

PACKAGING WASTE PREVENTION AND MINIMISATION *THE QUANTITY AND VALUE OF SAVINGS BY REPAK MEMBERS*

Prepared for:

Repak Limited



By:

Dr. Pat McCloughan

Managing Director

PMCA Economic Consulting

PMCA ECONOMIC CONSULTING

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Executive Summary

This report by Dr. Pat McCloughan of PMCA Economic Consulting estimates the monetary savings from the packaging waste prevention activities of Repak's member firms. After estimating the tonnes of packaging waste prevented by Repak members, the report proceeds to estimate the associated procurement savings and the supply chain savings from 2005 to 2016. The study updates the earlier report by PMCA for Repak published in 2012, which considered the period 2005-2011 (the base year in both studies is 2005).

Repak is the approved compliance scheme operator for packaging in Ireland and assists businesses in meeting their legislative obligations in respect of packaging and package waste prevention (paper, glass, plastics etc.). Day-to-day, it coordinates the funding of packaging recycling and works with its members to optimise packaging placed on the market in Ireland.

The waste management hierarchy emphasises *prevention* as the preferred option for dealing with all types of waste and currently occupies a central place in European and Irish waste policy.

Prevention of waste is not only beneficial for the environment but is also good for the economy because it means lower costs for businesses, thereby improving their operating performance (other things being equal) and in turn helping to sustain and create employment – the main economic policy priority.

The analysis presented in this report suggests that Repak's members are responsible for significant monetary savings arising from their packaging waste prevention activities. Member activities have been supported by packaging waste prevention and minimisation initiatives developed by Repak, including the organisation's *Prevent and Save* website and the provision of packaging technology expertise dedicated to working with Repak members in optimising the volume of packaging placed in Ireland.

Making use of data from Repak, the Central Statistics Office, the Environmental Protection Agency and other sources, the main findings of the study are as follows:

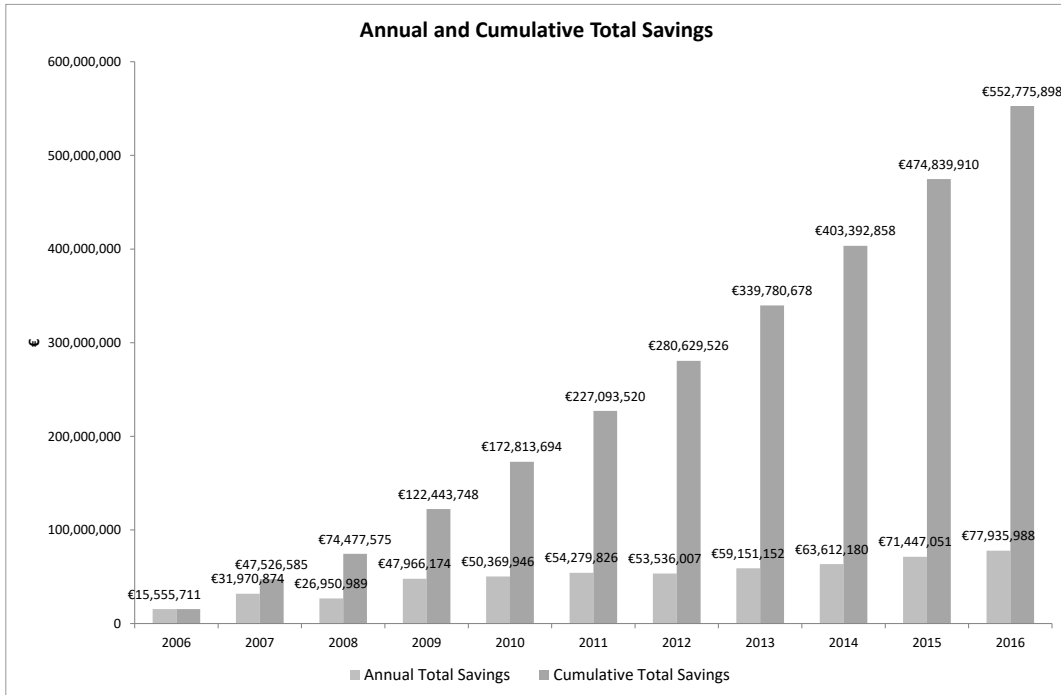
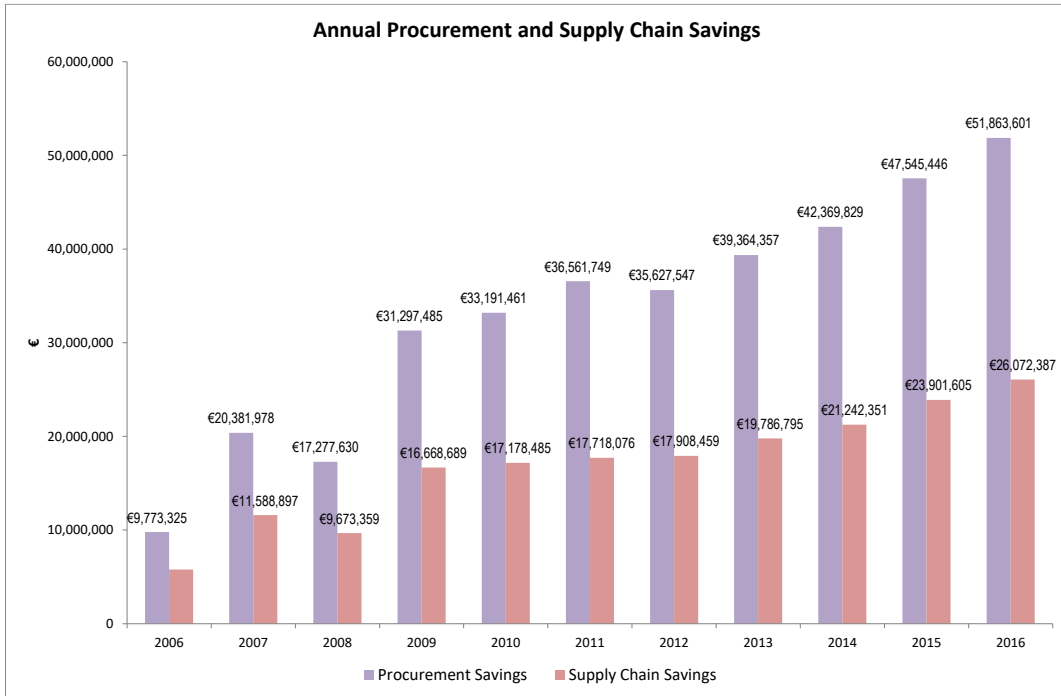
- **Tonnes prevented** – 857,000 tonnes cumulatively 2006-2016 and 121,700 in 2016 alone;
- **Procurement savings** – more than €365m cumulatively during the period and €52m in 2016;
- **Supply chain savings** – €187.5m cumulatively and €26m in 2016;
- **Total savings** – €553m cumulatively and €78m in 2016;

The €78m in total savings in 2016 represents almost €37,000 per Repak member and 18% average annual growth compared with the corresponding figure a decade earlier.

The two graphs presented overleaf illustrate the substantial total cost savings estimated to result from the packaging waste prevention activities of Repak's member firms. The details are given in the main body of the report.

(Note that since the PMCA report of 2012, recovery through waste-to-energy as a waste management option now makes up the majority of packaging waste not recycled in Ireland. The introduction of recovery through waste-to-energy has had an increased influence on the supply chain cost estimates and this is reflected in the estimates presented in Section 4 of this report. On the other hand, disposal of packaging waste through landfill is estimated at 9% of all packaging waste generated based on the latest available EPA data for 2015, with the remaining 91% made up of 68% recycling and 23% recovery. Thus landfill's impact on supply chain costs is lower compared with the previous PMCA report of 2012.)

Estimated Annual and Cumulative Savings from Packaging Purchases and Costs Prevented by Repak Members (2006-2016)



Source: Repak, CSO and EPA data; PMCA analysis.

Note: Total savings are the sum of procurement and supply chain savings. Details in the main body of the report.

Glossary of Terms

CAGR	Compound annual growth rate.
CSO	Central Statistics Office.
DCCAE	Department of Communications, Climate Action and Environment.
EPA	Environmental Protection Agency.
EU	European Union.
EU28	The twenty-eight Member States of the European Union (EU).
HDPE	High density polyethylene.
LDPE	Low density polyethylene.
Major producer	Businesses involved in the production, distribution and retailing of products containing packaging who annually place more than 10 tonnes of packaging (other than packaging for reuse or export) on the Irish market and have an annual turnover of more than €1 million.
NWPP	National Waste Prevention Programme.
Packaging	Any material used to contain and protect goods or to aid in their handling, delivery or presentation. Packaging is made from such materials as cardboard, paper, glass, plastic, steel, aluminium, wood, and composite materials such as those used in milk and juice cartons. The European legislative framework covers all types of packaging, including the outer box that holds a larger batch of smaller packaged products.
PET	Polyethylene terephthalate.
PMCA	PMCA Economic Consulting.
PP	Polypropylene.
PS	Polystyrene.
PVC	Polyvinyl chloride.
Repak	Repak Limited.
RSI	Retail Sales Index (produced by the Central Statistics Office, CSO). The volume version of the index (excluding motor trades) is used in this report.

Acknowledgements and Disclaimer

Acknowledgements

Dr. Pat McCloughan would like to thank the following people at Repak for their help and assistance in the preparation of this report: Mr. Seamus Clancy (Chief Executive), Mr. Colm Munnely (Membership Manager) and Mr. Brian Walsh (Packaging Technology Executive). Thanks are also due to staff at the Central Statistics Office and the Environmental Protection Agency.

Disclaimer

This report is the sole responsibility of PMCA Economic Consulting. By virtue of preparing the report or otherwise in connection with this study, PMCA will not assume any responsibility or have any liability to any third parties.

1 Introduction

1.1 Purpose of the Report

This report is prepared for Repak Limited (hereinafter Repak) by Dr. Pat McCloughan, Managing Director of PMCA Economic Consulting (PMCA). It provides independent estimation of the monetary savings associated with the packaging waste prevention activities of Repak's members during the period 2005-2016. The study updates the previous packaging waste prevention report by PMCA for Repak completed in 2012, which covered the earlier period 2005-2011; the present study pertains to the longer period since 2005 and spans an economic cycle from boom, (major) recession and recovery in the country.

1.2 Background

Packaging is an important and necessary part of our everyday lives – it allows goods to be transported safely and serves to inform consumers about products. However, the packaging that comes with the products we buy has environmental implications, and excessive packaging or packaging that is more than necessary can damage the environment and impose extra costs on the economy.

Repak is a government-approved environmental compliance scheme operator whose aims include the prevention and minimisation of packaging waste in Ireland as well as the funding of packaging recycling. Under European and Irish legislation, certain businesses – known as 'major producers' – are obliged to comply with the law, and the conditions for compliance apply to businesses in manufacturing, distribution and retailing with turnover greater than €1m and who place more than 10 tonnes of packaging/packaged goods in the country annually. Such obligated businesses have a choice of two compliance routes – they can self-comply and register with a local authority or they can become a member of Repak. The membership fees associated with joining Repak are used to fund packaging recycling and help Ireland to meet its packaging waste recovery and recycling targets. Repak is the predominant choice of compliance route for obligated businesses and the organisation has played a leading role in ensuring that Ireland has successfully achieved all of its recovery and recycling targets since the legislation came into effect in 1997.

According to the latest available comparative data from Eurostat (the official statistics agency of the EU), Ireland achieved packaging recycled per capita of 144 kg in 2014, which was more than one-third higher than that for the EU28 (107 kg), while packaging recovered per head was 195 kg in Ireland compared with 129 kg in the EU28, meaning the differential in favour of Ireland was more than 50% in that year.

In the same year, the Eurostat data also show that Ireland's overall recovery and recycling rates for all packaging waste were 93% and 68% respectively, higher than the corresponding rates of 79% and 65% for the EU28. Furthermore, Ireland has also exceeded all of its recycling targets for specific materials, namely glass (87% versus the target rate of 60% by weight at the end of 2011), paper and board (79% v 60%), metals (81% v 50%), plastics (35% v 22.5%) and wood (85% v 15%).¹

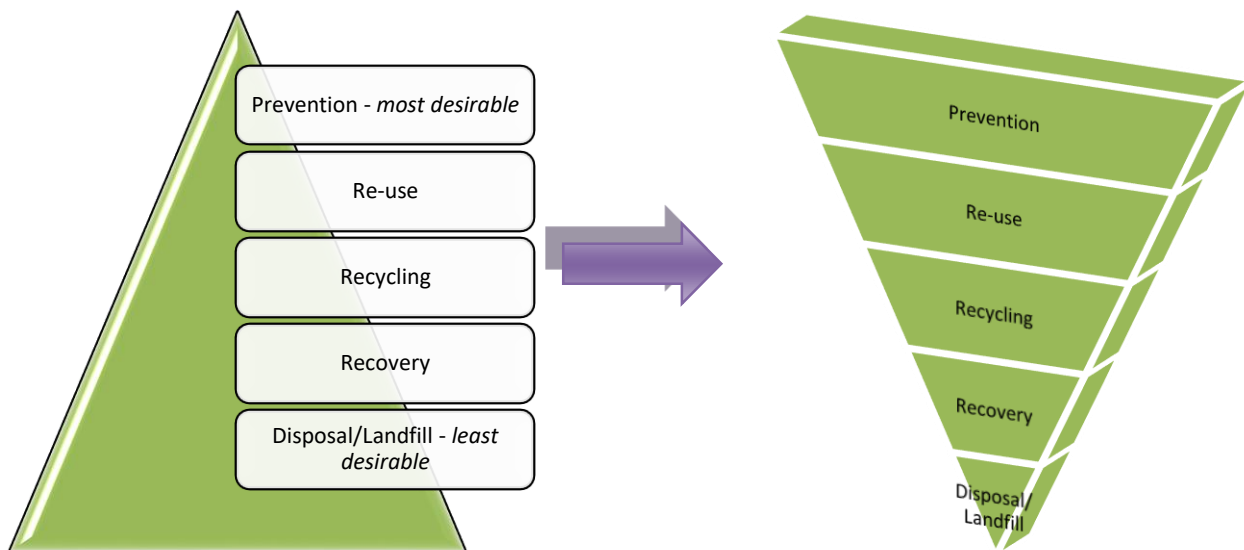
Repak membership fees are designed to incentivise obligated businesses to use less and lighter packaging. It also has initiatives aimed at packaging waste prevention, including the Repak *Prevent and Save* website and advice to members on packaging optimisation through its packaging technology expertise.

¹ Data received from the Environmental Protection Agency in July 2017 show overall recovery and recycling rates of 91% and 68% for Ireland in 2015, and specific materials recycling rates of 88% glass, 34% plastic, 80% paper and board, 75% metals and 85% wood (2015 data for the other EU members are not yet available from Eurostat).

The initiatives and positive outcomes associated with Repak and its members (which have also benefitted from involvement by the EPA) are noteworthy in the context of the waste management hierarchy, which has formed a central part of Ireland’s waste management policy and emphasises the principle of prevention over all other forms of waste management. The long-term goal of waste policy is to invert the pyramid, ensuring that desirable waste management activities exceeds the least desirable (landfill).

Since the PMCA report of 2012, disposal of packaging waste through landfill has fallen, while recovery through waste-to-energy as a waste management option now makes up the majority of packaging waste not recycled in Ireland. The introduction of recovery through waste-to-energy has had an increased influence on the supply chain cost estimates presented in Section 4 of this report.

Figure 1.1: Waste Management Hierarchy – ‘Today’ and ‘Tomorrow’



Source: National waste management policy.

1.3 Methodology

This study seeks to estimate the monetary savings arising from Repak members’ initiatives to prevent and minimise packaging in Ireland. The analysis proceeds in three stages, using data from the EPA and the Central Statistics Office (CSO) as well as Repak:

- Estimation of the tonnage of packaging waste prevented annually due to the prevention and minimisation initiatives of Repak members (Section 2);
- Estimation of the monetary procurement savings and supply chain savings associated with the tonnes prevented (Sections 3 and 4 respectively); and
- The estimated overall monetary savings (Section 5).

Further details of the methods as well as the results are outlined in the respective sections of the report.

2 Estimated Tonnes of Packaging Waste Prevented

The basis of the quantified monetary savings from the packaging waste prevention activities of Repak members (presented in Sections 3 and 4) are the estimates of tonnes of packaging waste prevented by Repak members presented in this section. Examples of Repak members' activities include removal of cardboard packaging, light-weighting of plastic and glass, replacement by lighter, more flexible and/or less packaging and the use of steel trolleys (see <http://www.preventandsave.ie/> for more information).

We estimate packaging waste prevented by constructing a 'counterfactual' relating to what would have happened had Repak members not engaged in packaging optimisation activities. To do this, we employ the CSO's Retail Sales Index (volume and excluding motor trades) and calculate the trend in packaging tonnes placed on the market by Repak members *according to the RSI* before deriving the estimates of packaging waste prevented as the difference between the actual and estimated counterfactual tonnes.

Before that, Figure 2.1 compares the trend in packaging tonnes placed by Repak members with the RSI during 2005-2016 (with the base year 2005 set equal to 100). It is evident from the graph that the volume of packaging placed by Repak members grew less rapidly compared with the volume of retail sales in Ireland during the sub-period before the economic crisis (2005-2007) and that, during 2007-2013, the volume of packaging placed by Repak members contracted by more than the volume of retail sales, with both series then showing strong recovery after 2013.

Figure 2.1: Index of Packaging Placed by Repak Members and the Retail Sales Index (2005-2016)

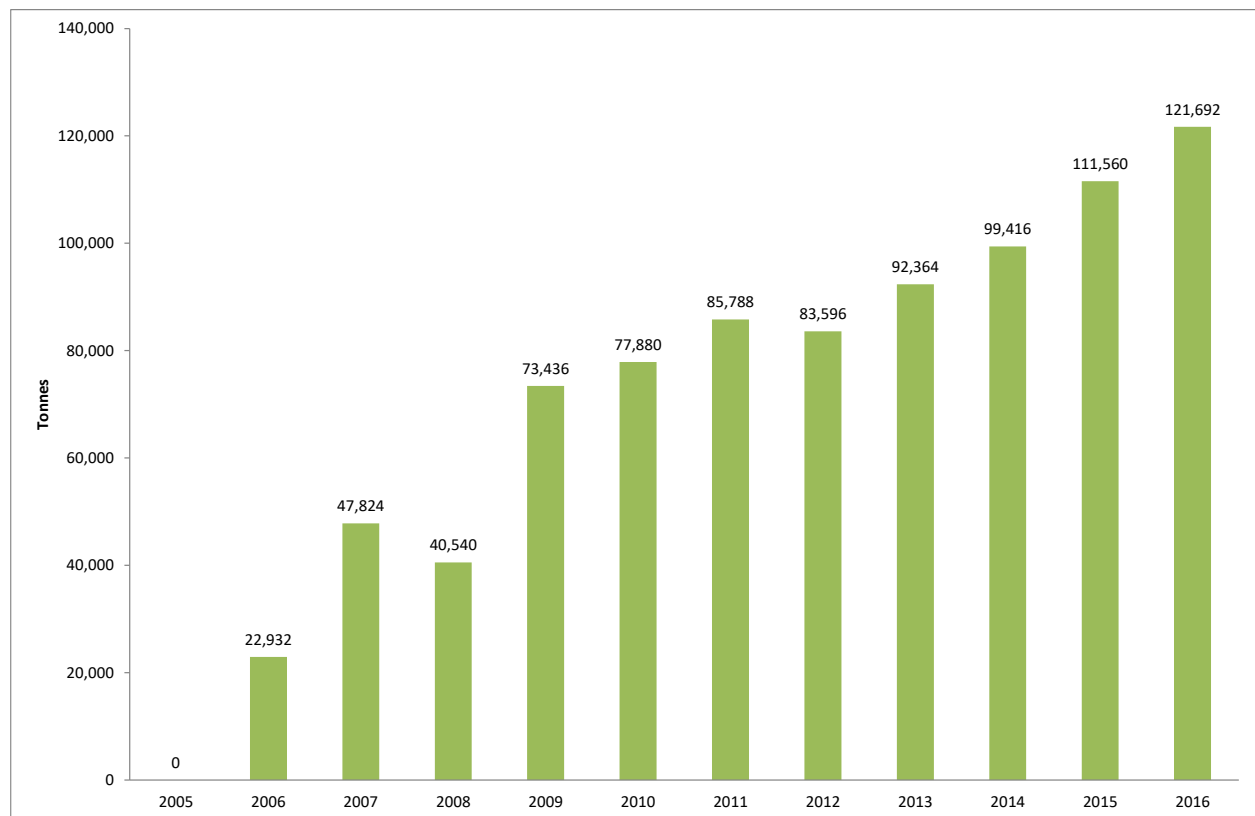


Source: Repak and CSO data; PMCA analysis.

The next chart (Figure 2.2 below) presents the estimates of packaging waste prevented by Repak members during the period, calculated as the difference between the counterfactual and actual tonnes of packaging placed by Repak members (as stated earlier, the counterfactual is estimated by extrapolating the tonnes placed by Repak members from 2005 to each subsequent year during 2006-2016 *according to the RSI*).

It is estimated that Repak members' activities resulted in the prevention of almost 23,000 tonnes of packaging waste in 2006, growing to almost 86,000 tonnes in 2011 and thereafter to nearly 121,700 in 2016. Apart from the dips in 2008 and 2012, the trend in packaging waste prevented by Repak members has been upward over the period, and the positive trend coincides with Repak's initiatives and ongoing commitment in respect of assisting its members with packaging and prevention from 2007.

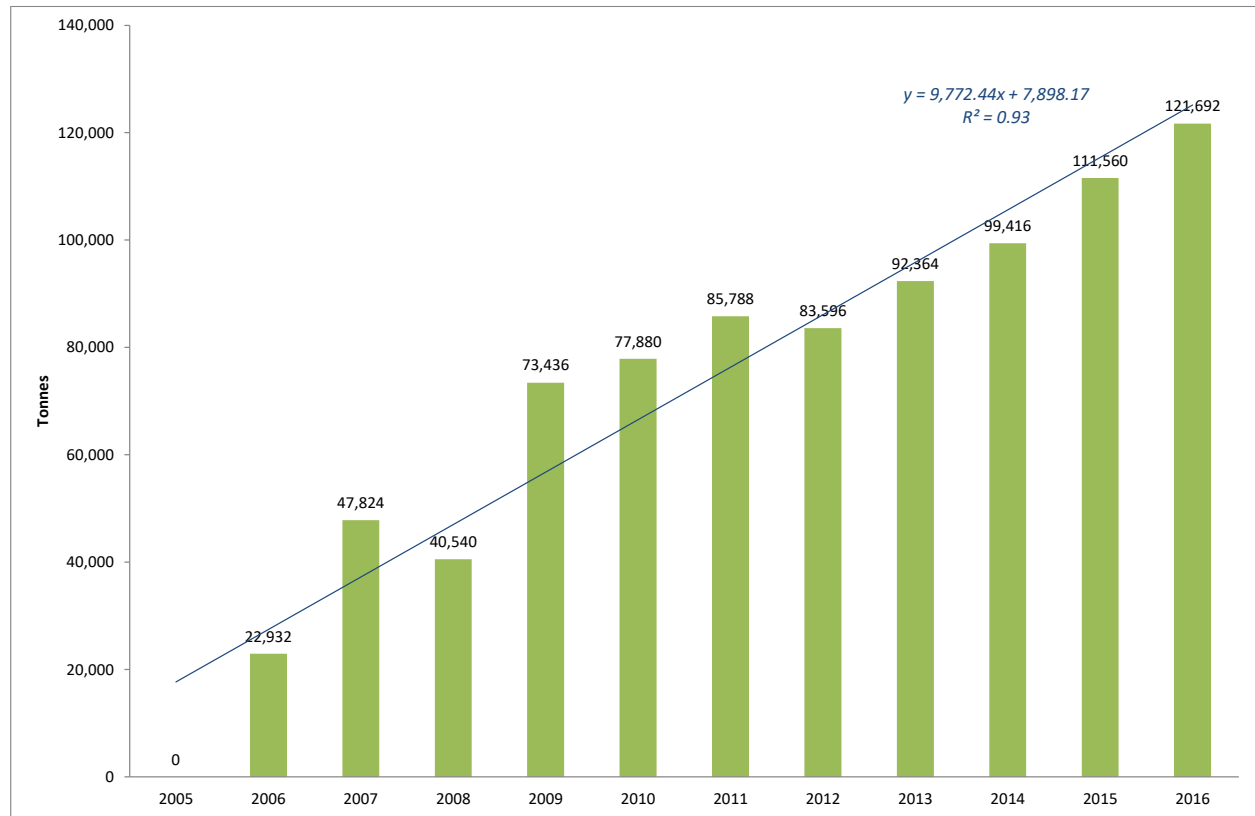
Figure 2.2: Estimated Annual Packaging Waste Prevented by Repak Members (2005-2016)



Source: Repak and CSO data; PMCA analysis.

Figure 2.3 superimposes a statistical trend line on the estimated tonnes of packaging waste prevented by Repak members and implies that, on average during the period, each successive year saw an additional approximately 9,800 tonnes on average being prevented in Ireland.

Figure 2.3: Estimated Annual Packaging Waste Prevented by Repak Members with Fitted Trend Line (2005-2016)



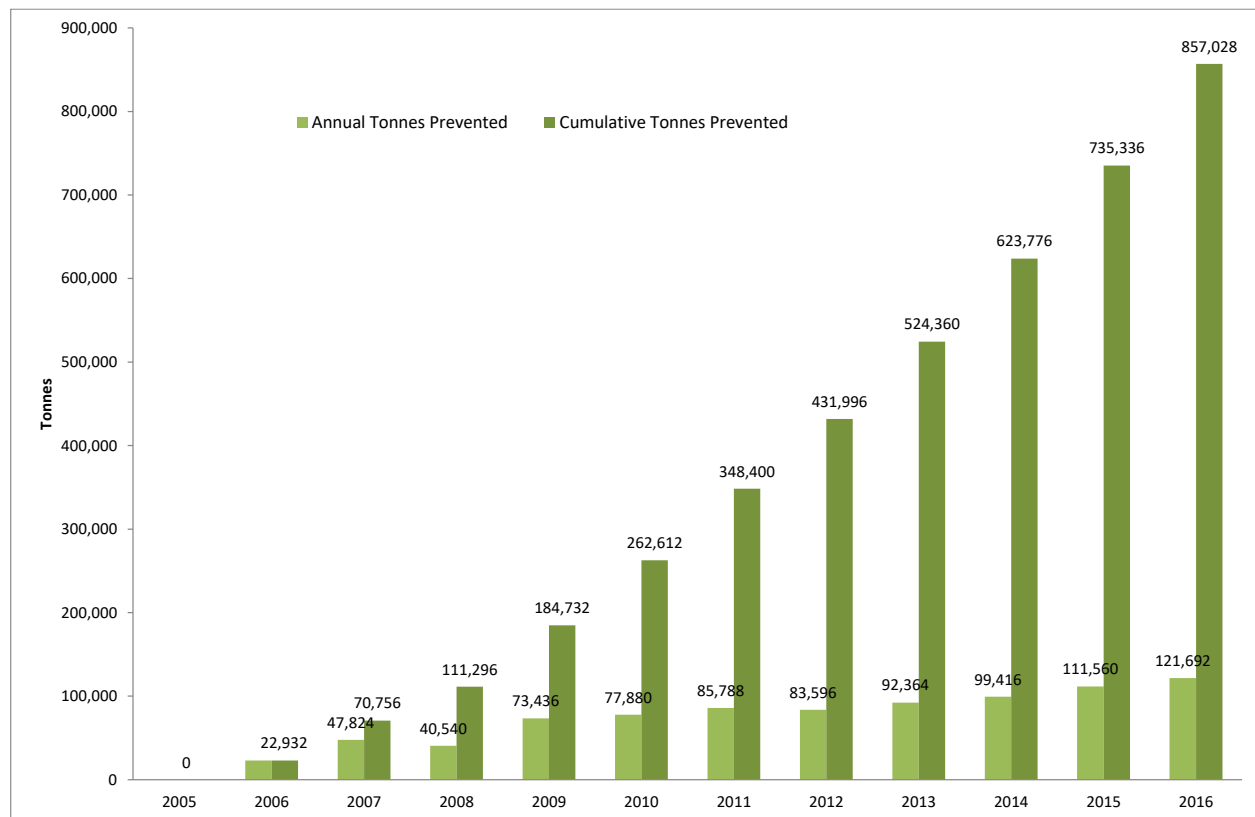
Source: Repak and CSO data; PMCA analysis.

Another way of expressing the packaging waste prevention activities of Repak members is to consider the estimated tonnes of packaging waste prevented per Repak member. It is estimated that tonnes prevented per Repak member grew from 10.6 in 2006 to 57.6 in 2016, representing average annual growth of 18% calculated on a compound annual growth rate (CAGR) basis, which is strong by any economic comparison.

The analysis suggests that Repak and its members have worked together productively in preventing packaging waste being placed on the market in Ireland: Repak has provided the initiatives, including the *Prevent and Save* website and the dedicated packaging technology expertise; and its members have successfully applied the initiatives to curtail the volume of packaging placed in the country.

Figure 2.4 shows both the estimated annual and cumulative tonnes of packaging waste prevented by Repak members. Over the whole period 2005-2016, Repak members have been responsible for preventing an estimated 857,000 tonnes cumulatively. In the previous PMCA study for Repak published in 2012, it was estimated that the cumulative tonnes prevented were 384,400 in 2011 – that figure (shown in the chart below) more than doubled in 2016.

Figure 2.4: Estimated Annual and Cumulative Packaging Waste Prevented by Repak Members (2005-2016)



Source: Repak and CSO data; PMCA analysis.

The economic significance of the packaging waste prevention achieved by Repak's members, and assisted through Repak's initiatives, is that it has facilitated Repak members to reduce their costs. Other things being equal, the reduction in costs associated with packaging optimisation has served to support the operating performance of Repak members, in turn putting them in a better position to maintain and create employment.

In the next two sections, we proceed to estimate the monetary cost savings from the tonnes prevented in respect of (a) procurement savings and (b) supply chain savings.²

² The CSO has changed its methodology for compiling the RSI. To ensure continuity with the previous PMCA report, we employ the RSI series (all retail businesses, excluding motor trades) published by the CSO (2005-2016) in its *archived* tables (with 2005=100 as in the 2012 PMCA report). The CSO data are as shown in Figure 2.1 (p. 3).

3 Estimated Monetary Procurement Savings

Procurement savings refer to the costs avoided by Repak members through not having to purchase packaging materials. The analysis presented below suggests that procurement savings achieved by Repak members are significant and that they have grown strongly over time.

Using latest available data (2016) on the percentage shares accounted for by specific types of packaging and information on the approximate cost per tonne (€) of procuring each specific packaging type, together with the estimated tonnes of all packaging waste prevented from the previous section of the report, we can estimate the monetary procurement savings associated with each specific type of packaging and in turn total procurement savings per year during 2005-2016.

For instance, of the tonnes of packaging placed on the market by Repak members in 2016, cardboard accounted for 18.52%, implying an estimated 22,537 tonnes of cardboard were prevented from being placed in that year. At about €142 to acquire a tonne of cardboard, this translates into estimated procurement cost savings by Repak members of €3.2m in 2016. This exercise is repeated for the other types of packaging material for each year to give the estimated annual and cumulative procurement savings associated with activities that have prevented the purchase of packaging by Repak members.

Table 3.1 shows the estimated procurement savings among Repak members for each type of packaging material at each year during 2006-2016. According to the analysis, procurement savings grew from €9.8m in 2006 to more than €36.5m in 2011 and to almost €52m in 2016. Procurement savings per Repak member increased from €4,514 in 2006 to €24,568 in 2016, representing average annual growth of 18% on a CAGR basis.³

Table 3.1: Estimated Procurement Savings from Packaging Purchases Prevented by Repak Members (2006-2016)

Packaging Type	Estimated Procurement Savings											Total
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Steel	€202,432	€422,166	€357,867	€648,256	€687,486	€757,294	€737,944	€815,343	€877,595	€984,796	€1,074,237	€7,565,415
Aluminium	€1,007,705	€2,101,540	€1,781,457	€3,227,013	€3,422,296	€3,769,799	€3,673,476	€4,058,770	€4,368,657	€4,902,303	€5,347,539	€37,660,555
Wood	€128,475	€267,932	€227,123	€411,422	€436,319	€480,623	€468,343	€517,465	€556,974	€625,010	€681,774	€4,801,460
Tetra	€3,582	€7,470	€6,332	€11,471	€12,165	€13,400	€13,058	€14,427	€15,529	€17,426	€19,008	€133,868
Paper	€593,306	€1,237,322	€1,048,867	€1,899,966	€2,014,943	€2,219,541	€2,162,829	€2,389,678	€2,572,131	€2,886,325	€3,148,466	€22,173,373
Cardboard	€603,075	€1,257,695	€1,066,137	€1,931,249	€2,048,119	€2,256,087	€2,198,441	€2,429,025	€2,614,482	€2,933,850	€3,200,306	€22,538,467
Glass	€292,734	€610,488	€517,505	€937,433	€994,162	€1,095,110	€1,067,128	€1,179,054	€1,269,075	€1,424,097	€1,553,436	€10,940,220
PET	€774,093	€1,614,347	€1,368,468	€2,478,906	€2,628,917	€2,895,860	€2,821,867	€3,117,839	€3,355,886	€3,765,819	€4,107,837	€28,929,839
HDPE	€1,138,523	€2,374,355	€2,012,721	€3,645,933	€3,866,568	€4,259,183	€4,150,355	€4,585,666	€4,935,783	€5,538,705	€6,041,739	€42,549,530
PVC	€60,311	€125,777	€106,620	€193,137	€204,824	€225,622	€219,857	€242,917	€261,464	€293,403	€320,050	€2,253,984
LDPE	€4,699,180	€9,799,998	€8,307,376	€15,048,358	€15,959,014	€17,579,505	€17,130,325	€18,927,046	€20,372,128	€22,860,652	€24,936,894	€175,620,476
PP	€151,351	€315,638	€267,564	€484,678	€514,008	€566,201	€551,734	€609,602	€656,146	€736,296	€803,168	€5,656,385
PS	€80,033	€166,906	€141,485	€256,292	€271,801	€299,400	€291,750	€322,350	€346,962	€389,344	€424,705	€2,991,028
Other plastic	€38,526	€80,344	€68,107	€123,372	€130,838	€144,124	€140,441	€155,172	€167,019	€187,421	€204,443	€1,439,807
Total	€9,773,325	€20,381,978	€17,277,630	€31,297,485	€33,191,461	€36,561,749	€35,627,547	€39,364,357	€42,369,829	€47,545,446	€51,863,601	€365,254,408
Total per Repak Member	€4,514	€9,320	€7,561	€13,178	€14,166	€15,890	€16,358	€18,665	€20,282	€22,980	€24,568	18%

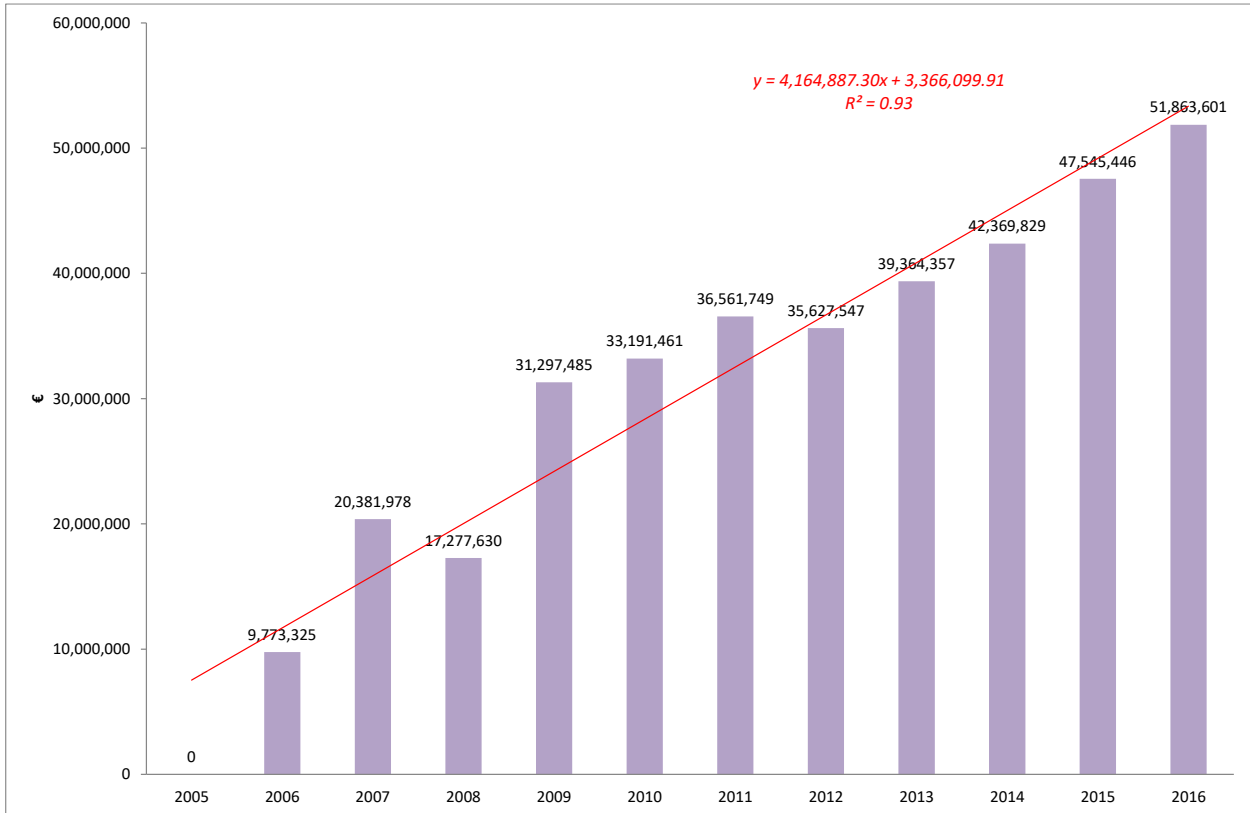
Source: Repak and CSO data; PMCA analysis.

Note: PET is short for polyethylene terephthalate, HDPE for high density polyethylene, PVC for polyvinyl chloride, LDPE for low density polyethylene, PP for polypropylene and PS for polystyrene. The year 2005 is not shown because it is the base year in the estimation analysis (it is included in the graphs overleaf for illustration purposes).

³ There are differences in the estimated procurement savings for 2006-2011 between this report and the 2012 PMCA report, due to using 2016 figures for the percentage shares of specific materials and procurement costs.

According to the graph presented in Figure 3.1, each successive year between 2005 and 2016 was associated with an estimated additional €4.2m in procurement savings on average being realised by Repak members. This figure is based on the estimated slope coefficient of the line-of-best fit shown in the graph below (in some years, the estimated procurement savings exceeded those predicted by the fitted line, while in other years the reverse pattern is observed – either way, the rate of change in the upward trend in procurement savings achieved by Repak members is appreciably high).

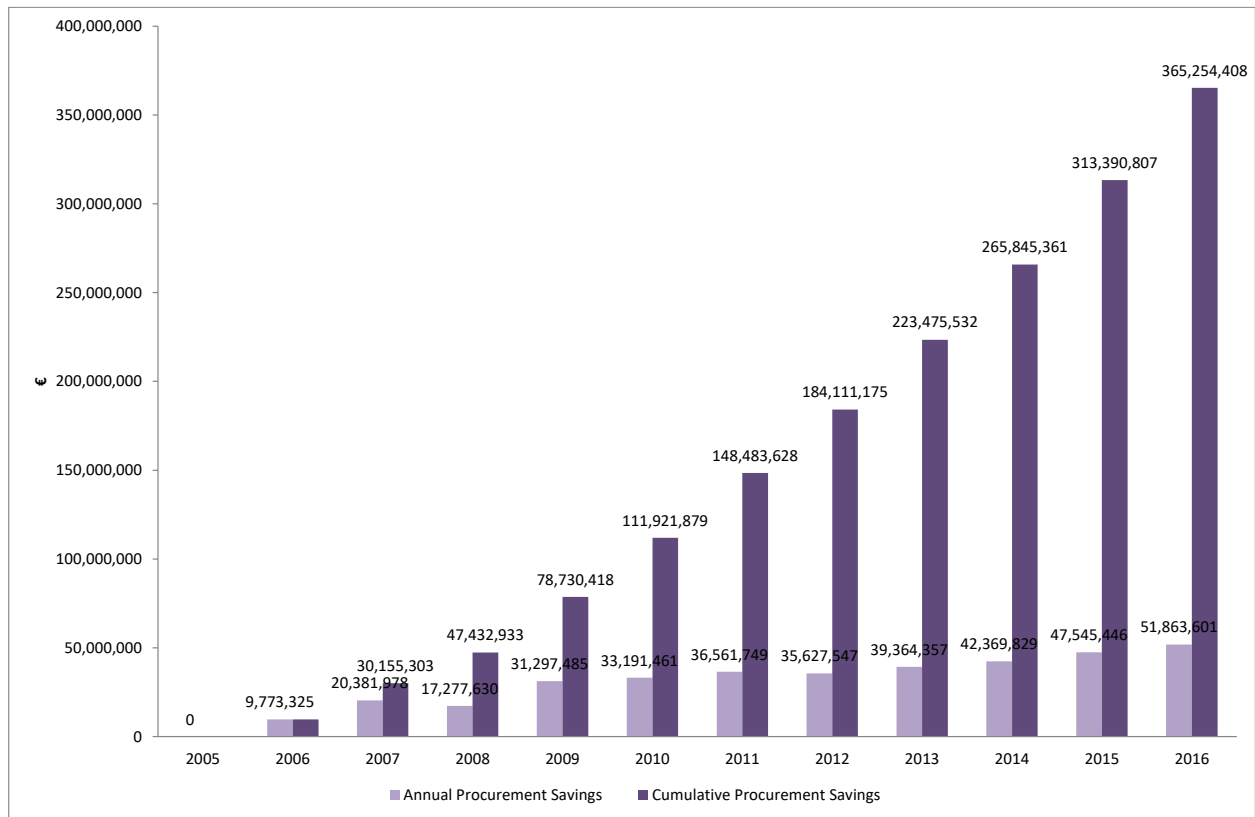
Figure 3.1: Estimated Annual Procurement Savings from Packaging Purchases Prevented by Repak Members with Fitted Trend Line (2005-2016)



Source: Repak and CSO data; PMCA analysis.

Figure 3.2 illustrates the trend in both the estimated annual and cumulative procurement savings made by Repak members since 2005 and shows the significant extent in these savings arising from the prevention of packaging. At the end of 2016, it is estimated that procurement savings by Repak members cumulated to over €365m.

Figure 3.2: Estimated Annual and Cumulative Procurement Savings from Packaging Purchases Prevented by Repak Members (2005-2016)



Source: Repak and CSO data; PMCA analysis.

4 Estimated Monetary Supply Chain Savings

Supply chain savings relate to savings attained by Repak members in logistics, production and Repak fees by avoiding the requirement for packaging.

The estimated supply chain savings are based on the following:

- Repak fees avoided;
- Supply chain costs avoided by Repak members (salaries, storage etc.);
- Recycling revenue; and
- Landfill expenses.

Repak charges fees to its members based on the amount and type of packaging placed on the market. More difficult to recycle materials are charged at higher rates than those easier to recycle. Repak fees comprise participation and material-specific fees and are applied across the packaging supply chain, reflecting the Producer Pays Principle. Repak's charging model was developed over a decade ago and its fees have been frozen at 2008 levels since that time. Repak fees avoided have been estimated for each packaging material type for the purposes of this report.

In relation to supply chain costs avoided, it is estimated that salary costs are €66.67 per tonne per year and storage costs are €100 per tonne per year. In addition, baling/compacting costs plus lift costs (sundry costs) are estimated at €20 per tonne per annum. These are fixed costs across packaging types.

The Landfill Levy has increased rapidly over the years, from €15 per tonne in 2002 to €75 per tonne in 2016 (under the Landfill Levy Regulations 2015). We have used the latter figure in this report, together with a gate fee for landfill of €45, which has fallen over the years.

Recycling fees are known to be highly volatile, shaped as they are by international market conditions and the recycling of packaging materials placed on the Irish market is carried out overseas. The analysis presented here is based on international data (the recycling fees incorporate material prices paid by international recyclers (late 2016), which vary by specific material type) (recycling fees are also quoted in sterling and the analysis here reflects the euro-sterling exchange rate at the beginning of December 2016).

The data for landfill rates and recycling rates for each specific material type are from the EPA (National Waste Reports) and are current for most of the years during the period. In particular, the rates for 2006 are for that year etc. to 2012; those for 2013 are based on the EPA's 2012 data; those for 2014 on the EPA's 2014 data; and the rates for 2015 and 2016 are based on the latest available EPA data for 2015.

Since the PMCA report of 2012, recovery through waste-to-energy as a waste management option now makes up the majority of packaging waste not recycled in Ireland. The introduction of recovery through waste-to-energy has had an increased influence on the supply chain cost estimates and this is reflected in the estimates presented in this section of this report. On the other hand, disposal of packaging waste through landfill is estimated at 9% of all packaging waste generated based on the latest EPA data for 2015, with the remaining 91% made up of 68% recycling and 23% recovery. Thus landfill's impact on supply chain costs is lower compared with the previous PMCA report of 2012.

According to the analysis presented in Table 4.1 overleaf, estimated supply chain savings arising from the packaging waste prevention activities of Repak members have grown from €5.8m in 2006 to €26m in 2016 or by almost €187.5m cumulatively over the period.

It is also seen from the table of analysis below that estimated supply chain savings per Repak member grew from €2,671 in 2006 to €12,351 in 2016, representing average annual growth of 17%.⁴

Table 4.1: Estimated Supply Chain Savings from Packaging Related Costs Prevented by Repak Members (2006-2016)

Packaging Type	Estimated Supply Chain Savings											Total
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Steel	€231,686	€415,060	€366,155	€690,088	€744,648	€757,601	€689,905	€762,266	€820,465	€920,688	€1,004,306	€7,402,870
Aluminium	€86,445	€177,612	€199,165	€104,832	€22,146	€31,571	-€213,973	-€236,416	-€254,466	-€285,550	-€311,484	-€680,117
Wood	€599,189	€1,244,848	€1,054,845	€1,910,065	€2,024,109	€2,231,340	€2,252,529	€2,488,786	€2,670,901	€2,996,576	€3,268,730	€22,741,918
Tetra	€8,158	€16,850	€14,219	€25,466	€26,720	€28,583	€28,748	€31,763	€33,914	€38,004	€41,455	€293,881
Paper	€793,020	€1,602,099	€1,337,851	€2,331,809	€2,382,216	€2,356,486	€2,649,253	€2,927,121	€3,099,055	€3,462,166	€3,776,605	€26,717,683
Cardboard	€806,077	€1,628,479	€1,359,880	€2,370,203	€2,421,441	€2,395,286	€2,692,875	€2,975,318	€3,150,082	€3,519,172	€3,838,789	€27,157,601
Glass	€1,457,016	€2,800,270	€2,397,884	€4,291,754	€4,493,552	€4,841,371	€4,717,667	€5,212,482	€5,403,438	€6,022,950	€6,569,964	€48,208,346
PET	€302,508	€625,202	€508,513	€878,776	€912,259	€949,974	€926,665	€1,023,858	€1,127,398	€1,281,252	€1,397,618	€9,934,023
HDPE	€274,987	€563,649	€440,587	€724,651	€734,359	€713,722	€732,464	€809,289	€923,359	€1,061,344	€1,157,737	€8,136,149
PVC	€18,402	€38,205	€31,734	€56,199	€59,001	€63,325	€60,431	€66,770	€72,331	€81,760	€89,185	€637,345
LDPE	€1,129,089	€2,319,477	€1,832,902	€3,057,116	€3,119,813	€3,095,582	€3,128,546	€3,456,685	€3,903,075	€4,471,700	€4,877,827	€34,391,812
PP	€44,523	€92,197	€75,676	€132,192	€137,918	€145,583	€140,615	€155,364	€169,835	€192,551	€210,039	€1,496,494
PS	€18,402	€38,205	€31,734	€56,199	€59,001	€63,325	€60,431	€66,770	€72,331	€81,760	€89,185	€637,345
Other plastic	€12,882	€26,744	€22,214	€39,339	€41,301	€44,327	€42,302	€46,739	€50,632	€57,232	€62,430	€446,141
Total	€5,782,386	€11,588,897	€9,673,359	€16,668,689	€17,178,485	€17,718,076	€17,908,459	€19,786,795	€21,242,351	€23,901,605	€26,072,387	€187,521,490
Total per Repak Member	€2,671	€5,299	€4,233	€7,018	€7,332	€7,700	€8,222	€9,382	€10,169	€11,552	€12,351	17%

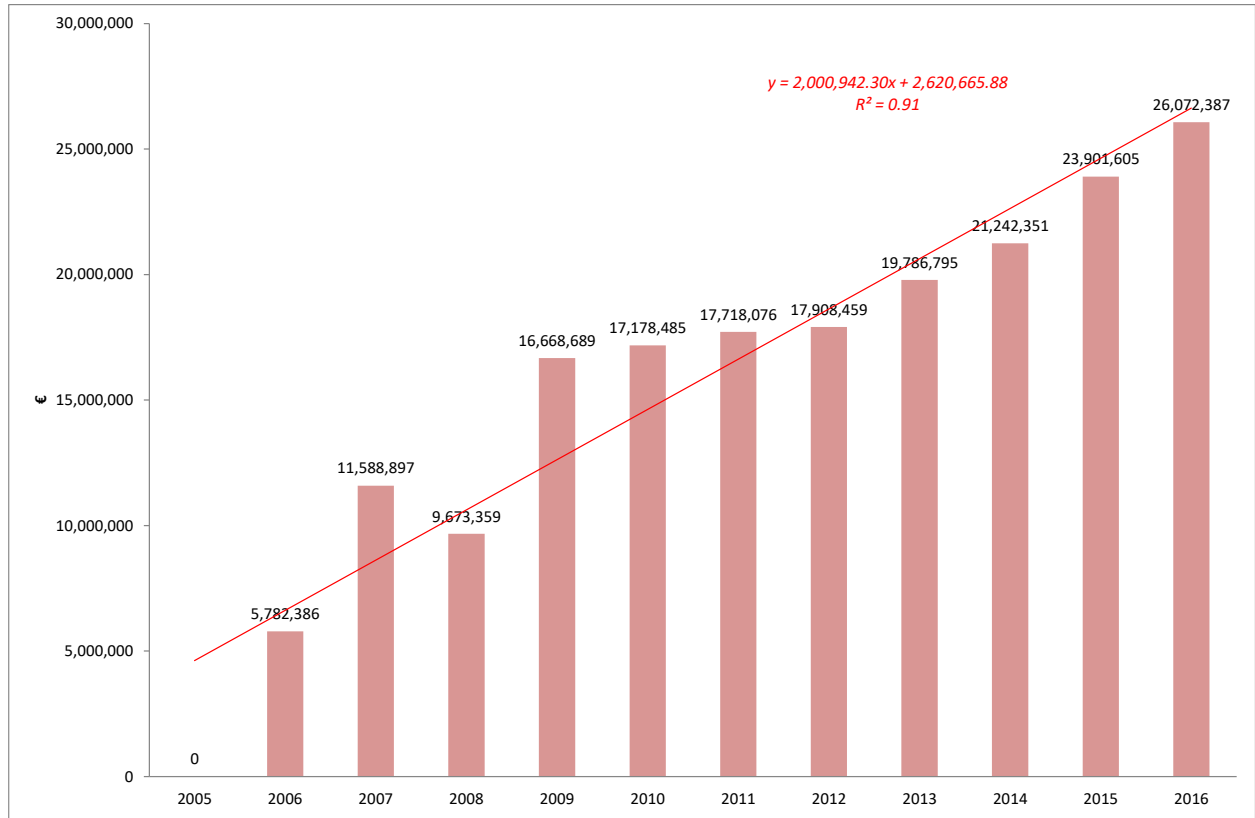
Source: Repak, CSO and EPA data; PMCA analysis.

Note: PET is short for polyethylene terephthalate, HDPE for high density polyethylene, PVC for polyvinyl chloride, LDPE for low density polyethylene, PP for polypropylene and PS for polystyrene. The year 2005 is not shown because it is the base year in the estimation analysis (it is included in the graphs overleaf for illustration purposes).

⁴ On comparison of the present results with those in the 2012 PMCA study, it is seen that there are variations within specific material types during the common period to both studies (2006-2011). This reflects the changes in (updated) supply chain cost components and the inherent volatility in recycling rates for specific materials. The total supply chain cost savings at the bottom of the respective tables (here and in the earlier PMCA report) are broadly similar for the common period (2006-2011).

During 2005-2016, the line of best fit shown in Figure 4.1 shows that each successive year during the period was associated with an estimated average €2m increase in supply chain savings by Repak members.

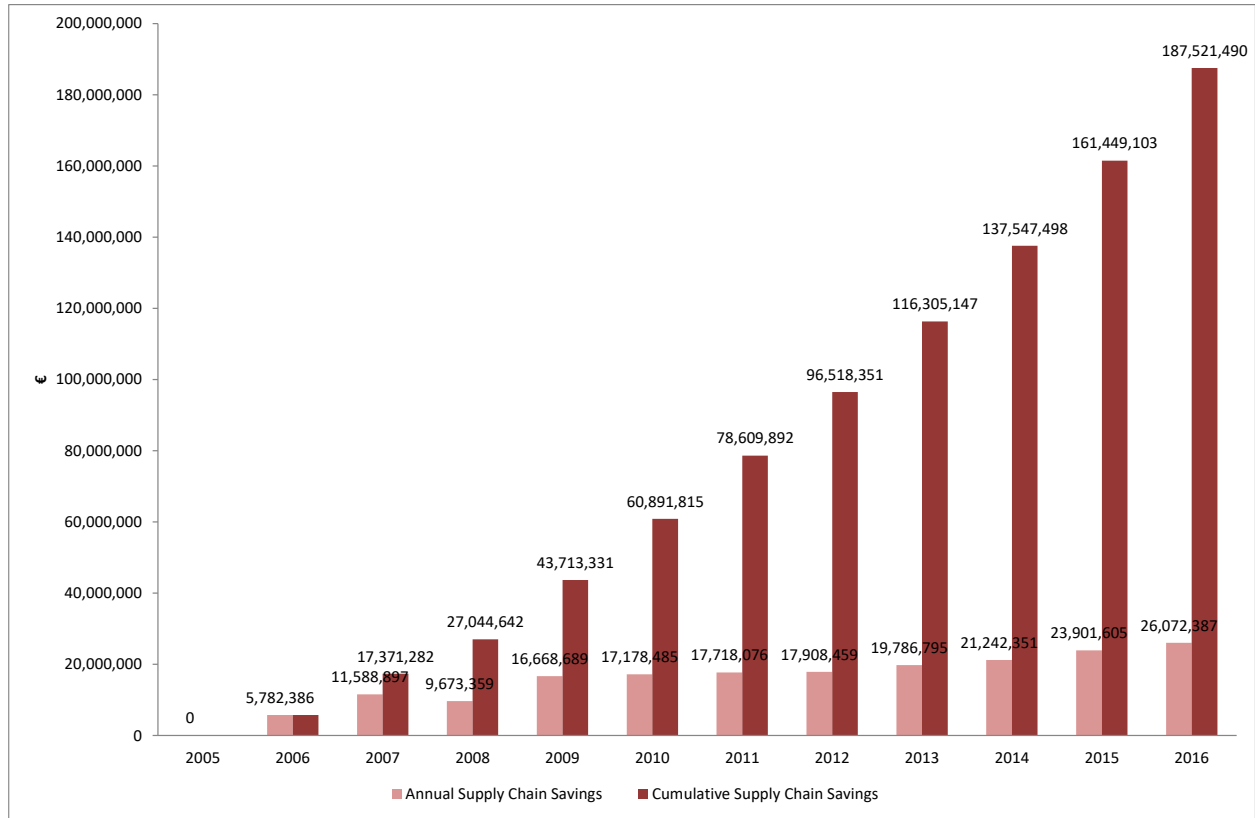
Figure 4.1: Estimated Annual Supply Chain Savings from Packaging Related Costs Prevented by Repak Members with Fitted Trend Line (2005-2016)



Source: Repak, CSO and EPA data; PMCA analysis.

Figure 4.2 shows the significant extent of the supply chain savings – annually and cumulatively – estimated among Repak members during the period, reaching an estimated €187.5m cumulative total in 2016.

Figure 4.2: Estimated Annual and Cumulative Supply Chain Savings from Packaging Related Costs Prevented by Repak Members (2005-2016)



Source: Repak, CSO and EPA data; PMCA analysis.

5 Estimated Overall Monetary Savings and Conclusions

5.1 Estimated Overall Savings

Table 5.1 summarises both the estimated procurement and supply chain savings made by Repak members from their prevention of packaging waste placed on the market in Ireland during 2006-2016.

It is seen that most of the savings have come from procurement savings and that total savings among Repak members are estimated at €78m in 2016 or a cumulative total of €553m at 2016.

Per Repak member, annual total savings grew by on average 18% during the period, from €7,185 in 2006 to €37,000 at the end of the period – appreciably strong growth by any economic comparison.

Table 5.1: Estimated Total Savings from Packaging Purchases and Costs Prevented by Repak Members (2006-2016)

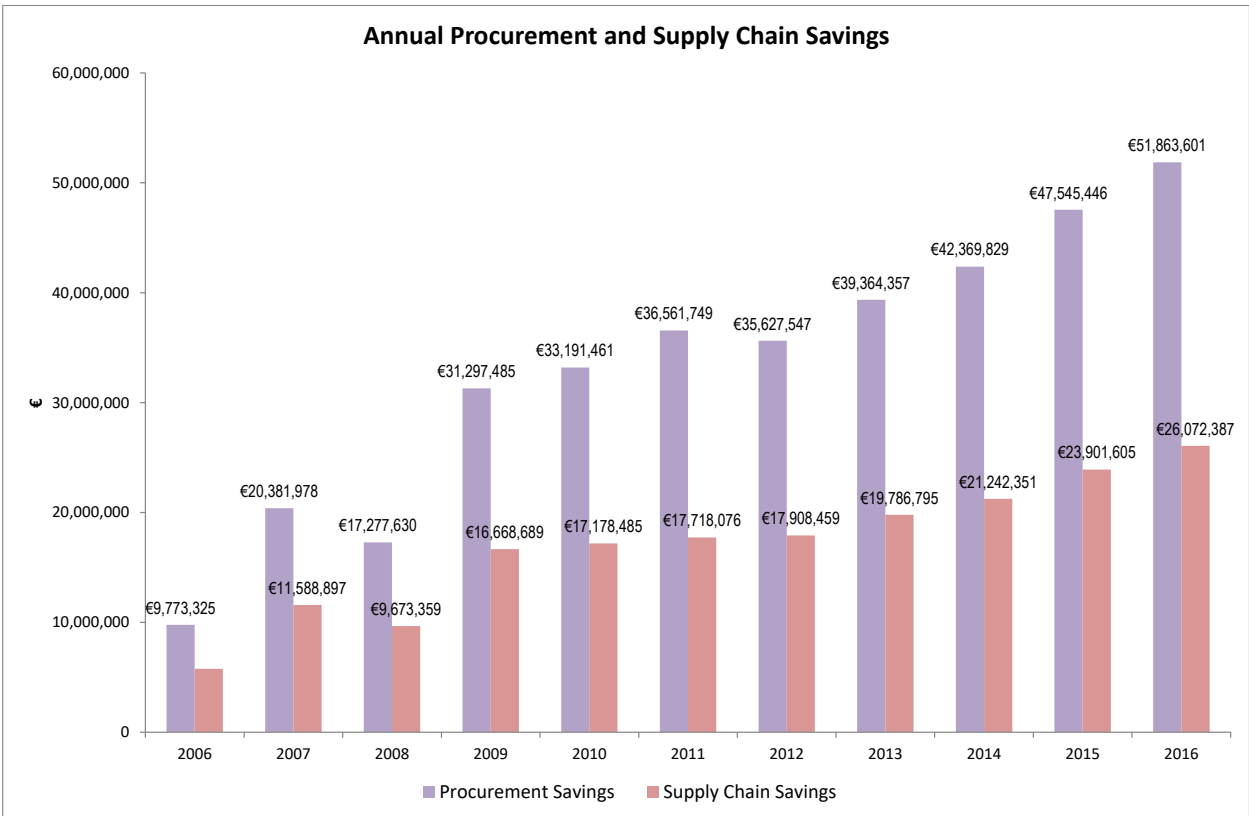
	Estimated Savings (€)				Annual per Repak Member
	Procurement	Supply Chain	Annual Total	Cumulative Total	
2006	€9,773,325	€5,782,386	€15,555,711	€15,555,711	€7,185.09
2007	€20,381,978	€11,588,897	€31,970,874	€47,526,585	€14,618.60
2008	€17,277,630	€9,673,359	€26,950,989	€74,477,575	€11,794.74
2009	€31,297,485	€16,668,689	€47,966,174	€122,443,748	€20,196.28
2010	€33,191,461	€17,178,485	€50,369,946	€172,813,694	€21,498.06
2011	€36,561,749	€17,718,076	€54,279,826	€227,093,520	€23,589.67
2012	€35,627,547	€17,908,459	€53,536,007	€280,629,526	€24,580.35
2013	€39,364,357	€19,786,795	€59,151,152	€339,780,678	€28,047.01
2014	€42,369,829	€21,242,351	€63,612,180	€403,392,858	€30,451.02
2015	€47,545,446	€23,901,605	€71,447,051	€474,839,910	€34,532.17
2016	€51,863,601	€26,072,387	€77,935,988	€552,775,898	€36,918.99
CAGR	18%	16%	17%		18%

Source: Repak, CSO and EPA data; PMCA analysis.

Note: 2005 not shown because it is the base year in the estimation analysis.

Figure 5.1 illustrates the trends in the estimated procurement and supply chain savings emanating from the packaging waste prevention activities of Repak members since 2005 and suggests the significant savings resulting from prevention.

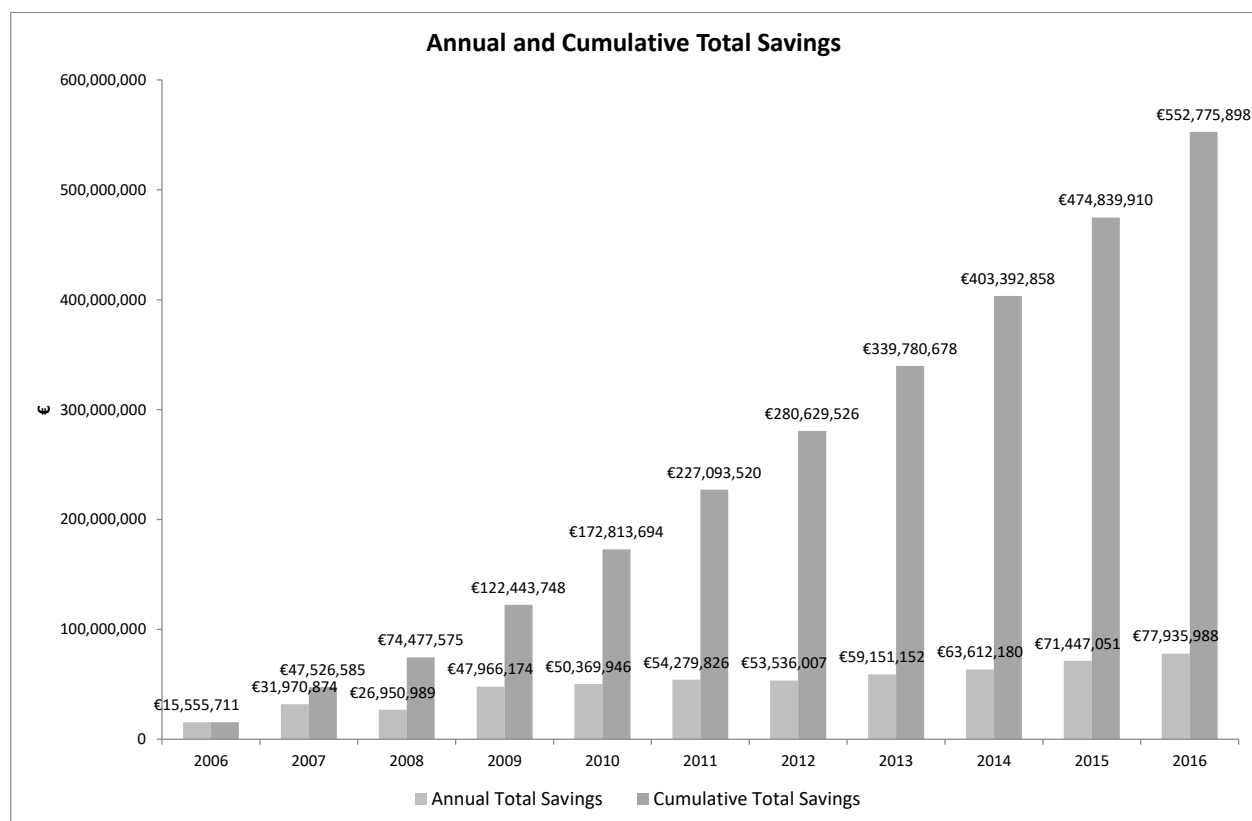
Figure 5.1: Estimated Procurement and Supply Chain Savings from Packaging Purchases and Costs Prevented by Repak Members (2006-2016)



Source: Repak, CSO and EPA data; PMCA analysis.

Finally, Figure 5.2 shows the total savings (both procurement and supply chain savings) from packaging waste prevented by Repak members during the period and it is estimated that the total cumulative savings amounted to €553m in 2016.

Figure 5.2: Estimated Annual Total and Cumulative Total Savings from Packaging Purchases and Costs Prevented by Repak Members (2006-2016)



Source: Repak, CSO and EPA data; PMCA analysis.

5.2 Conclusions

PMCA's estimates suggest the following findings:

- **Tonnes prevented** – 857,000 tonnes cumulatively 2006-2016 and 121,700 in 2016 alone;
- **Procurement savings** – more than €365m cumulatively during the period and €52m in 2016;
- **Supply chain savings** – €187.5m cumulatively and €26m in 2016;
- **Total savings** – €553m cumulatively and €78m in 2016;

The €78m in total savings in 2016 represents almost €37,000 per Repak member and 18% average annual growth compared with the corresponding figure a decade earlier. The estimated savings are beneficial for the Irish economy as well as for the environment because they serve to support Repak members' operating performance and this in turn puts these firms in a better position to maintain and create jobs – the main economic policy priority.