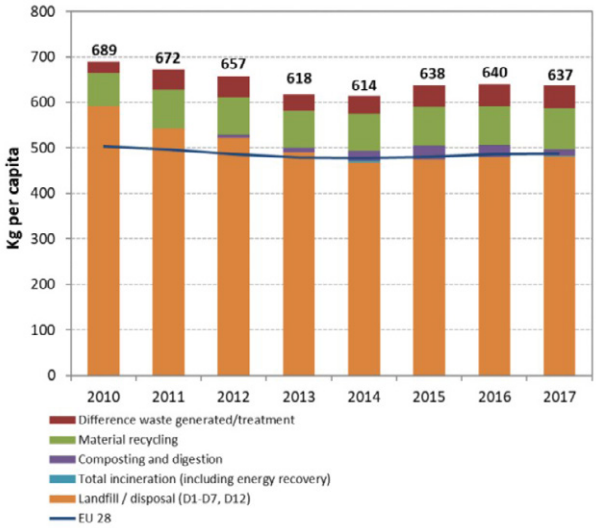
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **5%**

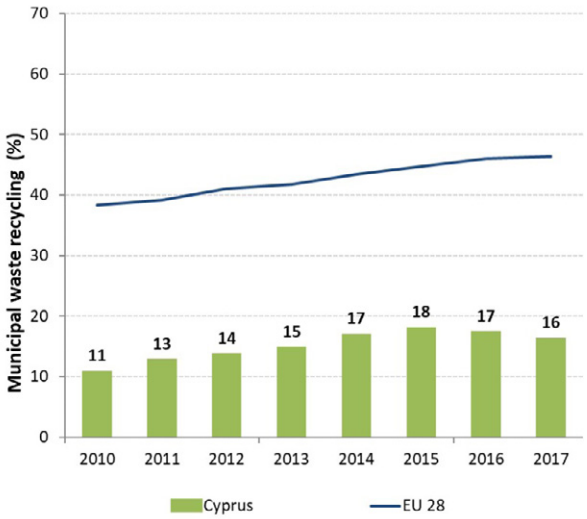
AMOUNT STILL TO BE CAPTURED (T): **56,116**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **16%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

No separate collection of bio-waste is implemented; it is collected with mixed MSW by municipalities or networks of municipalities. The 2010 and 2013 targets to divert biodegradable municipal waste from landfills were missed by a significant margin. However, there are plans to introduce mandatory separate collection of municipal waste, including for bio-waste.

PLANS AND PROPOSALS:

The Waste Management Plan adopted in 2015 proposes that 15% of MSW be separately collected as organic waste by 2021, and introduces economic deterrents such as a landfill tax. However, implementation has been quite slow.
The WMP foresees restrictions on disposal of certain materials, such as green waste, in order to promote recycling and diversion of waste from landfills. This recommendation is being implemented, and 23 Green Points which receive green waste are now operational.

A green point in Limassol.
Source: newsincyprus.com

RECENT UPDATE - CASE STUDY

An EU-funded project aims at implementing electromechanical composters for small municipalities. Some of the Green Points are receiving 60% of waste generated by households.
Source: **cyprus-mail.com**

CZECHIA

TOTAL POPULATION (MILLION): **10.65**

% CITIES: **30.0%**

% TOWNS AND SUBURBS: **34.0%**

% RURAL: **36.0%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **93.7**

POTENTIAL GENERATION (T): **998,355**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **848,602**

CURRENT CAPTURE (T): **96,394**

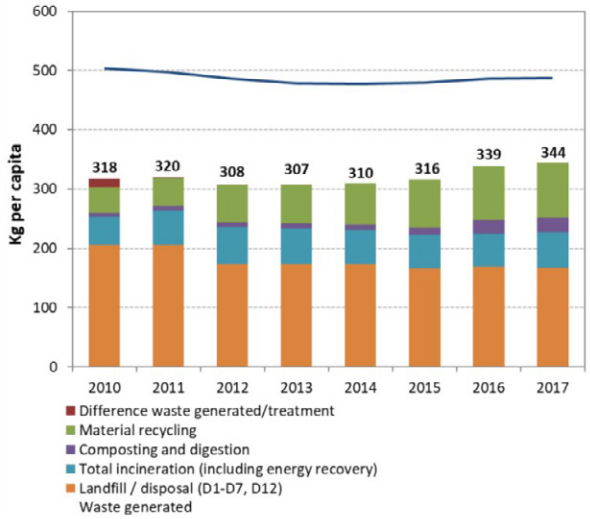
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **10%**

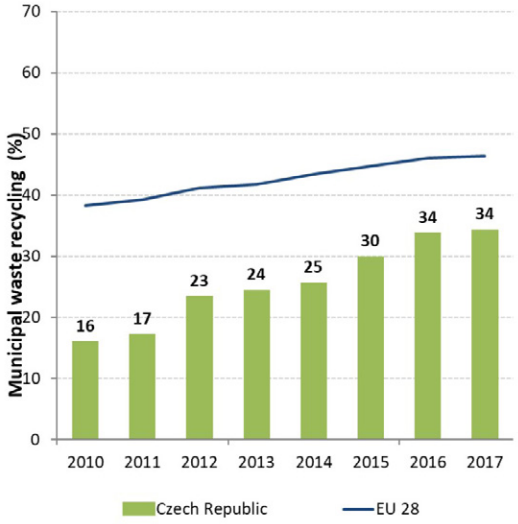
AMOUNT STILL TO BE CAPTURED (T): **752,207**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **19%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

The main separate collection systems operated in Czechia are bring points and civic amenity sites. In Prague, brown containers for biodegradable waste were introduced in 2015, but only from April to September. An extension to year-round collection was proposed in 2019. Currently there are no unified official data on the capacity of composting plants in the Czech Republic. According to the Agricultural Technology Research Institute, total capacity is higher than 1 million tonnes per year, with the greatest capacity in the regions of Central Bohemia and South Bohemia.

PLANS AND PROPOSALS:

According to the National Waste Management Plan (2015-2024) [CZ NWMP 2014], to fulfil the objectives of Directive No. 2008/98/EC municipalities shall set up a collection system based on available waste processing technology, at least for paper, plastic, glass, metal and bio-waste. The Act on Waste No. 185/2001, revised 2014, introduced obligatory separate collection of bio-waste in every municipality and town beginning in 2015 (based on the Landfilling Directive obligation).

Bio-waste containers in Prague.
Source: Praha.eu

RECENT UPDATE - CASE STUDY

The city of Prague recently showed interest to increase separate collection of bio-waste, taking Milan as a reference.

DENMARK

TOTAL POPULATION (MILLION): **5.81**

% CITIES: **32.5%**

% TOWNS AND SUBURBS: **34.2%**

% RURAL: **33.3%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **103.5**

POTENTIAL GENERATION (T): **600,929**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **510,790**

CURRENT CAPTURE (T): **131,100**

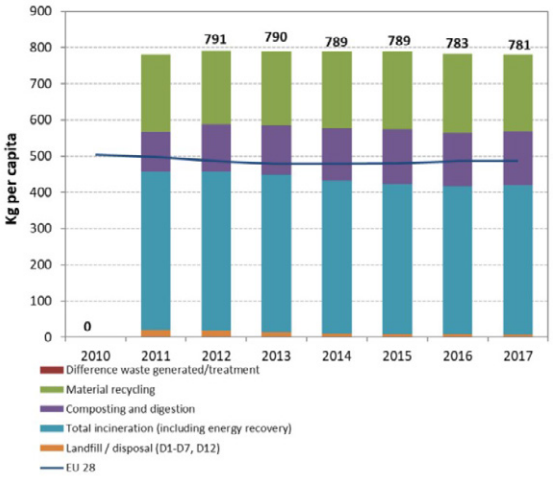
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **22%**

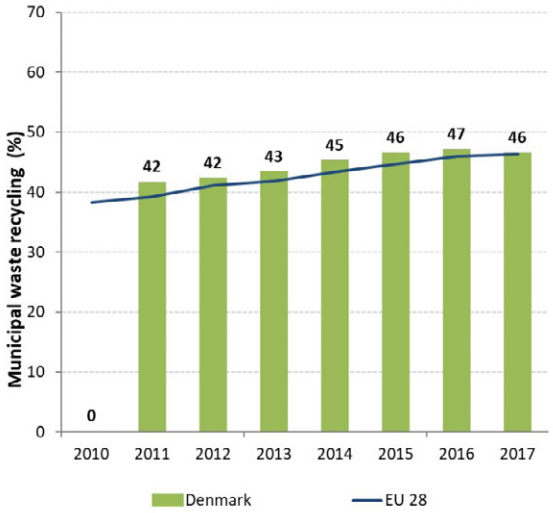
AMOUNT STILL TO BE CAPTURED (T): **379,690**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **83%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Most food waste is not collected separately, apart from recent developments e.g. in Copenhagen. Door-to-door collection of garden waste is widespread.

PLANS AND PROPOSALS:

Denmark's waste management plan aims to reduce incineration and increase recycling, which also includes increased collection of bio-waste.

Bio-waste collection in Copenhagen

RECENT UPDATE - CASE STUDY

Copenhagen started separate collection of food waste covering almost the entire population in mid-2017, reaching 1,100 t/month in a few months. The capture rate is still low, but the city wants to improve this strategy, introducing new awareness campaigns and a plan to build an anaerobic digestion facility.

ESTONIA

TOTAL POPULATION (MILLION): **1.32**

% CITIES: **59.9%**

% TOWNS AND SUBURBS: **8.3%**

% RURAL: **31.8%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **111.8**

POTENTIAL GENERATION (T): **148,153**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **125,930**

CURRENT CAPTURE (T): **4,341**

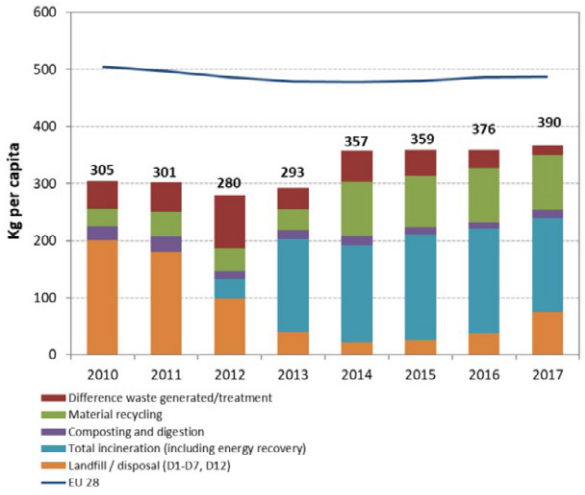
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **3%**

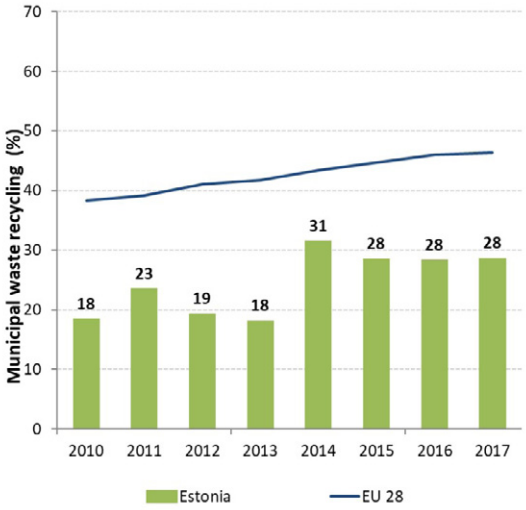
AMOUNT STILL TO BE CAPTURED (T): **121,589**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **8%**

LINK TO NATIONAL WASTE DATA





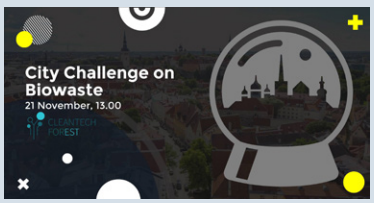
Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Civic amenity sites for garden waste are the preferred option. Household bio-waste is collected in urban areas from larger housing blocks. Separate bins for bio-waste are compulsory near buildings with more than 10 apartments; institutions or companies with bio-waste generation of more than 20 kg per week; restaurants and catering establishments with more than 25 seats; kindergartens, schools or hospitals with more than 112 places. Separate collection is not yet efficient, with a lack of focus on door-to-door services and generous derogations from the obligation to organise food waste collection, which may be limiting the system's overall performance.

PLANS AND PROPOSALS:

The national regulation 'Requirements for producing compost from biodegradable waste' is in force.
The Estonian Waste Recycling Competence Centre was established as a candidate to be a Certification Centre; this non-profit organisation was intended to promote waste recycling in Estonia and support waste companies in producing high-quality certified materials from waste (compost, digestate, construction and demolition aggregates).



Tallinn City Challenge on bio-waste - 2018
Source: @cleantechforest

RECENT UPDATE - CASE STUDY

In 2018 the city of Tallinn launched the first Tallinn City Challenge, looking for start-ups, companies or scientists with ideas for improving separate bio-waste collection in the capital.

FINLAND

TOTAL POPULATION (MILLION): **5.52**

% CITIES: **38.9%**

% TOWNS AND SUBURBS: **32.5%**

% RURAL: **28.6%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **102.0**

POTENTIAL GENERATION (T): **562,898**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **478,464**

CURRENT CAPTURE (T): **84,554**

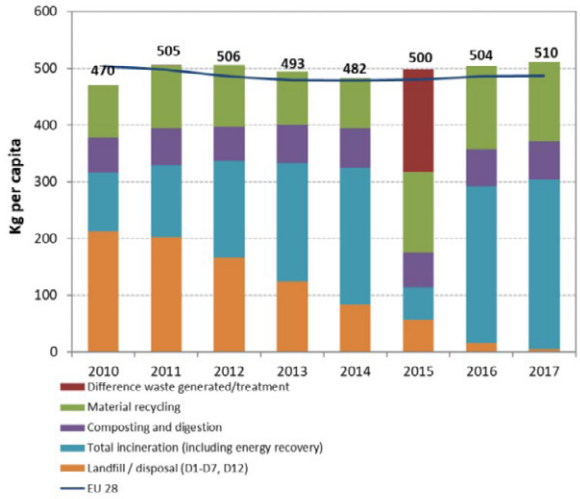
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **15%**

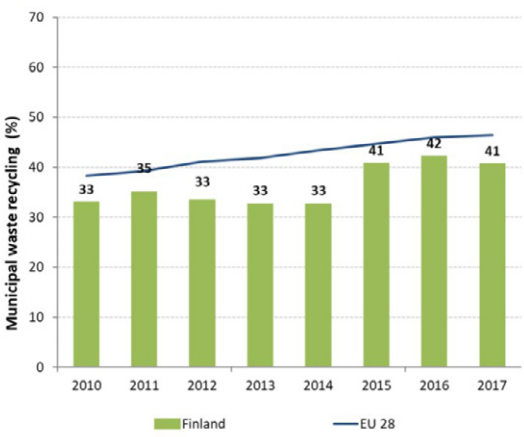
AMOUNT STILL TO BE CAPTURED (T): **393,910**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **34%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

In more than 100 municipalities, regulations require separate bio-waste collection. It is usually obligatory for buildings with 5-10 apartments or more, in some regions more than two apartments. Bio-waste is typically collected in 240-litre bins, in some cases lined inside with paper or biodegradable plastic bags. In certain new housing estates a vacuum waste collection system has been installed, where different waste types are collected in different coloured bags.

PLANS AND PROPOSALS:

Legislation prohibits landfilling of waste with more 10% organics from 1 January 2016. In 2018 the National Waste Plan was published. Biodegradable waste is one of the four key areas of intervention. Some notable targets for bio-waste:

- reducing food wastage to 50% of the current level
- 60% of all bio-waste included in municipal waste must be recycled
- increasing the use of organic fertilisers and soil conditioners

Separate collection in Helsinki
Source: hsy.fi

RECENT UPDATE - CASE STUDY

In Helsinki, bio-waste is collected in bins at properties with more than 10 apartments. From 2021 it will be expanded to cover properties with more than five apartments, with collection every two weeks (weekly collection can be requested for a higher price). Suggestions include using paper bags, drying food waste before putting it into the bag or putting pieces of cardboard in to dry the mixture .

FRANCE

TOTAL POPULATION (MILLION): **67.03**

% CITIES: **47.6%**

% TOWNS AND SUBURBS: **19.3%**

% RURAL: **33.1%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **122.3**

POTENTIAL GENERATION (T): **8,199,668**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **6,969,718**

CURRENT CAPTURE (T): **1,720,000**

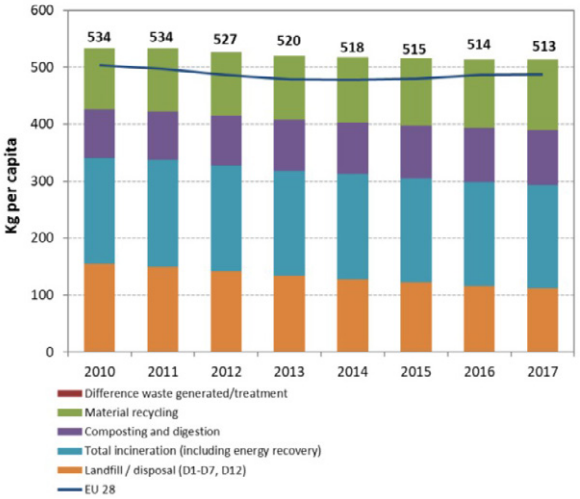
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **21%**

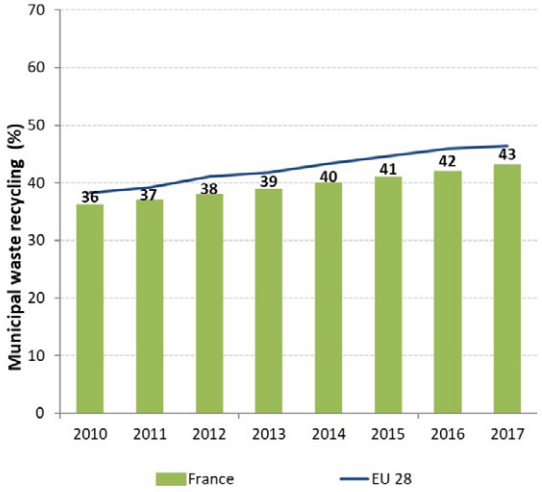
AMOUNT STILL TO BE CAPTURED (T): **5,249,718**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **54%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Separate collection of bio-waste is not common in France, implemented in just 125 municipalities, representing 5.7% of the French population, as of 2016, according to The National Environmental Agency ADEME. Reseau Compost Plus, mentioned above, estimated in 2018 that only 9% of the population was covered by this kind of collection, compared to 99% for dry recyclables.

PLANS AND PROPOSALS:

Since 2016, an obligation to separately collect bio-waste has applied to large producers generating more than 10 tonnes/year (i.e. more than 30 kg/day, so the entire Horeca sector is covered). The Energy Transition Law of 2015 states that from 2025 all producers, including households, shall implement such collection.

Kitchen caddy delivered in Paris.
Photo Sophie Robichon / Ville de Paris

RECENT UPDATE - CASE STUDY

In Paris, since 2017 separate collection of food waste with the 'Italian scheme' based on vented kitchen caddies and compostable bags is in place in 2 districts (2nd and 12th arrondissement, 130,000 people). The capture rate is still quite low, at 15 kg per capita per year, but the quality is good as it is still somewhat voluntary, and visual inspections are performed. In October 2019 the scheme was expanded to another 185,000 people in the 19th arrondissement bringing the total to 315,000 people.
Source: **paris.fr**

GERMANY

TOTAL POPULATION (MILLION): **83.02**

% CITIES: **36.3%**

% TOWNS AND SUBURBS: **40.7%**

% RURAL: **23.0%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **94.4**

POTENTIAL GENERATION (T): **7,834,000**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **6,658,900**

CURRENT CAPTURE (T): **2,077,200**

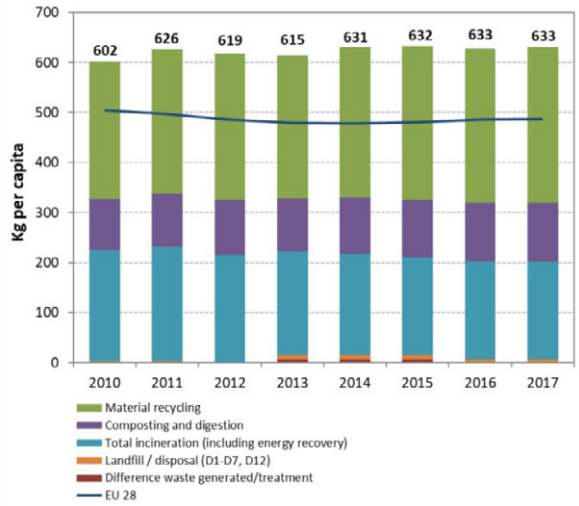
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **27%**

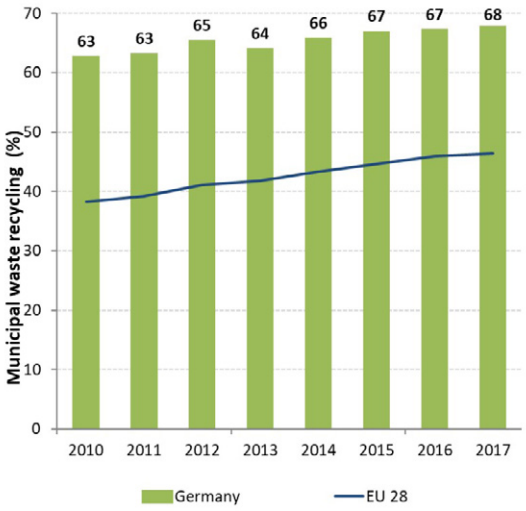
AMOUNT STILL TO BE CAPTURED (T): **4,581,700**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **57%**

LINK TO NATIONAL WASTE DATA





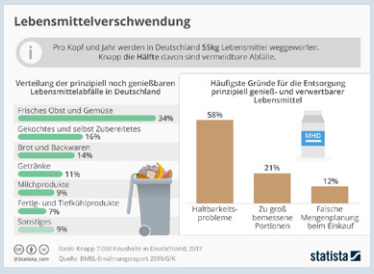
Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

The German Circular Economy Act ('Kreislaufwirtschaftsgesetz', or KrWG) adopted in 2012 sets a recycling rate of 65% by 2020 for municipal waste. A bio-waste bin is commonly used for collection (commingled garden/kitchen waste) in 402 German districts; 286 districts have access to a comprehensive separate collection system, covering the whole district. A 2012 survey revealed that the actual rate of private households' access to separate bio-waste collection using bio-waste bins amounts to roughly 52% nationwide, increasing to 65% in areas of comprehensive separate collection systems. Overall, close to 40 million people in Germany do not use bio-waste bins.

PLANS AND PROPOSALS:

The revised Act on the Circular Economy (KrWG, 2012, § 11 paragraph 1) obliged all waste producers and mandated waste management authorities to collect bio-waste separately as of 1 January 2015. Thus, an increase in the amount of bio-waste and compost and digestate is ongoing.



Capture rates of bio-waste and garden waste in German regions. Source u.a.b.

RECENT UPDATE - CASE STUDY

The typical collection scheme in Germany relies on commingled collection of food and yard waste, with low collection frequency (every week/every two weeks) and no compostable bags. On average, Germany collects 54 kg per capita with biobins and 72 kg per capita of yard waste. Of the 54 kg, according to some analyses, 20-30% is food waste, so seemingly the average capture rate of this fraction is around 10-15 kg per capita.

GREECE

TOTAL POPULATION (MILLION): **10.72**

% CITIES: **39.6%**

% TOWNS AND SUBURBS: **30.9%**

% RURAL: **29.4%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **142.7**

POTENTIAL GENERATION (T): **1,530,315**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **1,300,768**

CURRENT CAPTURE (T): **65,041**

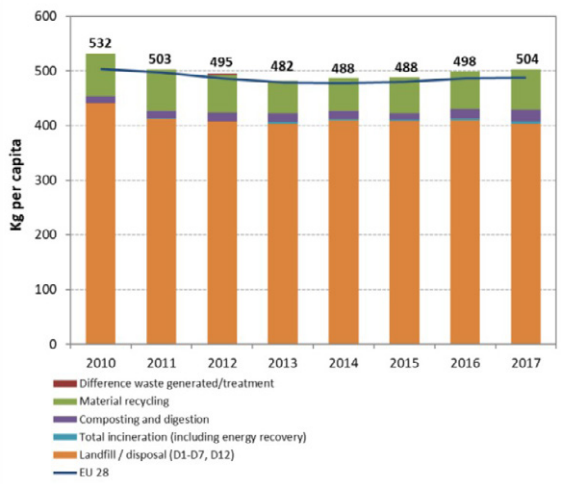
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **4%**

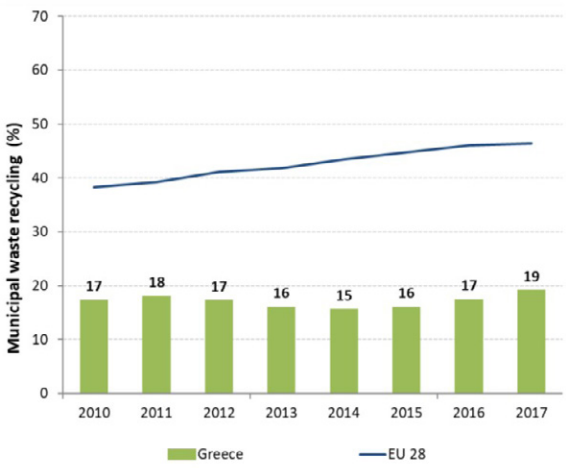
AMOUNT STILL TO BE CAPTURED (T): **1,235,727**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **16%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

In Greece, separate collection of bio-waste basically consists of home composting and diversion of organic waste in rural areas.

PLANS AND PROPOSALS:

Greece adopted a landfill tax in 2012, but its application was then postponed until 2019.
Despite the national waste management plan's ambitious goal to reach a bio-waste recycling rate of 40%, reaching more than 8-10% by 2020 seems unlikely, especially without adequate treatment infrastructure.

Separate collection and generation of dehydrated food waste in Halandri, EU-funded project Waste4Think.

RECENT UPDATE - CASE STUDY

Two EU-funded projects tested separate collection of food waste in Greece, with a door-to-door scheme based on small vented kitchen caddies plus compostable bags. With 'LIFE ATHENS-BIO-WASTE', the pilot was in Athens and Kifissia in 2014. In Athens, 186 tonnes of food waste were collected in 22 months, in an area with 4,150 people and restaurants (25 kg per capita per year).
With the 'Waste4Think' project, funded under Horizon 2020, the same scheme is being tested in Halandri, with better results since 2018, with an expansion in 2019 (40% participation rate).

HUNGARY

TOTAL POPULATION (MILLION): **9.77**

% CITIES: **32.8%**

% TOWNS AND SUBURBS: **34.2%**

% RURAL: **33.0%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **110.0**

POTENTIAL GENERATION (T): **1,075,121**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **913,853**

CURRENT CAPTURE (T): **53,550**

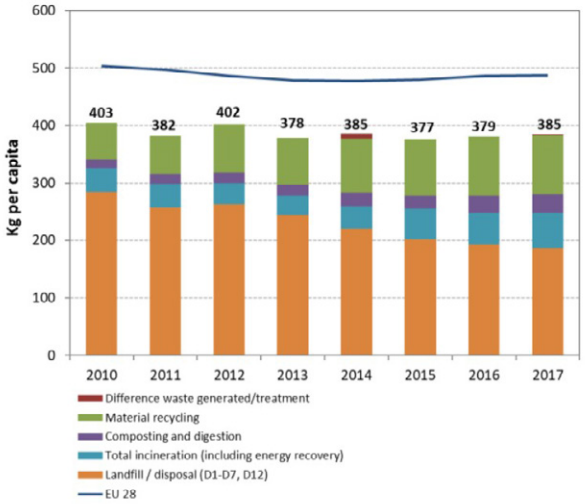
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **5%**

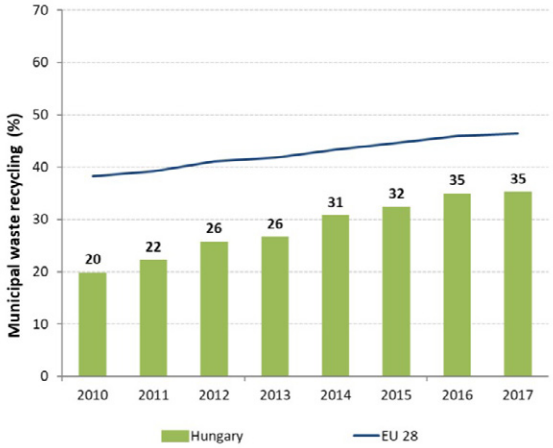
AMOUNT STILL TO BE CAPTURED (T): **860,303**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **11%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Hungary is struggling to meet EU targets. In 2015 no separate collection of food waste was in place, but many households were served by bring points for dry recyclables. However, door-to-door collections are being progressively rolled out across the country.

PLANS AND PROPOSALS:

A landfill fee of €20/tonne is applied since 2013, but this is not enough to encourage separate collection. In November 2019 the new National Collection and Recovery Plan for 2020 was published, but it basically addresses only dry recyclables and electronic waste.

Leaflet of the Compost Awareness Day organised by HUMUSZ

RECENT UPDATE - CASE STUDY

A national 'Compost Awareness' initiative is performed yearly, coordinated by the NGO Humusz.

Source: **humusz.hu**

IRELAND

TOTAL POPULATION (MILLION): **4.9**

% CITIES: **46.3%**

% TOWNS AND SUBURBS: **22.3%**

% RURAL: **31.4%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **118.2**

POTENTIAL GENERATION (T): **579,621**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **492,678**

CURRENT CAPTURE (T): **46,123**

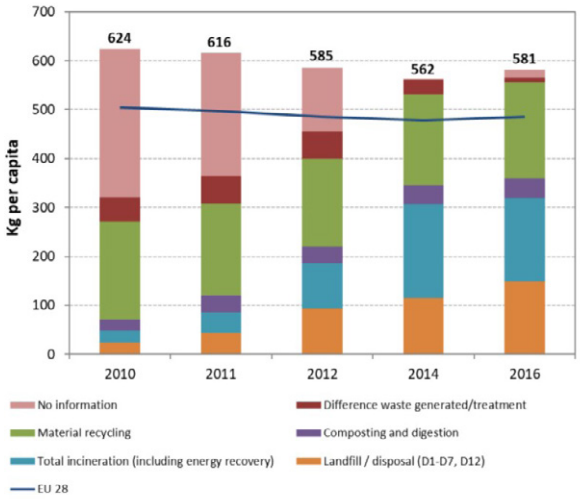
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **8%**

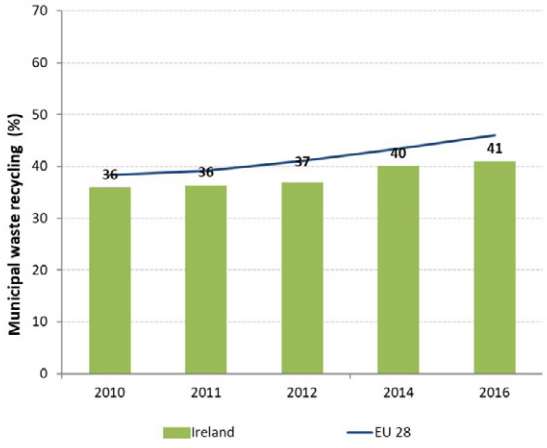
AMOUNT STILL TO BE CAPTURED (T): **446,554**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **20%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

In 2009 the Waste Management (Food Waste) Regulations were introduced, requiring food-producing businesses to separate their food waste for organic recycling; this was followed in 2015 by the Household Food Waste and Bio-waste Regulations, which requires all waste collectors to provide separate collection of bio-waste in agglomerations >500 households, and for all households to use the service unless they are home composting. The regulations initially had a significant impact, but a lack of enforcement in recent years has meant overall performance has fallen off. This in turn has led to a number of in-vessel composters converting their facilities to handle mixed waste to produce RDF (refuse derived fuel) and SRF (solid recovered fuel).

PLANS AND PROPOSALS:

Ireland is in the process of developing a Waste Action Plan for a Circular Economy which includes a number of scenarios to increase the performance of bio-waste collection and recycling systems.

Leaflet of the campaign performed in Sligo. Source: sligococo.ie

RECENT UPDATE - CASE STUDY

In 2014-5 the national composting association 'Cré' with a number of partners ran a Brown Bin Awareness Programme in the city and county of Sligo. The trial included door-to-door education and awareness raising, the distribution of kitchen caddies and compostable liners, as well as local media and events. At the end of the trial, participation and organic waste capture had doubled, contamination had fallen from 18% to 1% and total organic waste in residual bins was reduced by 10%.

ITALY

TOTAL POPULATION (MILLION): **60.36**

% CITIES: **34.3%**

% TOWNS AND SUBURBS: **41.2%**

% RURAL: **24.5%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **127.7**

POTENTIAL GENERATION (T): **7,707,443**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **6,551,327**

CURRENT CAPTURE (T): **3,659,595**

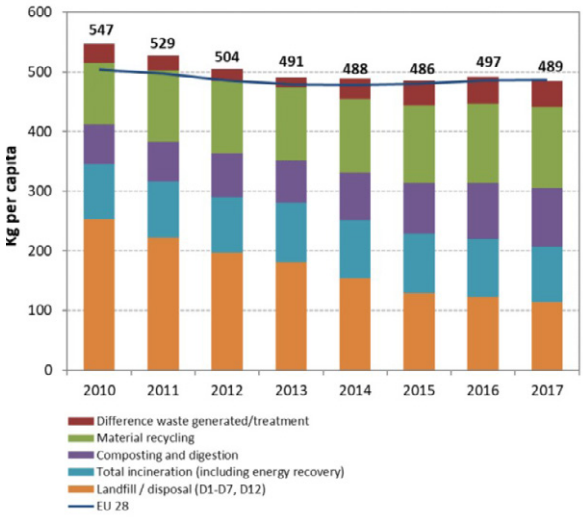
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **47%**

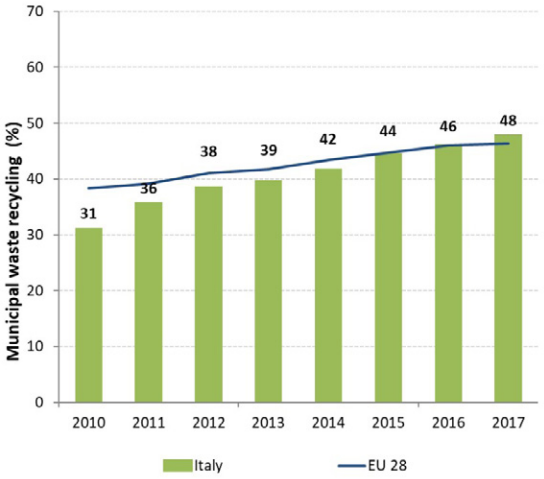
AMOUNT STILL TO BE CAPTURED (T): **2,891,731**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **55%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Separate collection of food waste started in 1993 in pioneer municipalities in northern Italy. Since then it has been spreading steadily at an impressive rate, now covering an estimated 46 million people, mostly with door-to-door schemes. Food waste is typically collected single stream, and the use of compostable bags is promoted (and compulsory in many areas). Capture rates tend to be high (60-100kg per capita per year).

PLANS AND PROPOSALS:

No national waste management plan is in place, but many regions have set specific targets for food waste separate collection (typically 60kg per capita), and some have specific incentive schemes to reward municipalities which start separate collection.

Separate collection of food waste in Italy at the municipal level. ARS Ambiente based on ISPRA data, 2018.

RECENT UPDATE - CASE STUDY

The incentive scheme running in Sardinia since 2004 is an interesting case of how to promote separate collection of food waste without engaging regional funds, by simply taking money from the laggards and rewarding the pioneers. A €30/t fee on mixed waste disposal was introduced for municipalities not separately collecting food waste, and this amount is returned to those who have implemented the scheme as a discount on the gate fee for composting plants.

LATVIA

TOTAL POPULATION (MILLION): **1.92**

% CITIES: **43.4%**

% TOWNS AND SUBURBS: **19.4%**

% RURAL: **37.2%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **107.4**

POTENTIAL GENERATION (T): **206,142**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **175,220**

CURRENT CAPTURE (T): **8,720**

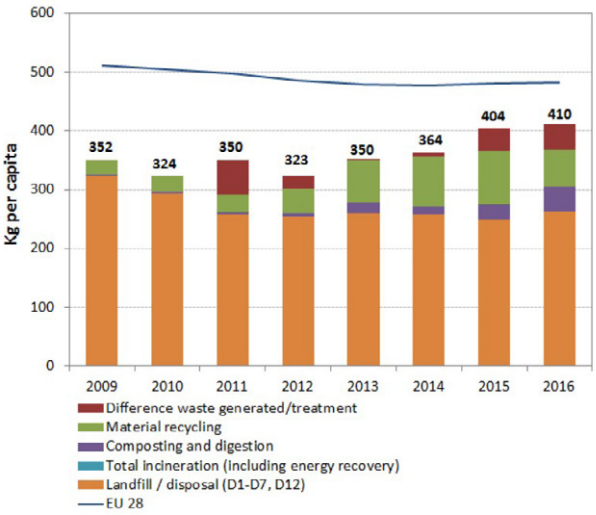
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **4%**

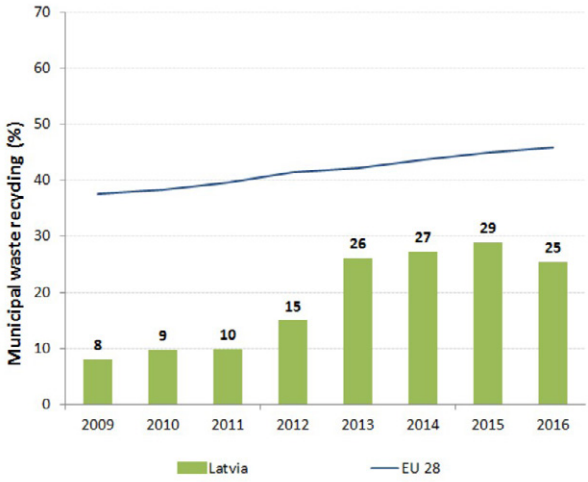
AMOUNT STILL TO BE CAPTURED (T): **166,500**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **10%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Separate collection of bio-waste is basically not implemented in Latvia. A few pilot projects are in place, such as in the municipality of Adazi.

PLANS AND PROPOSALS:

The landfill tax (known as the natural resources tax) increased from €12/t in 2016 to €25/t in 2017, and a further increase to €50/t is envisaged by 2020, but refunds are not linked to the implementation of separate collection schemes. It seems that the new Waste Management Law, currently in the legislative process, will introduce mandatory separate collection of biodegradable waste from January 1, 2021. The recently approved (end-2019) act on waste management in the city of Riga states that key waste fractions, including biodegradable waste, shall be collected separately.

Bio-waste containers in Adazi - Latvia.
Source: db.lv

RECENT UPDATE - CASE STUDY

Adazi is currently one of the few municipalities in Latvia that has publicly available containers for biodegradable waste. There are 36 sorting stations with large bins, to collect commingled garden and food waste. This project has been implemented by the company Eco Baltia and funded by the EU cohesion fund.

LITHUANIA

TOTAL POPULATION (MILLION): **2.79**

% CITIES: **43.5%**

% TOWNS AND SUBURBS: **2.3%**

% RURAL: **54.3%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **121.4**

POTENTIAL GENERATION (T): **339,217**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **288,335**

CURRENT CAPTURE (T): **19,385**

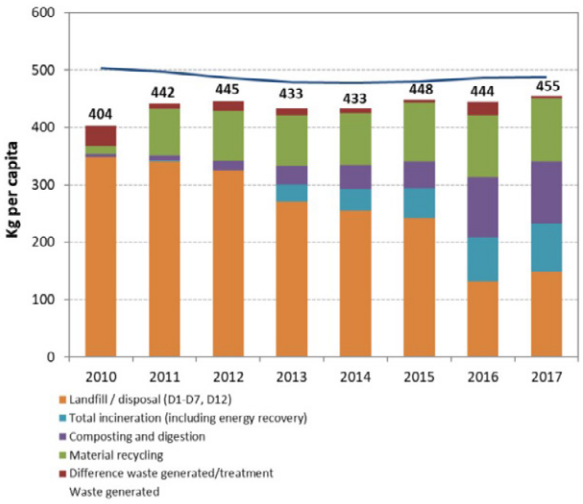
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **6%**

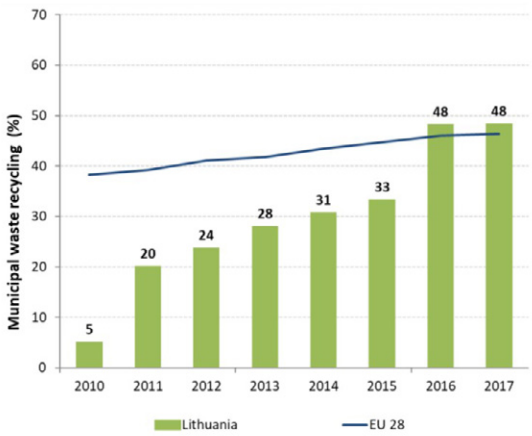
AMOUNT STILL TO BE CAPTURED (T): **268,950**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **14%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Sorting of biodegradable waste is only required for supermarkets, cafes, restaurants and other food processing entities. Currently there are 53 composting facilities, only for garden waste.
Source: **atliekos.gamta.lt**

PLANS AND PROPOSALS:

The current waste management law (Act 1999/21) requires municipalities to ensure the sorting of household food and kitchen waste and to implement separate collection in cities with more than 50,000 inhabitants; it also requests to introduce separate collection in other areas where it is economically viable and technically feasible. A tender to support the preparation of the new WMP for 2021-2027 was launched at the end of 2019.

Domantas Tracevicius, founder of the NGO "Circular Economy".
Source: circulareconomy.lt

RECENT UPDATE - CASE STUDY

'Circular Economy', an NGO, is actively promoting a transition towards more bio-waste collection and recycling. Its founder, Domantas Tracevicius, is active in the European Compost Network and Zero Waste Europe and has promoted many study tours in European cities to gather information on the best performing separate collection schemes for bio-waste.

LUXEMBOURG

TOTAL POPULATION (MILLION): **0.61**

% CITIES: **15.1%**

% TOWNS AND SUBURBS: **43.7%**

% RURAL: **41.2%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **118.3**

POTENTIAL GENERATION (T): **72,636**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **61,741**

CURRENT CAPTURE (T): **9,780**

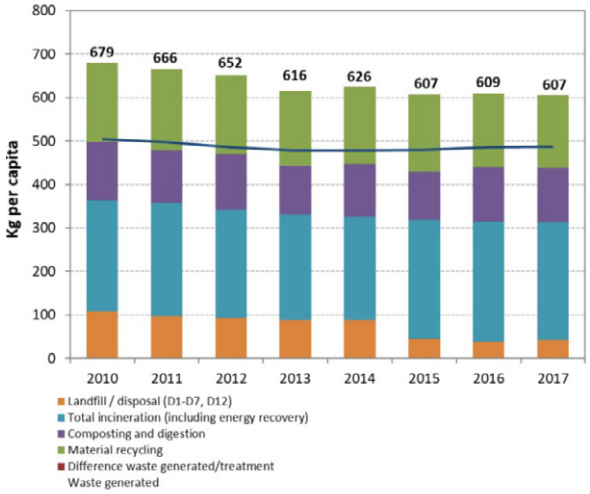
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **13%**

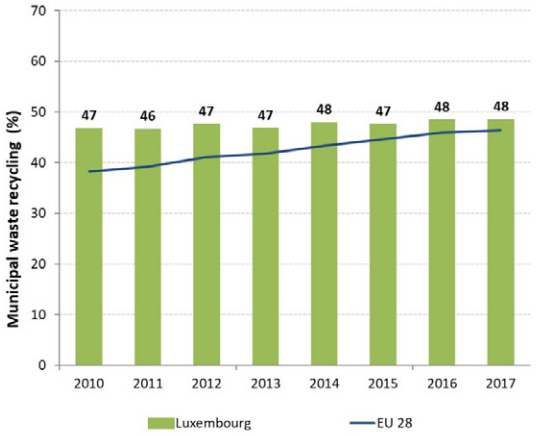
AMOUNT STILL TO BE CAPTURED (T): **51,961**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **29%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Bio-waste including kitchen and green waste is subject to separate collection, as this is a priority in the Waste Management Plan (WMP). Kitchen waste is collected door to door, covering 67% of households in 2016 according to the WMP. Green waste is collected at bring points; additionally, most cities collect green waste door to door [LU WMP 2010].

PLANS AND PROPOSALS:

Article 25 of the waste law of 21 March 2012 mandates separate collection of bio-waste. The target for 2022 is to cover the entire population and to reduce the content of bio-waste in residual waste by 60%.

Pay As You Throw scheme encouraging bio-waste (Source: SIDEC - Municipality of Lintgen)

RECENT UPDATE - CASE STUDY

Many municipalities in Luxembourg are introducing a 'Pay As You Throw' scheme in which the brown bin for bio-waste is voluntary, but the charging scheme makes it economically appealing. Interestingly enough, bio-waste bins of larger volume are charged as well, to encourage food waste prevention. Collection frequencies are low (monthly in winter, fortnightly in summer).

MALTA

TOTAL POPULATION (MILLION): **0.49**

% CITIES: **89.8%**

% TOWNS AND SUBURBS: **10.0%**

% RURAL: **0.2%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **113.3**

POTENTIAL GENERATION (T): **55,934**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **47,544**

CURRENT CAPTURE (T): **2,339**

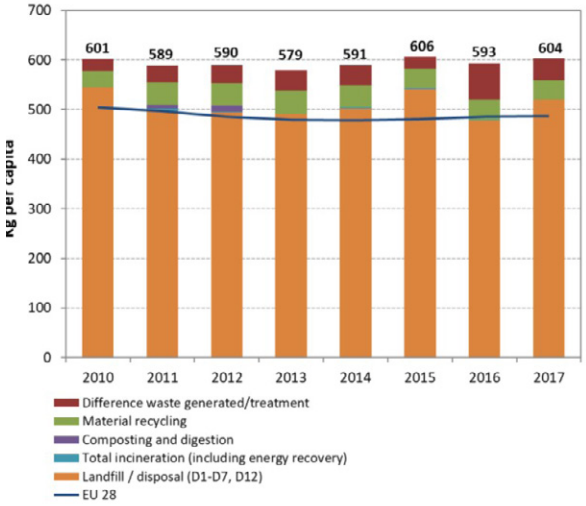
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **4%**

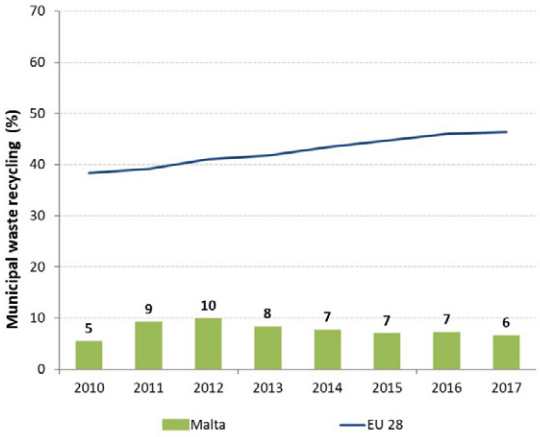
AMOUNT STILL TO BE CAPTURED (T): **45,205**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **19%**

LINK TO NATIONAL WASTE DATA





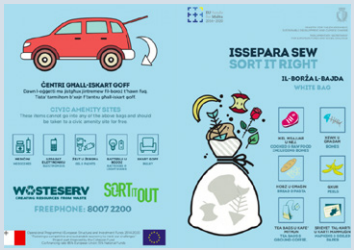
Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Separate collection of food waste was implemented in 2018. Food waste is collected in white compostable bags, typically three times per week, and more than 21,500 tonnes of segregated organic waste were collected in 2019.

PLANS AND PROPOSALS:

Food waste collection expanded throughout the country in late 2018, with good results. Around 30,000 tonnes, i.e. 60 kg per capita, were collected in 2019. There are still concerns about the quality of collected bio-waste and of the compost generated though. Source segregated waste that is currently being collected has exceeded initial estimates, so the Sant Antonin Waste Treatment Plant is closer to reaching its critical mass to operate solely on source segregated waste, without the addition of mechanically selected organic waste from the black bag.



Food waste collection without buckets in Malta. Source: tvm.com.mt

RECENT UPDATE - CASE STUDY

The collection model is quite peculiar, in the sense that only the bags need to be set out on the street, without bins. Even if easier for citizens, this may lead to some problems due to animals and ruptured bags.

NETHERLANDS

TOTAL POPULATION (MILLION): **17.28**

% CITIES: **56.4%**

% TOWNS AND SUBURBS: **33.0%**

% RURAL: **10.7%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **111.8**

POTENTIAL GENERATION (T): **1,932,858**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **1,642,929**

CURRENT CAPTURE (T): **293,800**

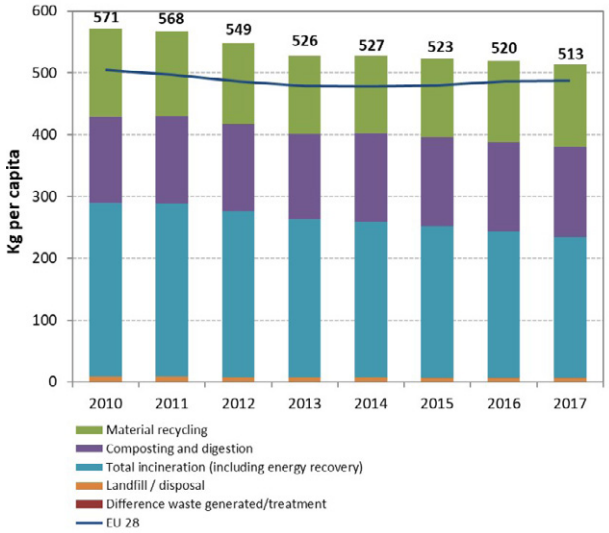
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **15%**

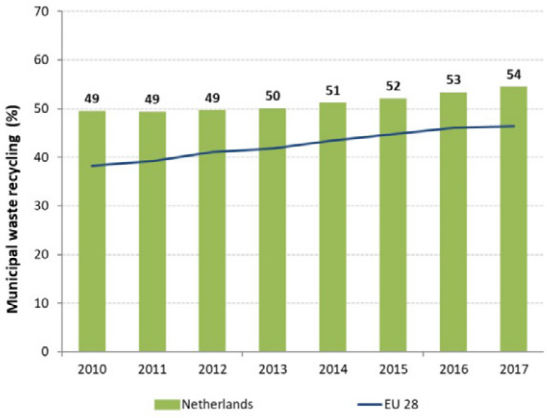
AMOUNT STILL TO BE CAPTURED (T): **1,349,129**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **41%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

The majority of bio-waste collected in the Netherlands consists of green waste, amounting to 3.2 million tonnes in 2018. Household bio-waste totals 1.4 million tonnes and is also referred to as vegetable-, fruit-, and garden waste (i.e. with no animal/fish waste inside).

PLANS AND PROPOSALS:

Many municipalities are implementing new financial or logistics incentives to stimulate more waste separation such as PAYT or reverse collection (door-to-door recyclables, bring banks for mixed waste). Approximately 100 garden waste composting facilities exist, plus 21 more for household bio-waste.

BVOR logo.

RECENT UPDATE - CASE STUDY

BVOR represents the majority of professional bio-waste processing facilities in the Netherlands. Its members process bio-waste into products such as compost, solid biomass and biogas for bioenergy production, as well as innovative products such as fibres, proteins and compost teas. Its core activities include lobbying, operating an organic resources knowledge centre, and a networking platform for its members. It also runs certification schemes.

Source: **bvor.nl**

NORWAY

TOTAL POPULATION (MILLION): **5.33**

% CITIES: **29.1%**

% TOWNS AND SUBURBS: **39.4%**

% RURAL: **31.5%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **78.8**

POTENTIAL GENERATION (T): **419.863**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **356,884**

CURRENT CAPTURE (T): **187,550**

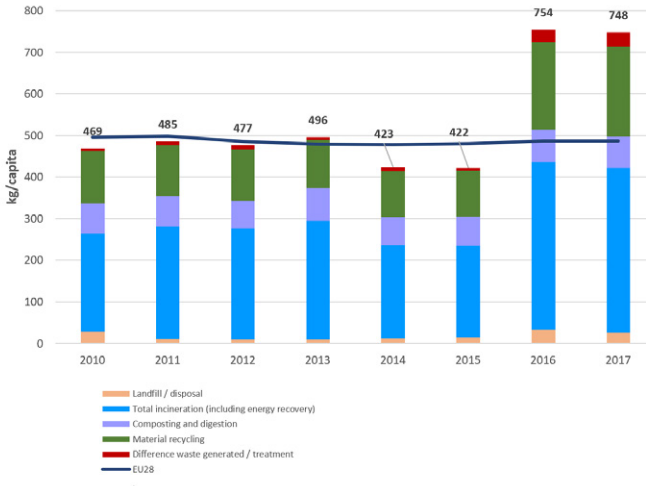
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **45%**

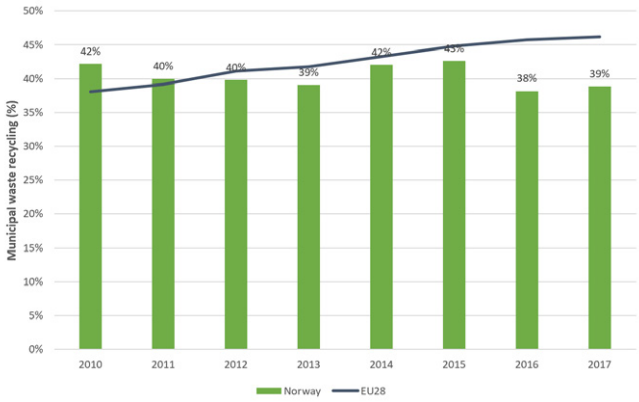
AMOUNT STILL TO BE CAPTURED (T): **169,334**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **30%**

LINK TO NATIONAL WASTE DATA





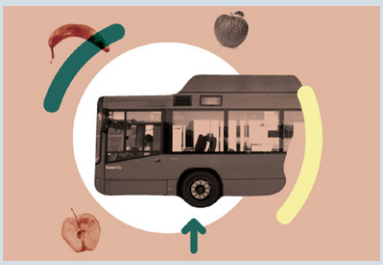
Eurostat data

COLLECTION:

Source separation of bio-waste started in Norwegian municipalities in the 1990s, motivated by a landfill ban for unsorted waste (made effective in 2001). It has increased from 171,000 tonnes in 2011 to 333,000 tonnes in 2016 (source: SSB). Seventy percent of the population lives in municipalities offering source separation and door-to-door collection of food waste. The collection rate from households (average source-sorted organic waste out of the total, where source sorting is implemented) is 69% (source: ECN - Østfoldforskning, 2016). Interestingly, this is the only country covered by this report for which the estimated capture rate for food waste is higher than for bio-waste (food + garden), as the focus is on food waste.

PLANS AND PROPOSALS:

A mandatory source collection of 'household-like' food waste has been evaluated and recommended by the Environmental Protection Agency of Norway in 2017, but decision hasn't been made yet. It is expected that this will be decided as part of the Government's report on the Circular Economy, under Norway's commitment to meet EU targets on material recovery (source ECN).



Circular economy in Norway: from food waste to fuel for buses.
Source: ks.no

RECENT UPDATE - CASE STUDY

Food waste in Norway is typically processed in anaerobic digestion plants. Products include renewable fuel (biomethane) for buses.

POLAND

TOTAL POPULATION (MILLION): **37.97**

% CITIES: **34.4%**

% TOWNS AND SUBURBS: **24.4%**

% RURAL: **41.1%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **112.0**

POTENTIAL GENERATION (T): **4,251,877**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **3,614,095**

CURRENT CAPTURE (T): **203,075**

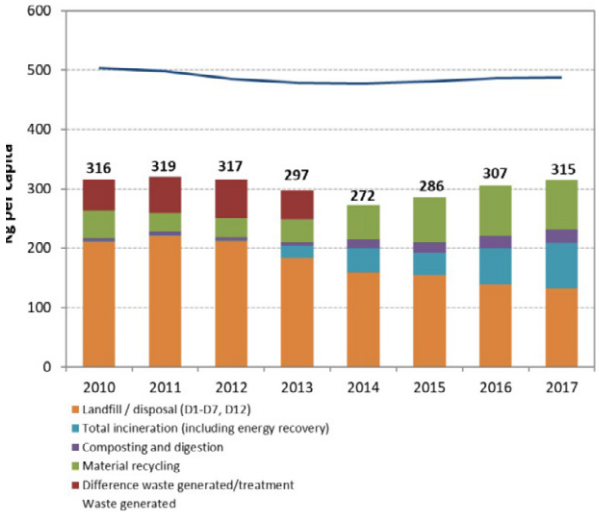
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **5%**

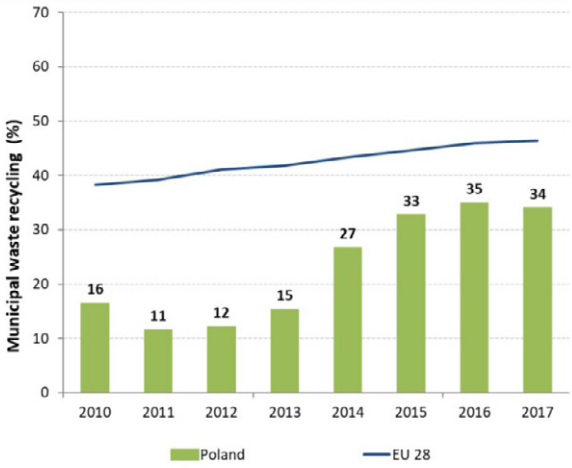
AMOUNT STILL TO BE CAPTURED (T): **3,411,020**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **11%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

According to Statistics Poland, in 2018 the selective collection of bio-waste was implemented in 2012 municipalities. The typical scheme is with brown wheeled bins; for multi-unit buildings, collection is commingled (garden/food waste) while for detached houses two separate bins are provided.

PLANS AND PROPOSALS:

The National Waste Management Plan 2022 (KPGO 2022) targets a 65% recycling rate for municipal waste by 2030, and introduction in all municipalities, by end of 2021, of systems of selective collection of green waste and other bio-waste at source by the end of 2021.

Separated brown bins for garden waste and food waste
Photo: odpady.ialystok.pl

RECENT UPDATE - CASE STUDY

In Poland, a municipality not reaching the annual targets is subject to a fine; targets have been set for recycling, preparation for reuse and recovery and reducing the weight of biodegradable municipal waste that is landfilled. The fines are calculated individually per tonne of waste and are increased each year to achieve the 2020 target; they were set as follows:

- 35 € (140 PLN) in 2018;
- 43 € (170 PLN) in 2019;
- 68 € (270 PLN) in 2020

PORTUGAL

TOTAL POPULATION (MILLION): **10.28**

% CITIES: **44.5%**

% TOWNS AND SUBURBS: **29.4%**

% RURAL: **26.1%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **127.2**

POTENTIAL GENERATION (T): **1,307,414**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **1,111,302**

CURRENT CAPTURE (T): **22,529**

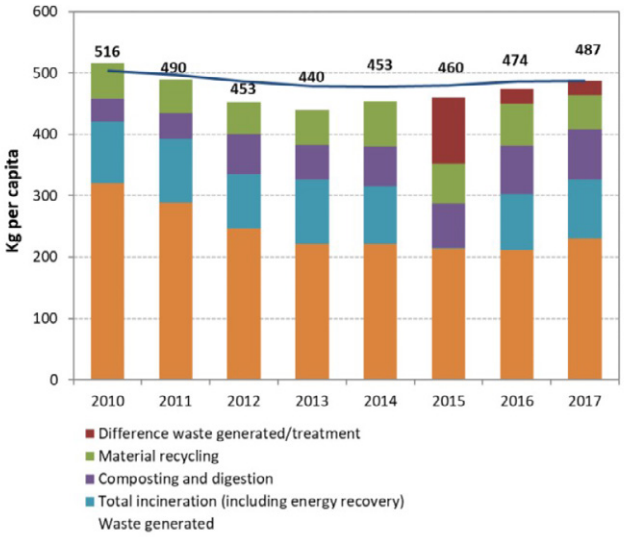
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **2%**

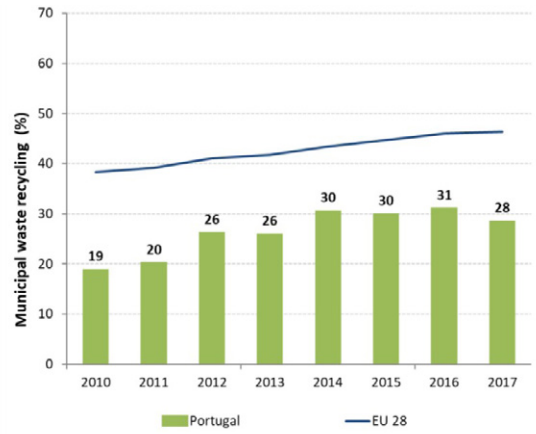
AMOUNT STILL TO BE CAPTURED (T): **1,088,772**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **4%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Separate collection of bio-waste is at an early stage. The country is relying on MBT of mixed waste, but some good experiences exist in the area of the LIPOR consortium, around Porto.

PLANS AND PROPOSALS:

In 2019 the National Environmental Protection Agency evaluated the feasibility of extending source separation of bio-waste to the whole country.
Source: **apambiente.pt**

Compost given back to citizens to reward them for recycling in Porto.
Source: nutrimais.pt

RECENT UPDATE - CASE STUDY

LIPOR is very active in promoting best practices in separate collection, with a focus on organic waste; it manages a composting facility that is going to be upgraded and plans to extend residential source separation of food waste. A good recent case study is implementation in some areas of the city of Porto: a street campaign to thank and congratulate everyone who made separation a daily habit, contributing to these results, also distributing packages of compost produced from the separated organic waste.

ROMANIA

TOTAL POPULATION (MILLION): **19,40**

% CITIES: **28,9%**

% TOWNS AND SUBURBS: **25,4%**

% RURAL: **45,7%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **127,7**

POTENTIAL GENERATION (T): **2,477,413**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **2,105,801**

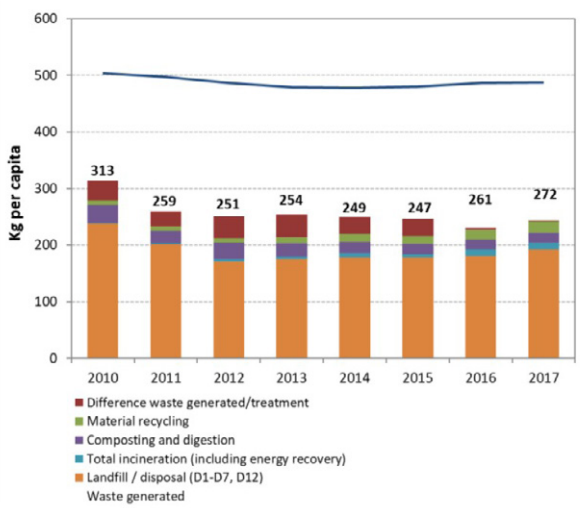
CURRENT CAPTURE (T): **69,846**

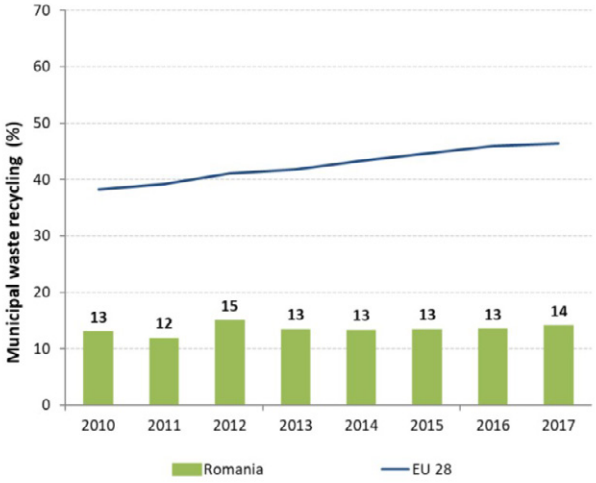
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **3%**

AMOUNT STILL TO BE CAPTURED (T): **2,035,955**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **7%**





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Until recent times, no separate collection was in place and very little progress in waste management has been seen in recent years in Romania. Low implementation of separate collection means that overall recycling performance remains very low. Most counties do not have infrastructure for effective management of municipal waste, and the majority is landfilled.

PLANS AND PROPOSALS:

Romania received an Early Warning Report specifically mentioning that EU funds should be used to ensure better separate collection of bio-waste. Emergency ordinance 74 of 17-07-2018 introduced Pay As You Throw as a scheme to promote separate collection. No specific provisions for bio-waste are in place. Some regional plans, such as in Sibiu County (2019 - 2025), now mention the opportunity to set up separate collection of bio-waste and build composting/anaerobic digestion facilities.

5 fractions door-to-door separate collection in Salacea. Photo: Zero Waste Europe

RECENT UPDATE - CASE STUDY

The city of Sălacea, in the north-west of Romania, not only managed to quickly increase from almost no waste recycling to 60% in 3 months, including door-to-door separate collection of bio-waste, but also reduced overall waste generation by 55%. The project was run in partnership with Zero Waste Europe.

SLOVAKIA

TOTAL POPULATION (MILLION): **5.45**

% CITIES: **22.0%**

% TOWNS AND SUBURBS: **36.4%**

% RURAL: **41.6%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **84.4**

POTENTIAL GENERATION (T): **460,170**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **391,145**

CURRENT CAPTURE (T): **43,003**

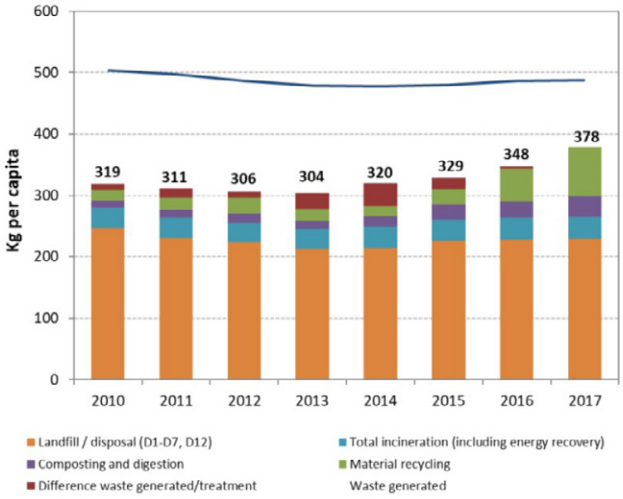
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **9%**

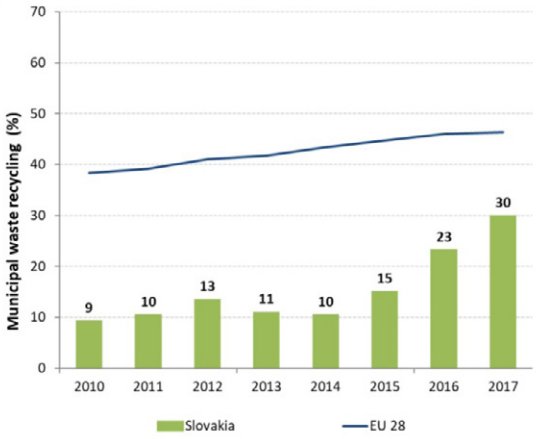
AMOUNT STILL TO BE CAPTURED (T): **348,142**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **17%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Separate collection of bio-waste is still limited in Slovakia. A national obligation is in place but its effect has been limited as exemptions are widespread.

PLANS AND PROPOSALS:

The Waste Act 371/2015 establishes that in order to ensure separate collection of biodegradable kitchen waste, communities have to ensure collection capacity of at least 250 litres per calendar year for each inhabitant. This is calculated as the product of the volume of available bins and the frequency of removal, which must be at least once every 14 days. If collection capacities are not sufficient, the municipality must increase it by adding more bins or increasing the frequency of collection.

Compostable packaging collection in Bratislava. Photo: Michele Giavini

RECENT UPDATE - CASE STUDY

Pilot separate collection schemes for bio-waste have been spreading lately through Slovakia. The city of Bratislava set up dedicated areas in public spaces for events, including collecting compostable items in bio-waste bins.

SLOVENIA

TOTAL POPULATION (MILLION): **2.08**

% CITIES: **19.3%**

% TOWNS AND SUBURBS: **35.1%**

% RURAL: **45.7%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **108.4**

POTENTIAL GENERATION (T): **225.520**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **191.692**

CURRENT CAPTURE (T): **30,381**

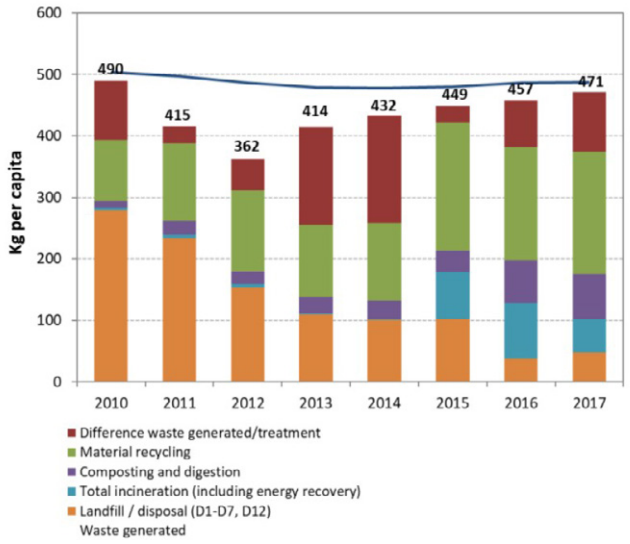
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **13%**

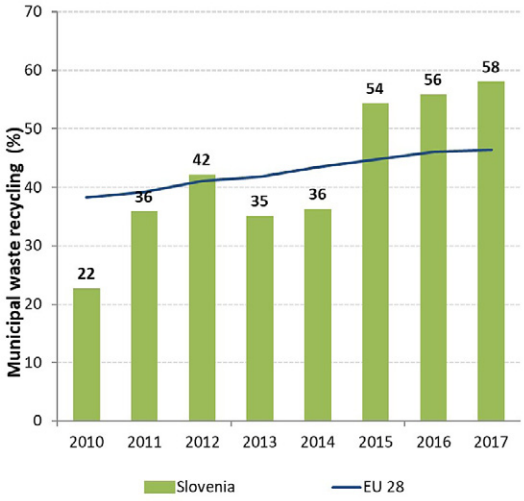
AMOUNT STILL TO BE CAPTURED (T): **161,311**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **28%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Since 1 July 2011, separate collection of biodegradable waste is mandatory throughout Slovenia, a factor that largely contributed to making Slovenia a global frontrunner in separate collection. After a one-year transition period, a regulation on the management of biodegradable kitchen waste and green garden waste came into force; currently many municipalities have brown-bin schemes in place, collecting commingled garden and food waste, with the typical low-frequency approach seen in central Europe.

PLANS AND PROPOSALS:

The city of Ljubljana has committed to:

- increase separate collection to 78% by 2025, and to 80% by 2035
- reduce yearly total waste generation to 280 kg per inhabitant
- reduce yearly residual waste to 60 kg by 2025 and 50 kg by 2035

Bio-waste bins in Ljubljana.
Photo: SNAGA

RECENT UPDATE - CASE STUDY

Ljubljana (400,000 people including suburban areas) is the most famous case study, being the first EU capital committed to Zero Waste and having bio-waste collection in place, including PAYT elements and a mixed scheme based on door-to-door and underground containers. In 2018 separate collection reached 68%.
The town of Vrhnika has also been pointed out as a best practice by Zero Waste Europe. Its 18,000 residents already went well above 70% separate collection and are aiming to increase this. Residual waste collection frequency was reduced to once per month, while bio-waste is collected door to door or home composted.
Source: **zerowasteeurope.eu**

SPAIN

TOTAL POPULATION (MILLION): **46.93**

% CITIES: **50.7%**

% TOWNS AND SUBURBS: **23.4%**

% RURAL: **25.9%**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **144.0**

POTENTIAL GENERATION (T): **6,758,587**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **5,744,799**

CURRENT CAPTURE (T): **175,360**

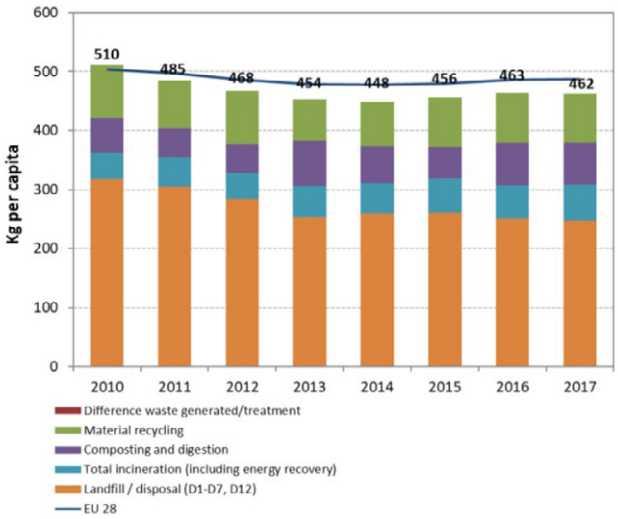
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **3%**

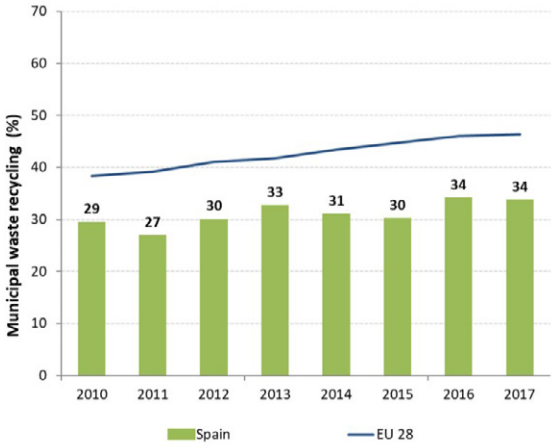
AMOUNT STILL TO BE CAPTURED (T): **5,569,439**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **10%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

Separate collection of bio-waste is currently in place mostly in certain Autonomous Communities. Catalonia is the best performing, having in place an obligation and currently testing various schemes (200 municipalities with door to door, many more with bring banks). Roadside containers with electronic locks and ID access cards are also being tested in some areas. The Basque Country, Navarra, the Balearics and the city of Madrid are other areas where bio-waste collection is being implemented.

PLANS AND PROPOSALS:

The National Waste Management Plan 2016-2022 and the national Waste Law 22/2011 set guidelines such as the need for Autonomous Communities' plans to include measures to promote separate bio-waste collection. Some of these plans are beginning to introduce specific measures in this respect, although the low cost of landfill and MBT hampers steady development in many areas.

One of the many guidelines and studies published by ARC - Catalan Waste Agency - on food waste separate collection

RECENT UPDATE - CASE STUDY

Catalonia exhibits a best practice in terms of promotion of separate collection of bio-waste. The Catalan Waste Agency manages the landfill/incineration tax return scheme, which rewards municipalities according to the amount and quality of food waste collected, and part of this tax funds quarterly waste composition analyses. A new Catalan waste law is in the discussion phase, seeking to introduce new elements as pay as you throw, and user identification with locks opened by electronic cards where door to door is not implemented.

SWEDEN

TOTAL POPULATION (MILLION): **10.23**

% CITIES: **39.9%**

% TOWNS AND SUBURBS: **40.3%**

% RURAL: **19.8%**

RECEIVED EARLY WARNING REPORT: **NO**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **105.7**

POTENTIAL GENERATION (T): **1,081,360**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **919,156**

CURRENT CAPTURE (T): **148,222**

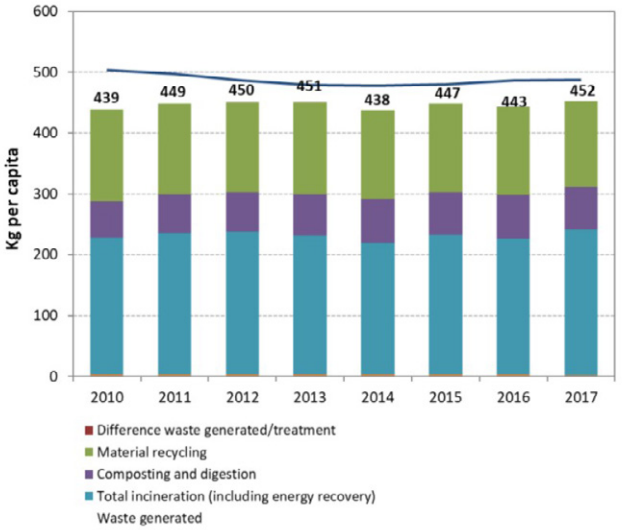
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **14%**

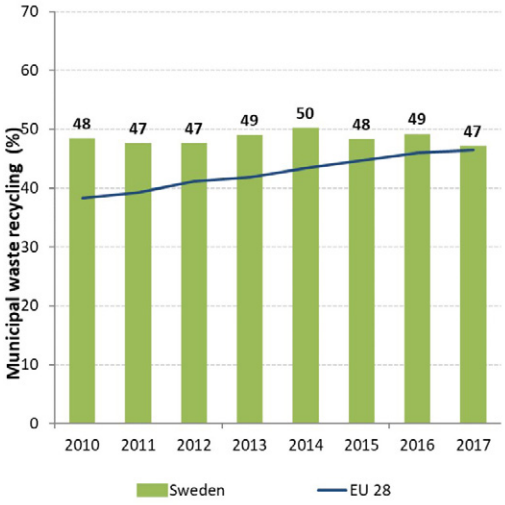
AMOUNT STILL TO BE CAPTURED (T): **770,934**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **32%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

More than 200 of 290 Swedish municipalities have introduced separate collection of food waste to some extent.
The most common system for source separated food waste from households is a separate bin. There are also multi-compartment bins for various fractions of waste such as packaging material, food waste and residual waste. Collection of food waste through optical sorting, where different coloured bags are placed in the same bin, is becoming increasingly common. Paper bags for collection of food waste are still the most common type of bag, but use of plastic bags made of 'fossil' plastic is increasing due to the popularity of the optical sorting system. Compostable plastic bags are still not used to a great extent (source ECN).

PLANS AND PROPOSALS:

There is a national environmental target focusing on recycling of nutrients and recovery of energy from food waste, under which by 2018 50% of all food waste had to be separately collected and treated by anaerobic digestion (40 percent) or composting (10 percent). Currently, there is an ongoing discussion on making separate collection of food waste mandatory. The focus on anaerobic digestion of food waste can be explained by another political target: a fossil-free transport sector by 2030. Upgraded biogas (bio-methane) is used to a large extent in the transport sector and particularly as an important fuel in the public transportation fleet (Source ECN).

Green bag optical selection system in Stockholm

RECENT UPDATE - CASE STUDY

Optical sorting of 'green bags' for food waste is used by several municipalities in Sweden, including Stockholm, where it is in place for a limited number of properties.
Residents sort the waste into different coloured plastic bags, one for food waste and one for residual waste, then put all bags in the same container. In a sorting facility, the bags are sorted by cameras reading the colour of the bag, and the sorted food waste is digested to produce biogas and an organic fertiliser.

UNITED KINGDOM

TOTAL POPULATION (MILLION): **66.65**

% CITIES: **59.3%**

% TOWNS AND SUBURBS: **27.9**

% RURAL: **12.8**

RECEIVED EARLY WARNING REPORT: **YES**

FOOD WASTE

POTENTIAL GENERATION (KG/CAPITA): **118.1**

POTENTIAL GENERATION (T): **7.873.663**

POTENTIAL MAXIMUM CAPTURE WITH OPTIMISED COLLECTION SCHEMES (T): **6,692,614**

CURRENT CAPTURE (T): **991,970**

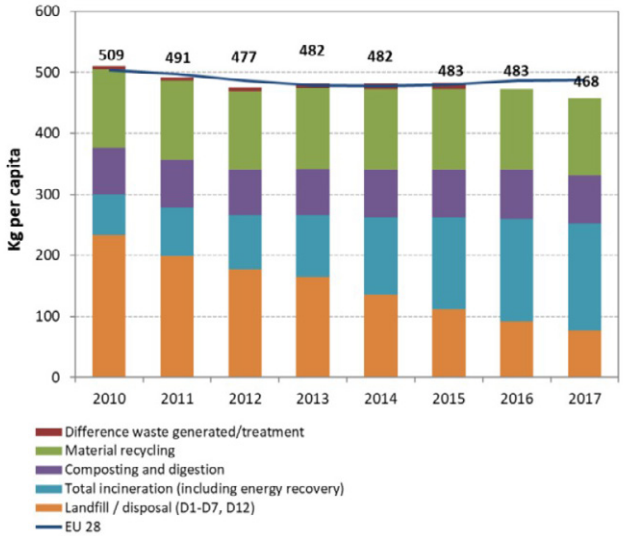
CURRENT CAPTURE (% ON POTENTIAL GENERATION): **13%**

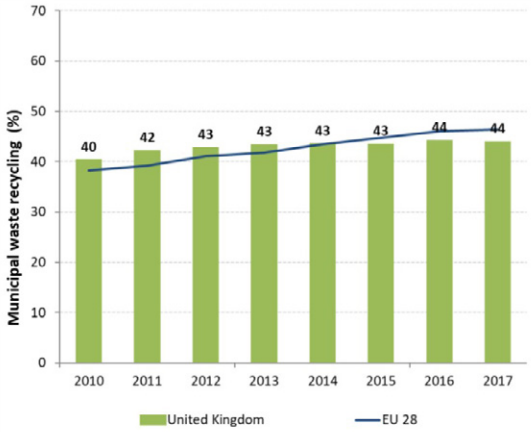
AMOUNT STILL TO BE CAPTURED (T): **5,700,644**

BIO-WASTE

CURRENT CAPTURE (% ON POTENTIAL GENERATION): **35%**

LINK TO NATIONAL WASTE DATA





Source: EC Environmental legislation implementation assessment, national reports 2019

COLLECTION:

The separate collection of garden waste is commonly diffused across the UK. In recent years there has been a move towards charging for the service, which appears to have reduced performance.

The collection of food waste is more fragmented. In Scotland and Northern Ireland, legislation requires separate collection of food from all urban households and certain businesses, either together with garden waste or separately. In Wales, only services which provide weekly separation for food waste are funded. All three of these nations have complete or near-complete roll-out. In England 45% of local authorities provide a separate service for food or food mixed with garden waste.

PLANS AND PROPOSALS:

In England, the Resources and Waste Strategy of 2019 is being followed up with the reading of the Environment Bill, which will require the weekly collection of food waste by all households and businesses from 2023.

A report by the Scottish EPA about plastic contamination in soils.

RECENT UPDATE - CASE STUDY

Contamination of compost and digestate, in particular by plastic, is of increasing concern to regulators. In Scotland, end of waste for compost has a limit of 0.06%, while for digestate the limit is significantly lower than the UK standard PAS110. In England, the regulator is considering the same requirements, whilst also consulting on setting a maximum input level of 0.5% to all bio-waste facilities.

6. Literature

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