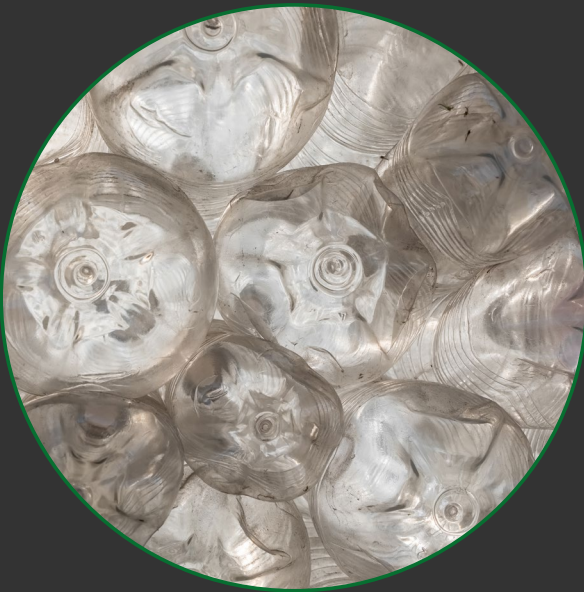


Municipal Solid Waste Recycling Rates Study

The Irish Waste Management Association

Final Report | November 2023



Report For

The Irish Waste Management Association (IWMA)

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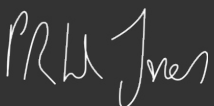
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1 Introduction

Eunomia Research & Consulting Ltd. (Eunomia) was commissioned by the Irish Waste Management Association (IWMA) to explore how Ireland compares with European nations that report the continent's highest recycling rates, once anomalies in reporting practices are corrected for. The study involved:

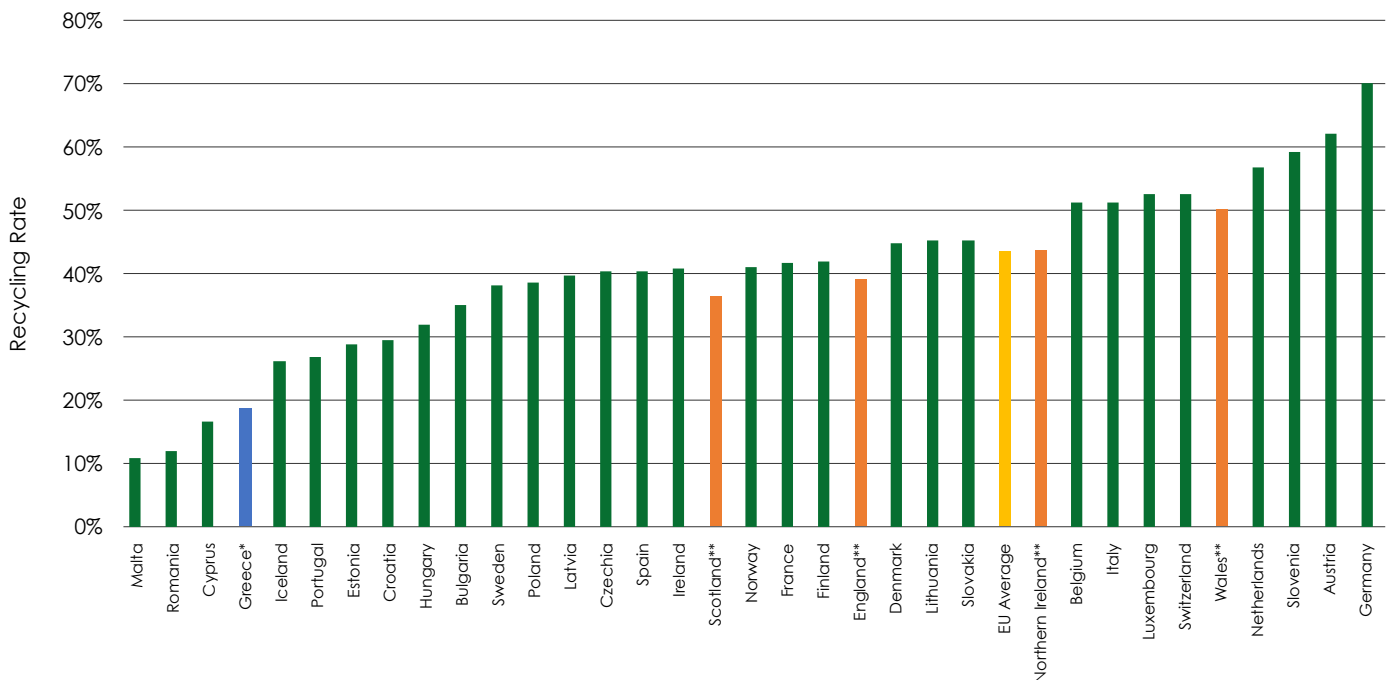
- Summarising, explaining and comparing the principal element of the European Union's (EU's) new 'preparing for reuse and recycling' (commonly abbreviated within this report for convenience to 'recycling') rate calculation methodology in contrast to previous EU calculation methods;
- Analysing Ireland's Municipal Solid Waste (MSW) recycling performance;
- Analysing and standardising, as far as possible, the MSW recycling performance for various leading European countries to produce figures that approximate their recycling rate under the new EU calculation methodology;
- Comparing the data compiled and standardised between Ireland and other countries; and
- Providing a summary of the study's findings in a report.

The countries to be investigated, as far as possible within this study, were Ireland, Germany, Wales, Austria, Belgium, Netherlands, Slovenia, Switzerland and Italy.

1.1 Background

Many countries around the world publish information about national and local recycling performance. Across the EU, Eurostat compiles municipal solid waste (MSW) recycling statistics for each member state.

Figure 1-1: European MSW Recycling Rates 2020



Source: Eurostat, *Recycling rate of municipal waste* available at: https://ec.europa.eu/eurostat/databrowser/view/sdg_11_60/default/table?lang=en NB. Some countries have produced 2021 data, but the 2020 dataset is more complete.

* No 2020 figure has been reported for Greece, so the 2019 figure has been quoted instead.

** UK countries do not produce data for Eurostat. The nearest comparable figures are the "waste from households" statistics published here: <https://www.gov.uk/government/statistical-data-sets/env23-uk-waste-data-and-management>.

When looking to understand which countries have highly effective recycling systems and which do not, it is tempting to compare published recycling statistics to try to identify the high performers. Indeed, the publication of statistical sets such as the Eurostat figures shown in Figure 1-1 invite comparison between countries. However, direct comparisons are problematic. Countries have generally developed their approach to calculating recycling performance based on the data that it was convenient for them to collect, with the goal of tracking changes in performance at a national level. The question of whether they are calculating recycling performance in a similar way to other countries rarely arises.

As a result, there can be substantial differences in factors such as:

- The sources of material that are included within the scope of the recycling calculation (e.g. to what extent waste from businesses is counted towards the recycling rate calculation);
- The types of material that are included within the scope of the recycling calculation (e.g. whether waste building materials or septic tank waste from households are counted towards the recycling rate calculation);
- Whether material recovered from incinerators or from the composting of residual waste can be counted towards the recycling rate calculation;
- The extent to which losses subsequent to waste being collected for recycling are accounted for – so that where non-recyclable material needs to be removed, this is not counted towards the amount of material recycled; and
- Whether material that is composted at source, without needing to be collected and transferred to a composting facility, can be counted towards the recycling rate calculation.

Within the EU, where all Member States have been required to meet common recycling targets, it might be expected that there would be greater uniformity of calculation methodology. However, while recent legislation has sought to standardise the way in which recycling rates are calculated, the full effect of the changes it has introduced has not yet been felt and some differences in calculation method appear to remain in the most recently published data.

The goal of this study is therefore to critically examine the performance of the highest performing nations shown in Figure 1-1 and to understand how Ireland compares with them. This examination is carried out using a range of publicly available data to better standardise the results reported by the high-performing Member States and enable a more accurate comparison of performance to be carried out.

1.2 Report Structure

The remainder of this report is structured as follows:

- Section 2.0 summarises, explains and compares relevant calculation methods for the reporting of recycling rates within the European Union (EU).
- Section 3.0 analyses and compares the selected European countries' (including Ireland) Municipal Solid Waste (MSW) recycling performance.
- Section 4.0 summarises the conclusions of the study.
- The Appendix provides details on the A 1.0 Methodology used in this study and the findings of an A 2.0 EEA Assessment of Member State 'New Rules' Recycling Rates.

Footnotes provide references to the sources of data used in the report.

● 2 Calculation Method Comparison

The challenge that this report seeks to address is that there are inconsistencies in the way that different European countries measure recycling performance. This is a problem that the EU is also seeking to address through legislation, although the full effects of revised rules have not yet been felt in the statistics produced by Member States. In this section we explain the current EU recycling calculation method and how it advances beyond the ways in which recycling rate were previously calculated.

2.1 Summary of EU New Method

The 2018 revision to the EU Waste Framework Directive (Directive 2018/851) – and the subsequent implementing decision on calculation, verification and reporting of data (Decision 2019/1004) – marked a significant advance in ambition regarding recycling in the EU. The 2018 Directive set new, higher recycling targets but also used a broader definition of “municipal waste” than many Member States had previously used, and provided greater clarity regarding the point at which recycling should be deemed to have occurred.

For the first time, the 2018 Directive gave a formal definition of what should be considered to be municipal waste. The definition covers mixed and separately collected wastes from households (including common household items such as WEEE, mattresses, furniture and other bulky waste) and also from other sources where the waste is similar in composition to household waste, which includes a great deal of commercial waste, whether collected by the public or the private sector.

Furthermore, it provided clarity on specific exclusions from the scope of municipal waste, notably “waste from production, agriculture, forestry, fishing, septic tanks and sewage network and treatment, including sewage sludge, end-of-life vehicles or construction and demolition waste.”. This therefore means that certain chapter 20 (municipal) waste codes are not municipal waste (20 03 04 ‘septic tank sludge’, 20 03 06 ‘waste from sewage cleaning’, and 20 02 02 ‘soil and stones’). Furthermore, all DIY waste must certainly be recorded under chapter 17 waste codes as construction and demolition waste, and not considered as municipal waste.

Many Member States had previously considered municipal waste to be the waste which is collected by or on behalf of municipalities (generally, local government bodies). These are typically responsible for collecting waste from households, while the amount of non-household waste that they collect varies. Some collect from most small businesses; some collect only from certain types of non-household premises such as schools and care

homes; and some compete with private sector collectors for business waste. As a result, prior to the 2018 Directive taking effect, the scope of what was considered to be “municipal waste” varied considerably between member states. The new directive provided clarity, with a definition that brings significantly more commercial business waste (dry recycling, organic waste recycling, and residual waste) into the scope of “municipal waste”.

The 2018 Directive also provided greater clarity on the point at which material should be considered to be “recycled”. Both the 2018 Directive and 2019 Implementing Decision were clear that recycling should exclude any losses which occur within the waste collection and processing systems prior to the point at which material is processed into new non-waste materials. Again, this marked a very significant change, as some Member States had been reporting as “recycled” almost all material that was collected for recycling, without factoring in subsequent losses. It also marked a significant point of departure for countries that had been reporting all sorting plant outputs as recycled, without taking into account subsequent process losses that may arise in recycling operations.

Article 3 of the 2019 Implementing Decision further clarifies that recycled municipal waste (i.e., waste at the calculation point) “may include non-targeted materials only to the extent that their presence is permissible for the specific recycling operation”. Full clarity on the meaning of this cannot be provided until the law is tested, but it appears to suggest (and we believe is intended to mean) that deductions do not need to be made for certain inputs into recycling processes, such as inks on paper products which are tolerated in the pulping operations, metal caps / glue / paper labels on glass bottles which are tolerable for the furnace and the resultant quality of cullet (or recovered metal by-product), or a small amount of non-target contaminants from misidentified polymer bottles / labels / caps etc. which are permissible for the recycled material being produced.

We note that the 2018 Directive talks somewhat generally about measuring recycling as it enters a 'recycling operation', and that this may be measured as outputs from sorting operations so long as any other losses prior to recycling are taken account of. However, this wording led to considerable confusion and debate within the material processing and recycling industries, and in subsequent political debates. As a result, the 2019 Implementing Decision provided much clearer prescriptive definitions in order to avoid confusion regarding what constitutes a "recycler" or "recycling operation". Definitions are provided in the implementing decision on a material-by-material basis. These clarify that the point of recycling – the 'calculation point' – occurs at input to a particular kind of facility: a glass furnace, metal smelter, pulping operation, plastics pelletisation/extrusion/ moulding operation, wood particleboard manufacture process etc. The decision clarifies that 'measurement points' may be taken upstream of these points (for example from outputs of sorting operations) but the recycling calculation must take into account any and all losses occurring between the measurement point and the calculation point (e.g., non-target materials, contamination losses, off-spec material, rejected loads etc.).

Additional points of clarification provided within the implementing decision confirm that ash, clinker or mineral products from energetic uses of municipal waste do not constitute recycling. The

one exception to this is for metals separated and recycled after incineration of municipal waste (excluding co-incineration).

A further innovation, which was called for in the 2018 Directive and defined formally in the subsequent implementing decision, was the option for Member States to count towards their recycling performance any municipal "bio-waste separated and recycled at source" (i.e., home composting). This allows "food and kitchen municipal bio-waste" and "garden and park municipal bio-waste" which is separated and recycled (composted) to be counted towards the municipal waste recycling statistics. A challenging set of direct or indirect measurement approaches are prescribed for calculating the amounts recycled. However, where biowaste recycled at source is less than 5% of municipal waste, a simplified and less onerous calculation approach is allowed, based on surveys and predetermined coefficients.

Article 4 of the implementing decision stipulates that, beyond 1st January 2027, municipal biowaste only counts as recycled if it is separately collected at source, or if it is collected together with waste of similar biodegradability and compostability properties (e.g., allowing for food waste, garden waste and biodegradable food waste bags to be collected together). This means that "compost" derived from mixed waste will no longer be allowed to contribute towards recycling targets.

2.2 Summary of Differences from EU Old Method

The 2008 update to the EU Waste Framework Directive (2008/98/EC) – and the subsequent implementing decision (2011/753/EU) – provide the “old rules” for calculating recycling rates, and apply to the 2020 recycling target. These old rules allowed four different calculation methods. Methods 1-3 relate only to subsets of total municipal waste, and so are considerably different from the recycling target under the 2018 Directive; only method 4 related to all municipal waste (though without a clear definition of what constituted “municipal waste”) and is the relevant method against which to compare the new calculation system.

The key changes in how municipal waste preparation for reuse and recycling are accounted for under the new EU rules (compared to method 4 of the old rules) are as follows:

- Recycling should be reported as amounts entering the final step in recycling chains for individual materials. The final step is one which process waste into non waste materials – e.g., metal furnaces, glass smelters, glass filter material production, fibre pulping operations, plastics extrusion processes, wood particleboard manufacturing, textile fibre or rag manufacturing etc. This therefore requires exclusion of all rejects, contamination and losses in sorting processes. It also requires exclusion of all rejects, contamination and losses which occur at recycling facilities prior to the final step which produces non-waste products.
- All construction and demolition waste (e.g., DIY waste from households) should be excluded from municipal waste.
- Septic tank sludge and sewage cleaning waste (which have the chapter 20 waste codes of 20 03 04, and 20 03 06) are not municipal waste and should be removed from the statistics. The same is the case for soil and stones (20 02 02).
- Biowaste which is separated and recycled at source (e.g., home composting, municipal parks waste composting) can be included within municipal waste, subject to specific rules on direct and/or indirect measurement.
- Any compost which is derived from mixed (residual) waste collection will not be allowed to contribute to recycling rates beyond 1st January 2027.

- Ash and clinker from incineration, co-incineration or other energetic use of waste may not be included in amounts recycled. However, metals recovered for recycling after incineration (but not co-incineration) of municipal waste can be included in amounts recycled.
- The scope of municipal waste is wider than that previously applied by many countries. All waste similar to household waste from commerce and industry should be counted as municipal waste, irrespective of who collects it.

It is taking some time for some countries to adapt to the new methods, as doing so requires considerable improvements to data collection to expand availability and increase resolution. One obvious example is where Member State definitions of municipal waste defined it as waste collected by municipalities; in many cases, new data collection systems are having to be implemented to capture data on private sector collections of (typically) commercial waste.

While the changes introduced by the 2018 Directive should lead to far greater uniformity in how recycling rates are calculated by different EU Member States, some points of difference remain. Some of the reporting elements are optional (e.g., home composting), which introduces some new areas for potential divergence in the reporting approaches adopted by different countries. Other data availability problems may lead to further differences in approach until improved data collection can be embedded in national systems (e.g., some countries not being able to resolve between preparation for reuse and recycling, or who don't have good national waste composition data that would enable them to provide a breakdown of municipal waste generation.

2.3 Data Collection

Since 1988, the OECD has been collecting data on municipal waste on an annual basis via a questionnaire to contributing countries. The most recent form of this data collection is a 'joint questionnaire' spreadsheet issued (jointly) by Eurostat and the OECD. The main features of this are shown in Figure 2-1. As this was a voluntary questionnaire to Member States and other OECD countries, no legally binding requirements regarding the calculation rules were set.

Figure 2-1: Eurostat and OECD Joint Questionnaire on Generation and Treatment of Municipal Waste

Generation and treatment of municipal waste (Eurostat and OECD Joint Questionnaire) (In this questionnaire, please only report those parts of waste that fall under the definition of municipal waste)					
Country:					
Reference year:	2020				
Municipal Waste	WST_OPER	UNIT	DATA	Standard footnote	Explanatory footnote
Total municipal waste generated*	GEN	Tonnes			
Waste generated by households (OECD)	GEN_HH	Tonnes			
Waste generated by other sources (OECD)	GEN_OTH	Tonnes			
Separate collection (of total municipal waste generated)	COL_SEP	Tonnes			
Municipal waste treated (of the waste generated, no matter in which country)*	TRT	Tonnes			
Recovery	ACV	Tonnes			
Preparing for reuse	PRP_REU	Tonnes			
Recycling - material	ACY_M	Tonnes			
of which Metal recycling from incineration bottom ash	ACY_M_JBA	Tonnes			
Recycling - composting and digestion	RCY_C_D	Tonnes			
of which separate collection and recycling of biowaste at source - e.g. home composting	COL_SEP_RCY	Tonnes			
Recovery - energy recovery (R1)*	RCV_E	Tonnes			
Recovery - other*	RCY_OTH	Tonnes			
Disposal	DSP	Tonnes			
Disposal - incineration (D10)*	DSP-I	Tonnes			
Disposal - landfill (D1, D5, D12)*	DSP-L	Tonnes			
Disposal - other (D2-D4, D6-D7):(OECD)	DSP_OTH	Tonnes			
Coverage of the collection system (share of population covered by the data)	COV	%			

*Mandatory from reference year 2020 onwards according to Commission Implementing Decisions 2019/1004 and 2019/1885

Cell Shading:

White: Data provision is required
Light Grey: The filling is taken over from table 2. The cell can as well be withdrawn
Light Orange: Footnotes (only to be filled in when relevant)
Light Green: Variable collected only from OECD countries

The 2019 implementing act defined a new broader set of data reporting requirements, which was developed into a MS Excel questionnaire by Eurostat (see figure 2-1). This resides (as Table 2) in the same data gathering spreadsheet as the Joint Questionnaire. 2020's waste data (the submission deadline for which was the end of June 2021) was the first for which reporting according to the new calculation rules and in the new reporting formats was mandatory. Although this data is currently being collected by Eurostat, it has not yet been made publicly available. It is, therefore, not yet publicly known whether Member States

are fully and accurately applying the new rules within the new data reporting requirements, or to what extent the results will differ from the Joint Questionnaire reporting (which is publicly available on the Eurostat and OECD websites). However, the questionnaire spreadsheet says that the OECD data reporting should now be aligned with the new rules.

From our investigations laid out in the subsequent sections of this current report, it is clear that countries are attempting to adapt to the new rules, but for a diverse set of reasons, it appears that the reporting falls short of full new rule compliance.

2.4 Approach to Standardising Recycling Rates

The approach adopted within the study is, as far as possible, to align the results for each country with the latest EU reporting requirements. However, in two respects it has not proved possible to reach full consistency:

- While home composting occurs in all of the countries within the scope of the study, not all report it. Since it is consistent with EU reporting rules to count home composting towards recycling performance, we have not removed this material when amending recycling rates. However, we cannot know the extent of home composting in the countries that do not currently report it, and so have not sought to add in an estimate of home composting for countries where this is absent. This therefore remains a point of inconsistency between countries in the study.
- Information regarding loss rates for material after it has been sorted is very limited, and it is difficult to determine the extent to which

different countries have accounted for this in their reporting, especially where material is being exported for reprocessing. We have sought, as far as possible, to make allowance for contamination in material that is destined to be input into the final recycling process, but have not sought to correct for additional losses that may occur. It is therefore likely that, if some countries are not fully accounting for subsequent losses, the performance figures reported in this study will somewhat overstate their recycling rate compared with strict adherence to the latest EU reporting rules, and such countries may be advantaged against those that are fully accounting for losses. The possible extent of such losses are summarised in the “*recycling loss*” rows of Figure 2-2.

- All recycling rates are inclusive of any preparation for reuse that is taking place within the country.

Figure 2-2: Losses Incurred in Sorting and Recycling Processes within the European Union¹

	PLASTICS	GLASS	PAPER/BOARD	METALS	WOOD
Sorting Loss					
- Household	25%	8%	4%	5%	5%
- Commercial/Industrial	5%	1%	2%	2%	10%
Recycling Loss					
- Household	29%	5%	10%	14%	-
- Commercial/Industrial	5%	5%	10%	14%	11%

¹ EXPRA [Extended Producer Responsibility Alliance] (2014), The effects of the proposed EU packaging waste policy on waste management practice - A feasibility study, available [here](#).

Figure 2-3: New Data Reporting Format (to be reported following the 'new rules') according to Implementing Decision (EU) 2019/1004

Table 2 - material breakdown according to Implementing Decision 2019/1004/EC Annex V

Country:																					
Reference year:																					
Codes	Municipal waste	List of Waste codes (LoW) (for generated amounts only)	Municipal waste generated (tonnes) ⁽¹⁾	Explanatory footnote	Standard footnotes	Separate collection ⁽⁸⁾ (tonnes)	Explanatory footnote	Standard footnotes	Preparing for reuse (tonnes)	Explanatory footnote	Standard footnotes	Recycling (tonnes)	Explanatory footnote	Standard footnotes	Energy recovery (tonnes) ⁽²⁾	Explanatory footnote	Standard footnotes	Other recovery (tonnes) ⁽³⁾	Explanatory footnote	Standard footnotes	
TOTAL	Total																				
W063_122_MUN_INC	Metals	20 01 40, 15 01 04, 15 01 11*																			
W064_122_MUN_INC	Metals separated after incineration of waste ⁽⁴⁾	20 01 40, 15 01 04, 15 01 11*																			
W071_MUN	Glass	20 01 02, 15 01 07																			
W074_MUN	Plastic	20 01 39, 15 01 02																			
W072_MUN	Paper and cardboard	20 01 01, 15 01 01																			
W091_092_MUN	Bio-waste	20 01 08, 20 01 25, 20 02 01																			
W091_092_MUN_S	Bio-waste separated and recycled at source ⁽⁵⁾	20 01 08, 20 01 25, 20 02 01																			
W075_MUN	Wood	20 01 37*, 20 01 38, 15 01 03																			
W076_MUN	Textiles	20 01 10, 20 01 11, 15 01 09																			
W082_84_MUN	Electrical and electronic equipment	20 01 21*, 20 01 23*, 20 01 35*, 20 01 36																			
W0841_MUN	Batteries	20 01 33*, 20 01 34																			
W1011_MUN	Bulky waste ⁽⁶⁾	20 05 07																			
W1011_1021_MUN	Mixed waste	20 05 01, 15 01 06																			
MUN_OTH	Other	See below ⁽⁷⁾																			

Notes:
 Cell shading:
 White: Data provision is required.
 Light blue: provision of data is voluntary.
 Light orange: Footnotes only to be filled-in when relevant)
 Black: Reporting is not applicable.

⁽¹⁾ The amount of generated waste per material may be based on data on separately collected waste and on estimates derived from regularly updated waste composition surveys of municipal waste. Where no such surveys are available, the category of mixed waste may be used. The concept of municipal waste generated is the same as in Table 1 - IQ Format. The LoW codes relate to the generated quantities only, other codes e.g. chapter 19 / 10 / 19 12 would relate to waste treatment.
⁽²⁾ This includes incineration with energy recovery and the reprocessing of waste to be used as fuel or other means to generate energy. The weight of waste subject to energy recovery per material may be based on estimates derived from regularly updated waste composition surveys of municipal waste. Where no such surveys are available, the category of mixed waste may be used.
⁽³⁾ This excludes preparing for reuse, recycling and energy recovery, and includes backfilling.
⁽⁴⁾ Metals separated after incineration of municipal waste shall be reported separately and shall not be included in the row for metals and in the total amount of waste entering energy recovery operations.
⁽⁵⁾ Bio-waste separated and recycled at source shall be reported separately and shall not be included in the row for bio-waste.
⁽⁶⁾ This includes large dimension waste items which require specific collection and treatment such as furniture and mattresses.
 Note: as you move through the waste process (e.g. from waste generation to recycling) there will be no bulky waste (e.g. under recycling) as this will be broken down by then.
⁽⁷⁾ 20 01 13*, 20 01 14*, 20 01 15*, 20 01 17*, 20 01 19*, 20 01 21*, 20 01 23*, 20 01 24*, 20 01 26*, 20 01 27*, 20 01 28, 20 01 29*, 20 01 30, 20 01 31*, 20 01 32, 20 01 41, 20 01 99, 20 02 03, 20 03 02, 20 03 03, 20 03 99,
⁽⁸⁾ Proportion of municipal waste generated that is collected separately - this does not equal the sum total of the subsequent columns.

● 3 Recycling Performance of Selected European Countries

In this section we examine what can be determined regarding the recycling performance of the countries within the scope of the study.

3.1 Main Goals and Challenges

The data assessments conducted for this current report focus on data for 2020. This year was chosen due to the change in the EU reporting systems, as it was the first year when reporting under the new calculation format against the new calculation rules became mandatory. Using 2020's data therefore should have eliminated many of the inconsistencies tolerated in previous years' reporting.

In the course of the project, it was possible to obtain the Eurostat 2020 municipal waste data questionnaire for Ireland from the Irish EPA. While this revealed useful data relating to Ireland's reporting, we did not have access to the same data for other countries, so we were reliant on public data sources. This means that the level of detail, and thus the precision that can be achieved, varies between countries.

One issue affecting waste generation, and potentially also performance, in 2020 was the lockdowns and economic turmoil arising as a result of COVID-19, which swept across Europe from around quarter 2 of that year. While for countries, such as Ireland, that have well established digital

data recording and reporting, this ought not to affect the quality of waste-related information, the pandemic gave rise to changes (reduction in commercial activity and a shift to home working, disruption to waste collection services) that may have affected:

- The volumes of household and commercial waste;
- The ability of providers of waste services to maintain normal operation; and
- The ability of national waste data managers to identify inconsistencies or issues with the statistics.

While a general trend of reduced commercial waste and more household waste than a 'normal' year can be expected, the extent to which this would have affected recycling rates is less easy to predict or observe. On balance, it was considered that the advantages of using data compiled under the new EU reporting rules outweighed the disadvantages of using information that may not reflect normal waste arisings or management practices.

3.2 Ireland

Ireland reported a municipal waste preparation for reuse and recycling rate of 41% for 2020. The Irish EPA estimates that this represented approximately a 2-percentage point increase in like for like recycling from the previous year, with a further 2 percentage point increase due to applying the new EU calculation rules.² The more historic recycling data shows performance to be relatively stable, fluctuating only between 36% and 41% since 2012.

Ireland seems to have effective reporting of municipal waste and makes use of data from the Central Statistics Office (CSO) to make estimates for uncollected or unmanaged waste, which may mean that Ireland is adopting a more thorough approach to accounting for municipal waste arisings than other countries do. Its estimates appear to account for waste from both households and businesses.

Of the total municipal waste generated in Ireland in 2020, 39% (1.26 million tonnes) was exported in 2020. This represents a small reduction from

the 40% (1.24 million tonnes) exported in 2019, despite municipal waste generation being higher than in 2019. Over half of the exported waste was recycled (57%, or 718,000 tonnes) with a third (409,000 tonnes) going for energy recovery, and 8% going to composting or for anaerobic digestion.

Ireland differs from other EU Member States in its approach to household waste management. Where most countries give substantial responsibility for household waste management to municipal authorities, in Ireland the collection system largely operates as a private market, with householders responsible for selecting a waste collector and paying for their services. Waste companies typically offer customers three bins (mixed recycling, mixed organics and mixed residual collection bins). While collections of organics are not yet universal, it is expected that they will be offered to all households in Ireland in 2024 under the requirements of the European Union (Household Food Waste and Biowaste) (Amendment) Regulations 2023, currently in draft and due to be finalised shortly.

² EPA (2020), *National Waste Statistics Summary Report*, Footnote 10, available [here](#).

3.2.1 Research Findings

3.2.1.1 Data Sources and Quality

- The EPA collects and reports Ireland's annual municipal waste data. Data is summarised on the EPA website,³ and in a summary report.⁴
- In addition, Eunomia obtained Ireland's annual Eurostat municipal waste questionnaire for 2020 from the EPA. The OECD and Waste Framework Directive (WFD) data within the Eurostat 2020 questionnaire align, and the associated explanations in the linked 'Quality Reports' mean Ireland's publicly published national data (on the Eurostat, OECD and EPA websites) is attempting to follow the new calculation rules for all reporting, rather than maintain two (or more) different calculation approaches. The quality report information indicates the EPA attempts to adjust to the new rules in the following ways:
 - Biowaste recycled is taken as the input to composters and digesters minus material removed post composting (assumed as contaminants), and adjustments made where the process does not produce a recyclable output (good quality compost or digestate).⁵
 - The approach taken to dry recyclable materials is explained as follows: *"At the calculation point for material that is finally treated or reaches End-of-waste in Ireland and at export for material that is exported abroad for final treatment."*⁶
 - *"Pure material streams that are exported abroad for recycling are segregated to ensure that only one type of material is present, and they are generally of good quality. These single material streams either stem from separate collections at source or are separated from mixed recyclable collections. We ask the waste operators exporting the waste to provide recycling percentages for final treatment facilities abroad. However, for 2020 this information was incomplete."*⁷

- The EPA provides extensive responses to most of the Quality Report questions within the Eurostat questionnaire (for both the OECD and WFD data). It is evident that the EPA goes to great lengths to understand and crosscheck data from different sources, and provides detailed responses to points to be addressed within the quality reports. Any concerns on quality for the Ireland data are, therefore, limited to aspects of operational waste practices beyond the EPA's reach (e.g., misreported activity, or management of exported materials).

3.2.1.2 Anomalies

- Of the total municipal waste generated in Ireland, 39% (1.3 million tonnes) was exported in 2020, according to the National Waste Statistics.
 - 8% of this (104,000 tonnes) was organic waste. Correlation against the 2020 green list export data from the National Trans-Frontier-Shipments Office, confirms that this was material exported to Northern Ireland for composting.
 - 57% of the exports (741,000 tonnes) were dry recyclables, representing 77% of total dry recycling for 2020. While the EPA has found that *"about a third of the waste placed in household recycling bins is not recyclable and belongs in the residual waste or organic bin,"*⁸ the Eurostat quality report explains that recyclables are sorted to a high quality before export. However, it appears that Ireland does not account for the small amount of remaining contaminants in its exported materials, or for subsequent losses prior to input into the final recycling process when waste is exported
- Recent work on textiles in Ireland⁹ indicates that in 2019 some 57,500 tonnes of textiles generated in Ireland were re-used in Ireland or abroad, with much of this material being

³ EPA (2020), *Municipal waste statistics for Ireland*, available [here](#).

⁴ EPA (2020), *National Waste Statistics Summary Report*, Footnote 10, available [here](#).

⁵ EPA (2022) *WFD questionnaire quality report*, Q3.2.2

⁶ EPA (2022) *WFD questionnaire quality report*, Q3.2.4

⁷ EPA (2022) *WFD questionnaire quality report*, Q3.2.4

⁸ EPA (2020), *National Waste Statistics Summary Report*, p30, available [here](#).

⁹ EPA (202021), *Nature and Extent of Post-Consumer Textiles in Ireland*, available [here](#).

classed as non-waste and sent for reuse in developing countries. However, the Irish Environmental Protection Agency counts only the small share of such material that is counted as recycled or prepared for reuse towards the recycling and reuse statistics, which appears to be a smaller share of textiles than other similar countries recycle or prepare for reuse.

3.2.2 Data Analysis

3.2.2.1 Standardisation Amendments

- Ireland produces good quality material for export, but does not account for remaining contaminants in its exported materials. We have therefore applied a small downward adjustment to reflect non target material that is exported:
 - 2% adjustment in dry recycling contamination.
- There were no adjustments made to the total MSW calculations for Ireland and it is assumed that the reporting is being done correctly as per the European Commission requirements for 2020.

3.2.2.2 Patterns

- Total MSW was 644 kg/capita (as reported in EPA National Waste Statistics), which is higher than the reported EU average of 521 kg/capita – though this EU figure has not been standardised to address differences in how far waste from non-household sources is counted towards different countries' figures.
- Organic waste accounts for around 37% of household recycling tonnages.
- Within its statistics, Ireland accounts for 15%

of plastics being lost between collection and reprocessing. This shows Ireland to be endeavouring to track such losses, which are a feature of all collection systems, though not always well accounted for in countries' recycling statistics. The losses that Ireland recognises are somewhat lower than studies suggest to be typical;¹⁰ plastic sorting losses from household collections can often reach 25%, while more recent data viewed by the consultants suggest that losses throughout the whole plastics recycling value chain could be higher still. It is possible that, despite the losses already accounted for, Ireland's data understates the losses of plastic through the value chain, but the evidence for this is not sufficiently strong to justify an amendment.

- Similarly, there may be losses at the recycling stage for all dry recycling, prior to the calculation point, that are not currently accounted for in Ireland's data. However, due to lack of data, no deduction has been made to account for this.
- In 2020, the latest date for which data is available, 62.4% of packaging waste was recycled. The biggest contributor to this recycling rate was paper & cardboard (50.9%), followed by glass (22.3%) and plastic (12.9%).

¹⁰ EXPRA (2014), *The Effects of the Proposed EU Packaging Waste Policy on Waste Management Practice - A feasibility study*, available [here](#).

3.2.3 Trends

- Ireland's captures of biowaste from households are likely to increase once it becomes mandatory for waste collectors to offer all householders a biowaste bin – a requirement expected to be implemented in the near future.
- Ireland has recently introduced a new law which promotes better use of the three-bin system by all commercial premises. The recycling services must be lower cost than residual collection. This is designed to incentivise recycling over disposal and improve the current use of recycling services by businesses.
- A DRS for PET bottles and aluminium cans is set to be introduced in Ireland, due to go live from February 2024. This has the aim of boosting recycling rates and contribute to meeting EU targets for separately collecting 77% of plastic beverage bottles placed on the market by 2025, and 90% by 2029, but will change the composition and value of dry recycling collected from households and businesses.
- A new waste recovery levy of €10 per tonne, and a €10 increase in the landfill levy were introduced in September 2023. By increasing the cost of waste disposal and energy recovery, these are intended to provide an additional financial incentive to households and businesses to recycle.

3.2.4 Impact of Divergences

- The amendment made to Ireland's recycling statistics to better align them to the European Commission's reporting system leads to:
 - A household recycling rate of 40.2%
 - A non-household recycling rate of 40.2%
 - An overall municipal recycling rate of 40.2%

3.3 Wales

Wales reported a municipal recycling rate of 65.4% in 2020/21, the highest rate that the country had achieved to that point. On any measure, Wales is the leading recycling nation within the UK, considerably exceeding the performance of England, Scotland and Northern Ireland.

The country's reported recycling rate has increased dramatically since the introduction of a new waste strategy, *Towards Zero Waste*,¹¹ in 2010. The strategy set long term, escalating recycling targets for local authorities in Wales, backed by financial penalties if the targets were missed. Local authorities have a statutory duty to arrange for the collection of household waste, and a duty to collect commercial waste if requested to do so. Some Welsh authorities, especially in rural areas where there is limited competition, have substantial commercial waste portfolios, but the great majority of municipal waste from non-household sources is collected by the private sector in a competitive market, and the data available on this waste is relatively poor.

To back up its strategy, the Welsh Government has provided financial support to enable local authorities to plan and implement service changes. In response, most local authorities have adopted the Welsh Government's preferred model for household waste collection, in which collection operatives sort dry recyclable materials at the kerbside onto a multi-compartment vehicle. This helps to minimise contamination and the need for subsequent sorting. All have also implemented collection of food waste and garden waste. Several have taken measures to greatly constrain the amount of residual waste that householders are able to dispose of, whether through reducing the volume of waste picked up on each collection (e.g. Monmouthshire) or reducing the frequency of collections to three weekly (e.g. Pembrokeshire, Powys) or even four weekly (e.g. Conwy). Almost all local authorities have succeeded in meeting the Welsh Government's targets, which culminate in a goal of reaching 70% by 2024/25.

3.3.1 Research Findings

3.3.1.1 Data Sources and Quality

- The quality of data available regarding local authority collected waste is good. Data is reported quarterly through a system called WasteDataFlow and is validated by the Government. There is comprehensive guidance and reasonable efforts are made to account for factors such as rejects and sorting losses.
- Nevertheless, it is difficult to precisely replicate Wales's published recycling performance because the detailed published data often concerns material as collected, while the recycling performance is calculated on the basis of material treated and includes contributions from sources such as incinerator metals and incinerator bottom ash.
- The published recycling rate and the targets only reflect waste collected by local authorities.

While this includes some commercial waste that is collected by councils, there are no targets and no annual data concerning the much larger quantity of non-household municipal waste collected by the private sector. The latest available data source is a national survey that relates to 2018.¹² The survey follows a broadly reasonable methodology, but is inherently less reliable than the local authority data, as it relies on a somewhat self-selecting sample of businesses (which may have led to an over-representation of those more engaged with waste issues), estimates of the weight of material based on bin volumes, and the surveyed businesses being aware of the end destination of their waste. It is also challenging to disaggregate municipal waste from other types of non-household waste.

¹¹ Welsh Government (2010), *Towards Zero Waste. One Wales: One Planet*, available [here](#).

¹² Natural Resources Wales (2021), *Survey of Industrial and Commercial Waste Generated in Wales 2018*, available [here](#).

3.3.1.2 Anomalies

- Wales is not part of the EU, and is not required to adopt the calculation method for municipal recycling rates specified by the European Commission. Its calculation method therefore diverges substantially from the new EU method.
- Wales does not claim any home composting towards its recycling rate, and distinguishes clearly between wood that is recycled and material that is incinerated.
- Wales's recycling rate calculation method also differs from the system used in other parts of the UK. When calculated on the same basis as the rest of the UK, and looking only at waste from households, Wales's recycling rate for 2020 was 56.5%, compared to 44.0% for England.¹³
- The biggest factors driving the difference are:
 - Over 140,000 tonnes of C&D waste (rubble, plasterboard, soil) are counted towards the recycling rate. This material would not be classified as municipal waste under EU definitions, and contributes to a very high level of recycling performance for Wales's reported non-household waste management.
 - 90,000 tonnes of incinerator bottom ash counted towards the recycling rate.
 - The 2018 Industrial and Commercial Waste Survey is the best available information on businesses' waste management in Wales. It reports a recycling rate of 64.4% for commercial waste. However:
 - It includes within its definition of commercial waste a number of materials that would not fall within the definition of non-household municipal waste.
 - It measures material at the point of collection, rather than at the point of entry into the final recycling process, and therefore does not account for contamination.
 - It applies an unduly heavy bulk density to mixed recycling, which will tend to overstate the recycling rate.

3.3.2 Data Analysis

3.3.2.1 Standardisation Amendments

- In order to bring Welsh municipal statistics into line with the European Commission's reporting requirements, Eunomia has:
 - Removed all C&D waste from the figures (both arisings and recycling).
 - Removed incinerator bottom ash recovered from incinerators.
 - Removed all non-household materials, as these would otherwise be double counted once results from the I&C survey are included.
- In order to bring the Welsh I&C survey figures into line with the European Commission's reporting requirements, Eunomia has:
 - Removed all wastes that would not be classed as household like from the data (both arisings and recycling)
 - Applied contamination estimates derived from recent compositional analysis of commercial waste and reduced reported recycling accordingly.
 - Scaled down the bulk density of mixed recycling, which reduces its contribution to recycling performance.

¹³HM Government (2022), *UK Statistics on Waste data 2022*, available [here](#).

3.3.2.2 Patterns

- Following amendments to the data, Wales's total municipal waste was calculated as 983 kg/capita, a significant increase from the initial reported 486 kg/capita. This is due to the addition of C&I waste according to the Welsh I&C survey (1,714,694 tonnes).
- Both garden waste and food waste are collected by all councils in Wales. Composting makes up around 22.5 percentage points of the household recycling rate. This is approximately equally split between garden waste (146,000 tonnes) and food waste (142,000 tonnes) with a further 10,000 tonnes of other compostable material.
- Paper and card is the biggest contributor to household dry recycling, at around 10 percentage points. This is followed by glass (8%) and metals and plastics (both around 4%).
- In non-household recycling, garden waste is a very small contributor, with less than 30,000 tonnes being reported as composted (or less than 2 percentage points of the recycling rate). The biggest contributors to non-household recycling are paper and card (23 percentage points, the vast majority being card), mixed recycling for which there is no clear composition (8 percentage points – again, likely to include a lot of card).
- Bulky waste, textiles and WEEE are all very small contributors to recycling performance.
- Wales does not currently publish packaging capture rates because placed on the market data is only available at the UK level.

3.3.3 Trends

- Wales is continuing to target further increases in recycling performance. For household waste, efforts are likely to focus on the authorities that do not currently meet the 70% target for 2024/25, which include Cardiff, the country's largest city. Many of these authorities are in the process of introducing new changes.
- Wales is in the process of implementing new requirements on businesses to source separate waste into at least three dry recycling streams plus food waste. These new requirements are expected to take effect in 2024, and if enforced could greatly increase recycling from businesses.
- Along with the rest of the UK, Wales is expected to implement extended producer responsibility for household packaging in 2025, which will potentially give rise to new funding for household collections, which may enable services to be further improved. It will also be likely to allow packaging capture rates for each constituent country of the UK.
- Along with the rest of the UK, Wales is expected to implement a DRS for certain beverage containers. This will increase overall captures of the target materials, which in Wales will include glass, metal and plastic containers. However, the model currently envisaged would divert recyclable material away from local authority and commercial waste collections, which may reduce the reported recycling rate for local authorities in future years – though it should improve the overall national figures.

3.3.4 Impact of Divergences

- Amending Wales's recycling statistics to better align them to the European Commission's reporting system leads to:
 - A household recycling rate of 55.9%
 - A non-household municipal recycling rate of 47.9%
 - An overall municipal recycling rate of 51.3%

3.4 Germany

According to published (OECD and Eurostat) statistics, Germany has already surpassed the EU target of 65% by 2035, as the country reported a recycling rate of 67.4% in 2020. Germany's recycling rate was already at a high level in 2002 with 56.1%, nearly double the then European average of 30.4%, and has increased steadily since. Germany is considered to be one of the best recycling countries in the world.

Germany has achieved a high level of performance through a number of measures that were established decades ago. For example,

Germany introduced producer responsibility for packaging in 1991, and subsequently extended the scheme to materials such as plastic, metal and composites. Germany started a Deposit Return Scheme (DRS) for glass, metal and plastic beverage containers in 2003, which contributed to the increase in recycling the following years, and achieves a return rate of 98%. Germany also implemented waste segregation at source, with the application of the Waste Management Act (KrWG), which made the sorting for organic waste, paper, metal, plastics and glass mandatory from 2015.

3.4.1 Research Findings

3.4.1.1 Data Sources and Quality

- As part of the EU, Germany is required to report waste in line with the prevailing EU reporting rules. Data is available through Eurostat and the OECD, and the two sources are consistent regarding the amount of waste generated and recycled. However, the proportion that is attributed to household waste differs between the datasets. Eurostat indicates that 72.2% of the MSW is from households, whereas OECD indicates 76.5% of MSW is household waste.
- There are a number of data sources providing MSW figures, including the Federal Statistical Office. However, many of these are contradictory, with total MSW values ranging from 39.6m tonnes to 53.3m tonnes, even within the Federal Statistical Office datasets themselves. It is likely that the lower values only included C&I waste co-collected with household, although the data set was described as including "*Household waste, commercial waste similar to household waste*".

3.4.1.2 Anomalies

- Even in the Eurostat figures, it is unlikely that all non-household municipal waste was included, as household waste made up 72.2% of the waste, whereas it would be expected

that around 35-50% of waste would come from businesses. Also, of the non-household waste that was reported by Germany, very little was recycled, and it appears that some non-household recycling may be included in Germany's household waste figures.

- Germany's reporting counts all inputs to "*material recycling facilities*" as recycled. It is not wholly clear whether "*material recycling facilities*" refer to sorting facilities or recycling facilities, but it appears that the former is intended and that contamination is likely to be underestimated.
- No over counting of C&D waste, wood, or incinerator bottom ash was observed from the data available. Where C&D waste is seen in the data, this is clearly labelled separately in total waste figures, and not included in municipal waste values.
- From the available data, Germany does not appear to include home composting or metals from IBA within its recycling rate, although it would be entitled to do so.

3.4.2 Data Analysis

3.4.2.1 Standardisation Amendments

- In order to bring Germany's reported figures in line with the method set out by the European Commission, Eunomia made a number of alterations to the data:
 - Addition of C&I waste tonnages (14,128,504 tonnes) to total municipal waste to reflect a 60:40 split of household and non-household waste, similar to that found in other similar countries such as Austria and Belgium. It was assumed that 45% of the additional C&I waste was recycled based on C&I recycling rates reported in the Federal Office of Statistics waste balance report.¹⁴ However, we did not seek to reallocate any household recycling to non-household, as there was no data to enable us to estimate the quantity that may have been wrongly attributed. This results in an anomalously high household waste recycling rate, paired with a low non-household rate.
 - Germany reports inputs to MBT as all being recycled. In fact, only 6% of material input to MBT goes on to processes that would count as "recycling" under EU definitions.¹⁵ Therefore, 2,236,022 tonnes material were removed from recycling.
 - As reporting accounts for materials input into material recycling facilities, Eunomia has applied a 13% deduction to dry recycling to reflect likely levels of unaccounted for contamination.

- A 10% unaccounted for contamination rate was assumed for organics, in line with findings from a previous Eunomia study.¹⁶

3.4.2.2 Patterns

- Following amendments to the data, Germany's total municipal waste was calculated as 811 kg/capita, a significant increase from the initial 641 kg/capita (OECD), but yields a result not greatly out of step with other countries.¹⁷ This is due to the addition of large quantities of apparently absent C&I waste to the data (14.1m tonnes).
- Food and garden waste account for 31% of household recycling, and are estimated to account for 14% of non-household municipal recycling. The separate collection of organic waste from households became mandatory in Germany in January 2015 and this well-established service is likely to be a contributing factor to the significant contribution made by organics.
- Paper and card is the biggest contributor to municipal dry recycling, at around 54 percentage points. This is followed by glass (20%) and WEEE (5%).
- In 2020, the latest date for which data is available, 68.2% of packaging waste was recycled. The biggest contributor to this recycling rate was paper & cardboard (54.2%), followed by glass (19.5%) and plastic (11.9%).

¹⁴ Federal Office of Statistics (2022), *Abfallbilanz*, available [here](#).

¹⁵ Deutsche Gesellschaft für Abfallwirtschaft e.V. (2016), *Quotenzauber Neue Berechnungsgrundlagen als Herausforderungen für die deutsche Kreislaufwirtschaft*, available [here](#).

¹⁶ Eunomia (2017), *Recycling – who really leads the world?*, available [here](#).

¹⁷ OECD Data, *Municipal waste*, available [here](#).

¹⁸ Federal Government and the Federal States, *Waste Prevention Programme*, available [here](#).

3.4.3 Trends

- Germany's waste prevention programme (2021-2027) contains the following quantitative targets¹⁹:
 - 70% of beverage containers to be reusable.
 - Halve food waste per capita by 2030.
 - Continue to decrease municipal solid waste at a similar rate to that achieved in 2004-2018.
- Germany will extend the EPR for certain single-use plastic items from the beginning of 2024, including beverage cups, plastic bags and food packaging.

3.4.4 Impact of Divergences

- The amendments made to the Germany's recycling statistics to better align them to the European Commission's reporting system (within the limits of our knowledge from data sources assessed) leads to:
 - A household recycling rate of 76.9%
 - A non-household municipal recycling rate of 25.9%
 - An overall municipal recycling rate of 56.7%

3.5 Austria

Austria reported a municipal recycling rate of 62.3% in 2020 and has been reporting consistently high levels of recycling for at least two decades. In the early 2000s, Austria reported recycling rates of 62-64%, which then dropped below 60% from 2010 to 2019 before rebounding in 2020. However, there was a break in the data series in 2020 that makes this year's data not directly comparable with previous years – the changes are explained in the sections below.

Austria has had widespread separate collections of organic waste across the country since 1995,

which is likely to have contributed to the high level of recycling. Household waste collections are the responsibility of local municipalities, and each household generally receives bins for paper, plastic and organic waste. Households are also required to separate their metal, coloured glass and clear glass waste, which they can deposit at central collection points.

Austria introduced EPR in 2002, which applies to WEEE, batteries and packaging. At the beginning of 2023, Austria extended EPR obligations for online platforms that sell in the country.

¹⁹ European Environment Agency (2023), Country profiles on waste prevention - Germany Profile, available [here](#).

3.5.1 Research Findings

3.5.1.1 Data Sources and Quality

- As a member of the EU, Austria is required to report waste in line with the prevailing EU reporting rules. Data is available through Eurostat and the OECD, and the two sources are consistent regarding the amount of waste generated and recycled, and on the proportion that is attributed to households (62.3%).
- Austria changed how it reports recycling rates in 2020, so direct comparisons cannot be made with previous years. The change in reporting (leading to a “break” in the data series) in 2020 is likely to involve the inclusion of C&I waste that was previously excluded.
- Austria currently uses a “top down” method to determine whether waste is municipal or not. This currently does not allow for a clear distinction to be made between household and non household municipal waste, although it is understood that the country has plans in place to enable this distinction to be made in future.
- It appears that losses due to sorting, contamination are already accounted for and that waste treated through MBT is correctly accounted for.

3.5.1.2 Anomalies

In its national municipal recycling statistics,²⁰ Austria reports municipal wood and metal arisings that are considerably higher than those of other countries – some 53kg/capita of wood and 91kg/capita of metal, where figures for other countries are typically below 20kg/capita and 10kg/capita respectively. It is difficult to explain the source of this anomaly, although some observations can be made. In other countries, it is not unusual for wood packaging tonnages to exceed municipal wood tonnages, due to packaging items such as pallets not generally falling within the scope of municipal waste. However, this does not appear to be the case in Austria. We also understand that Austria has many unstaffed locations where people can drop off different types of waste, including wood and metal items, which may capture material from non-municipal sources. It appears that, under Austria’s current method of determining the origin of waste that is managed, all such material may be classed as municipal waste.

- The available data does not indicate that Austria claims any home composting within its recycling rate, although it would be entitled to do so.
- Austria appears to have made efforts to account for losses subsequent to sorting, which again means that it is potentially taking a stricter approach than we have endeavoured to apply in this report – but one that cannot readily be corrected for due to lack of data.

²⁰ Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie (2023), *Die Bestandsaufnahme der Abfallwirtschaft in Österreich*, available [here](#).

3.5.2 Data Analysis

3.5.2.1 Standardisation Amendments

- In view of the anomaly identified regarding wood and metal, in order to bring Austria's figures into line with the EU reporting method we have applied a reduction both to municipal waste arisings and municipal waste recycling to bring Austria's metal and wood figures down to numbers more typical of other EU countries:
 - Wood: a reduction of 329,129 tonnes of municipal waste arisings and 217,614 tonnes of municipal dry recycling.
 - Metal: a reduction of -740,127 tonnes of municipal waste arisings and 682,439 tonnes of municipal dry recycling.
- No other changes were made to the initial data from Eurostat, as there are no further indications that Austria's reporting deviates from the latest European Commission requirements. The figures appear to account for losses through processing, and with the exception of the uncertainties regarding wood and metal, reflect the boundaries of municipal waste.

3.5.2.2 Patterns

- After deductions, total MSW was 777 kg/capita. This is significantly higher than the EU average of 521 kg/capita (although the average may include figures from some countries that are under-reporting non-household municipal waste). This is a significant increase from Austria's 2019 OECD data, which reported 588 kg/capita. The increase is likely to be due predominantly to a change in the methodology used for reporting. This is a strong indicator that, through the new methodology, Austria is now accounting for all household and non-household municipal waste, although its method may be drawing in some material from non-municipal sources.
- Organic waste represents 43% of the recycling tonnage.
- In 2020, the latest date for which data is available, 63.4% of packaging waste was recycled. The biggest contributor to this recycling rate was paper & cardboard (55.5%), followed by glass (28.6%) and plastic (8.5%).

3.5.3 Trends

- Austria's Waste Prevention Programme 2023-2028 includes the following targets:
 - To reach the Sustainable Development Goal Target 12.3 to halve food waste from consumers and retailers by 2030; and
 - To reduce the quantity of single-use plastic packaging by 20% by 2025 compared to 2018.
- A DRS scheme will be implemented in Austria in 2025 and will cover aluminium cans and plastic bottles, which is expected to boost recycling rates.

3.5.4 Impact of Divergences

- The amendments made to the Austria's recycling statistics to better align them to the European Commission's reporting system (within the limits of our knowledge from data sources assessed) leads to a decrease against the reported municipal recycling rate to 58.6%.

3.6 Belgium

Belgium has reported a recycling rate higher than 50% since reaching 50.4% in 2001. This was significantly above the EU average at the time, which was 28.7%. In subsequent years, the highest figure achieved was 56.7% in 2007, while the lowest was 51.4% in 2020.

The recent decrease in the reported recycling rate can be explained as an effect of applying the new recycling rate calculation methods. In addition, from 2020, Belgium started reporting its non-household municipal waste more fully, which led to an increase in MSW from 416 kg/capita to 729 kg/capita and may also have contributed to the decrease in the reported recycling rate.

The three Belgian regions have separate waste prevention programmes in place and different waste performances²¹.

- Flanders is the best performing region, with a 2020 recycling rate of 62.3%. It introduced several consecutive ambitious waste prevention programmes over the years since 1997, with the 2016-2022 Implementation Plan for Household Waste and Similar Industrial Waste aiming for a reduction of 15% in residual waste and the Action Plan Food Loss and Biomass aiming

for 30% of reduction in food waste losses by 2025. The 2023-2030 plan is being developed in consultation with the public.

- Wallonia reported a recycling rate of 43.6% in 2020. The region developed a waste plan in 2018²² which is to be renewed every six years. This plan includes some challenging quantitative targets for priority waste flows, with (for example) a 33% reduction of food waste in households by 2025; however, it does not include a target for the overall municipal recycling rate.
- Brussels Capital Region (BCR) recorded the lowest municipal recycling rate of the three regions, achieving 39% in 2020. The region's waste plan targets a reduction in household waste per capita of 20% by 2030 and a household recycling rate of 65% by 2035; however, the previous target of 50% for 2020 has not been reached, and it is not yet clear how BCR intends to make the significant progress its target demands. BCR also aims for a reduction of food waste by 30% by 2025 and 50% by 2030.

3.6.1 Research Findings

3.6.1.1 Data Sources and Quality

- As a member of the EU, Belgium is required to report waste in line with the prevailing EU reporting rules. Data is available through Eurostat and the OECD, and the two sources are consistent regarding the amount of waste generated and recycled. However, the proportion that is attributed to household waste differs slightly between the datasets. Eurostat indicates that 63.5% of the MSW is from households, whereas OECD indicates 61.3% of MSW is household waste. For the purpose of this analysis, the lower of these two numbers was used, as it was clearer how it was supported by the evidence.
- Belgium does not produce separate domestic statistics regarding its waste performance at a national level. Instead, the three regions of Wallonia, Flanders and Brussels Capital Region (BCR) each report separately. The platform StatBel provides some aggregated data, but the figures differ slightly from Eurostat and OECD data, which suggests that some corrections have been made to bring the Eurostat/OECD data into line with reporting rules. Detailed waste data is available for Flanders, while minimal information is available for Wallonia and BCR. The lack of clear and consistent data makes Belgium's recycling performance more challenging to analyse.

²¹ European Environment Agency (2023), *Country profiles on waste prevention - Belgium Profile*, available [here](#).

²² Wallonie (2018), *Plan Wallon des Déchets-Ressources*, available [here](#).

3.6.1.2 Anomalies

- Two data sources indicate differing household and non-household municipal breakdown of total tonnages. The lower number appears to be better supported, and it was therefore considered that 61.3% of the MSW was from households.
- There is no data available to identify the household and non-household municipal tonnages for residual, dry recycling and organic waste. The breakdown between household and non-household municipal waste stream tonnages has been estimated by apportioning the municipal totals for three streams in proportion to the total tonnages (i.e., 61.3% of each stream being assigned to households).
- Belgium accounts for both home composting and incinerator metals in their recycling rate, which is in line with the EU calculation methods. Home composting represents approximately 427,000 tonnes and incinerator metals 1.4% of the incinerator tonnages.²³
- Belgium reported that it calculates the recycling rate at the recycling stage rather than at the sorting stage, which means that in theory all the contamination and losses have

been accounted for. Whilst it appears that Flanders does account for contamination and losses correctly, this is less clear for other regions.

- It is estimated that a quarter of Belgian separately collected is recycled in another EU country and approximately 10% outside of the EU. While the available data is not definitive, it appears likely that some losses from contamination in exports are not accounted for; and that there would be further losses from the recycling process (although these are not considered within the scope of this study).

3.6.1.3 Standardisation Amendments

- A contamination rate adjustment was applied to account for sorting losses in Wallonia and BCR as well as for contaminants likely to still be present in the exported waste:
 - 6% adjustment in dry recycling contamination for both household and non-household municipal waste.
 - 4% adjustment in organics contamination for household waste.
- There were no adjustments made to the total MSW calculations for Belgium and it appears that the reporting is being done correctly as per the European Commission requirements for 2020.

²³ Wallonie (2011) *Préparation du plan Wallon des déchets volet « infrastructures de valorisation et d'élimination de déchets ménagers et assimilés »*, p28, available [here](#).

3.6.1.4 Patterns

- Belgium reports a total MSW of 729 kg/capita, which is higher than the average for EU countries of 521 kg/capita (Eurostat). This can be explained in part by the fact that Belgium reports a higher percentage of municipal waste originating from non-household municipal sources compared to most of the other European countries. When considering the countries included in this report, Belgium reports the second highest percentage of non-household municipal waste at 38.7%, after Ireland at 43%. Belgium also accounts for its home composting in their MSW which not all European countries do, which represents 37 kg/capita (5% of total MSW).
- Food and garden waste account for 37% of municipal recycling, with no breakdown available for household and non-household municipal sources. Across the country, different separate food waste collections are offered to households via a variety of methods: door-to-door collections, bring banks, shared composters and/or individual composters distributed by councils.
- Paper and card is the biggest contributor to municipal dry recycling, at around 45 percentage points. This is followed by wood (17%), glass (16%), plastics (8%) and metals (6%).
- Bulky waste, textiles and WEEE are all very small contributors to recycling performance.
- FostPlus, the packaging compliance scheme in Belgium, reports high level of recycling for Belgium's packaging waste, with a packaging recycling rate of 89.8% in 2021.²⁴ However, this reported recycling rate includes a recycling rate of 114% for glass and 105% for ferrous metals. This anomaly arises because the recycling rate is calculated by comparing the tonnage of each material recycled with the tonnage that FostPlus members put on market; and the recycled tonnage includes packaging materials put on the market by non-FostPlus members and by consumers that bought packaged products abroad – the latter happening in considerable volumes for glass. Therefore, Belgium's packaging recycling rates have to be treated with some caution.

3.6.2 Trends

- The separate collection of food waste became mandatory in Brussels Capital Region on 15 May 2023,²⁵ which is expected to drive an increase in the recycling rate in the coming years. The same will apply to the Walloon region at the end of 2023 and Flanders at the beginning of 2024; however, the impact on the recycling rate in these two regions is expected to be minimal as most of their local authorities already have food waste collections in place.
- Belgium does not have any plans to implement DRS in the future, because of the high packaging recycling rates already reported by FostPlus.

3.6.3 Impact of Divergences

- The amendments made to the Belgium's recycling statistics to better align them to the European Commission's reporting system (within the limits of what can be ascertained from the data sources assessed) leads to:
 - A household recycling rate of 48.7%
 - A non-household municipal recycling rate of 49.4%
 - An overall municipal recycling rate of 48.9%

²⁴ FostPlus (2021), *2021 Activity Report*, available [here](#).

²⁵ Environnement Brussels (2023), *Le tri des biodéchets obligatoire pour les ménages bruxellois*, available [here](#).

3.7 Netherlands

The Netherlands reported a municipal recycling rate of 56.9% in 2020. The recycling rate has increased steadily in the country since 2001, when it was at 43.7%, while MSW per capita decreased steadily from 2007 (606 kg/capita) to 2019 (508 kg/capita), although the figure rose to 533 kg/capita in 2020, perhaps as a result of impacts from Covid restrictions.

The Netherlands introduced a DRS for large plastic bottles in 2006, which was extended to small plastic bottles in 2021, and to metal beverage containers in April 2023. The Netherlands has also implemented EPR for several products and waste streams over the years: packaging, consumer

electronics, batteries, vehicles, tyres and float glass. From 1 July 2023, EPR in the Netherlands will also cover clothing and household textiles.

Household collections are the responsibility of local municipalities, and the format of waste collections varies between locations. While door-to-door collections are widespread across the country, larger cities such as Amsterdam operate mainly with roadside waste collection points which can be street level or underground containers. Households are required to segregate paper and cardboard, plastics and cans and glass. Separate household organic waste collections happen in some areas but are not implemented universally.

3.7.1 Research Findings

3.7.1.1 Data Sources and Quality

- As a member of the EU, the Netherlands is required to report waste in line with the prevailing EU reporting rules. Data is available through Eurostat and the OECD, and the two sources are consistent regarding the amount of waste generated and recycled. However, the proportion that is attributed to household waste differs between the datasets. Eurostat indicates that 99.8% of the MSW is from households, whereas OECD indicates 90% of MSW is household waste.
- Further information is available from CBS Statistics Netherlands,²⁶ including:
 - Total MSW
 - Household MSW, split into that collected at kerbside and bring sites
 - Proportion of household waste that is separately collected (60% in 2020)
 - Processing of municipal waste, the proportion of waste sent for recycling or reuse, composting, separation afterwards, incineration and landfilling.
 - Breakdown of materials included in MSW
- Although a breakdown of overall MSW into household and non-household waste generated could be found, this did not provide a breakdown between residual waste, dry recycling and organic waste for each of the two waste sources.

²⁶ CBS Statistics Netherlands, *Municipal waste quantities*, available [here](#).

3.7.1.2 Anomalies

- The breakdown of municipal waste indicated that some C&D waste (rubble, bitumen, gypsum, asbestos, soil) was included in the reported values. These materials equated to 8.5% (794,963 tonnes) of the total MSW recorded.
- Three separate sources provide different figures for household municipal waste, but all reported that household waste was 89% or more of total MSW. It is therefore likely that non-household municipal waste has been under reported.
- There did not appear to be any incorrect inclusion of wood recycling within the data.
- No metals from incineration appear to have been included in the recycling statistics.
- It does not appear that any home composting was included in the recycling statistics, since total organics reported matched organics processed.
- Organic waste represented more than 50% of the recycling, which may indicate that dry recycling has been undercounted.
- Losses appear to have been accounted for in the Netherlands' OECD data, which deducts around 10% of dry recyclable material between the collection and recycling stages.

3.7.2 Data Analysis

3.7.2.1 Standardisation Amendments

- Eunomia has amended the reported municipal waste figures in the following way to more closely align with the requirements of the European Commission:
 - Removed all C&D waste from the figures (both arisings and recycling).
 - Added C&I waste to increase total arisings so that non-household tonnages amount to around 40% of overall MSW tonnages, in line with other countries; and increased the amount of material recycled and composted, assuming that 45% of C&I waste is recycled. As a result, this results in the addition of 4.6m tonnes of non-household municipal waste, including 1.6m tonnes of non-household dry recycling and 0.5m tonnes of organic recycling.

3.7.2.2 Patterns

- After amendments were made to the MSW recycling rate, total MSW was 754 kg/capita, a significant increase from the 533 kg/capita pre-amendments to the data. The increase can be attributed to the addition of a large amount of C&I waste that appears to have been omitted from the data.
- After C&I adjustments, organic waste represents 49% of the recycling tonnages.
- Paper and card is the largest contributor to household dry recycling with 34 percentage points, followed by glass (22%).
- Non-household dry recycling composition was not available.
- In 2020, the latest date for which data is available, 75.2% of packaging waste was recycled. The biggest contributor to this recycling rate was paper & cardboard (57.3%), followed by glass (17.5%) and plastic (12%).

3.7.3 Trends

- The Netherlands adopted a Waste Prevention Programme in December 2020²⁷ and contains the following targets:
 - Halve the food waste per capita by 2030 compared to 2015;
 - Reach the legal target of returning 90% of small and large plastic bottles through the DRS scheme; and
 - Reduce plastic usage by 20% by 2024 compared to 2017.

3.7.4 Impact of Divergences

- The amendments made to the Netherlands' recycling statistics to better align them to the European Commission's reporting system leads to:
 - A household recycling rate of 53.1%
 - A non-household municipal recycling rate of 45.0%
 - An overall municipal recycling rate of 50.1%

3.8 Slovenia

In 2020, Slovenia's reported municipal recycling rate was 59.2%, which was above the European Union average of 47.8%.

Slovenia's recycling rate increased dramatically post-2014 when its capital city, Ljubljana, adopted a Zero Waste Strategy, setting the target of becoming a zero-waste city. The city's recycling rate increase from 29.3% in 2008 to 68% in 2023.²⁸ This was achieved through increased separate collection of recyclable materials (collecting 69.5% of waste in 2020), separate collection of biowaste,²⁹ reduced frequency of residual waste collections, communications campaigns and

utilising "pay as you throw" charges for residual and biowaste. The successful waste strategy has since been extended to other areas of Slovenia.³⁰

Ljubljana's Regional Waste Management Centre (RCERO) provides disposal and treatment services for more than 50 municipalities, which represent a third of Slovenia. This project was launched in 2015 to help tackle waste management issues and uses MBT to sort and treat residual waste, bulky waste and biowaste. At the end of the process, it is claimed that less than 5% of waste is landfilled, although the balance between material recycled and material sent for incineration is less clear.

²⁷ European Environment Agency (2023), *Country profiles on waste prevention - Netherlands Profile*, available [here](#).

²⁸ I FEEL SLOVENIA (2019), *Zero waste Slovenia*, available [here](#).

²⁹ Zero Waste Europe (2015), *The Story of Ljubljana*, available [here](#).

3.8.1 Research Findings

3.8.1.1 Data Sources and Quality

- As a member of the EU, Slovenia is required to report waste in line with the prevailing EU reporting rules. Data is available through Eurostat and the OECD, and the two sources are consistent regarding the amount of waste generated and recycled. They also report very similar information regarding the proportion of municipal waste that is household waste (61.4% for Eurostat, 61.5% for OECD).
- The Republic of Slovenia Statistical Office provides waste data:
 - at national and regional level;
 - giving figures for both generated and collected MSW;
 - splitting generated MSW by household, production and service activities, and from storage; and
 - splitting material into packaging waste, separately collected fractions, garden and parks waste and other municipal waste.
- Further information was publicly available from Voka Snaga, the company that runs the RCERO.
- Due to very high recycling performance reported by Ljubljana, it is often seen as an example of best practice, and there are several reports that provide information on the city (e.g. Zero Waste Europe has used Ljubljana as a case study) and there are various news articles highlighting its performance.

3.8.1.2 Anomalies

- C&D waste does not appear to be included in the municipal waste data, as the available compositional data does not show this type of material, and municipal waste reported is much lower than total waste.
- Some C&I waste appears to be included within the reported figures. However, the majority of this (88%) is recycling and composting according to the Republic of Slovenia Statistical Office data, which may suggest under reporting of municipal C&I residual waste. This compares to a more plausible 63% collected recycling rate for household waste. The overall balance between household waste and non-household waste, however, appears to be reasonable, although the total arisings of MSW per capita are very low.
- There is no indication that incinerator bottom ash is being counted as recycled, and the absence of incinerators within Slovenia means this is unlikely to be an issue.
- Home composting does not appear to be included in the reported figures for composting.
- It appears that the data reported by Slovenia is based on collected tonnages, rather than post-treatment. Therefore, an amendment has been made to include recyclable materials separated through MBT. Biowaste outputs from MBT (2,300 tonnes) are assumed not to be recyclable. A further amendment was made to account for sorting losses between collection and entry into the final recycling process.

³⁰ RCERO Ljubljana, O Projektu, available [here](#).

3.8.2 Data Analysis

3.8.2.1 Standardisation Amendments

- In order to bring Slovenia's municipal statistics into line with the European Commission's reporting requirements, Eunomia has:
 - Added C&I residual waste, which appears to be under-reported. To this end, we have adopted a 50:50 split between household and C&I waste, which is somewhat higher than in other countries. The result of this is that the commercial recycling and composting figure (discussed above) falls from 88% to 71%.
 - Given credit for materials separated for recycling and composting through MBT.
 - Made adjustments to account for contamination:
 - A reduction in dry recycling of 6.4% to reflect actual recycling rather than collected for recycling and a further 5% dry recycling contamination to account for contaminants in exported waste, which gives a total reduction of 11.4%, applied both to household and non-household dry recycling.
 - A 10% reduction for contamination in household organic waste.

3.8.2.2 Patterns

- After amendments were made to Slovenia's reported waste figures, Eunomia calculated total MSW arisings of 532 kg/capita. This is higher than the 489 kg/capita in 2020 reported by Republic of Slovenia Statistical Office³¹ or 488 kg/capita reported by OECD,³² as a result of the inclusion of additional C&I residual waste. The calculated generated municipal waste of 532 kg/capita is close to the average for EU countries of 521 kg/capita (Eurostat).
- Food and garden waste account for 35% of household recycling but only 11% of non-household recycling. The collection of biowaste door to door that was introduced in 2006 is likely a key contributor to this figure.
- Household dry recycling was predominantly mixed packaging waste (33%) followed by paper and card at 20%.
- Paper and card are the main contributors to non-household recycling and account for 50% of non-household dry recycling, followed by metals (15%) and wood (11%).
- In 2020, the latest date for which data is available, 68.1% of packaging waste was recycled. The biggest contributor to this recycling rate was paper & cardboard (51.4%), followed by glass (20.0%) and plastic (13.2%).

³¹ SISat database, Waste indicators, available [here](#).

³² OECD, *Municipal waste, Generation and Treatment*, available [here](#).

3.8.3 Trends

- Slovenia aims to reach a recycling rate of at least 75% by 2025.
- Ljubljana continues to improve its recycling performance and has set the following goals:
 - Increase separate collection to 80% by 2035.
 - Decrease total waste generation to 280 kg/capita/year.
 - Decrease residual waste to 50 kg/capita/year by 2035.

3.8.4 Impact of Divergences

- The amendments made to Slovenia's recycling statistics to better align them to the European Commission's reporting system leads to:
 - A household recycling rate of 39.0%
 - A non-household municipal recycling rate of 63.1%
 - An overall municipal recycling rate of 50.0%
- Due to the poor data on non-household arisings and recycling, there is significant uncertainty regarding the balance between household and non-household recycling and the relative performance of these two streams.

3.9 Italy

Italy reported a municipal recycling rate of 51.4% in 2020, which is the country's highest ever performance and a dramatic increase compared to performance in 2000, when the country reported a 14.2% recycling rate. Italy has also reduced total MSW generation, with municipal waste per capita dropping 10% between 2004 and 2020.

In the past twenty years, Italy has introduced waste segregation at source and brought in several taxes and economic measures to drive recycling up, including "pay-as-you-throw" in most municipalities. The segregation of waste

from households varies from one local authority to another, but most offer separate containers for paper and cardboard, plastic and metals, glass, organic and residual waste. The landfill tax, introduced in 1996 and increased in value since, has contributed to the diversion of waste from landfill. A new waste tariff was introduced in 2010, which is proportional to waste quantity and quality per floor area unit. Italy published its first Waste Prevention Programme in 2013,³⁵ which focused on biodegradable waste, paper waste, packaging waste and WEEE.

³³ | FEEL SLOVENIA (2019), *Zero waste Slovenia*, available [here](#).

³⁴ | Zero Waste Europe (2015), *The Story of Ljubljana*, available [here](#).

³⁵ | European Environment Agency (2023), *Country profiles on waste prevention - Italy Profile*, available [here](#).

3.9.1 Research Findings

3.9.1.1 Data Sources and Quality

- As a member of the EU, Italy is required to report waste in line with the prevailing EU reporting rules. Data is available through Eurostat and the OECD, and the two sources are consistent regarding the amount of waste generated and recycled. It is unclear the proportion of municipal waste that is household, as Eurostat data allocates all municipal waste to households, and OECD does not document any data on the quantity of household and non-household waste for Italy.
- A key source of information is a report by ISPRA,³⁶ which contains waste data including:
 - At national and regional level;
 - Collected waste (showing 63% of waste was separately collected for recycling in 2020);
 - Quantities of waste for disposal and different treatment methods;
 - Home composting figures, which constitute part of the overall municipal recycling data; and
 - Composition data regarding municipal waste and municipal recycling.
- The European Environment Agency (EEA) also commented on the ISPRA assessments and overall Italian data, stating that no substantial adjustments are required to separately collected waste (in particular packaging waste and biowaste fractions), since these are “*calculated with a methodological approach already somewhat aligned with the new calculation criteria*”. Examples are then given, which clarify that the composting and digestion figures already exclude material removed in pre-treatment, and also that plastic packaging contaminants removed before reception at final recycling plants are not counted as recycling.
- Italy accounts for home composting in their recycling rate calculations, contributing 1% towards the municipal recycling rate, using an approach which is in line with the EU calculation methods.
- There does not appear to be an over reporting of wood or inclusion of incinerator bottom ash within the recycling statistics.
- It appears that at least some of Italy's C&I waste is included in the municipal waste values, although no split between household and non-household waste was available in the data. In many municipalities, household waste and non-household municipal waste (at least from smaller businesses) are co-collected.
- As the collected recycling rate (63.0%) is significantly higher than the reported recycling rate (51.4%), it appears that the EEA's assessment that contamination is accounted for already in the reported values is likely to be correct.

3.9.1.2 Anomalies

- The ISPRA report reveals that Italy is not taking into account one important aspect of the new EU method for calculating the recycling rate in the OECD/Eurostat reported figures, erroneously leaving a significant quantity of C&D waste (e.g., DIY waste) within the data.

³⁶ ISPRA (2020), *Rapporto Rifiuti Urbani*, available [here](#).

3.9.2 Data Analysis

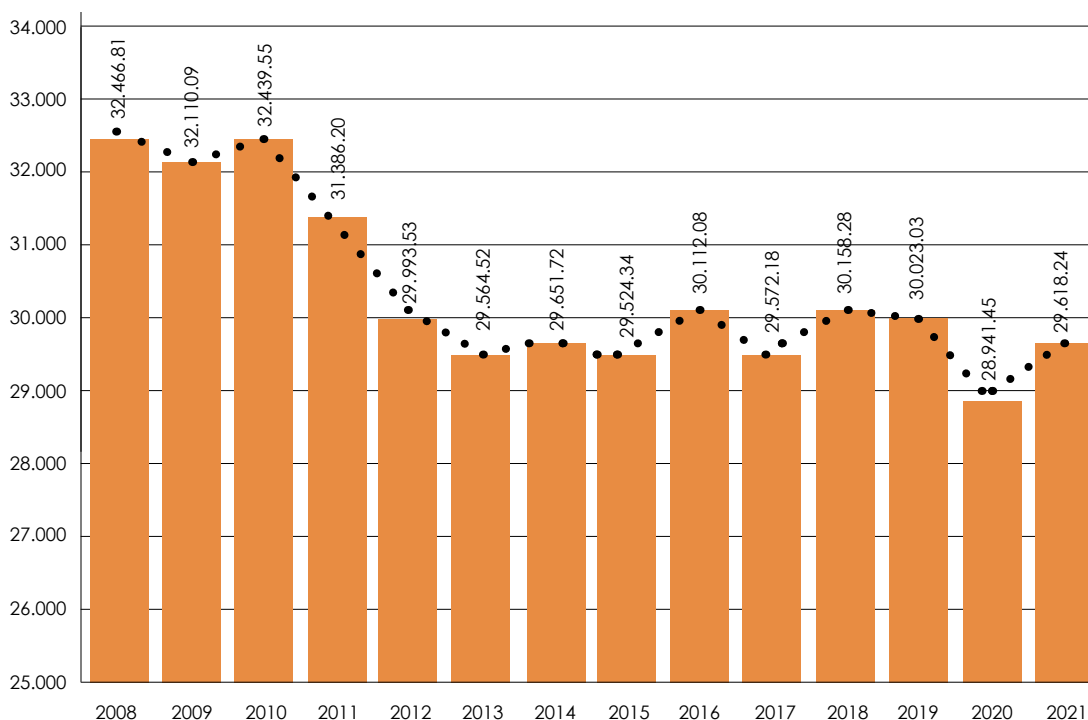
3.9.2.1 Standardisation Amendments

- In order to bring Italy's municipal statistics into line with the European Commission's reporting requirements, Eunomia made the following amendment:
 - Removal of 549,947 tonnes C&D waste (1.9% of municipal waste generated).
- While it appears that some MSW generated by larger businesses may not be included in the statistics, the lack of any information within the data regarding the split between household and non-household waste makes it difficult to arrive at an adjustment that might account for any such under-reporting.

3.9.2.2 Patterns – Waste Generation

- After the adjustments to the data detailed above (to align towards the new calculation rules), the kg/capita of total MSW dropped from 486 kg/capita to 477 kg/capita. The drop in total MSW is due to the removal of C&D waste from the values. The values are lower than the 525 kg/capita reported by ISPRA for 2020 and lower than the EU average of 521 kg/capita (Eurostat). This may reflect some under-counting of MSW generated by larger businesses, but Eunomia investigated whether the low MSW figure is plausible for a country of Italy's economic standing.
- Viewing ISPRA's medium-term time series of MSW generation (Figure 3-1 below) reveals a sharp drop in the two-year period 2011-2012, which ISPRA states is simultaneous with the contraction in GDP and in household consumption. The 2020 drop appears to be connected to the pandemic.

Figure 3-1: MSW Production, Italy 2008-2021³⁷

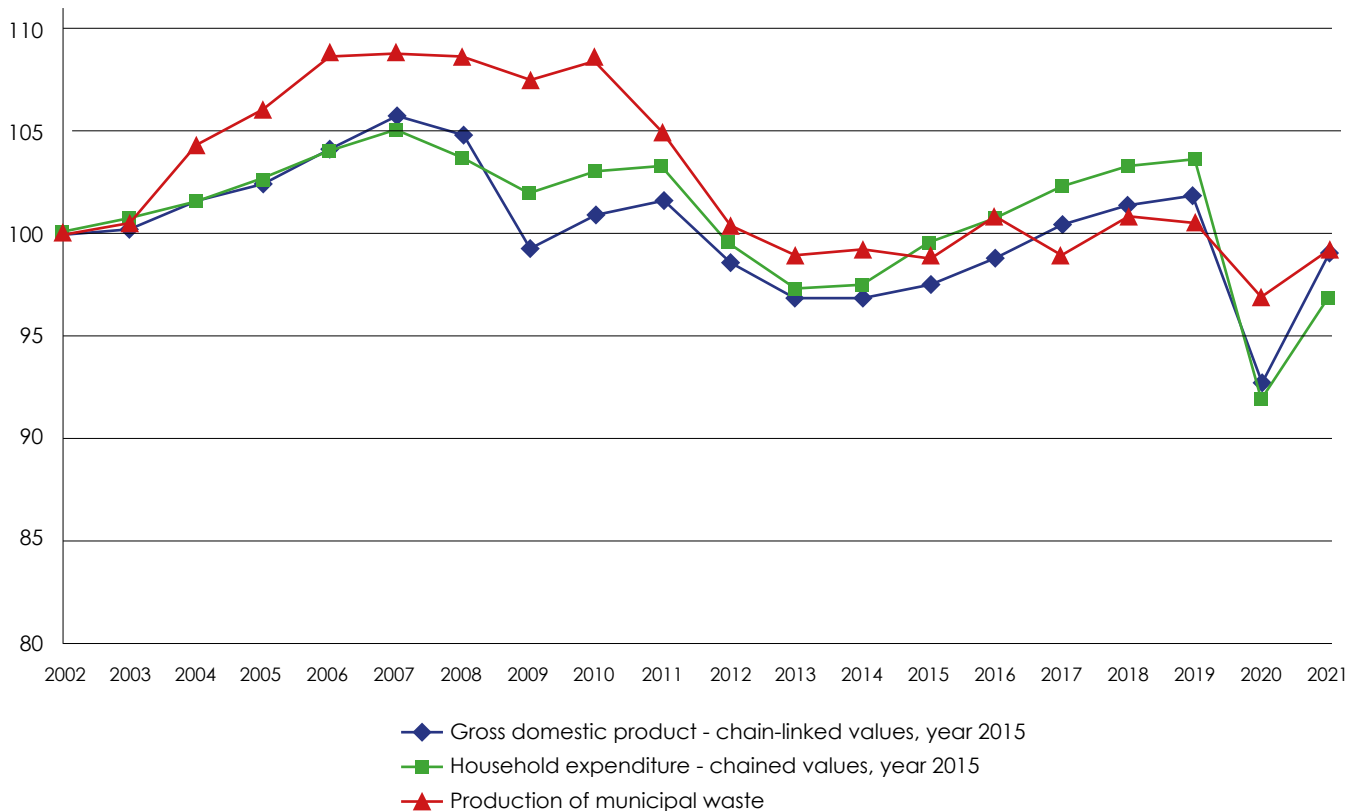


Units: Thousands of tonnes

³⁷ ISPRA (2022), *Rapporto Rifiuti Urbani*, Figura 2.1, available [here](#).

- Viewing ISPRA's longer-term time series of MSW generation alongside socio-economic indicators (Figure 3-2 below) reveals municipal waste generation outstripping GDP and household expenditure data in the first decade of the century, followed by a contraction following the 2008 economic crisis. Waste generation through the second decade indicates MSW was more decoupled from economic growth.

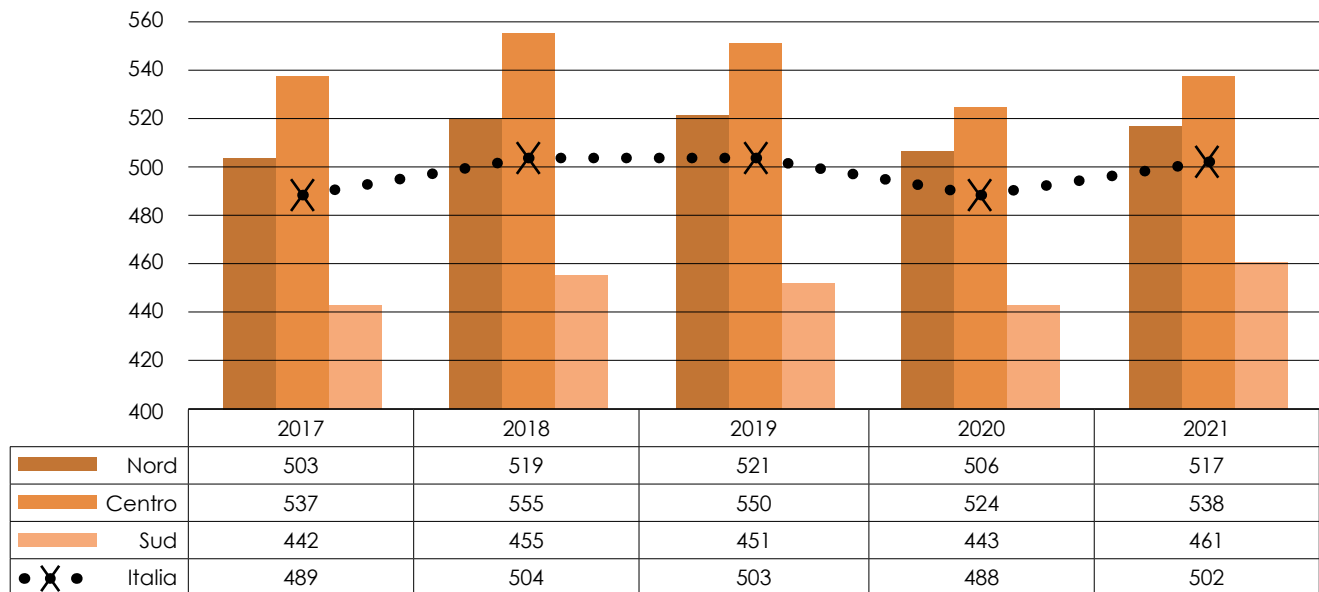
Figure 3-2: Change in MSW Production and Socio-Economic Indicators, Italy 2002-2021³⁸



Units: Percentage change from 2002.

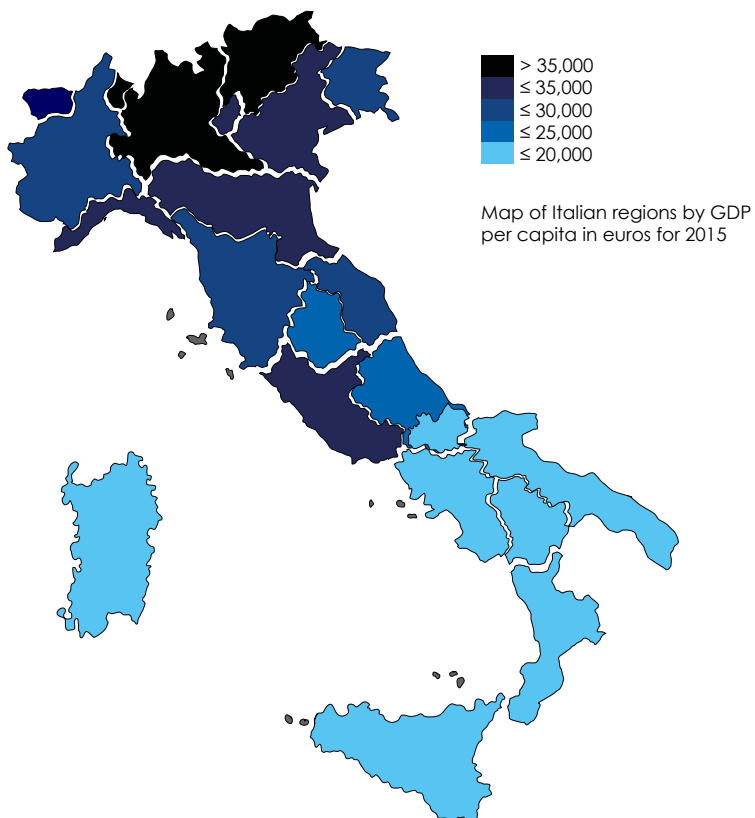
- In relation to these trends, the ISPRA report discusses the impacts of the National Waste Prevention Program, initially envisaged within a Legislative Decree in 2006, and then issued within a directorial decree in 2013. This enforced certain waste prevention measures, and set the production of municipal waste per unit of GDP, per unit of household consumption, as parameters to be monitored for the evaluation of the effectiveness of the programme.
- ISPRA also provides MSW generation per capita data per geographical area of Italy, reproduced in Figure 3-3.

³⁸ ISPRA (2022), *Rapporto Rifiuti Urbani*, Figura 2.2, available [here](#).

Figure 3-3: Per capita generation of MSW by geographical macro-area, Italy 2017-2021³⁹

Units: MSW generation: kg per capita per annum

- The regional differences appear to be linked to the differences in GDP per capita in Italy's regions, as illustrated in Figure 3-4.

Figure 3-4: Italy GDP per Capita, by Region, 2015⁴⁰

³⁹ ISPRA (2022), *Rapporto Rifiuti Urbani*, Figura 2.8, available [here](#).

⁴⁰ Conte di Cavour (2017), *Own work*, available [here](#).

- While certain news reports have highlighted a problem with mafia-related illegal waste activity, especially in the south of Italy, a brief search conducted as part of this review was not able to link this to any patterns in municipal waste arisings.
- Italy is recognized as the birthplace of the 'Zero Waste Cities' initiative in Europe, and can claim the highest number of municipalities that are implementing zero waste strategies. Zero Waste Italy works with 311 municipalities, covering over 6 million inhabitants.⁴¹
- Figures from the World Bank show that GDP per capita in Italy was around US\$36,000 in 2021, compared with Germany's around US\$48,500 in the same year. This relatively low figure may help to explain the low MSW generation figures observed in Italy.
- In conclusion, ISPRA finds it credible that Italy's current low waste generation figures are linked to a successful National Waste Prevention Program, which has decoupled waste generation from economic growth. The strong waste policy measures now active across large parts of the country (mandatory source segregation, fines for non-compliance, and PAYT for residual and organic waste) are likely to contribute to the low waste production rates. A regional assessment also reveals an apparent link between regional MSW generation and regional GDP; and this lends credibility to a link between Italy's relatively low

GDP per capita and its low national average MSW generation figure.

- Overall, while there may be some under-counting of non-household waste, the evidence suggests that Italy's MSW generation rate is relatively low, and that may be more related to effective policy measures than to unreported waste.

3.9.2.3 Patterns - Other

- It was not possible to determine the household and non-household recycling rates due to a lack of data on the origins of the municipal waste.
- Organics made up 35% of total municipal waste, and 39% of separately collected municipal waste.
- Paper and cardboard made up the bulk of the dry recycling, accounting for 22% of total municipal waste and 44% of the dry recycling.
- In 2020, the latest date for which data is available, 69.5% of packaging waste was recycled. The biggest contributor to this recycling rate was paper & cardboard (47.2%), followed by glass (24.9%) and wood (12.1%). Italy is therefore unusual in that paper & cardboard make up less than half of all packaging recycled, and that wood packaging exceeds plastic packaging in its contribution to packaging recycling.

3.9.3 Trends

- The new Waste Prevention Programme is under revision and will be published in 2023, with targets covering the 2023 to 2030 period.
- The National Circular Economy Strategy⁴² was agreed in 2022 and aims to:
 - Introduce a new digital waste-tracking system, which may improve waste data;
 - Provide tax incentives to support recycling activities; and
 - Reform the EPR system.

3.9.4 Impact of Divergences

- The amendments made to Italy's recycling statistics to align them as closely as possible to the new methodology set out by the European Commission leads to:
 - An overall municipal recycling rate of 50.4%
- It was not possible to determine the recycling rates for households and non-household waste separately due to the lack of data evidencing the proportion of municipal waste from each source.

⁴¹ Zero Waste Europe (2020), *The State of Zero Waste Municipalities*, available [here](#).

⁴² Governo Italiano (2023), *Strategia nazionale per l'economia circolare*, available [here](#).

3.10 Switzerland

The data situation for Switzerland is complex, in part due to the country's regional structure and the lack of any direct measurement of non-household waste management. Despite undertaking initial research on the country, it was not possible to derive any data that would enable revisions to be made to the data reported by Switzerland to Eurostat and the OECD.

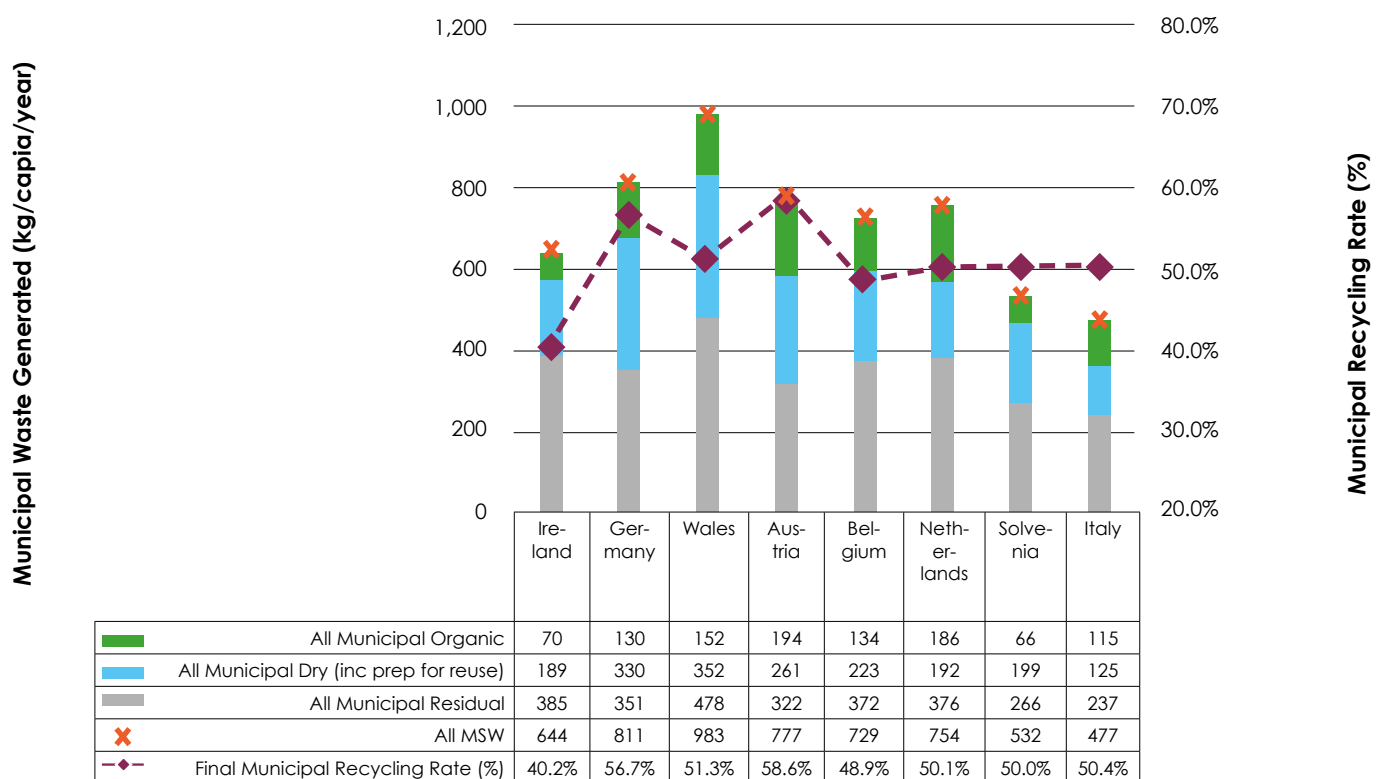
We have not, therefore, undertaken any detailed analysis of the position in Switzerland, or sought to make any amendments to the country's waste statistics.

3.11 Data Comparisons Between Ireland and Other Countries

3.11.1 Municipal Waste Arisings

Figure 3-5 shows the adjusted 2020 municipal waste arisings per capita and adjusted 2020 municipal recycling rates for Ireland and other countries analysed in the present report.

Figure 3-5: Municipal Waste Arisings per Capita and Recycling Rates for Ireland and Other Countries



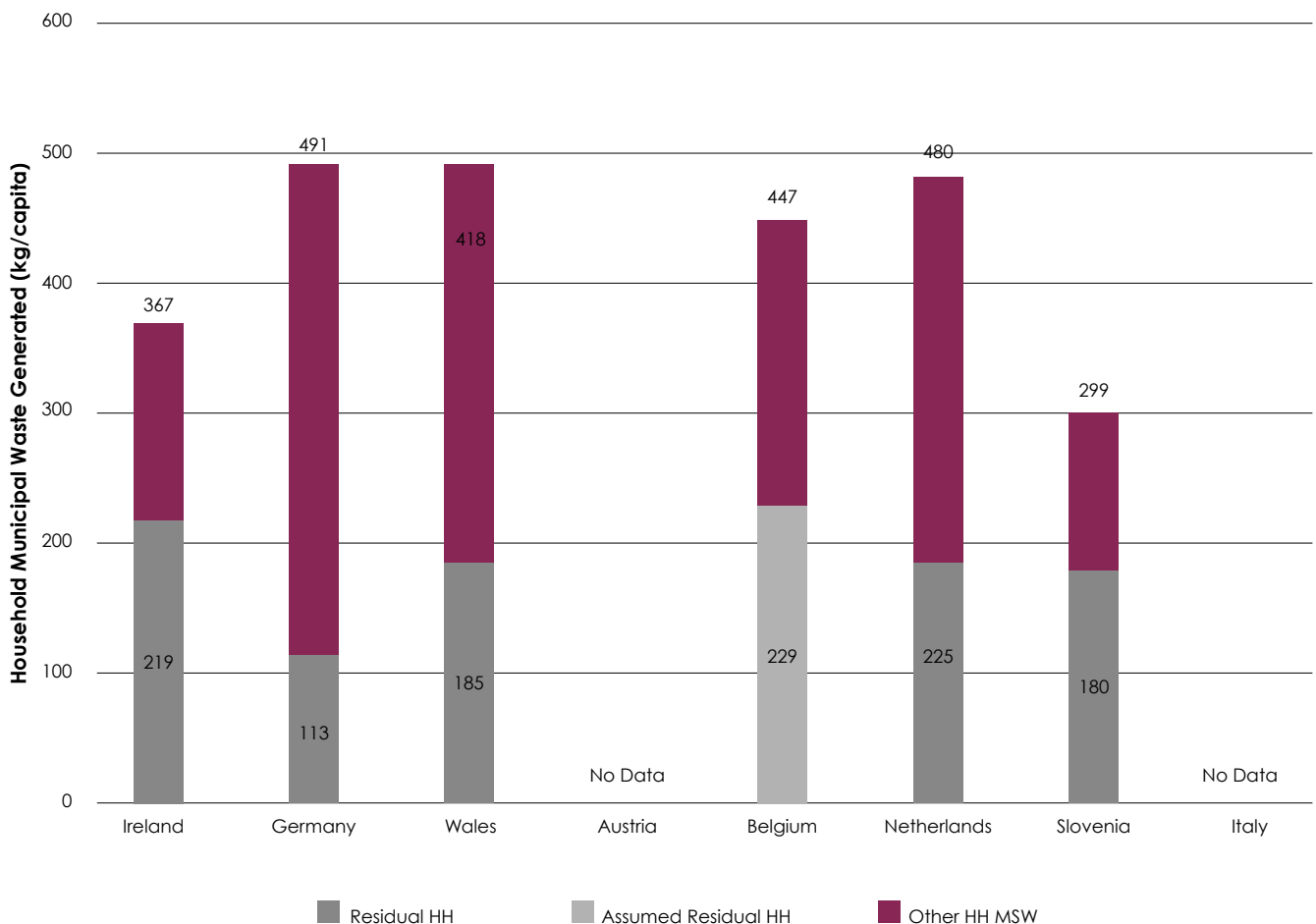
After adjustments, Wales had the highest MSW per capita, while Italy had the lowest. Ireland ranked third lowest in MSW per capita across the eight countries included in the analysis. Wales also had the highest municipal dry recycling per capita and highest municipal residual waste, while Austria had the highest municipal organic per capita. Ireland's municipal organic waste per capita was one of the lowest, along with Slovenia's. Italy had the lowest municipal dry recycling per capita, as well as the lowest municipal residual waste per capita.

After adjustments, Austria ranked first in terms of municipal recycling rate, with 58.6%. As a result of the project scope, which focused on Europe's highest recycling nations, Ireland ranked last with 40.2% - a recycling rate that, while needing to improve to meet future EU targets, exceeds that of many other Member States. There is no apparent link between the amount of MSW generated per capita and the achieved recycling rate; and in

line with the waste hierarchy, it is worth noting that a high recycling rate achieved across a large volume of waste may be less environmentally sustainable than a lower rate achieved across considerably smaller waste arisings. In addition to examining recycling rates, we therefore also examined MSW tonnages.

Where data allowed, the total household MSW per capita and household residual waste per capita were analysed (Figure 3-6). Ireland has the second lowest household MSW arisings per capita amongst the countries included in this research at 367kg, with only Slovenia (299kg) reporting less. Germany has the highest household MSW per capita (491kg) but the lowest household residual waste per capita (113kg), reflecting its very high household waste recycling rate. Ireland's 219kg of residual waste per capita is lower than the figures for Belgium (229kg) or the Netherlands (225kg), despite these countries' higher recycling rates.

Figure 3-6: Household Municipal Waste Arisings per Capita and Household Residual Waste per Capita for Ireland and Other Countries



Organic waste for each country was also assessed to determine if separate garden and food waste values could be obtained. Figure 3-7 shows those countries where data for separate garden and food waste tonnages were available for all MSW. Ireland has the second lowest total municipal tonnage per capita and the lowest garden waste arisings per capita of the countries analysed. Similarly, when considering only household organic waste (Figure 3-8), Ireland has much lower garden waste arisings than the other countries analysed. It is possible that this is due to the provision of a charged garden waste service in much of Ireland, in contrast with such services being free of charge in several of the other countries analysed.

Total MSW food waste captures in Ireland are around half those achieved in Wales and Austria. However, part of this difference appears to relate to food from commercial sources. Per capita, household food waste captured for recycling in Wales is only 15% greater than in Ireland. Ireland's overall household organic waste arisings are very similar to Slovenia, but Slovenia's garden waste is 22 kg per capita greater than Ireland, with food waste captures being correspondingly lower. In making these observations, it is important to note that in Ireland and Austria garden and food waste are typically collected as a mixed stream from households, which can give rise to some uncertainty about the split between these materials.

Figure 3-7: Total Municipal Organic Waste Arisings per Capita for Ireland and Other Countries

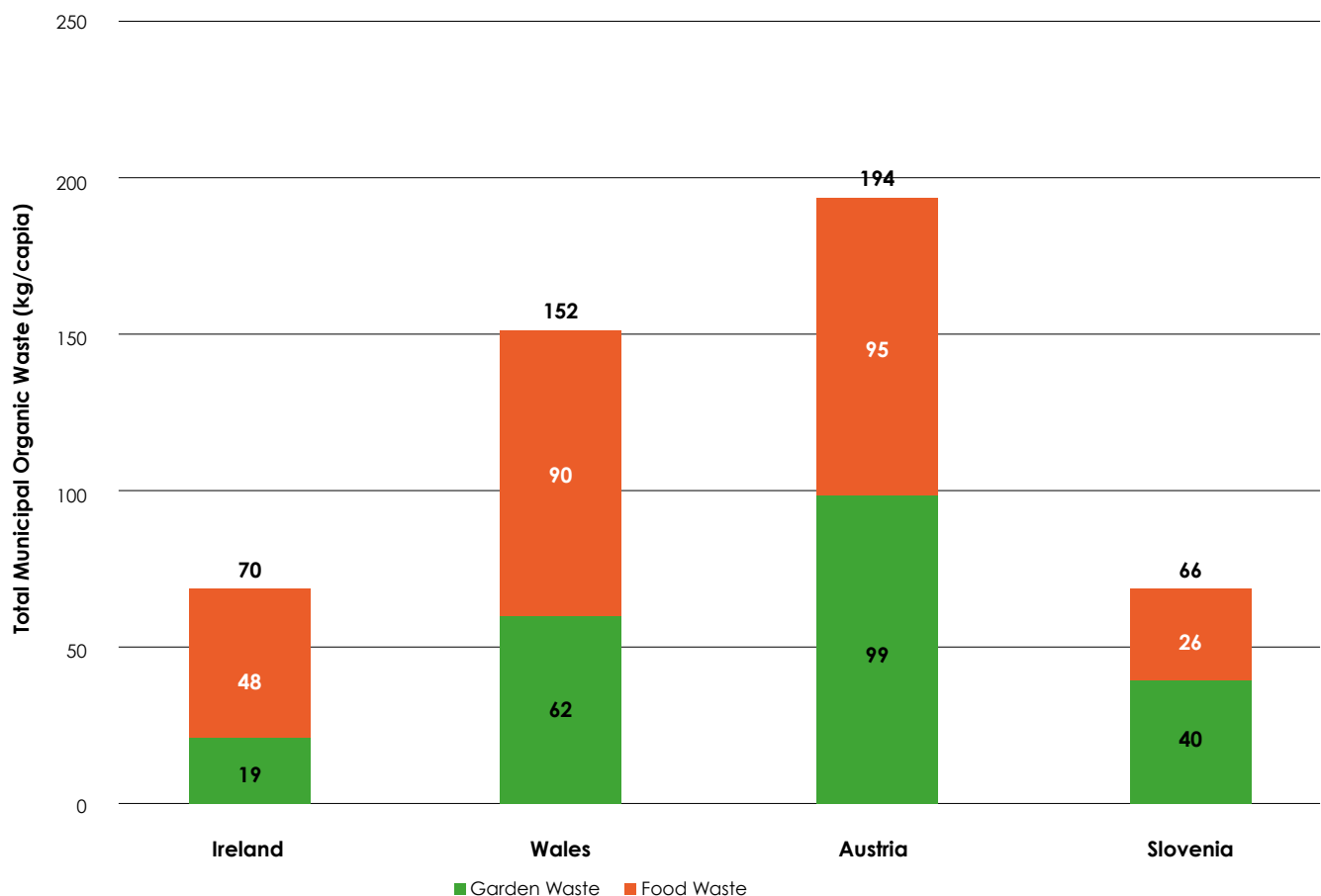
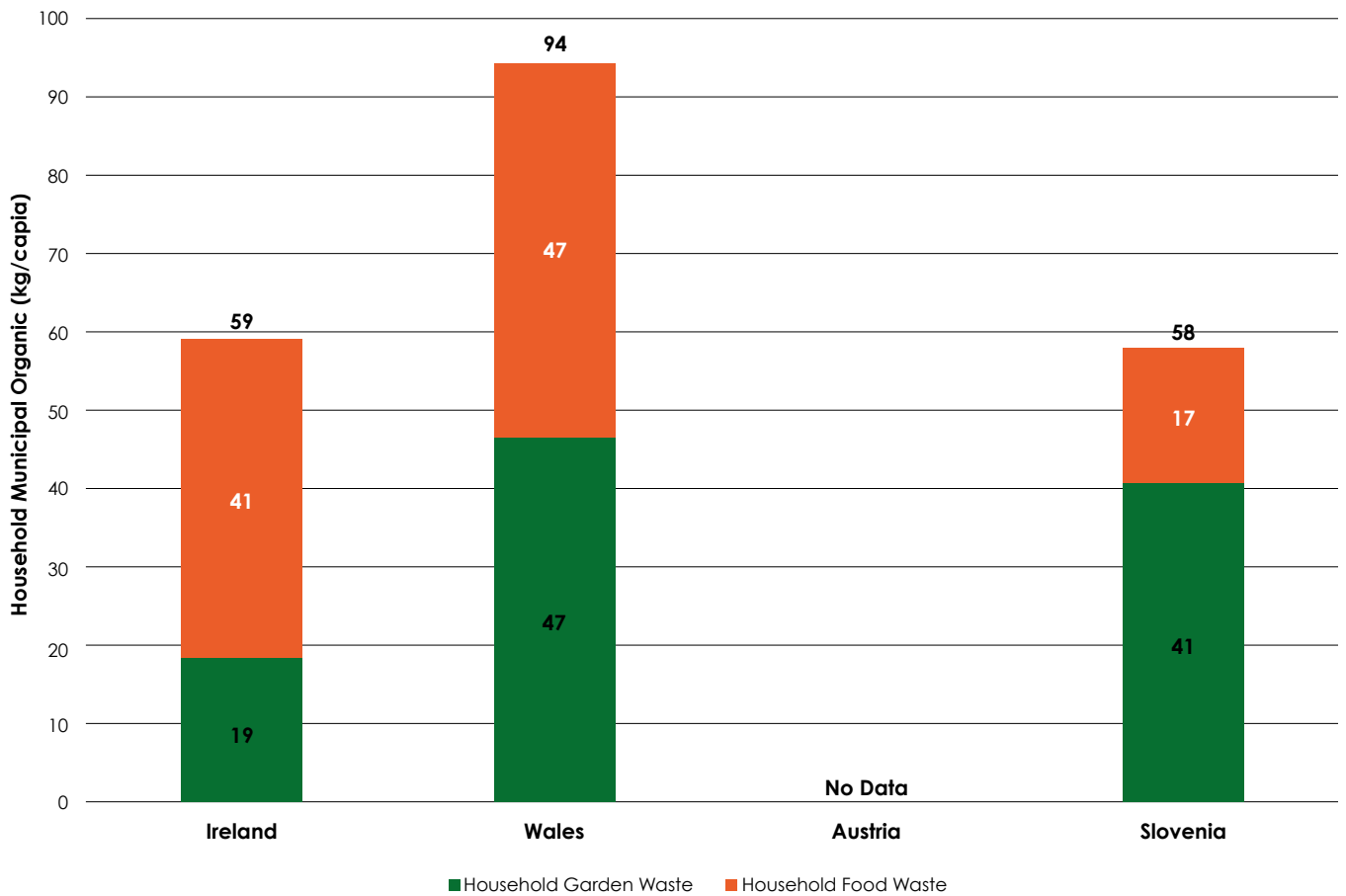


Figure 3-8: Household Municipal Organic Waste Arisings per Capita for Ireland and Other Countries



3.11.2 Packaging Waste

Eunomia found numerous different and inconsistent breakdowns of the materials within various countries' waste streams. In many cases, in order to try to correct the overall recycling rate, it was necessary to make adjustments at a high level that cannot reliably be translated into adjustments to specific waste streams due to a lack of information.

In order to present a reasonably reliable comparison between different countries'

performance on different waste streams, Eunomia focused on packaging waste, using Eurostat reporting as the source.⁴³ However, it is important to note that this data could not be adjusted to reflect the amendments made to each country's reported figures. No data from Switzerland was included in the Eurostat reporting, and that Wales could not be included as they do not appear in Eurostat data and only report packaging waste recycling in a form that is combined with data from the rest of the UK, so these countries are excluded.

⁴³ Eurostat, *Packaging waste by waste management operations*, available [here](#).

3.11.2.1 Glass Packaging

Figure 3-9 shows the 2020 glass packaging generated per capita and the 2020 glass packaging capture rate for Ireland and other countries analysed in the present report.

Figure 3-9: Glass Packaging Generated per Capita and Capture Rate for Ireland and Other Countries



Glass packaging generated ranged from 16.3 kg/capita/year for Slovenia to 45.8 kg/capita/year for Italy. Belgium, Austria, Germany and Ireland all generated similar amounts of glass packaging per capita, in the range of 36-38kg/capita/year.

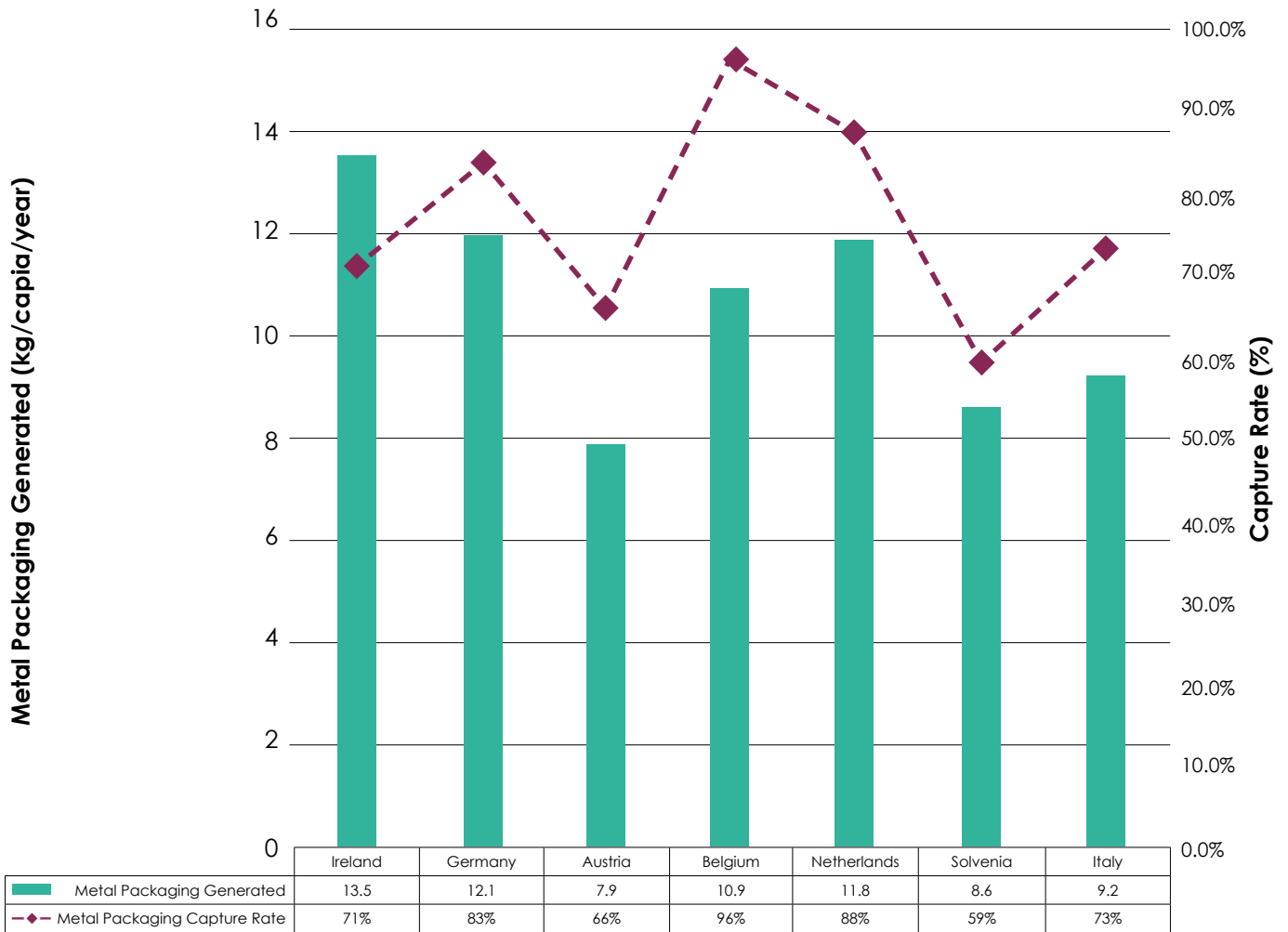
Whilst Slovenia generates the least glass packaging per capita, it has the highest capture rate at 98%. This may indicate that the amount

of glass packaging generated in Slovenia is underestimated. Belgium also has a high capture rate, at 97%. As detailed in section 3.6, this capture rate is likely to be inflated due to the impact of bottled beverages that members of the public buy abroad but dispose of in Belgium. Ireland reports the third highest capture rate for glass packaging at 84%.

3.11.2.2 Metal Packaging

Figure 3-10 shows the 2020 metal packaging generated per capita and 2020 metal packaging capture rate for Ireland and other countries analysed in the present report.

Figure 3-10: Metal Packaging Generated per Capita and Capture Rate for Ireland and Other Countries



Metal packaging generated ranged from 7.9 kg/capita/year for Austria to 13.5 kg/capita/year for Ireland.

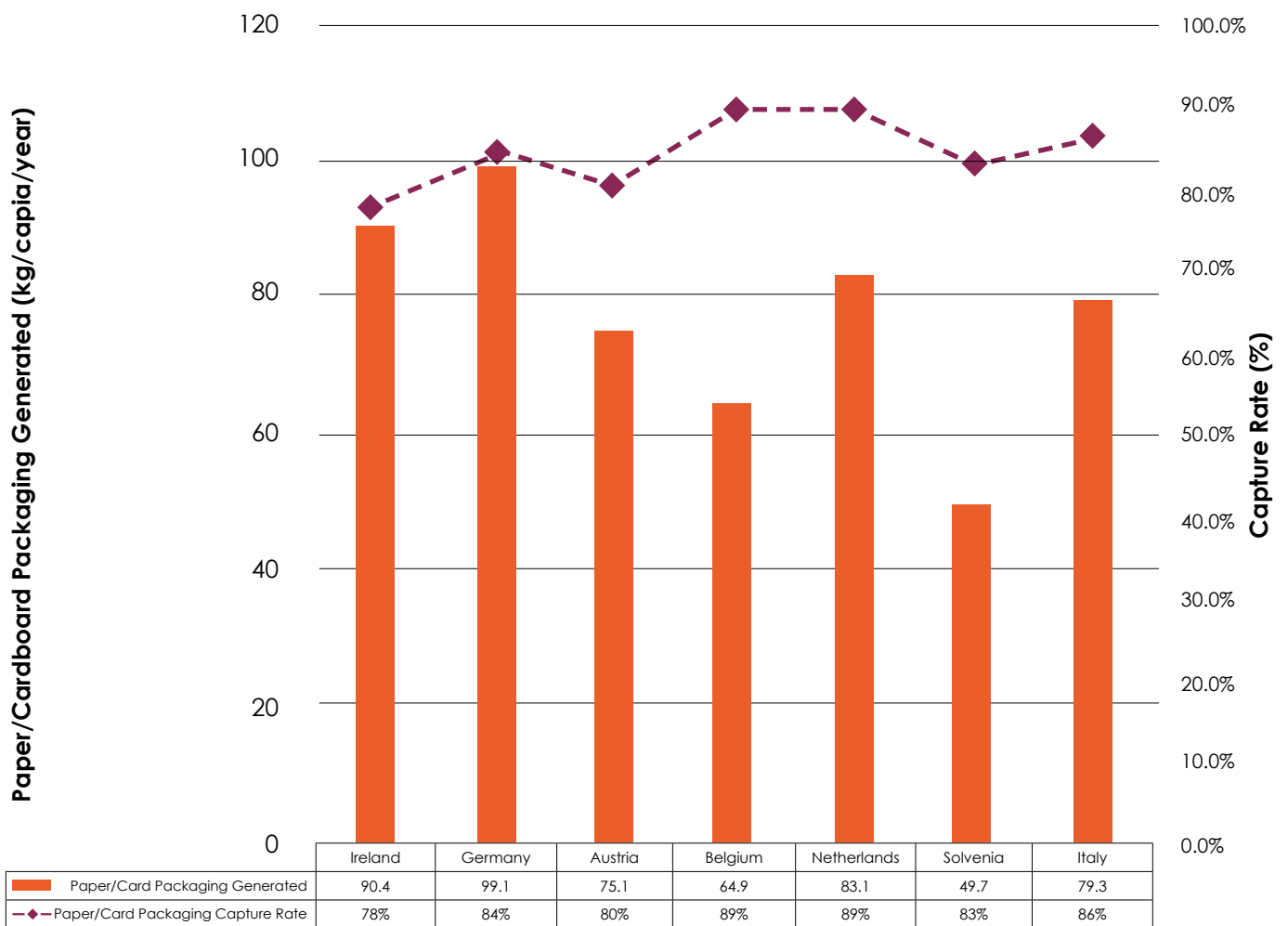
In Belgium, the figures reflect the same issue as with glass: the capture rate is likely to be overestimated due to beverages in metal containers being brought abroad. Other than Belgium, capture

rates ranged from 59% for Slovenia to 88% for the Netherlands. The Netherlands' capture rate is likely to increase further following the introduction of DRS on metal beverage containers in April 2023; Ireland's figures are also likely to improve once its DRS for metal beverage containers comes into effect in 2024.

3.11.2.3 Paper and Cardboard Packaging

Figure 3-11 shows the 2020 paper and cardboard packaging generated per capita and the 2020 paper and cardboard packaging capture rate for Ireland and other countries analysed in the present report.

Figure 3-11: Paper and Cardboard Packaging Generated per Capita and Capture Rate for Ireland and Other Countries



Paper and cardboard packaging generated ranged from 49.7 kg/capita/year for Slovenia to 99.1 kg/capita/year for Germany.

Capture rates did not vary as greatly between countries as is the case for glass and metal. The lowest capture rate was 78% for Ireland, while the highest was 89% achieved by both Belgium and the Netherlands

3.11.2.4 Plastic Packaging

Figure 3-12 shows 2020 plastic packaging generated per capita and the 2020 plastic packaging capture rate for Ireland and other countries analysed in the present report.

Figure 3-12: Plastic Packaging Generated per Capita and Capture Rate for Ireland and Other Countries



Plastic packaging generated ranged from 23.7 kg/capita/year for Slovenia to 61.5 kg/capita/year for Ireland, the highest figure amongst the countries examined.

Capture rates were significantly lower than for the other packaging materials, ranging from 25% in Austria to 49% in the Netherlands. It is interesting to note that the two countries with a DRS system

in place for plastic packaging, Germany and the Netherlands, presented the highest capture rates, with 46% and 49% respectively. Other countries, however, managed to achieve capture rates only slightly lower than this, with both Belgium and Slovenia reaching 45% and Italy 44%. Ireland's capture rate for plastics is likely to be improved by the introduction of a DRS for plastic beverage containers in 2024.

● 4 Conclusions

4.1 Data Quality and Anomalies

The work undertaken as part of this study have identified that the majority of countries appear to still diverge from the EU's new recycling calculation method. The largest areas of uncertainty, where the greatest amendments have needed to be made are:

- Accounting properly for non-household waste. Many countries' collection system involves municipalities in the collection of waste from at least some businesses, with this waste often being co-collected with household waste, making it inherently difficult to disaggregate the two. In many cases, data regarding municipal waste from businesses that is collected by private sector operators is less good than for household waste. The absence of data is difficult to correct for accurately. Some countries have already made efforts to improve this data, while others are introducing new waste data capture systems. The consistency of this information is therefore likely to increase.
- Accounting properly for recycling contamination. While some countries are making considerable efforts to accurately assess the amount of recyclable material at the calculation point, there are many cases (especially where recycling is measured at an early stage in the collection and sorting process, or where material is exported for recycling) where it appears that the deductions made are incomplete.

The quality of Ireland's data appears largely to be good, with only minor deductions being necessary in respect of contamination in exported dry recycling.

While deductions were made from the reported recycling rates of many of the high recycling countries examined in the course of the study, Ireland remains the country with the lowest recycling rate in the group at 40.2%. Many of the other countries exceed 50%, with Austria achieving the highest figure at 58.6%.

4.2 International Differences

Austria appears to be the best performing country in Europe in terms of recycling rates, despite having a packaging recycling rate that is lower than several other EU countries. Compared with Ireland, it is clear that Austria generates much higher volumes of green waste and paper waste than Ireland and that high recycling rates for these materials contribute to its high overall recycling performance, and thus if it generated less of these wastes, its recycling rate would be lower. Ireland might take the view that, in the context of the waste hierarchy, its lower arisings constitute a success in waste prevention. However, the Waste Framework Directive MSW recycling targets apply to all arisings and do not account for differences in waste generation.

Success against the recycling target should not be regarded as the only measure of success in waste management, and it is important to look at other metrics, such as municipal waste arisings per capita and residual waste per capita, to gain a fuller perspective.

The research shows that there are significant differences in the wastes that are captured for recycling in each country. Ireland's waste arisings are amongst the lowest in the group of countries studied, which may be connected with the fact that householders have to pay for much of the waste they produce to be managed. Other countries have introduced "pay as you throw" schemes as a means of reducing residual waste, while Ireland is likely already to benefit from the impact of charging.

Ireland's captures of organic waste are amongst the lowest of the countries studied at 70kg/capita, with only Slovenia capturing a smaller amount. The small quantity of organic waste – and in particular, garden waste – that is captured is a significant contributor to Ireland's relatively low recycling rate. This does not necessarily reflect low overall arisings of organic waste in Ireland, as the EPA indicates that more than half of organic waste in Ireland is placed in the residual waste bin.

On dry recycling, Ireland's capture of this material is relatively low at 189kg/capita per year, with only Italy reporting lower figures. Ireland's figure is similar to the kg/capita figures reported by the Netherlands and Slovenia, but considerably lower than many of the leading recycling nations.

For individual packaging streams:

- Ireland's glass packaging arisings per capita and capture rate are very similar to those of Germany, Belgium and Austria, while the countries with substantially higher capture rates have exceptional circumstances that call the accuracy of the capture rates into some doubt.
- Ireland's metal packaging arisings per capita are the highest of the group of countries examined, but its capture rate is amongst the lowest.
- Ireland's packaging paper and card arisings per capita are the second highest of the group of countries examined, behind only Germany, but its capture rate is amongst the lowest.
- Ireland's plastic packaging waste arisings per capita are the second highest of the group of countries examined, behind only Germany, but its capture rate is amongst the lowest.

In addition, Ireland counts a relatively small proportion of the textiles that are collected for reuse towards its municipal reuse and recycling rate. If, prior to export, other textiles are being checked and sorted to a standard that would satisfy the criteria for classification as "*preparation for reuse*", it may be that a greater share of this material could correctly be categorised as having managed as waste before being determined to be suitable for reuse. It may be appropriate for the EPA to investigate the sorting processes that used textiles are subject to, to determine whether they meet the requisite standard. If it was determined that the standard is met, it could add a percentage point or more to Ireland's recycling rate and bring Ireland's level of reuse and recycling of textiles up to a per capita rate that is more similar to other countries.

As a result of the differences in captures between Ireland and the leading recyclers, despite Ireland's relatively low total arisings, municipal residual waste generation in Ireland (385kg/capita) is similar to that of the Netherlands and Belgium, while being considerably greater than in Italy and Slovenia.

4.3 Opportunities for Improvement

The greatest areas of opportunity for Ireland to improve its recycling rate are the materials that arise in greatest quantity and where Ireland's capture rates fall below those of comparator countries. Key areas of focus would be on organic waste and paper/card, although there may also be opportunities to capture non-bottle plastics and minor waste streams such as electrical items and textiles.

Ireland is already taking steps to improve. The new waste recovery levy will add to the financial incentive for both householders and businesses to divert waste from the residual stream. Captures of food waste are likely to grow through the roll-out of kitchen caddies and brown bins more widely across the country. An increasing number of businesses, too, are being offered brown bins, along with greater price incentives to recycle.

Meanwhile, the Irish Waste Management Association (IWMA) has formed a Task Force to work on increasing MSW recycling rates in Ireland. The Task Force is working on a wide range of initiatives to increase capture rates of separately collected materials, including:

- Increasing recycling rates at apartments by informing property management companies and apartment owners of their legal obligations regarding the source segregation of dry recyclables and biowaste.
- Providing league tables to waste collectors to encourage better performance in terms of capturing source segregated recyclables from both household and commercial customers.
- A trial in which larger recycling bins are provided to households that appear to need them.
- Commissioning an independent study that will involve examining the coding of municipal versus non-municipal waste as it is accepted at transfer stations in skips and other bins. This may lead to more reliable classification of waste and the removal of some C&D waste or postproduction residues from the MSW figures.
- Better accounting for reused textiles.
- The use a camera detection system, initially by Ireland's largest waste collection company to reduce contamination in dry recycling bins. Trials of this system have reduced contamination levels from c.25% to less than 10% and have shown increased recycling rates due to people becoming better educated regarding how to source segregate recyclable wastes.
- Plans formed by some IWMA members to recover recyclables - particularly metals and plastics - from residual MSW prior to recovery or disposal.

While Ireland clearly faces a substantial challenge if it is to increase its recycling performance to match the leading recyclers in Europe and achieve the future MSW recycling targets, the combination of these measures is likely to lead to a substantial increase in Ireland's MSW recycling rate. However, it will be important to review the impact of these steps as promptly as possible to determine whether they are having a sufficiently substantial effect on performance, or whether further measures need to be devised to ensure that sufficient progress is made.

Glossary

BCR	Brussels Capital Region
C&D	Construction and Demolition
C&I	Commercial and Industrial
CSO	Central Statistics Office
DRS	Deposit Return Scheme
EEA	European Environment Agency
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
EU	European Union's
EXPRA	Extended Producer Responsibility Alliance
GDP	Gross Domestic Product
I&C	Industrial and Commercial
IBA	Incinerator Bottom Ash
ISPRA	Italian Institute for Environmental Protection and Research
IWMA	Irish Waste Management Association
MBT	Mechanical Biological Treatment
MSW	Municipal Solid Waste
OECD	Organisation for Economic Co-operation and Development
PAYT	Pay-As-You-Throw
PET	Polyethylene terephthalate
RCERO	Regional Waste Management Centre
WEEE	Waste Electrical and Electronic Equipment
WFD	Waste Framework Directive

A 1.0 Methodology

The methodology for this study consisted of the following tasks.

Methodology Tasks

Task 1	Comparison of Old and New Calculation Methodologies
Task 2	Analysis of Ireland's MSW Recycling Performance
Task 3	Recycling Performance for Various Leading European Countries
Task 4-6	Data Comparisons Between Ireland and Other Countries
Deliverables	Report in a format suitable for the IWMA's internal use

Task 1 involved undertaking research to produce an accurate summary of the principal elements of the EU's new preparing for reuse and recycling rate calculation methodology, and of the contrasts between it and the previous EU calculation method.

In Task 2 we sought information from public sources and directly from the Irish EPA regarding Ireland's recycling performance, and undertook analysis to understand any divergences between the calculation method used to produce Ireland's recycling rate and the EU's calculation methodology.

Task 3 involved undertaking research to find publicly available data sets and reports that would provide information regarding the detailed recycling performance of the European countries requested by the client, and to establish whether there were any anomalies in the data or the calculation methods found.

In Tasks 4-6, Eunomia undertook analysis of the recycling performance of the different countries researched, focusing on how Ireland diverges from the comparators, looking at overall tonnages, percentage performance terms and, where relevant, differences in per capita performance .

As **deliverables**, the findings from the previous tasks were compiled into a report in a format suitable for use by the IWMA for its internal purposes.

A 2.0 EEA Assessment of Member State ‘New Rules’ Recycling Rates

The work carried out by Eunomia in the course of this study is not the only attempt to assess the degree to which different countries diverge from EU recycling reporting rules. In responses to questionnaires sent by the EEA in 2021 as part of the EEA Early Warning Assessments covering (inter alia) the MSW preparing for reuse and recycling targets, a few Member States provided quantified estimates on how the new reporting rules would impact the national recycling rate data. Reductions of between 3.8 and 13 percentage points were indicated, with an average of 5.5-6.7 percentage points. In cases where the country did not provide quantified estimates of the impact of the new rules, the EEA assumed that these would reduce the national figure by 5 percentage points.⁴⁴

For the focus countries within the current study, the EEA National Early Warning Assessment reports provide the information compiled in Table 1. While the EEA document provided data only for 2019, within the right-hand column of the table we also provide updated projected adjusted [preparation for reuse and] recycling rates for 2020, applying the adjustments that the EEA assessed to be necessary. Note that the estimates made by Eunomia in the body of this report are not fully consistent with the EEA's methodology for making deductions, as Eunomia has made no adjustment for recycling losses other than due to contamination.

Table 1: Summary of MSW Recycling Rates Impacts from EEA 2022 Early Warning Assessments

Country	Country has quantified the impact of new calculation rules	MSW preparation for reuse and recycling adjustment made, and on what basis	Adjustments applied (by Eunomia, following the EEA approach) for 2020
Ireland ⁴⁵	Yes	The EPA communicated to the EEA in 2021 that the recycling rate for 2019 (37.4%) would reduce to 32-34% with the new calculation rules. The EEA does not clarify why, however.	2020 published Eurostat rate: 40.8% 2020 possible adjusted rate: 36.4% [confidence: low ⁴⁶] {includes home composting}
Wales	Not covered by EEA study	-	-
Germany ⁴⁷	No	The EEA applies a 5% reduction, based on an average reduction as observed from other countries.	2020 published Eurostat rate: 71.6% 2020 possible adjusted rate: 66.6% [confidence: low]

⁴⁴ EEA (2022), *Methodology for the EEA's input to the 'Early warning' Assessment – Municipal Solid Waste Preparing for Reuse and Recycling target*, available [here](#).

⁴⁵ EEA (June 2022), *Early warning assessment related to the 2025 targets for municipal waste and packaging waste – Country Profile: Ireland*, available [here](#).

⁴⁶ Although Ireland were one of the countries who replied directly to the EEA project questionnaire, providing an estimate of the adjustment likely to be required to fit with the new calculation rules, this related only to the 2019 data. Communication with the EPA during this current project reveals that the EPA used new calculation techniques for 2020, and so the EEA adjustment does not also apply to the 2020 data. For this reason, the confidence level in the adjusted rate provided here is considered "low".

⁴⁷ EEA (June 2022), *Early warning assessment related to the 2025 targets for municipal waste and packaging waste – Country Profile: Germany*, available [here](#).

Austria ⁴⁸	No: "According to the Austrian authorities the assessment on the impact of the application of the new calculation rules on the recycling rate is still ongoing"	The EEA document states that "The Austrian authorities indicated that preliminary results for the application of the new reporting rules would increase the recycling rate"	2020 published Eurostat rate: 62.7% 2020 possible adjusted rate: >62.7% [confidence medium to high]
Belgium ⁴⁹	Yes, for Flanders and Brussels Capital Region (BCR).	The EEA states that "Flemish and BCR authorities have estimated that the application of the new calculation rules will reduce the recycling rate by 10.5 – 12 percentage points [below 54.2%] while no similar estimate is available for Wallonia."	2020 published Eurostat rate: 51.6% 2020 possible adjusted rate: 43.5% [confidence medium to high]
Netherlands ⁵⁰	Partially (household waste only): "The Dutch authorities indicate that the first rough calculations show a recycling rate for household waste of 52.5% based on the new calculation rules." This is not related to any figures within the EEA work, but it is notable that separation of household waste (separation at source + post separation) was targeted to increase from 2014 rates of 52% up to the policy target of at least 75% within the Netherlands National Waste Management Plan. ⁵¹	The EEA applies a 5% reduction, based on an average reduction as observed from other countries.	2020 published Eurostat rate: 56.9% 2020 possible adjusted rate: 52.5% [confidence: low]
Slovenia ⁵²	No	The EEA applies a 5% reduction, based on an average reduction as observed from other countries.	2020 published Eurostat rate: 59.3% 2020 possible adjusted rate: 54.3% [confidence: low]
Italy ⁵³	Partially	The EEA report that ISPRA believes no substantial differences will be seen relating to separately collected materials, but that the new rules will reduce the calculated recycling rates. Reasons for this are not provided, however.	2020 published Eurostat rate: 51.4% 2020 possible adjusted rate: 47% [confidence: medium to high]
Switzerland	Not covered by EEA study	Though not covered by the EEA, a 5% reduction would be likely to apply, based on the average reduction applied for other countries where no impact quantification was available.	2020 published Eurostat rate: 52.8% 2020 possible adjusted rate: 47.8% [confidence: low]

⁴⁸ EEA (June 2022), *Early warning assessment related to the 2025 targets for municipal waste and packaging waste – Country Profile: Austria*, available [here](#).

⁴⁹ EEA (June 2022), *Early warning assessment related to the 2025 targets for municipal waste and packaging waste – Country Profile: Belgium*, available [here](#).

⁵⁰ EEA (June 2022), *Early warning assessment related to the 2025 targets for municipal waste and packaging waste – Country Profile: Netherlands*, available [here](#).

⁵¹ Rijkswaterstaat (2019), *National Waste Management Plan - Section A: General policy framework*, available [here](#).

⁵² EEA (June 2022), *Early warning assessment related to the 2025 targets for municipal waste and packaging waste – Country Profile: Slovenia*, available [here](#).

⁵³ EEA (June 2022), *Early warning assessment related to the 2025 targets for municipal waste and packaging waste – Country Profile: Italy*, available [here](#).

