

Data collection on food waste and plastic packaging trends

Plastics production, both globally and at European level, has witnessed a steady increase from 1950 to present times. A downturn in the production trend was experienced as a response to the 2008 economic crisis, after which production levels recovered. Plastics production is expected to double in the next 20 years if actions are not taken (Jambeck et al, 2015).

Table 1 – Global and European plastics production over time

Year	Europe (million tonnes)	World (million tonnes)
1950	0.35	1.7
1976	19.8	47
1989	27.4	99
2002	56.1	204
2005	61	230
2007	65	257
2009	55	250
2010	57	270
2011	58	280
2012	57	288
2013	57	299
2014	59	311
2015	58	322

Source: (Plastics Europe, 2016)

Packaging is the largest application of plastics, accounting for roughly 40% of total plastics demand in Europe.

Table 2 – European plastic packaging demand

Year	% of plastics demand	Million tonnes
2011	39.4	18.5
2012	39.4	18.1
2013	39.6	18.3
2014	39.5	18.9
2015	39.9	19.5

Source: (Plastics Europe, 2016)

Domestic plastic packaging waste generated in Europe has increased over time, due to the growing presence of plastics and its significant application in the packaging sector.

Table 3 – Development of EU domestic plastic packaging waste generation (mt)

Year	EU 28	EU 27	EU 15
1998	.	.	9.9
1999	.	.	10.1
2000	.	.	10.3
2001	.	.	10.7
2002	.	.	11.1
2003	.	.	11.5
2004	.	.	11.9
2005	.	14.1	12.3
2006	.	14.7	12.9
2007	.	14.9	13.2
2008	.	15.0	13.1
2009	.	14.6	12.8
2010	.	14.8	12.9
2011	.	14.9	13.0
2012	15.1	15.1	13.0
2013	15.0	14.9	12.8
2014	15.4	15.3	13.2

Source: (Eurostat, 2017b)

The growth in plastic packaging waste generation over time has witnessed at the same time an increase in food waste in Europe. Eurostat data show household waste of animal, vegetable and mixed food over time. Households are the main contributors to food waste in Europe and, even though historic data are not readily available, more recent data show that levels of food waste generated by households have almost doubled between 2004 and 2014.

Table 4 – EU household food waste

Year	Million tonnes	Kg/capita
2004	16.15	33
2006	21.3	43
2008	23.81	48
2010	26.55	53
2012	28.66	57
2014	31.2	61

Source: (Eurostat, 2017a)

Table 5 – Time series of domestic plastic packaging and food waste in Europe in million tonnes

Year	Household food waste	Plastics packaging waste
1950	.	0
1960	.	.
1970	.	.
1980	.	.
1998	.	9.9
2000	.	10.3
2002	.	11.1
2004	16.15	12.0
2005	.	14.1
2006	21.3	14.8
2007	.	15.0
2008	23.81	14.9
2009	.	14.6
2010	26.55	14.8
2011	.	14.9
2012	28.66	15.1
2013	.	15.0
2014	31.2	15.4

Source: (Eurostat, 2017a, b)

Eurostat data demonstrate a simultaneous growth in household food waste and domestic plastic packaging waste, with the former increasing at a faster rate than the latter. A value of zero was assigned to plastic packaging waste in 1950 in Table 5 to reflect the absence of plastic packaging at the time. This is therefore an estimate which was not retrieved from Eurostat.

Table 6 – EU food waste levels in the Food Supply Chain

Sector	Food waste (million tonnes)	Food waste (kg/person)
Production	9	20
Processing	17	33
Wholesale and retail	5	9
Households	47	92
Food services	12	21
Total	88	173

Source:(FUSIONS, 2015, 2016) *Estimates for 2012 with 95% CI

Natural capital impacts of plastic sectors

Table 7 – Natural capital costs from plastics in different consumer goods sectors

Sector	%	Total natural capital cost USD	Total natural capital cost EUR
Total consumer goods	100	75	64.5
food	23	17.25	14.835

soft drinks	12	9	7.74
non-durable household goods	10	7.5	6.45
automobiles	9	6.75	5.805
furniture	9	6.75	5.805
retail	8	6	5.16
durable household goods	6	4.5	3.87
foot wear	6	4.5	3.87
clothing and accessories	5	3.75	3.225
toys	4	3	2.58
personal products	3	2.25	1.935
consumer electronics	2	1.5	1.29
athletic goods	1	0.75	0.645
restaurants	1	0.75	0.645
tobacco	1	0.75	0.645
medical and pharmaceuticals	1	0.75	0.645

Source: (UNEP, 2014)

Natural capital describes the finite stock of natural assets (air, water, and land) from which goods and services flow to benefit society and the economy. Natural capital includes ecosystems (providing renewable resources and services), and non-renewable deposits of fossil fuels and minerals. Natural Capital costs describe the impact to natural capital of processes and activities in the economy. Derived by multiplying the natural capital intensity by revenue. In this study the main natural capital costs identified were GHG emissions, water extraction, terrestrial land and water pollution, as well as ocean pollution (UNEP, 2014).

Product lifetimes of plastic utilising sectors

Table 8 - Product lifetime distributions for major sectors utilising plastics

Sector	Lifetime (Years)			Standard Deviation	Variance
	Min	Max	Mean		
Transport	1	20	13	3	9
Packaging	0	1	0.5	0.1	0.01
Construction/Building	10	60	35	7	49
Electrical and Electronic Applications	1	10	8	2	4
Consumer and Institutional	1	10	3	1	1
Industrial Machinery	5	30	20	3	9
Others	1	10	5	1.5	2.25

Source: (Geyer, Jambeck & Law, 2017)

Table 88 compiles information of product lifespans of plastics in different sectors. Differences in product lifetimes exist between sectors – notably most packaging leaving its use phase in

the same year it has been placed on the market. Other applications have longer lifespans. In addition to waste management data (i.e. rates of recycling, incineration and landfill), product lifetimes give an indication of how materials are used in the economy.

Grocery retail contributions to plastic packaging

While grocery retailers, including major supermarkets, are understood to be major contributors to plastic packaging waste very little data on actual contributions from the sector are publically available. All EU economic operators including retailers are obliged to provide data on the packaging they put on the market to national authorities according to the Packaging and Packaging Waste Directive (94/62/EC), however data disaggregated to specific sectors or operators is not accessible.

Some data on plastic packaging linked to food retail can be drawn from independent sources or studies. Though these sources may include assumptions they provide an indication of the scale of plastic packaging waste associated with food.

Table 91 – UK plastic packaging by industrial sector (WRAP, 2016)

Sector	Rigid	Films	Total
Grocery retail	667	313	980
Non-grocery retail	452	101	553
<i>Total consumer</i>	<i>1,119</i>	<i>414</i>	<i>1,533</i>
C&D	0	50	50
Agriculture	2	11	13
C&I	337	287	624
<i>Total non-consumer</i>	<i>339</i>	<i>348</i>	<i>687</i>
TOTAL	1458	762	2,220

As shown in Table 919, WRAP data on UK plastic packaging identifies that “the largest source of plastic packaging is the grocery retail sector, accounting for almost 1 million tonnes (or 43%) of plastic packaging arising in 2014” (WRAP, 2016: p.6).

In separate research reported in a UK newspaper (Guardian, 2018), packaging data provided by two major UK retailers (Aldi and Coop) were extrapolated, using market share data, to estimate overall plastic packaging intensity from the UK grocery sector. This estimate broadly supports the scale of the contribution from grocery retail provided in the WRAP data - see Table 0.

Table 10 – Estimate of plastic packaging from major UK supermarkets

Source	Unit	Year	UK
Eunomia/Guardian	Aldi Plastic packaging production (tonnes)	2016	64,000
	Coop Plastic packaging production (tonnes UK only)	2016	43,495
Kantar World Panel	Aldi Grocery Market Share (%)	2017	6.80%

	Coop Market Share (% UK only)		5.80%
<i>UK calculations</i>			
	Aldi & Coop market share (%)		12.60%
	Aldi & Coop plastics (tonnes)		107,495
	Estimated plastic packaging from grocery market (tonnes)		853,000.00

Based on this data it is possible to calculate the plastic packaging intensity of the UK grocery market. Assuming comparable intensities between countries allows for a rough estimate of plastic packaging placed on the market by supermarkets in different countries. France and Germany are given as examples below. Though, it should be noted that this extrapolation includes a number of assumptions so the values cannot be considered as robust.

The main report for this annex calls for greater transparency from actors in the food supply chain on their contribution to food and packaging waste. The authors welcome any initiatives to share waste data from food retailers in particular.

Table 11 – Data (multiple sources) to assess scale of grocery contributions to plastic packaging waste

Source	Unit	Year	UK	Germany	France
Eurostat	Domestic plastic packaging (tonne)	2015	2,260,000	3,052,200	2,133,626
	Per capita (kgs)	2015	39.77	34.58	31.2
Kantar World Panel	Aldi Grocery Market Share (%)	2018	6.80%		2.30%
Fresh Plaza		2016		11.90%	
Kantar World Panel	Coop Market Share (% UK only)	2017	5.80%	na	na
Eunomia/Guardian	Aldi Plastic packaging production (tonnes)	2016	64,000		
	Coop Plastic packaging production (tonnes UK only)	2016	43,495	na	na
Statista	Grocery retail market size (EUR bn)	2017	221.49		
USDA		2011			179.65
FEVIA		2014			208
Planet Retail		2013			240
IGD		2016			234.1
The Grocer		2017		700	
Statista	Number of stores (ALDI)	2015		4192	
Aldi Nord		2018			900

Table 12 – Estimate of plastic packaging linked to French and German grocery retail

	UK	Germany	France
Estimated plastics from grocery sector (tonnes) based on UK intensity	853134.9206	901706.1038	924431.7168
Aldi share local market (EUR bn)		26.35731	5.52

Estimated plastics Aldi nationwide based on # stores (tonnes) using UK per store value	64,000	383,269	82,286
Comparison with national data			
Supermarket plastic packaging/domestic plastic packaging / (%)	37.75%	29.54%	43.33%

Definitions

Food supply chain

The food supply chain is the connected series of activities used to produce, process, distribute and consume food. The food supply chain starts when the raw materials for food are ready to enter the economic and technical system for food production or home-grown consumption. This is a key distinction in that any products *ready for harvest or slaughter* being removed are within scope, not just those that are harvested and subsequently not used. It ends when the food is consumed or 'removed' from the food supply chain (FUSIONS, 2014).

Food Contact Materials

Food contact materials are all materials and articles intended to come into contact with food, such as packaging and containers, kitchen equipment, cutlery and dishes. These can be made from a variety of materials including plastics, rubber, paper and metal. They also include materials used in processing equipment, such as coffee makers or production machinery as well as containers used for transport (European Food Safety Authority, 2017).

Food loss

Food losses refer to a decrease in mass or nutritional value (quality) of food that was originally intended for human consumption. These losses are mainly caused by inefficiencies in the food supply chains, such as poor infrastructure and logistics, lack of technology, insufficient skills, knowledge and management capacity of supply chain actors, and lack of access to markets. In addition, natural disasters play a role (FAO, 2013).

Food waste

Food waste refers to food appropriate for human consumption being discarded, whether or not after it is kept beyond its expiry date or left to spoil. Often this is because food has spoiled but it can be for other reasons such as oversupply due to markets, or individual consumer shopping/eating habits (FAO, 2013).

Food wastage

Food wastage refers to any food lost by deterioration or waste. Thus, the term 'wastage' encompasses both food loss and food waste (FAO, 2013).

Avoidable food waste

Food waste that could be avoided in the first place through improved efficiency and planning to reduce spillages, spoilage and unnecessary disposal (Mason et al, 2011).

Unavoidable food waste

Food waste that cannot be avoided (e.g. banana peels), hence must be managed through resource recovery (e.g. composting or anaerobic digestion for use as fertilisers or energy) (Mason et al, 2011).

Packaging

Packaging is defined as any material which is used to contain, protect, handle, deliver or present goods (Eurostat, 2017c).

Packaging waste

Packaging waste can arise from a wide range of sources including supermarkets, retail outlets, manufacturing industries, households, hotels, hospitals, restaurants and transport companies. Items like glass bottles, plastic containers, aluminum cans, food wrappers, timber pallets and drums are all classified as packaging (Eurostat, 2017c).

References

European Food Safety Authority (2017) *Food Contact Materials*. <https://www.efsa.europa.eu/en/topics/topic/food-contact-materials> Accessed 11/10/2017

Eurostat (2017a) *Generation of waste by waste category, hazardousness and NACE Rev. 2 activity*. Dataset. Accessed

Eurostat (2017b) *Packaging waste by waste operations and waste flow*. Dataset. http://ec.europa.eu/eurostat/search?p_auth=LD8d4hlx&p_p_id=estatsearchportlet_WAR_estatsearchportlet&p_p_lifecycle=1&p_p_state=maximized&p_p_mode=view&estatsearchportlet_WAR_estatsearchportlet_action=search&text=Packaging+waste+by+waste+operations+and+waste+flow Accessed 2/09/2017

Eurostat (2017c) *Packaging waste statistics*. Dataset. http://ec.europa.eu/eurostat/statistics-explained/index.php/Packaging_waste_statistics Accessed 8/17/2017

FAO (2013) *Full Cost Accounting of Food Wastage - Working Paper*. Rome.

FUSIONS (2014) *Definitional Framework for Food Waste*.

Geyer, R., Jambeck, J.R. & Law, K.L., *Production, use, and fate of all plastics ever made*. Science Advances, 2017. **3**(7).

Jambeck, J R, Geyer, R, Wilcox, C, Siegler, T R, Perryman, M, Andrady, A, Narayan, R and Law, K L (2015) Plastic waste inputs from land into the ocean. *Science* No 347 (6223), 768-771.

Mason, L, Boyle, T, Fyfe, J, Smith, T and Cordell, D (2011) *National Food Waste Assessment*. Institute for Sustainable Futures & University of Technology Sydney, Sydney.

Plastics Europe (2016) *Plastics - The Facts 2016*. Plastics Europe, Brussels.

The Guardian (2018) Nearly 1m tonnes every year: supermarkets shamed for plastic packaging. <https://www.theguardian.com/environment/2018/jan/17/nearly-1m-tonnes-every-year-supermarkets-shamed-for-plastic-packaging> Accessed 25/01/2018

UNEP (2014) *Valuing Plastics: The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry*. Global Partnership on Marine Litter (GPML) &

Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) Nairobi.

WRAP (2016) *Plastic Market Situation Report Spring 2016*.
[http://www.wrap.org.uk/sites/files/wrap/Plastics Market Situation Report.pdf](http://www.wrap.org.uk/sites/files/wrap/Plastics_Market_Situation_Report.pdf) Accessed
05/01/2018