



# Recycling –who really leads the world?

Identifying the world's best municipal waste recyclers

# Research Questions

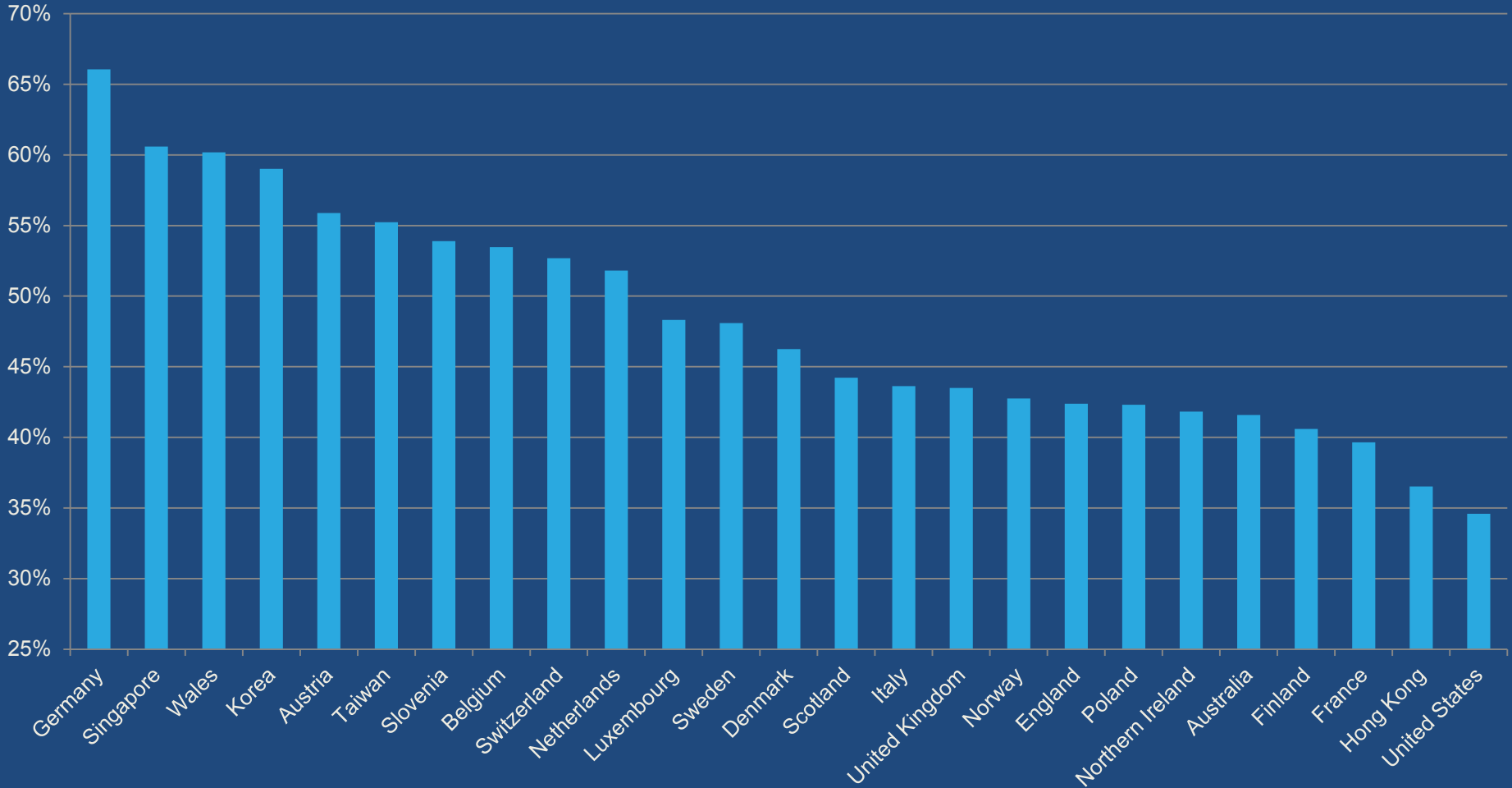
- How do leading European recycling nations compare to the rest of the world?
- How comparable are reported rates?
- Can we improve comparability?
- How does improving comparability change the league table?

# Introduction

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- **Around the world, recycling rates are widely reported – but not in ways that can be easily compared**
- **Some eye-catching recycling rate claims need to be treated with caution**
- **By compiling data from sources including Eurostat and OECD we can assess the top 25 MSW recycling rate performers**
- **We can then examine the data to compare the top performers on a more consistent basis**

## Top 25 MSW Recyclers - Reported Recycling Rate



# Top performers

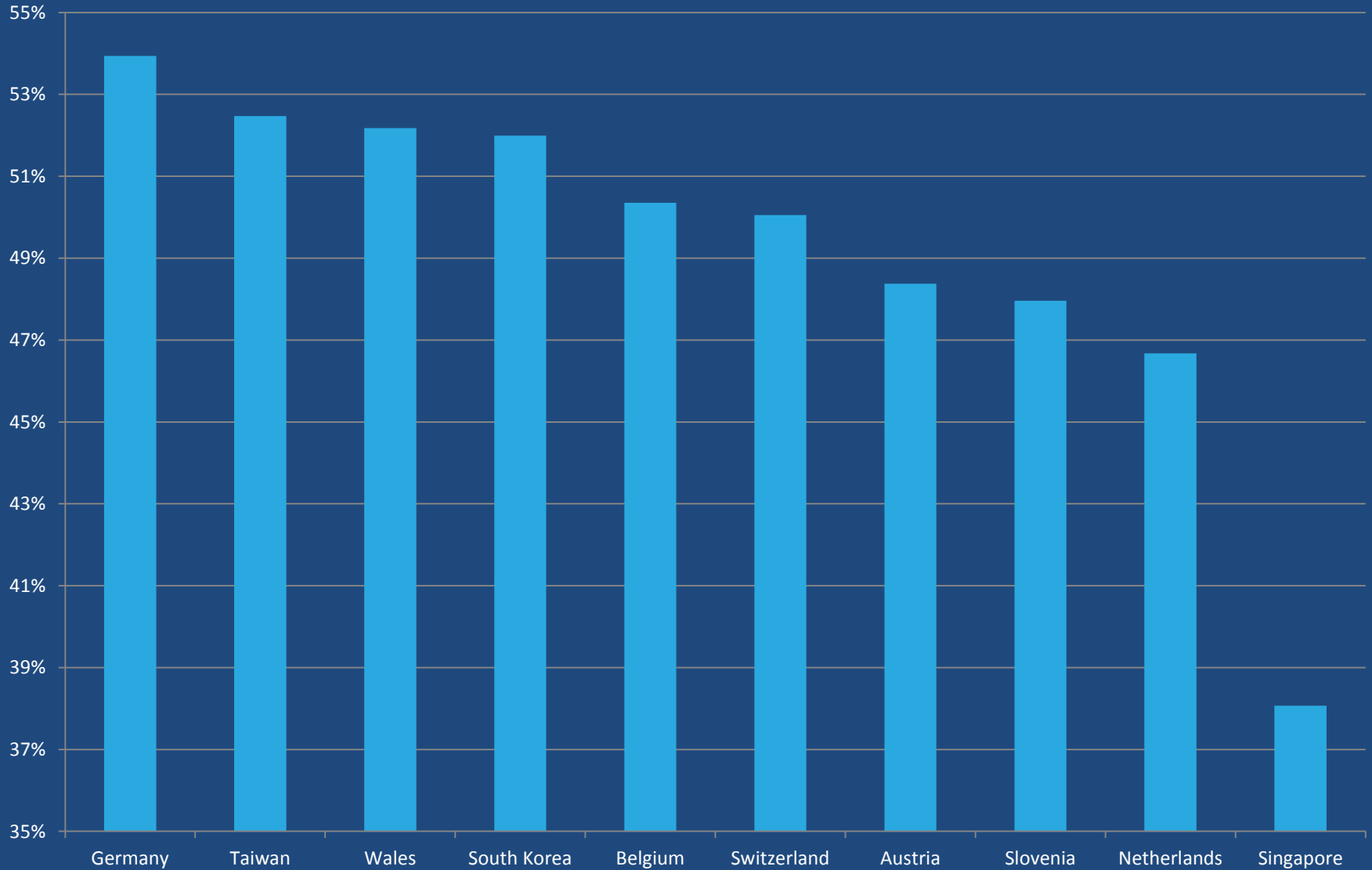
- **EU member states are well represented in high performers, as are several Asian states**
- **Wales is in the top three and comfortably ahead of other UK nations**
- **But we are not comparing like with like**

# Towards a Better Comparison

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- Digging further into the underlying data and the recycling practices in each country allows us to produce an adjusted top 10 taking into account:
- Identifying what material is included/excluded:
  - How much commercial, industrial and construction? (e.g. rubble)
  - Incinerator bottom ash (including metals from IBA)?
  - Contamination within dry recycling and biowaste
- Clarifying definitions of 'recycling' and at what point it is measured
- Adjusting the top 10 performers from our longlist delivers a revised order and some significant performance changes

## Top 10 MSW Recyclers - Adjusted Recycling Rate



*(See method section for details of adjustments made)*

# Germany, Taiwan and Wales hold the top spots

- Germany remains top of the adjusted league table
- Taiwan holds second place
- Wales is second in Europe, and third in the world
- The rest of UK has some catching up to do



# Levers for high performance

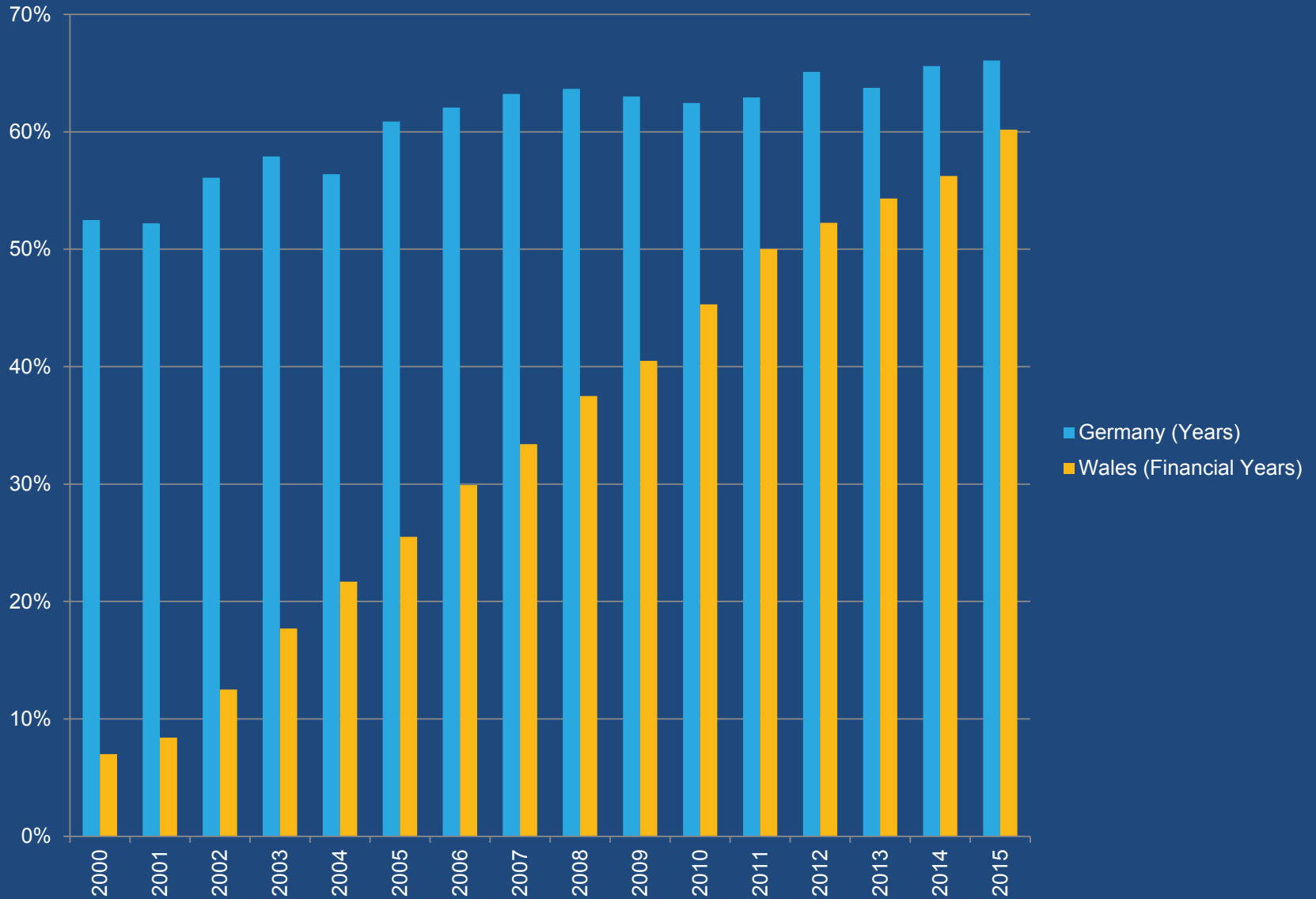
While the details vary, leading nations all have effective packages of policy levers in place:

- Comprehensive schemes to enable people to recycle
- Clear performance targets and policy objectives
- Good funding for recycling, e.g. government funding, extended producer responsibility
- Incentives to encourage citizens to recycle e.g. residual restriction, differential Pay As You Throw, deposit refund schemes

# Wales continues to make progress

- **The Welsh Government is moving towards a 70% target**
- **Welsh authorities have binding targets and scope to improve performance**
- **Wales could soon overtake Germany**

# Recycling Rate Change - Germany and Wales



Source: Eurostat / Welsh Government – see *method* section for details

# Conclusions

- **Fair comparison of rates between countries remains difficult**
- **Political leadership and investment is making Wales a global leader**
- **Wales' continuing ambition could see it take top spot**
- **The challenge is on for the rest of the UK to catch up**

# Method and Assumptions

## 1.0 Introduction

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Many countries are reported to have some quite astonishing recycling rates. The casual observer could be forgiven for thinking that Sweden recycles 99% of its waste.<sup>1</sup> If you ask Google what Germany's recycling rate is, the leading result reports it as high as 87%.<sup>2</sup> Singapore claims a rate of just over 60%; and closer to home, so does Wales. Resource recently reported that "if Wales was reported as a separate country, it would be the second best recycling nation in Europe" – trailing only Germany.<sup>3</sup>

However, recycling figures are often produced by very different methods, and comparing them sheds little light on how the different nations really perform. For example:

- The 99% figure for Sweden counts incineration for energy recovery as a form of recycling, which (even given the high level of efficiency of Sweden's incinerators) is out of step with how the term "recycling" is generally used;
- Germany's 87% figure isn't clearly sourced but appears to include a large amount of commercial and industrial waste, as does Singapore's 61%.

In this report, Eunomia and Resource attempt to compare municipal waste recycling rates on as equal a footing as possible, to answer the question: *which is the world's leading recycling nation?* In doing so, we draw upon analysis Eunomia has previously carried out, including work to support the setting of more consistent recycling rate targets across Europe. However, the key focus of the work is to provide consistent, comparable rates for each nation. This requires an approach that sees recycling rates generally being 'downgraded' to reflect available data and consistent interpretation of 'recycling', but is not intended to be a critique of the different reporting methods used.

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<sup>1</sup> Lum, Z.-A. (2014) 99 Per Cent Of Sweden's Garbage Is Now Recycled, *Huffington Post*

<sup>2</sup> Wefuturecycle (2015) *Waste Management in Germany, 87% Recycling Rate*

<sup>3</sup> Carter, K. (2017) Wales Records Another Recycling Leap to 62 per cent Rate, *Resource*

## 2.0 Method

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### 2.1 Longlisting

In order to develop a longlist of 25 high performing recycling nations, Eunomia identified two key data sets: Eurostat’s Environmental Data Centre on Waste<sup>4</sup> and the OECD iLibrary on Municipal Waste.<sup>5</sup> For each nation, the most recent available year was used. Most nations have reported 2015 data, but in some cases data is only available from earlier years.

The recycling rates quoted for UK nations are the waste statistics published by the governments in each of the four nations for 2015/16. There are differences in the basis on which these figures are calculated. Household waste figures only are used for Scotland, while for the other nations municipal waste figures are used. The UK government also prepares a “waste from households” report, which adjusts each of the four nations’ statistics to make them more consistent, and to remove any non-household waste. The latest version of this report covers 2015, and also includes an overall assessment of UK municipal waste recycling, which is used as the source for the UK’s overall recycling rate.<sup>6</sup>

The wide coverage of high-recycling nations provided by these resources was supplemented by additional research on non-OECD nations that have high recycling rates. In practice, there are few such nations, with the figures quoted for Singapore and Taiwan standing out.

The advantage of using the data collected by Eurostat and OECD is that some level of vetting has already been carried out on the data, helping to make them more readily comparable. For example, in some cases recycling rates are quoted that show recycling and composting as a percentage of all waste receiving final treatment, rather than as a percentage of waste generated or collected. Where MBT is widely used, the former basis of calculation can artificially boost the apparent recycling rate – mainly due to moisture losses during this process.

The data underlying the longlist is set out in Table 1.

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<sup>4</sup> *European Data Centre on Waste*, accessed 10 March 2017, <http://ec.europa.eu/eurostat/web/waste/transboundary-waste-shipments/key-waste-streams/municipal-waste>

<sup>5</sup> *Municipal Waste*, [http://www.oecd-ilibrary.org/environment/data/oecd-environment-statistics/municipal-waste\\_data-00601-en?isPartOf=/content/datacollection/4de0116a-en](http://www.oecd-ilibrary.org/environment/data/oecd-environment-statistics/municipal-waste_data-00601-en?isPartOf=/content/datacollection/4de0116a-en)

<sup>6</sup> Defra (2016) *UK Statistics on Waste*, August 2016, [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/547427/UK\\_Statistics\\_on\\_Waste\\_statistical\\_notice\\_25\\_08\\_16\\_update\\_2\\_.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/547427/UK_Statistics_on_Waste_statistical_notice_25_08_16_update_2_.pdf)

**Table 1: Waste Generation and Treatment (Kg per Capita)**

Country	Year	Source	Population (000s)	Waste Generated	Landfill	Incineration	Other Recovery	Material Recycling	Composting and Digestion	Recycling Rate
1. Germany	2015	Eurostat	81,202	628.6	59.3	196.7		300.7	114.6	66.1%
2. Singapore	2015	Singapore Government	5,399	1421.3	560.1			861.2		60.6%
3. Wales	2015/16	Welsh Government	3,100	513.6	93.4	97.4	1.3	212.6	96.5	60.2%
4. South Korea	2014	OECD	50,424	361.3	60.9	91.5		209.9	3.3	59.0%
5. Austria	2015	Eurostat	8,538	566.4	16.8	214.6		145.3	177.0	55.9%
6. Taiwan	2015	Taiwan EPA	23492.0	307.7	3.9	133.8	0.1	144.0	26.0	55.2%
7. Slovenia	2015	Eurostat	2,067	448.1	101.7	76.5	14.3	208.1	34.3	53.9%
8. Belgium	2015	Eurostat	11,369	414.1	78.4	179.7		142.1	79.2	53.5%
9. Switzerland	2015	Eurostat	8,129	741.8		350.6		236.7	154.5	52.7%
10. Netherlands	2015	Eurostat	16,981	521.5	13.1	244.5		128.3	141.3	51.8%
11. Luxembourg	2015	Eurostat	563	632.7	111.5	215.7		180.4	125.1	48.3%
12. Sweden	2015	Eurostat	9,799	446.6	3.6	228.7		144.6	69.8	48.1%
13. Denmark	2015	Eurostat	5,611	799.3	9.1	420.4		217.9	151.8	46.3%
14. Scotland	2015	SEPA	5,400	457.2	213.1	41.9		202.1		44.2%
15. Italy	2015	Eurostat	61,637	479.0	176.7	90.6		124.1	84.4	43.6%
16. United Kingdom	2015	Defra	64,532	489.2	115.0	153.5		133.3	79.4	43.5%

Country	Year	Source	Population (000s)	Waste Generated	Landfill	Incineration	Other Recovery	Material Recycling	Composting and Digestion	Recycling Rate
17. Norway	2015	Eurostat	4,904	446.0	15.1	233.5	6.3	116.5	74.4	42.8%
18. England	2015/16	Defra	54300	481.1	98.1	166.8	12.3	126.9	77.0	42.4%
19. Poland	2015	Eurostat	38,016	285.7	129.7	37.9		75.4	46.0	42.3%
20. Northern Ireland	2015/16	Daera	1,900	510.1	205.4	90.0	1.4	122.3	91.1	41.8%
21. Australia	2015	Eurostat	23,941	557.2	260.6	64.9		231.7		41.6%
22. Finland	2015	Eurostat	5,493	498.5	57.3	238.9		140.2	62.1	40.6%
23. France	2015	Eurostat	66,498	502.3	134.8	174.4		111.8	86.7	39.6%
24. Hong Kong	2014	Hong Kong Government	7,240	776.2	492.7			283.6		36.5%
25. United States	2014	OECD	318,857	735.3	386.7	94.3		188.9	65.5	34.6%

## 2.2 Top 10 Analysis

Even within the EU and OECD statistics, there are considerable variations in the calculation methods used. We have explored the top 10 recycling nations' figures in greater depth in order to bring further consistency to the results. There is a significant gap (3.5 percentage points) between the Netherlands in 10<sup>th</sup> place and Luxembourg in 11<sup>th</sup>. It is unlikely that, even with quite significant adjustments, any nation from outside the top 10 could rise to the top of our chart. In this section we explain the adjustments made to each country's recycling statistics.

In each case, we examine municipal waste, which includes household waste, and some waste from commercial and industrial sources that is similar to household waste. The extent to which commercial waste is included in the statistics for each nation varies, and it is not possible with the data available to render the data wholly consistent regarding the influence of waste from non-household sources on the results. However, where non-household waste has a clear and distorting impact on the performance, we have sought to rectify this.



## 2.2.1 Germany

Germany's recycling figures required the following changes to bring them into line with other nations:

- *Mechanical Biological Treatment (MBT) plants.* Germany reports all inputs to MBT processes (around 2.1 million tonnes) as recycled. A credible recent German report estimates that only 6% should be counted as recycled.<sup>7</sup> This reduces recycling by 24.3kg per capita.
- *Metal recovery from incinerator bottom ash (IBA).* Germany reports metals recovered from IBA as recycled, but this approach is not consistently applied across the top 10 countries. We have therefore removed metals recovered by this means; based on the tonnage of material incinerated, this is estimated at 3.9kg per capita.
- *Contamination within dry recycling reported as recycled.* Germany's recycling figures include some contamination within its dry recycling. Eunomia's work for the European Commission indicates that, across a basket of materials, this is likely to amount to 13.4% of dry recycling. 36.4kg per capita have been removed to reflect this.
- *Contamination within biowaste composted/anaerobically digested.* Germany's recycling figures include some contamination within its organic waste. Eunomia's work for the European Commission indicates that, across garden and food waste, this is likely to amount to 10% of biowaste. 11.5kg per capita have been removed to reflect this.

## 2.2.2 Singapore

Closer examination of Singapore's recycling statistics indicate that a very large amount of construction, demolition, commercial and industrial waste is likely to be included in the total, resulting in very high waste generation per capita - almost five times as much per capita as Taiwan, for example.<sup>8</sup> Singapore reports very high recycling rates of some of these materials. Singapore's recycling figures required the following changes to bring them into line with other nations:

Together the following waste types account for 31% of waste and 39% of recycling:

- Construction Debris
- Used slag

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<sup>7</sup> Deutsche Gesellschaft für Abfallwirtschaft e.V. (2016) *Quotenzauber Neue Berechnungsgrundlagen als Herausforderungen für die deutsche Kreislaufwirtschaft*, January 2016, [http://www.dgaw.de/wp-content/uploads/dgaw-pm-artikel-recyclingquote-20160129-endfassung\\_1454338264.pdf](http://www.dgaw.de/wp-content/uploads/dgaw-pm-artikel-recyclingquote-20160129-endfassung_1454338264.pdf)

<sup>8</sup> Singapore Government *Waste Statistics and Overall Recycling*, accessed 10 March 2017, <http://www.nea.gov.sg/energy-waste/waste-management/waste-statistics-and-overall-recycling>

- Scrap tyres
- Ash & Sludge
- Others (stones, ceramic, rubber, etc.)

Singapore's figures also include high levels of materials that may form part of the household stream, but are likely to principally derive from commercial sources (e.g. metals, wood). Metals recovery includes an unspecified level of material recovered from IBA, while wood "recycled" is almost all used as biomass. We have further adjusted the composition to reflect a more normal level of household arisings (500kg per capita) and composition. For example, we have included only 20% of ferrous metals arisings (50kg per capita), but 65% of paper arisings (144kg per capita).

It is unclear to what extent contamination is taken into account in Singapore's figures. We have assumed that no further adjustment for dry or organic recycling rejects is required.

### 2.2.3 Wales

Wales's recycling figures required the following changes to bring them into line with other nations:

- *Rubble*. Wales counts significant amounts of rubble collected at household waste recycling centres towards its recycling rate, but this material is not consistently counted as municipal waste across Europe. 28.6kg per capita have therefore been deducted from both the municipal waste arisings and the recycling figures to remove this material from consideration.
- *Incinerator bottom ash (IBA)*. Wales reports a significant amount of IBA as recycled, whether as metals or as aggregate. This approach is not consistently applied across the top 10 countries. We have therefore removed 18.4kg per capita to account for this material.
- *Contamination within dry recycling reported as recycled*. Wales collects approximately half of its dry recycling via the kerbside sort collection system, which results in low levels of contamination. Reporting of dry recycling accounts extensively for material rejected at the initial sorting stage, and to some degree at later stages. The level of unreported contamination should therefore be low, and is estimated at 4% of dry recycling (6.6kg per capita).
- *Contamination within biowaste composted/anaerobically digested*. Reporting of biowaste accounts for material rejected at the gate and during the recycling process. The level of unreported contamination should therefore be low, and is estimated at 2.5% (2.4kg per capita).

## 2.2.4 South Korea

South Korea's statistics clearly differentiate household waste from commercial and other sources, and there are no indications of material recovered from incinerators being counted towards recycling. While South Korea practices a high degree of source separation in its household recycling, and employs "pay as you throw" for residual waste, it is heavily reliant on bring sites for free recycling collections. South Korea's recycling figures required the following changes to bring them into line with other nations:

- *Contamination within dry recycling reported as recycled.* Bring based systems often encounter relatively high levels of contamination, and it is unclear from South Korean data whether recycling is measured before or after sorting has occurred. The level of unreported contamination is therefore estimated at 12% of dry recycling (25.2kg per capita).
- *Contamination within biowaste composted/anaerobically digested.* The biowaste collection system also operates on a bring basis. Contamination is estimated at 5% (0.2kg per capita).

## 2.2.5 Austria

Austria's recycling figures required the following changes to bring them into line with other nations:

- *Mechanical Biological Treatment (MBT) plants.* It appears that in 2014 Austria reported some 274,000 tonnes of outputs from MBT plants as composted, when in practice this material did not meet compost standards and was sent to landfill.<sup>9</sup> Taking account of this tonnage reduces composting by 32.1kg per capita.
- *Metal recovery from incinerator bottom ash (IBA).* Austria reports metals recovered from IBA as recycled, but this approach is not consistently applied across the top 10 countries. We have therefore removed metals recovered by this means; based on the tonnage of material incinerated, this is estimated at 4.3kg per capita.
- *Contamination within dry recycling reported as recycled.* Austria appears to account quite scrupulously for contamination and rejects. The level of unreported contamination should therefore be low, and is estimated at 1% of dry recycling (1.3kg per capita).
- *Contamination within biowaste composted/anaerobically digested.* Similarly, Austria appears to report biowaste so as to take account of most rejects. The level of unreported contamination should therefore be low, and is estimated at 2.5% (4.4kg per capita).

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<sup>9</sup> European Environment Agency (2016) *Municipal Waste - Austria*, October 2016, [http://www.eea.europa.eu/publications/managing-municipal-solid-waste/austria-country-paper-on-municipal/at\\_download/file](http://www.eea.europa.eu/publications/managing-municipal-solid-waste/austria-country-paper-on-municipal/at_download/file)

## 2.2.6 Taiwan

Taiwan's statistics clearly differentiate household waste from commercial and other sources, with only a small amount of apparent commercial material in the household stream – principally containers for agricultural products such as pesticides. There are no indications of material recovered from incinerators being counted towards recycling. Taiwan's recycling figures required the following changes to bring them into line with other nations:

- *Contamination within dry recycling reported as recycled.* While Taiwan appears to practice some degree of co-mingled collection of dry recyclables, its recycling facilities are heavily audited, in a process that seems to closely monitor inputs and outputs.<sup>10</sup> However, it is unclear at what stage in the process recycling is deemed to have occurred. We have therefore estimated that 5% of reported dry recycling may be lost (7.2kg per capita).
- *Contamination within biowaste composted/anaerobically digested.* Little information was found regarding the measurement of contamination in food waste, although it seems that quite stringent auditing is in place. We have estimated that 5% less biowaste than is reported as recycled may in the end be used beneficially (1.3kg per capita).

## 2.2.7 Slovenia

Slovenia's recycling figures required the following changes to bring them into line with other nations:

- *Contamination within dry recycling reported as recycled.* Our previous research on Slovenia's recycling system indicates that recycling is often measured prior to any significant level of sorting having been carried out. The level of unreported contamination is therefore high, and we have therefore deducted 12% of the dry recycling total (25kg per capita).
- *Contamination within biowaste composted/anaerobically digested.* Slovenia reports relatively little biowaste composting. Limited information is available on the performance of the biowaste collection system, and we have assumed that 5% less biowaste than is reported as recycled may in the end be used beneficially (1.7kg per capita).

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<sup>10</sup> US Environmental Protection Agency (2012) *Auditing and Supervision of Collection and Recycling Enterprises*, October 2012, [https://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0ahUKEwic-oO64c3SAhUMK8AKHY1EA2IQFggpMAI&url=https%3A%2F%2Fwww.epa.gov%2Fsites%2Fproduction%2Ffiles%2F2014-05%2Fdocuments%2Fhandout-8-recyclerauditing.pdf&usg=AFQjCNG\\_6g\\_-lysZqN1S97hZlgJn7uhqtA&bvm=bv.149397726,d.ZGg](https://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0ahUKEwic-oO64c3SAhUMK8AKHY1EA2IQFggpMAI&url=https%3A%2F%2Fwww.epa.gov%2Fsites%2Fproduction%2Ffiles%2F2014-05%2Fdocuments%2Fhandout-8-recyclerauditing.pdf&usg=AFQjCNG_6g_-lysZqN1S97hZlgJn7uhqtA&bvm=bv.149397726,d.ZGg)

### 2.2.8 Belgium

Belgium's recycling figures required the following changes to bring them into line with other nations:

- *Metal recovery from incinerator bottom ash (IBA)*. Belgium reports metals recovered from IBA as recycled, but this approach is not consistently applied across the top 10 countries. We have therefore removed metals recovered by this means; based on the tonnage of material incinerated, this is estimated at 3.6kg per capita.
- *Contamination within dry recycling reported as recycled*. Our past research on Belgium's recycling system indicates that recycling is often measured after initial sorting has been carried out. The level of unreported contamination is therefore relatively low, and based on our previous analysis of some of the country's dry recycling streams, we estimate this at 6.5% of dry recycling (9.2kg per capita).
- *Contamination within biowaste composted/anaerobically digested*. Limited information is available on the performance of the biowaste collection system, and we have assumed that 5% less biowaste than is reported as recycled may in the end be used beneficially (4.0kg per capita).

### 2.2.9 Switzerland

Switzerland's recycling figures required the following changes to bring them into line with other nations:

- *Contamination within dry recycling reported as recycled*. We understand that Switzerland primarily measures recycling after initial sorting has been carried out. The level of unreported contamination is therefore relatively low, at perhaps 5% of dry recycling (11.6kg per capita).
- *Contamination within biowaste composted/anaerobically digested*. Limited information is available on the performance of the biowaste collection system, and we have assumed that 5% less biowaste than is reported as recycled may in the end be used beneficially (7.6kg per capita).

### 2.2.10 Netherlands

The Netherlands' recycling figures required the following changes to bring them into line with other nations:

- *Metal recovery from incinerator bottom ash (IBA)*. Belgium reports metals recovered from IBA as recycled, but this approach is not consistently applied across the top 10 countries. We have therefore removed metals recovered by this means; based on the tonnage of material incinerated, this is estimated at 4.9kg per capita.

- *Contamination within dry recycling reported as recycled.* Our previous research on the Netherlands' recycling system indicates that recycling is often measured before any significant sorting has been carried out. The level of unreported contamination is therefore relatively high, and we have therefore deducted 12% of the dry recycling total (14.9kg per capita).
- *Contamination within biowaste composted/anaerobically digested.* Limited information is available on the performance of the biowaste collection system, and we have assumed that 5% less biowaste than is reported as recycled may in the end be used beneficially (7.1kg per capita).

## 2.3 Germany and Wales Comparison

The annual data for Germany is unadjusted data drawn from Eurostat's European Data Centre on Waste.<sup>11</sup> No directly comparable time series data for Wales is available, and so the Welsh Government's statistics for the closest financial year are instead used as a comparison.<sup>12</sup> This data series includes a change of definition taking effect from April 2012.

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<sup>11</sup> [http://appsso.eurostat.ec.europa.eu/nui/show.do?query=BOOKMARK\\_DS-150766\\_QID\\_-11D60F9D\\_UID\\_-3F171EB0&layout=TIME,C,X,0;GEO,L,Y,0;WST\\_OPER,L,Z,0;UNIT,L,Z,1;INDICATORS,C,Z,2;&zSelection=DS-150766INDICATORS,OBS\\_FLAG;DS-150766WST\\_OPER,GEN;DS-150766UNIT,KG\\_HAB;&rankName1=UNIT\\_1\\_2\\_-1\\_2&rankName2=INDICATORS\\_1\\_2\\_-1\\_2&rankName3=WST-OPER\\_1\\_2\\_-1\\_2&rankName4=TIME\\_1\\_0\\_0\\_0&rankName5=GEO\\_1\\_2\\_0\\_1&pprRK=FIRST&pprSO=PROTOCOL&ppcRK=FIRST&ppcSO=ASC&sortC=ASC\\_-1\\_FIRST&rStp=&cStp=&rDCh=&cDCh=&rDM=true&cDM=true&footnes=false&empty=false&wai=false&time\\_mode=ROLLING&time\\_most\\_recent=false&lang=EN&cfo=%23%23%23%2C%23%23%23.%23%23%23](http://appsso.eurostat.ec.europa.eu/nui/show.do?query=BOOKMARK_DS-150766_QID_-11D60F9D_UID_-3F171EB0&layout=TIME,C,X,0;GEO,L,Y,0;WST_OPER,L,Z,0;UNIT,L,Z,1;INDICATORS,C,Z,2;&zSelection=DS-150766INDICATORS,OBS_FLAG;DS-150766WST_OPER,GEN;DS-150766UNIT,KG_HAB;&rankName1=UNIT_1_2_-1_2&rankName2=INDICATORS_1_2_-1_2&rankName3=WST-OPER_1_2_-1_2&rankName4=TIME_1_0_0_0&rankName5=GEO_1_2_0_1&pprRK=FIRST&pprSO=PROTOCOL&ppcRK=FIRST&ppcSO=ASC&sortC=ASC_-1_FIRST&rStp=&cStp=&rDCh=&cDCh=&rDM=true&cDM=true&footnes=false&empty=false&wai=false&time_mode=ROLLING&time_most_recent=false&lang=EN&cfo=%23%23%23%2C%23%23%23.%23%23%23)

<sup>12</sup> <https://statswales.gov.wales/Catalogue/Environment-and-Countryside/Waste-Management/Local-Authority-Municipal-Waste/Annual>

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