Report

The Scottish Carbon Metric

A national carbon indicator for waste

2013 update to the Technical Report

Zero Waste Scotland works with businesses, individuals, communities and local authorities to help them reduce waste, recycle more and use resources sustainably.

Find out more at www.zerowastescotland.org.uk

Written by: Michael Lenaghan, Zero Waste Scotland

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Executive Summary

The Scottish Carbon Metric measures the whole life carbon impacts of Scotland's waste using a ground-breaking carbon accounting approach that employs consumption boundaries to national waste data. This method includes the carbon impacts across the whole life cycle of a product[1], regardless of where they occur, expressing these in carbon dioxide equivalents (CO2e). Traditionally, the carbon impact of waste has focussed on the emissions generated within a particular territorial border, meaning that decision makers do not have a complete picture of the carbon impacts associated with the materials in waste. Further information on the Carbon Metric (CM) can be found on the Zero Waste Scotland website.

The first estimation of Scotland's waste carbon footprint was published in 2013 by Zero Waste Scotland (ZWS) using national waste data for 2011. This report is the third annual update to the Carbon Metric. It presents the carbon impact of Scotland's waste for 2013 and compares this to information for 2012 and 2011. Both the carbon factors and annual waste data used in the Carbon Metric have been updated as part of the on-going development and improvement process; these changes are described in this report.

The carbon impacts of Scotland's waste continued to fall in 2013, achieving a 3% reduction from 2012 levels, and a cumulative 17% reduction below the 2011 baseline year. This was achieved despite a 13% increase in waste arisings over the same period, offset in part by a higher rate of recycling, and a higher proportion of low-carbon waste materials arising, particularly in the Non-Household waste stream.

With the release of the 2013 waste data, SEPA revised its 2011 and 2012 waste datasets. The 2013 Carbon Metric therefore incorporates the latest versions of the 2011, 2012 and 2013 waste datasets. The impact of these revisions are described in this report.

Several updates were also made to recycling carbon factors in the 2013 Carbon Metric and applied retroactively to previous years. Generally, these changes capture carbon savings resulting from material displacement that were previously underestimated or unaccounted for. While several of the affected carbon factors have changed significantly, their impact on Scotland's total waste carbon footprint has been relatively minor due to the comparatively low volume of affected waste materials.

Scotland's existing waste policies (Making Things Last: A Circular Economy Strategy for Scotland[2]) were initially anticipated to deliver a 22% (3.1MtCO2e) drop in waste related carbon emissions between 2011 and 2025 based on a 2011 baseline of 13.9MtCO2e. Updates to the 2011 waste data and Carbon Metric carbon factors however, have resulted in a new projection for annual waste carbon savings in 2025 of 26% (3.3MtCO2e). As of 2013, a 17% carbon savings from the 2011 baseline has been achieved.

[1] Excluding emissions from product use.
[2] Scottish Government, 2016. http://www.gov.scot/Resource/0049/00494471.pdf

1 Waste data updates

1.1 Revisions of the 2011 and 2012 waste data

In July 2014, SEPA released its 2013 waste dataset for Scotland. At the same time SEPA published a revision of the 2011 and 2012 dataset. The main revision was to the commercial and industrial data, although there were some erratum addressed such as including the 2012 organics recycling.

In addition to the SEPA revisions described above, it was discovered during the 2013 CM update, that previous versions had mistakenly classified waste 'disposed by incineration' as having been sent to landfill. This issue has also been addressed, resulting in slightly lower landfill tonnages for 2011 and 2012 than were originally reported.

The 2013 Carbon Metric incorporates the latest versions of SEPA's 2011, 2012 and 2013 waste datasets [3], covering all Scottish waste treated both domestically and abroad through recycling, incineration and landfill. Non-Scottish waste treated in Scotland is not included in the Carbon Metric. While the revised figures ensure methodological consistency across all three annual datasets, the changes have impacted the waste tonnage estimates reported in previous Carbon Metrics. The most significant impacts are described below.

1.2 Impact of waste data updates

1.2.1 2011 Baseline

The revised 2011 Scottish waste data has changed significantly from the original figures published in the 2011 Carbon Metric. Table 1 compares the two datasets across Household (HH) and Commercial and Industrial (C&I) arisings and disposal pathways. For a full breakdown of 2011 waste tonnages, see Annex 1 – Table 1a).

Table 1 Updates to the 2011 Carbon Metric waste tonnages

		Revised 2011		Change from Original 2011 (tonnes)	Change from Original 2011 (%)	Original 2011	
		Tonnes	Share of Arisings			Tonnes	Share of Arisings
HH	Arisings	2,606,759		204,339	8.5%	2,402,420	
	Recycle	1,045,046	40.1%	68,751	7.0%	976,295	40.6%
	Incinerated	107,829	4.1%	97,013	897.0%	10,816	0.5%
	Landfill	1,453,776	55.8%	5,697	0.4%	1,448,079	60.3%
C&I	Arisings	10,313,561		-523,323	-4.8%	10,836,884	
	Recycle	4,484,917	43.5%	-157,671	-3.4%	4,642,588	42.8%
	Incinerated	335,655	3.3%	97,965	41.2%	237,690	2.2%
	Landfill	3,201,167	31.0%	-164,010	-4.9%	3,365,177	31.1%
	Total Arisings	**12,920,320**		**-318,984**	**-2.4%**	**13,239,304**	

2011 Household Waste Data

Net Household waste arisings increased by 8.5% in the revised 2011 waste data. Figures for all three HH waste disposal pathways also rose, most significantly in incineration, up (897%) from figures originally reported in the 2011 CM. While these changes indicate

[3] Obtained from SEPA's Waste Discover Data Tool in October 2015

more HH waste was produced in 2011 than first estimated, they also show the landfill rate for HH waste in Scotland was lower than first reported in the Carbon Metric's baseline year.

2011 Commercial and Industrial Waste Data

Revised Commercial and Industrial waste arisings in 2011 are 4.8% lower than originally report. Combined with the revised HH waste figures, this results in 318,984 tonnes (2.4%) fewer total waste arisings in 2011. C&I recycling and landfill tonnages also fell by 3.4% and 4.9% respectively, while incinerated tonnages rose by 41.2%. These changes have in turn altered the disposal rates for C&I waste in 2011, increasing recycle and incineration rates and decreasing the landfill rate.

The impact of all waste data changes on Scotland's waste carbon footprint are discussed in Section 4 of this report.

1.2.2 2012 Data

The key revisions to Scotland's 2012 waste data are presented in Table 2.

Table 2 Updates to the 2012 Carbon Metric waste tonnages

		Revised 2012		Change from Original 2012 (tonnes)	Change from Original 2012 (%)	Original 2012	
		Tonnes	Share of Arisings			Tonnes	Share of Arisings
HH	Arisings	2,500,837		0	0.0%	2,500,837	
	Recycle	1,029,152	41.2%	0	0.0%	1,029,152	41.2%
	Incinerated	85,660	3.4%	70,857	478.7%	14,803	0.6%
	Landfill	1,382,196	55.3%	-36,582	-2.6%	1,418,772	56.7%
C&I	Arisings	8,409,687		-451,927	-5.1%	8,861,614	
	Recycle	3,869,423	46.0%	114,707	3.1%	3,754,716	42.4%
	Incinerated	374,603	4.5%	162,821	76.9%	211,782	2.4%
	Landfill	3,095,685	36.8%	-98,306	-3.1%	3,193,991	36.0%
	Total Arisings	**10,910,524**		**-451,927**	**-4.0%**	**11,362,451**	

2012 Household Waste Data

HH waste arisings and recycling tonnages have not changed in the revised 2012 CM waste data, however incineration increased significantly by (478.7%) while waste to landfill fell (2.6%) from the originally reported figures. As a result of these changes, the recycling rate for HH waste in Scotland in 2012 has remained constant, while the incineration rate has increased and the landfill rate fallen.

2012 Commercial and Industrial Waste Data

Net C&I waste arisings fell 5.1% with revisions to the 2012 CM waste data, resulting in a net 451,927 tonne (4.0%) decrease in total Scottish waste arisings for the year. Meanwhile, recycling and incineration figures for C&I waste increased by 3.1% and 76.9% respectively, while landfill tonnages were revised down by 3.1%.

2 Updates to the Carbon Metric's carbon factors

A number of changes were made to recycling carbon factors (CFs) as part of the 2013 Carbon Metric update. These changes, presented in Table 3, have corrected modelling inconsistencies identified since the 2012 update, or improved the accuracy of carbon savings estimates resulting from avoided production.

Table 3 Updates to the carbon factors for the 2013 Carbon Metric dataset

Update	Applies to	Reference
Several recycling CFs were found to include avoided landfill emissions. This resulted in double counting since a shift from landfill to recycling necessarily lowers landfill emissions. Avoided landfill emissions were removed, consistent with all other recycling CFs.	HH and C&I Recycle CFs for 1) Paper and Card, 2) Rubber, 3) Wood	N/A
CF for recycled Discarded Vehicles did not account for avoided raw material production resulting from recovered materials. A new CF was developed using material composition of vehicles and the UK recycle & recovery rate.	Discarded Vehicles - Recycling CF (HH & C&I)	End-of-life vehicle statistics, Table 2
Rubber Recycling CF assumed 100% open loop recycling into aggregate. A new CF developed to include bailing for civil engineering and re-treading recycle pathways.	Rubber Recycling CF (HH & C&I)	Curry et al. (2011); Confidential Optimat Study (2013)
Recycle CF for C&I Batteries and Accumulators excluded avoided production via material recovery. A new CF was developed using composition data and recovery rates.	Batteries and Accumulators - Recycling CF (C&I)	Olivetti et al. 2011
Recycle CF for C&I Plastics did not account for avoided raw production emissions. CF was changed to (Closed loop CF - Production CF), consistent with HH plastics	Plastics - Recycling EF (C&I)	N/A
Wood recycling CF assumed 100% composting but used the equation (Compost CF - Wood Production CF). This was incorrect as compost replaces other soil enhancers, not wood. CF also excluded alternative recycle pathways. These were added along with appropriate avoided material production emissions.	Wood - Recycle/Compost (HH & C&I)	WRAP (2011)
HH & Similar waste is an unsorted waste type composed of numerous CM material categories. The exact material content is derived from compositional analysis. Since HH & Similar waste contains some of the materials affected by the 2013 recycle CF updates, its CF has also changed.	HH & Similar – Recycle CF (HH and C&I)	N/A

2.1 Application of 2013 carbon factors

Standard carbon accounting methodology requires that the same carbon factors be used to compare datasets. This ensures differences and trends observed between datasets are not the result of methodological differences. For this reason, the 2011 and 2012 CM dataset have been updated with the new 2013 carbon factors. All carbon figures published in this report use the 2013 carbon factors unless otherwise stated.

2.2 Impact of the changes

The 2013 recycle CF updates have been significant relative to previous 2012 figures, particularly in the case of Discarded Vehicles, Batteries and Acuccmulators, and C&I Plastics (see Annex 2 for a full list of 2013 carbon factors). While the new factors provide a more comprehensive account of the carbon benefits of recycling, they have had a minor

impact on total carbon emissions from previously reported years. This is because the material categories affected by the changes occur in low quantity in Scotland relative to other material types. Applying the new CFs to the updated 2012 waste data results in a net emissions reduction of 16,240 tCO2e, 0.1% less than the estimate using the 2012 Carbon Metric's carbon factors.

3 Outstanding data gaps and limitations

3.1 Significant data gaps

The proportion of overall waste tonnage without a corresponding carbon factor makes up 6.3% of the overall waste arisings for Scotland, similar to previous years. This means the estimated carbon impact of Scotland's waste is likely to be slightly underestimated.

Net waste disposal tonnages for C&I waste continue to fall short of total C&I waste arisings. In 2013, the disposal pathway for 15% of all C&I waste arisings was unknown, compared to 22% in 2011, and 13% in the 2012. This suggests that a significant amount of C&I waste is escaping data capture on its way to treatment outside of Scotland. A small portion of waste arisings may also be diverted from disposal via reuse. In the short-term, this issue is likely to persist, resulting in underestimated waste carbon impacts, however the proposals from the Scottish Government to make the 'edoc' (electronic Duty of Care) system mandatory would help close this data loop-hole[4].

Finally, large annual fluctuations in C&I waste arisings, presented in Table 4, continue to have a significant impact on Carbon Metric estimates despite the application of a uniform methodology across all three annual waste datasets. While these estimates are the best available for Scotland, and will continue to improve overtime with more sophisticated data collection and analysis, on-going annual fluctuations in C&I waste arisings are likely to persist with changing economic activity, particularly in the construction and demolition industry. As such, the results within the Carbon Metric, particularly around C&I waste, should be treated with caution.

Table 4 Annual fluctuations in C&I waste arisings

	C&I arisings	Change from 2011 baseline	Change from previous year (tonnes)	Change from previous year (%)
2011	10,313,561	100%		
2012	8,409,687	82%	-1,903,874	-18%
2013	9,878,016	96%	1,468,329	17%

4 The carbon impacts of Scotland's waste

The annual carbon impacts of Scotland's waste from 2011 to 2013 are presented in this section. These figures include the impact from all waste produced in Scotland during a given year and the impact from managing this waste (wherever this occurs). They include the carbon benefits from recycling (avoided production of virgin materials) and energy from waste (avoided fossil fuel generation) as well as the impacts from all waste

[4] "Making Things Last: A Circular Economy Strategy for Scotland". Scottish Government, 2016. http://www.gov.scot/Resource/0049/00494471.pdf

management routes. Reuse and repair activities that prevent waste are not captured in the Carbon Metric dataset.

4.1 Revised national headline results for 2011

Table 5 compares the old waste carbon estimates for Scotland in 2011 (as published in the 2012 Carbon Metric) with the new estimate using the revised waste data and the Carbon Metric's 2013 carbon factors. Under the new figures, the carbon impacts of HH waste in 2011 is 8% greater than original estimates, while those of C&I waste have fallen 26%. Taking these figures together, the net carbon impact of Scotland's waste in 2011 is 12%, or 1.7MtCO2e, lower than the last estimate published in the 2012 Carbon Metric.

Table 5 Changes to estimated carbon impacts of waste in 2011

	Lifecycle Stages	Revised 2011	Change from Original (tonnes CO2e)	Change from Original (%)	Original 2011
HH	Arisings	6,604,609	518,917	9%	6,085,692
	Recycle	-506,737	-25,547	5%	-481,190
	Incinerated	4,677	4208	897%	469
	Landfill	695,687	2,726	0%	692,961
	Total HH Waste Carbon	**6,798,236**	**500,304**	**8%**	**6,297,932**
C&I	Arisings	7,688,732	-2,090,159	-21%	9,778,891
	Recycle	-1,560,297	-29,893	2%	-1,530,404
	Incinerated	-93,833	-22,933	32%	-70,900
	Landfill	257,615	-66,945	-21%	324,560
	Total C&I Waste Carbon	**6,292,217**	**-2,209,930**	**-26%**	**8,502,147**
	Total Waste Carbon	**13,090,453**	**-1,709,627**	**-12%**	**14,800,080**

4.2 Revised national headline results for 2012

Table 6 compares the old waste carbon estimates for Scotland in 2012 (as published in the 2012 Carbon Metric) with the new estimate using revised waste data and 2013 carbon factors. While HH waste carbon impacts remain virtually unchanged, C&I impacts have fallen by 25% as a result of revisions, resulting in a net decrease in waste carbon impacts for 2012 of 1.6MtCO2e, or 12%.

Table 6 Changes to estimated carbon impacts of waste in 2012

	Lifecycle Stage	Revised 2012 (tonnesCO2e)	Change from Original (tonnes CO2e)	Change from Original (%)	Original 2012 (tonnesCO2e)
HH	Arisings	6,426,372	0	0%	6,426,372
	Recycle	-509,097	21,846	-4%	-530,943
	Incinerated	3,716	3,074	379%	642
	Landfill	661,433	-17,503	-3%	678,936
	Total HH Waste Carbon	**6,582,424**	**7,417**	**0%**	**6,575,007**
C&I	Arisings	6,267,563	-1,484,085	-19%	7,751,648
	Recycle	-1,595,824	-38,635	2%	-1,557,189
	Incinerated	-127,811	-47,443	59%	-80,368
	Landfill	190,336	-34,964	-16%	225,300
	Total C&I Waste Carbon	**4,734,264**	**-1,605,127**	**-25%**	**6,339,391**
	Total Waste Carbon	**11,316,688**	**-1,597,710**	**-12%**	**12,914,398**

4.3 National headline results for 2013

The national headline results for Scotland's waste carbon impacts in 2013 are set out in Table 7 below.

Table 7 Estimated carbon impacts of waste in 2013

	Overall waste carbon impact (tCO_2eq)	Overall waste carbon impact (%)
Household waste	6,428,234	59%
Commercial and Industrial waste	4,377,644	41%
Total	**10,805,878**	100%

The 2013 results can also be broken down by the carbon impact associated with the production and waste management pathways. These results are shown in Table 8 below. Negative figures indicate net carbon savings.

Table 8 National carbon impact of waste by management process in 2013

Waste management	Waste carbon impact (tCO_2eq)
Arisings	12,397,917
Recycled	-2,255,322
Incinerated	-122,634
Landfilled	785,919

4.4 Comparison to 2012 results

The carbon impacts of Scotland's waste continued to fall in 2013, achieving a 3% reduction from 2012 levels, and a cumulative 17% reduction below the 2011 baseline year (see Table 9 below). Per capita waste carbon impacts also fell from 2.13tCO2e in 2012 to 2.03tCO2e in 2013.

Table 9 National carbon impact of Scotland's waste since 2011

Year	Waste Arisings (tonnes)	Waste Carbon Impacts (tCO2e)	Change from 2011 Baseline (%)	Sector Contribution		Scottish Population	Waste Carbon Per Capita (tCO2e)	Carbon Recycling Rate
				HH	C&I			
2011	12,920,320	13,090,453		52%	48%	5,254,800	2.49	14%
2012	10,910,524	11,316,688	-14%	58%	42%	5,313,600	2.13	17%
2013	12,290,722	10,805,878	-17%	59%	41%	5,327,700	2.03	18%

Although waste arisings in 2013 increased 13% (1.4Mt) from the previous year, this is largely attributed to a 1.4Mt increase in C&I soil waste, a material with low lifecycle carbon impacts. This, combined with higher rates of material recovery and recycling, explains why waste carbon impacts declined in 2013 despite a higher volume of waste.

One interesting trend observed in the Carbon Metric is the growing share of waste carbon impacts attributed to the HH waste stream. Table 10 shows how waste carbon impacts from C&I waste have declined relative to HH waste since 2011. Most notably, carbon savings from C&I recycling have steadily increased relative to HH waste recycling, while C&I emissions from landfilling have declined relative to HH landfilling.

Table 10 Changing share of waste carbon impacts between 2011 and 2013

	2011		2012		2013	
	HH	C&I	HH	C&I	HH	C&I
Arisings	46%	54%	51%	49%	51%	49%
Recycle	-25%	-75%	-24%	-76%	-22%	-78%
Incineration	5%	-105%	3%	-103%	4%	-104%
Landfill	73%	27%	78%	22%	79%	21%
Total	**52%**	**48%**	**58%**	**42%**	**59%**	**41%**

4.5 Measuring Progress 2011-2025

There are two main policy drivers[5] which are expected to reduce total waste tonnages and increase recycling rates in Scotland:

1. Reduce the amount of waste produced in Scotland by 15% below 2011 levels by 2025.
2. Increase recycling of all waste to 70% and reduce waste to landfill to a maximum of 5% by 2025 (both tonnage targets)

By reducing waste arisings and increasing recycling rates, these policies are expected to reduce Scotland's annual carbon impact of waste by 26%, or 3.3MtCO2e, below 2011 levels by 2025. This figure has been revised from the initial estimate of 22% (3.1MtCO2e) as a result of changes to the 2011 waste data and the carbon factors within the Carbon Metric. For more information on how the 2025 savings estimate was calculated, see the original Carbon Metric Technical Report.

[5] "Making Things Last: A Circular Economy Strategy for Scotland". Scottish Government, 2016. http://www.gov.scot/Resource/0049/00494471.pdf

Table 11 Changes in Scotland's average waste footprint from 2011-2013, with projections to 2025

Year	Population	Waste impact (tonnesCO2e)	Waste Footprint (tCO2e per person)
2011 Baseline	5,254,800	13,090,453	2.49
2012 Dataset	5,313,600	11,316,688	2.13
2013 Dataset	5,327,700	10,805,878	2.03
2025 Projection	5,596,000[6]	9,746,039	1.74

5 Conclusions

This report describes the carbon impact of Scotland's waste in 2013, as well as the impact of Carbon Metric updates to Scotland's waste carbon footprint since 2011. Revisions to the 2011 and 2012 Carbon Metric waste data significantly reduced the waste carbon impacts from estimates published in the 2012 Carbon Metric. Several changes were also made to a number of recycling carbon factors, although their impacts have been far less significant due to the relatively low volume of affected waste materials.

The overall carbon impact of waste in Scotland was 10.8 $MtCO_2eq$ in 2013, down 3% from 2012, and 17% from the 2011 baseline year. This decrease occurred despite a 13% increase in total waste arisings over the same period, and can be explained by a higher proportion of low carbon waste arising, as well as higher recycling rates in general.

Further information on the Carbon Metric and archived documents relating to its development can be found on the Zero Waste Scotland website.

[6] Projected population of Scotland in 2025 is taken from: The Registrar General's "Projected Population of Scotland (2010-based)" (2011)

Annex 1. Annual Waste Data 2011-2013

Red cells indicate a carbon factor does not exist for this material and waste management route based on current available evidence.

Table 1a Revised 2011 Carbon Metric Waste Data

Material Type (WSR)	Household				Waste from non-household sources			
	Arisings	Recycled	Incinerated	Landfilled	Arisings	Recycled	Incinerated	Landfilled
Spent solvents	0	0	0	0	53,365	0	171	0
Acid, alkaline or saline wastes	0	0	0	0	6,169	1,420	0	0
Used oils	559	558	0	0	67,057	0	0	198
Chemical wastes	241	244	0	0	183,131	50,485	25,826	546
Industrial effluent sludges	0	0	0	0	50,483	1,137	3,764	15,414
Sludges & liquid wastes from waste treatment	0	0	0	0	177	16,659	8,745	392
Health care & biological wastes	0	0	0	0	31,157	0	2,369	5,588
Metallic wastes, ferrous	1,479	6,516	0	0	261,642	522,680	0	9,331
Metallic wastes, non-ferrous	537	2,120	0	0	25,776	45,267	0	262
Metallic wastes, mixed	24,683	34,835	4,421	59,607	226,421	38,180	0	93
Glass wastes	93,048	94,974	5,626	75,857	38,773	161,388	0	976
Paper & cardboard wastes	111,933	244,122	16,230	218,819	77,941	0	85	435
Rubber wastes	1,171	1,402	0	0	32,700	0	15,235	80
Plastic wastes	8,127	29,654	14,285	192,596	33,231	40,542	0	377
Wood wastes	64,023	89,492	2,619	35,309	112,661	169,759	90,640	2,899
Textile wastes	11,784	14,753	4,920	66,327	18,286	0	6,960	6,295
Waste containing PCB	0	0	0	0	3,616	0	0	0
Discarded machines and equipment	36,226	36,638	2,953	39,818	28,719	0	0	586
Discarded vehicles	389	395	0	0	57,374	1,718	0	0
Batteries & accumilators wastes	398	541	0	0	10,499	6,581	1	9
Animal & mixed food waste	63,680	63,789	29,793	401,676	121,404	7,783	344	5,617
Vegetal wastes	281,494	283,303	4,198	56,596	360,031	255,005	3	1,662
Animal faeces, urine & manure	0	0	0	0	128,617	151	119,309	12
Household & similar wastes	1,790,529	8,075	17,991	242,558	1,256,493	52,571	0	277,057
Mixed & undifferentiated materials	11,124	10,471	0	0	148,616	38,596	3,439	75,182
Sorting residues	0	0	0	0	622	19,950	21,564	668,129
Common sludges	0	0	0	0	148,081	132,449	37,200	28,546
Mineral waste from construction & demolition	91,701	100,735	4,792	64,612	2,052,946	668,448	0	178,606
Other mineral wastes	0	0	0	0	134,490	55,513	0	50,127
Combustion wastes	0	0	0	0	542,756	1,062	0	511,179
Soils	13,633	22,429	0	0	4,089,491	2,170,712	0	1,202,936
Dredging spoils	0	0	0	0	9,775	2,564	0	1,765
Mineral waste from waste treatment & stabilised wastes	0	0	0	0	1,061	24,298	0	156,868
Total	**2,606,759**	**1,045,046**	**107,829**	**1,453,776**	**10,313,561**	**4,484,918**	**335,655**	**3,201,167**

Table 1b Revised 2012 Carbon Metric Waste Data

Material Type (WSR)	Household				Waste from non-household sources			
	Arisings	Recycled	Incinerated	Landfilled	Arisings	Recycled	Incinerated	Landfilled
Spent solvents					53,267	0	1,699	0
Acid, alkaline or saline wastes					4,860	1,199	1	0
Used oils	490	492	0	0	101,720	0	96	116
Chemical wastes	303	304	0	0	105,242	0	4,013	1,345
Industrial effluent sludges	0	0	0	0	58,293	2,939	9,231	13,596
Sludges & liquid wastes from waste treatment	0	0	0	0	2,355	36,602	11	6,616
Health care & biological wastes	0	0	0	0	37,623	0	1,409	5,885
Metallic wastes, ferrous	1,377	6,055	0	0	212,198	456,328	0	3,096
Metallic wastes, non-ferrous	403	2,594	0	0	26,580	50,612	0	110
Metallic wastes, mixed	25,489	39,046	3,512	56,672	202,412	63,652	0	0
Glass wastes	87,982	96,658	4,470	72,122	81,411	101,246	0	155
Paper & cardboard wastes	96,624	233,225	12,893	208,045	68,515	0	54	43
Rubber wastes	1,192	1,195	0	0	29,299	0	14,536	54
Plastic wastes	7,228	34,627	11,348	183,113	38,649	0	0	2,892
Wood wastes	67,777	93,840	2,080	33,570	84,979	194,492	127,178	3,181
Textile wastes	11,909	14,501	3,908	63,062	15,616	0	9,723	1,630
Waste containing PCB	0	0	0	0	400	0	1	249
Discarded machines and equipment	34,160	33,746	2,346	37,858	14,306	0	97	867
Discarded vehicles	356	360	0	0	51,978	9,135	0	0
Batteries & accumilators wastes	404	417	0	0	6,001	4,526	0	0
Animal & mixed food waste	80,769	80,652	23,668	381,899	114,788	47,101	198	6,493
Vegetal wastes	259,581	261,533	3,335	53,810	417,379	319,973	0	2,096
Animal faeces, urine & manure	0	0	0	0	133,509	12,738	120,509	128
Household & similar wastes	1,721,307	6,779	14,292	230,615	920,560	30,629	0	90,535
Mixed & undifferentiated materials	5,871	5,742	0	0	109,662	30,220	32	47,513
Sorting residues	0	0	0	0	3,605	7,164	45,127	868,224
Common sludges	0	0	0	0	127,271	403,278	40,688	28,367
Mineral waste from construction & demolition	84,213	95,921	3,807	61,430	1,744,431	560,795	0	95,360
Other mineral wastes	0	0	0	0	175,705	104,343	0	54,963
Combustion wastes	0	0	0	0	499,687	782	0	453,593
Soils	13,402	21,465	0	0	2,952,992	1,344,888	0	1,217,230
Dredging spoils	0	0	0	0	7,788	6,550	0	63
Mineral waste from waste treatment & stabilised wastes	0	0	0	0	6,606	80,230	0	191,285
Total	**2,500,837**	**1,029,152**	**85,660**	**1,382,196**	**8,409,687**	**3,869,422**	**374,603**	**3,095,685**

Table 1c 2013 Carbon Metric Waste Data

Material type (WSR)	Household				Waste from non-household sources			
	Arisings	Recycled	Incinerated	Landfilled	Arisings	Recycled	Incinerated	Landfilled
Spent solvents					55,927	0	784	0
Acid, alkaline or saline wastes					7,719	1,688	0	2
Used oils	568	571	0		80,372	0	16	55
Chemical wastes	416	416			114,884	3,351	2,596	1,825
Industrial effluent sludges					58,477	1,040	7,816	15,330
Sludges & liquid wastes from waste treatment					2,551	39,356	4,353	9,811
Health care & biological wastes					40,653	0	1,403	5,397
Metallic wastes, ferrous	1,410	6,659	0	0	266,858	506,206	49	0
Metallic wastes, non-ferrous	571	3,056	0	0	23,044	57,185	0	114
Metallic wastes, mixed	25,022	38,322	4,279	52,925	200,794	70,552	0	3
Glass wastes	84,888	99,973	5,446	67,354	71,856	127,421	0	164
Paper & cardboard wastes	89,630	227,924	15,709	194,291	52,744	0	1	480
Rubber wastes	831	1,022	0		33,556	0	15,025	75
Plastic wastes	5,467	38,127	13,826	171,007	33,973	0	0	1,975
Wood wastes	74,907	98,688	2,535	31,351	217,311	153,772	122,523	3,592
Textile wastes	11,402	13,244	4,762	58,893	17,291	0	11,597	1,631
Waste containing PCB					195	0	0	0
Discarded machines and equipment	31,309	31,367	2,858	35,355	16,598	0	53	1,105
Discarded vehicles	320	320	0	0	59,970	4,931	0	0
Batteries & accumilators wastes	366	381	0	0	8,607	4,573	0	0
Animal & mixed food waste	112,963	112,328	28,836	356,651	133,301	64,305	260	7,200
Vegetal wastes	230,768	234,332	4,063	50,252	512,566	377,421	0	3,624
Animal faeces, urine & manure					139,352	15,201	123,748	147
Household & similar wastes	1,654,533	8,221	17,413	215,369	714,888	18,591	0	65,998
Mixed & undifferentiated materials	303	1,164	0	0	133,026	27,353	0	39,025
Sorting residues					6,270	13,949	38,021	794,755
Common sludges					104,697	367,864	36,060	26,943
Mineral waste from construction & demolition	72,645	84,880	4,638	57,369	1,745,686	682,330	37	59,822
Other mineral wastes					178,802	103,958	0	76,746
Combustion wastes					453,684	889	0	318,714
Soils	14,387	17,220		0	4,303,868	2,523,545		1,197,672
Dredging spoils					11,228	6,605	0	2,420
Mineral waste from waste treatment & stabilised wastes					77,268	49,485	0	134,874
Total	**2,412,706**	**1,018,215**	**104,364**	**1,290,818**	**9,878,016**	**5,221,571**	**364,342**	**2,769,499**

Annex 2. 2013 Carbon Factors for Waste

Grey cells indicate that the waste management route is not applicable for some waste streams arising from specific sectors.

Red cells indicate it was not possible to create a carbon factor for this material and waste management route based on current available evidence.

Positive figures indicate a net carbon impact. Negative figures indicate a net carbon saving.

Table 2a Carbon Factors for household wastes for Scotland, 2013

Material type (WSR)	Household (kgCO2eq per tonne of material)			
	Arisings	Recycled/ Composted	Incinerated	Landfilled
Spent solvents				
Acid, alkaline or saline wastes				
Used oils	1,401	-725	-1,195	
Chemical wastes				
Industrial effluent sludges				
Sludges & liquid wastes from waste treatment				
Health care & biological wastes				
Metallic wastes, ferrous	2,937	-1,806	16	5
Metallic wastes, non-ferrous	12,960	-9,985	16	5
Metallic wastes, mixed	3,907	-2,573	16	5
Glass wastes	895	-201	26	26
Paper & cardboard wastes	893	-778	-541	490
Rubber wastes	3,410	-514		
Plastic wastes	3,194	-566	1,185	5
Wood wastes	525	-293	-847	925
Textile wastes	21,148	-5,891	140	524
Waste containing PCB				
Discarded machines and equipment	1,754	-181		17
Discarded vehicles	3,406	-1,720	328	
Batteries & accumulators wastes	12,109	-487		75
Animal & mixed food waste	4,060	-90	-62	977
Vegetal wastes	-	-49	-58	214
Animal faeces, urine & manure				
Household & similar wastes	3,155	-547	-3	463
Mixed & undifferentiated materials	1,910	-1,226	-101	108
Sorting residues				
Common sludges				
Mineral waste from construction & demolition	23	2		3
Other mineral wastes				
Combustion wastes				
Soils	-	1.14		1
Dredging spoils				
Mineral waste from waste treatment & stabilised wastes				

Table 2b Carbon factors for Non-Household (Commercial & Industrial and Construction & Demolition) wastes for Scotland, 2013

Material type (WSR)	Non-Household (kgCO2eq per tonne of material)			
	Arisings	Recycled/ Composted	Incinerated	Landfilled
Spent solvents	1,515	- 1,197	1,521	6,284
Acid, alkaline or saline wastes	869			
Used oils	1,401	- 725	- 1,195	
Chemical wastes	1,323	4,037	250	7
Industrial effluent sludges		159	- 68	330
Sludges & liquid wastes from waste treatment				9
Health care & biological wastes			668	420
Metallic wastes, ferrous	2,937	- 1,806	16	5
Metallic wastes, non-ferrous	12,960	- 9,985	16	5
Metallic wastes, mixed	3,499	- 2,235	16	5
Glass wastes	895	- 201	26	26
Paper & cardboard wastes	893	- 778	- 541	490
Rubber wastes	3,410	- 514		
Plastic wastes	3,194	- 1,211	1,185	5
Wood wastes	600	- 342	- 847	925
Textile wastes	21,148	- 5,891	140	524
Waste containing PCB				
Discarded machines and equipment	1,754	- 181		17
Discarded vehicles	3,406	- 1,720	328	
Batteries & accumulators wastes	12,109	- 2,099	405	93
Animal & mixed food waste	3,700	- 113	- 62	977
Vegetal wastes	-	- 118	- 58	214
Animal faeces, urine & manure	-	143	- 289	142
Household & similar wastes	2,642	- 787	16	472
Mixed & undifferentiated materials	1,910	- 1,226	- 101	108
Sorting residues				128
Common sludges	-	326	236	117
Mineral waste from construction & demolition	81	- 79		2
Other mineral wastes	18	1	518	14
Combustion wastes		17		10
Soils	-	1.14		1
Dredging spoils				
Mineral waste from waste treatment & stabilised wastes		16	41	17

Zero Waste Scotland
Ground Floor, Moray House, Forthside Way,
Stirling FK8 1QZ.
E-mail: helpline@zerowastescotland.org.uk
Helpline freephone 0808 100 2040
www.zerowastescotland.org.uk