

**The circular
revolution
in Ireland**



**ADOPTING
A CIRCULAR
ECONOMY
COULD CREATE
€1.65 BILLION (0.7%)
OF GDP IN IRELAND**

How the circular economy will boost Ireland's GDP

At Veolia, we know the world is facing an enormous challenge. Demand for raw materials has seen exponential growth with a fast-expanding global population and rising standards of living. Yet the resources on which we all rely are depleting fast. It's time for businesses to wake up to the reality of the throw-away economy and put more value on resources.

The circular economy is the industrial revolution for a new generation. A business model that enables the economy to grow, while minimising the amount of virgin resources that are extracted. But the focus is no longer just environmental, it's all about the bottom line. The circular economy saves resources and saves money. A catalyst for 'free growth' that requires no Government or external funding, just a change of mindset.

The World Economic Forum has forecast that the circular economy will contribute \$1 trillion per annum globally by 2025. But until now, there has been no specific analysis of the potential gains to be made in Ireland.

This Imperial College London report, commissioned on our behalf, outlines the business case for adopting a circular economy. The results demonstrate that using resources in a closed loop system has the potential to contribute €1.65 billion (0.7%) of GDP and create 5,000 new jobs in Ireland.

Six ways that the circular economy contributes to GDP

The analysis focused on generating value from commodities from all resource flows in Ireland including household, commercial, industrial and construction sources.

Ireland GDP Contributions: total €1.65bn

*Numbers have been rounded to the nearest decimal place

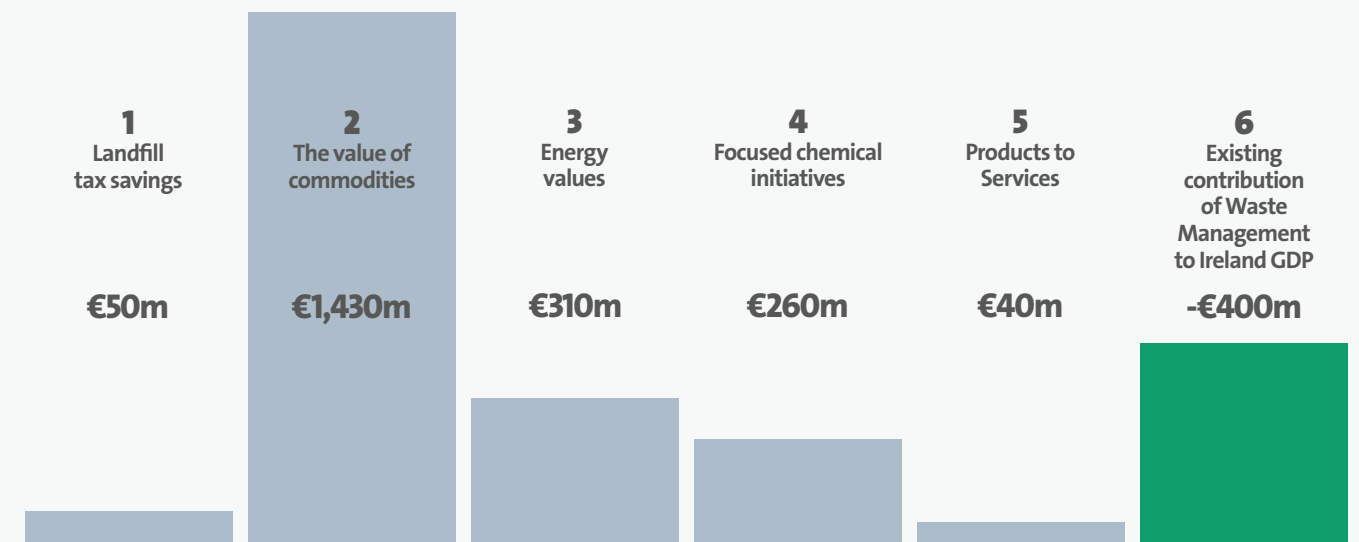


Figure 1: Ireland GDP Contributions



Calculating GDP value from the circular economy

The contribution to GDP, as a result of a transition to a circular economy, was calculated based on the following six strategies:

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1 Landfill Tax Savings
Savings generated from landfill diversion.
- 

2 The Value of Commodities
Commodity value of materials used again and imports replaced.
- 

3 Energy Values
Value from materials that cannot be reprocessed into commodities, e.g. food, animal, vegetal and residual waste.
- 

4 Focused Chemical Initiatives
Initiatives for deriving value from chemical by-products, steam or heat.
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5 Products to Services
Recovering value by switching from buying and disposing of products to selling them as part of a service.
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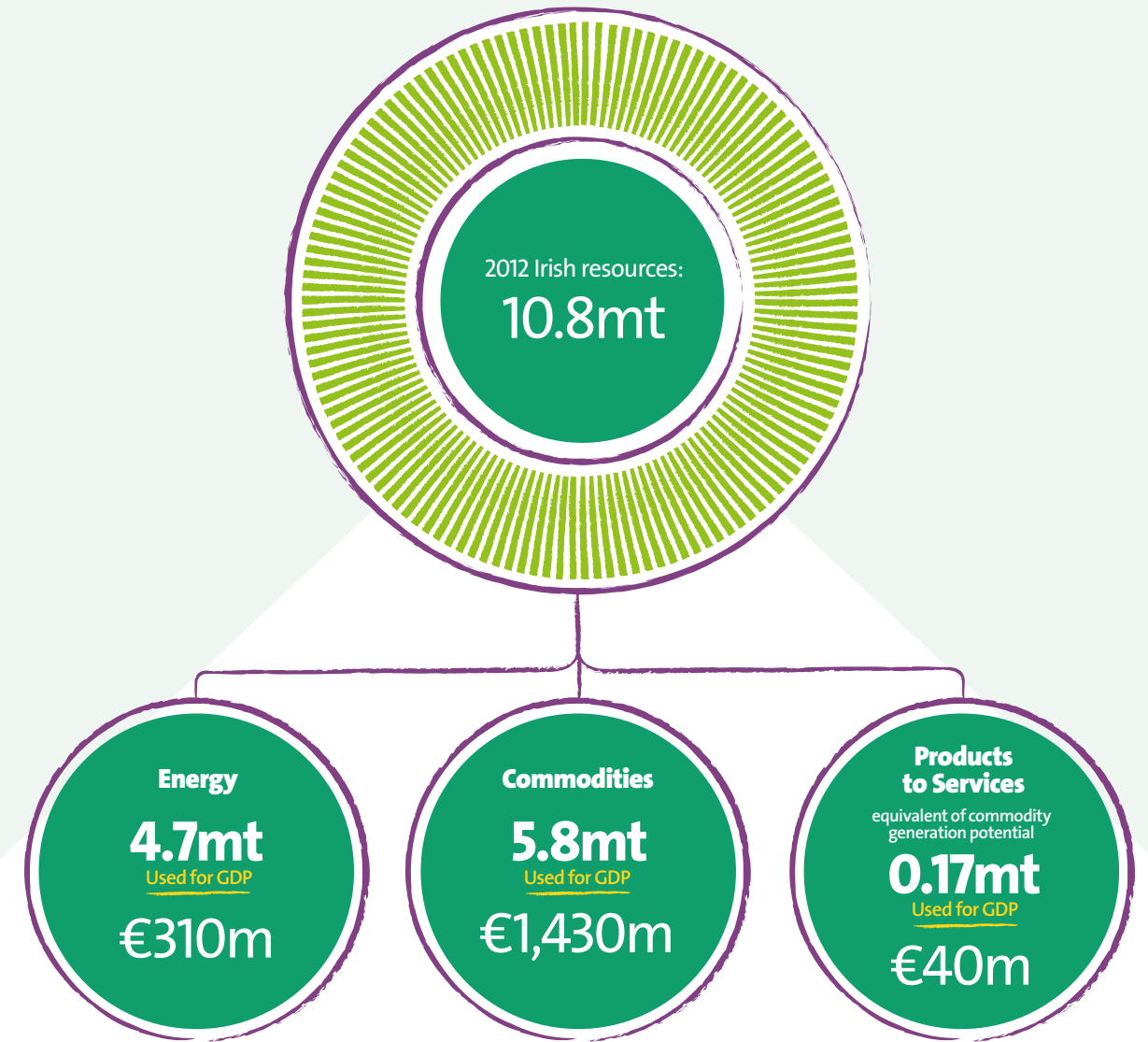
6 Contribution of Waste Management and Circular Economy

Ireland opportunities

Ireland's total resource flows are 10.8 million tonnes (mt). Of this 4.7mt is used to generate energy, 5.8mt to create commodities and 0.17mt recovered by moving from products into services. These steps will therefore add back into the Irish economy €310m from energy production, €1.43bn in commodities and €40m from moving products into services.



Breakdown of circular economy potential



26% diverted from Landfill Tax: €50m

Figure 2: Total Ireland resources

1. Landfill Tax savings

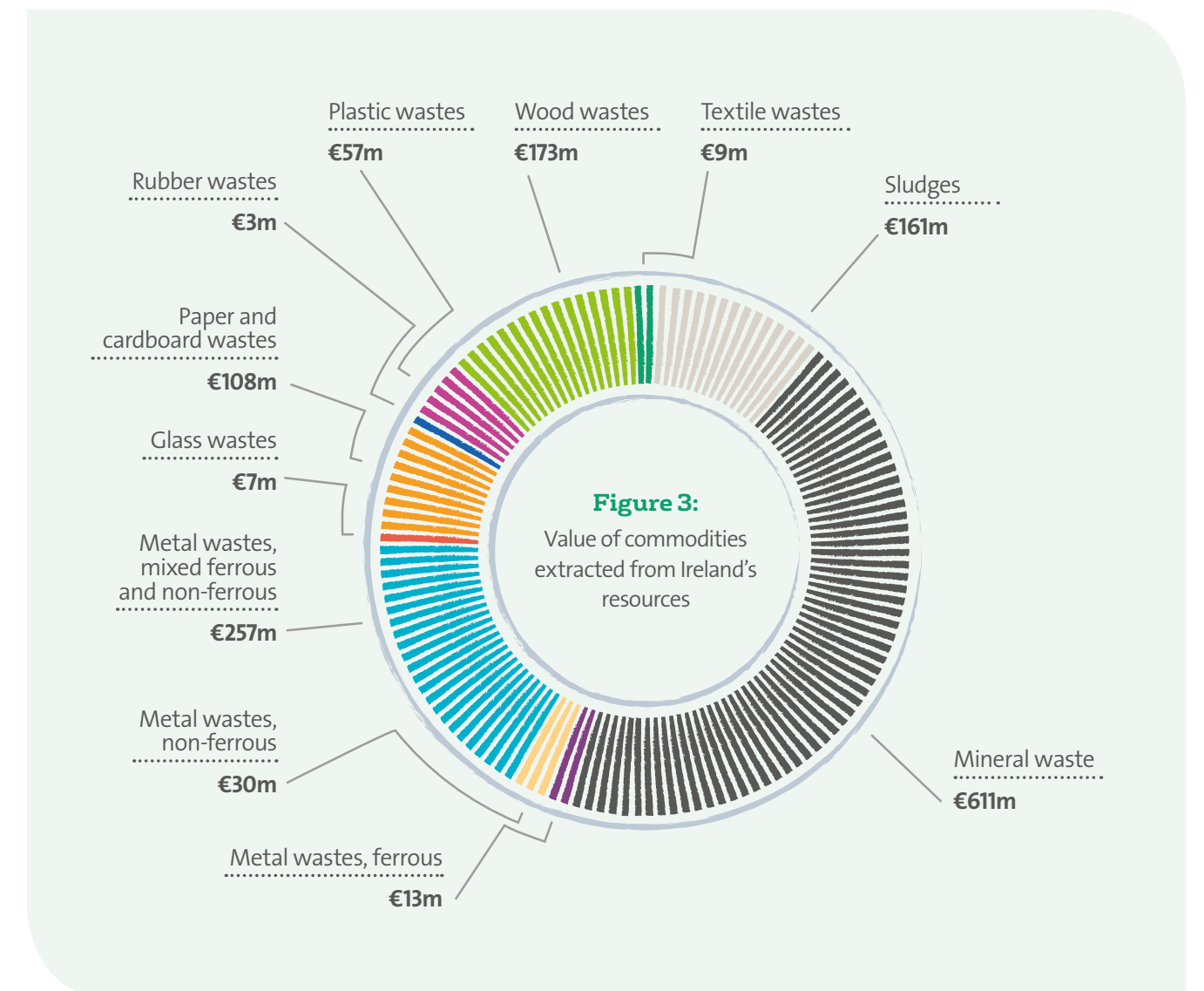
The tax previously paid on resources lost to landfill can now be circulated back in the economy, boosting GDP. The total of landfill levy receipts valued €51 million* in 2012 and so this is the GDP value gained by avoiding landfill.

*Central statistics office for Ireland



2. The value of commodities

The value of commodities extracted from Ireland's resource flows is presented below. Values reflect the high price scenario. Mineral waste (€611m) and Mixed Metals (€257m) offer the greatest gains.





3. Energy values

The value of energy extracted from flows in Ireland is calculated based on a price of €0.13 eurocents per kilowatt hour. It concerns materials that cannot be reprocessed into commodities such as food, animal, vegetal and residual waste. The results are presented in Table 1 below.

Flow	Tonnes (2012)	kwh/tonne	Value/tonne	Value €m
Mixed ordinary waste	3,453,435	550	75	260
Animal and mixed food waste, vegetal waste	1,224,102	300	42	50
Total	4,677,537	-	-	310

Table 1: Energy value of flows



OUR
CALCULATIONS
FOR IRELAND'S
CHEMICAL
WASTE STREAMS
PRODUCE
A VALUE OF
UP TO **€259M**

4. Focused chemical initiatives

In this report, deriving value from the unwanted chemicals and resources produced by an industry was included as a separate initiative. We have estimated the value of four chemical waste streams: spent solvents, acid/alkaline wastes, used oils and other chemicals. The value is based upon the price of common chemicals such as ammonia.

5. Products to Services

One of the characteristics of the circular economy is changing the business models, by shifting from selling a product to offering a service. In this report, we have used this transition from products to services as another way of recovering value from commodities.

Our calculated figure consists of the remaining flows after consideration of commodity and energy values. This amounts to 170,000 tonnes with an estimated value of €40m.

Case studies exemplifying products to services include a diverse range of companies and products:

Electrolux - charging for each wash rather than a washing machine

Castrol - offering a lubricant service package instead of selling bottles of lubricant

Koppert - offering crop protection by the square metre, as opposed to barrels of pesticide

(Ellen MacArthur Foundation, Design for Sustainability www.d4s-sbs.org).



TOTAL WASTE HAS ALMOST HALVED FROM **24MT TO 13MT**, WHILE GVA IN THE WASTE MANAGEMENT SECTOR HAS INCREASED FROM **€604 MILLION TO €774 MILLION**.



6. Existing contribution of Waste Management to the Circular Economy

Using Eurostat figures for 2004 and 2012, this report finds that the value of the Waste Management sector in Ireland has increased while the volume of waste has decreased. This suggests an increase in the GVA (Gross Value Added) per tonne of waste for the waste management sector.

Total waste has decreased from 24mt to 13mt, while GVA in the waste management sector has increased from €604 million to €774 million. GVA per tonne has increased from €24.65 per tonne to €57.67 per tonne.

Comparing 2012 with 2004, the additional value is calculated to be €443 million.

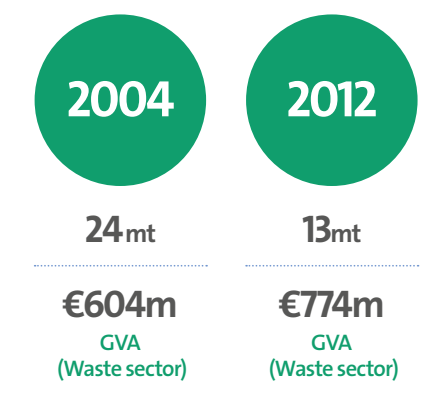


Figure 4: Growth of the GVA of the Waste Management Sector in Ireland

Which sectors have the most to gain from the circular economy?

Analysis of GVA and waste generation of sectors illustrates the importance of sector activity for waste generation. Certain sectors hold more value in their unutilised resources compared to others in terms of their share of the GVA pie (Table 2).

Resource flows in the economic sectors are not uniform, and thus the benefit (additional GDP) is not directly linked to the

GVA value of that sector. The manufacture of coke and refined petroleum products, electricity, gas, steam and air conditioning supply, and services sectors yield lower values based upon their actual waste generation than that of their GVA ratio.

Table 2: Sectoral analysis of GVA and waste generation.

Sectors Ireland	GVA 2012 (€m)	Total waste kt	Value calculated from sector share of total GVA (€)*	Value calculated on actual flows (€)**
Manufacture of food products Agriculture, Forestry and Fishing	2,436	73	30	28
Construction	2,300	364	30	64
Manufacture of food products; beverages and tobacco products	6,889	2,038	89	453
Manufacture of textiles, wearing apparel, leather and related products	118	20	2	10
Manufacture of wood, paper, printing and reproduction	668	250	9	131
Manufacture of chemical, pharmaceutical, rubber and plastic products; other non-metallic mineral products	17,148	231	221	97
Manufacture of basic metals and fabricated metal products, except machinery and equipment	638	1,370	8	216
Mining and Quarrying	526	2,023	7	299
Manufacture of computer, electronic and optical products, electrical equipment, motor vehicles and other transport equipment	3,340	175	43	152
Electricity, gas, steam and air conditioning supply	2,941	395	38	56
Services (except wholesale of waste and scrap)	103,967	1,894	1,341	304
Water collection, treatment and supply; sewerage; remediation activities and other waste management services	940	232	12	18
Totals	141,821	9,066	1,829	1,829

* 'Value calculated from actual flows' is the value of Commodities, Energy and Chemical Initiatives

** This figure represents the value of a sector's waste resource flow if the total waste value was distributed among sectors based upon their relative size in terms of GVA.



Job creation

Ireland's unemployment rate at close to 10% is among the highest in the EU with over 200,000 people unemployed. Based on findings from the report 'More Jobs, Less Waste (Friends of the Earth 2010*)' it is estimated that at least 5,000 jobs will derive from investing in circular economy activity, thus making a significant contribution to reducing unemployment and supporting growth.

This estimate is based on the recycling of certain materials and does not cover all materials or aspects of this report. Figure 5 below provides an overview of the materials and the jobs derived from their recycling.

*Whilst the material based job estimates were calculated in 2010, they remain relevant today and have been used in this report with 2012 waste data to provide an up to date estimate of total job creation.

Total jobs gained: 5,000



Figure 5: Jobs gained from recycling of materials from Ireland's resources (Jobs gained figures from Friends of the Earth, More Jobs, Less waste 2010).

Conclusion

When Veolia commissioned this report, we were convinced that there were gains to be made from Ireland's businesses thinking circular. However, the findings have far exceeded our expectations of the contribution that the circular economy could make in terms of GDP and employment.

€1.65 billion and 5,000 jobs, with particular opportunities in the plastic sector, makes a compelling business case for change. Organisations that embrace the circular revolution now will make considerable savings in the future. Quick wins that require no additional funding, just a simple change in mindset.

At Veolia we are already helping businesses to rethink their resource requirements and waste streams. There is no one size fits all solution. The best approach is one that is tailored to individual businesses and market sectors.

The opportunity is here for business to benefit from designing products to take into account a second and third life and better supply chain pricing as the quality of secondary recycled materials becomes business critical. By promoting greater resource efficiency we can help manufacturers protect their own supply chains and stimulate a growth in the market for recovered materials.

On the following page you will find two case studies that highlight some of the ways that Veolia is helping businesses to preserve resources and grow the economy through closed-loop thinking. In short we see the circular economy as the industrial revolution for a new generation.



Examples of the circular economy in action

The circular revolution in the cement industry

In Ireland, Veolia's hazardous waste business is already delivering circular economy solutions for a variety of hazardous wastes that our clients produce. For example, we have pioneered the production of Solvent Liquid Fuel (SLF). We have also encouraged the use of alternative raw materials from waste streams that would otherwise be disposed of in landfill or by incineration. Both these initiatives are now employed by the cement industry as a replacement fuel and naturally-occurring raw materials in the production of cement.

Example one Turning waste solvent into a high-grade fuel

At Veolia's Solvent Blending Plant in Fermoy, Cork, we transform waste solvent from the pharmaceutical, medical devices, IT and other sectors into a high-grade SLF. This is then supplied to the cement sector as a fuel substitute for oil, gas or petroleum coke.

Since 2007, Veolia has made significant investment in plant and laboratory equipment at the Fermoy site. Furthermore, we have a highly specialised and trained team of operational and laboratory personnel whose combined expertise enabled us to produce almost 10,000 tonnes of SLF for the cement industry in 2014 alone.



Example two Replacing natural raw materials with chemical sludge

Historically, all sludges that were produced by industrial processes were landfilled. Following a thorough investigation into the chemical make-up of these sludges, Veolia found that many had the same chemical constituents that are used in the manufacture of cement.

Following the discovery, we approached a cement plant in Ireland to investigate the possibility of using these industrial sludges as Alternative Raw Materials (ARM) for the chemical constituents

that are normally derived from quarried rock. If viable, the initiative would preserve naturally-occurring raw materials and reduce waste to landfill.

The success of these investigations were such that, in 2014, Veolia sent around 5,000 tonnes of ARM derived from the pharma, automotive, IT and water treatment sectors to the cement plant. Truly an example of the circular economy in action.



Resourcing the world

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