VEOLIA

Resourcing the world

Leading the Circular Economy

Sustainable solutions
for a sustainable world

Driving circular thinking

The circular economy now represents **25%** of our turnover

At Veolia, we're committed to a future where end-of-life resources are transformed into products that enrich our lives and power homes and businesses. A future where production and consumption go hand in hand – and nothing goes to waste.

It's the reason we're committed to helping our customers embrace the circular economy.

By throwing things away without a second thought, we are missing opportunities to create new products and low-carbon energy.

We support closed-loop models that reuse and re-manufacture materials as standard, design products to last longer and integrate sustainability seamlessly into our lives. Everything that we buy, use or consume should be recycled or converted into energy.

And we're working hard to make this circular vision a reality for our customers.

Leading the way

Now is the time we make a fundamental shift towards the circular economy. This isn't recycling rebranded it's full supply chain management taking into account resource management across the board - water, waste and energy. There are three players in this game, the brands that produce the products, the consumers that buy them and Veolia the enabler giving them a second, third or fourth life. With our expertise we can help our customers meet these challenges through fully integrated resourcing solutions.

Reshaping the future

The circular economy already represents 25% of our turnover, but we believe we can do more. That's why we are constantly developing innovative ways to gain access to, preserve and replenish precious resources.

Inside, you can learn about the many ways we have already closed the loop in collaboration with our customers.

And of course we'd also like to talk to you. **Get in touch to see if we can help you turn more materials into green resources and unlock the real potential of going circular.**

Estelle Brachlianoff

Senior Executive Vice-President, UK & Ireland.

£29bn
windfall to UK GDP from circular economy

175k
new jobs could be created throughout the UK

£££
How much could it be worth to you?

Boost your bottom line – think circular

Whether you are a large corporate or an SME, circular thinking can help you extract value from the waste and resources in your supply chain.

But no one has all the answers. That's why collaborating with a partner like Veolia is so important. We're keen to hear about your new projects and innovations, which is why we've set up the #livingcircular hub on our website to showcase the very best in circular ideas. Why not take a look: livingcircular.veolia.com/en or sign up to our Twitter feed at twitter.com/LivingCircular for regular updates.

In the case studies that follow, you'll see that by adopting processes that recover and transform waste, water and energy, the circular economy can deliver value by:

- diverting waste from landfill and moving waste up the hierarchy
- creating competitively priced feedstocks and products
- reducing your environmental footprint versus using raw materials.

Our innovative processes can prepare and clean materials such as recovered plastics, metals and fibres to standards that are often superior to virgin materials.

And thanks to technological efficiencies, our circular materials are guaranteed to be competitively priced and offer resource security compared with conventionally sourced raw materials.

So whether you are already engaged in circular economy activities, or are starting from scratch, Veolia's economic and environmental synergies across water, waste and energy can help you to boost your bottom line.

Our approach includes:

- site audits and dedicated account managers
- access to Veolia's innovation development process
- unique technology and capital investment.

Whatever your challenge, wherever you are on the circular economy journey, we'd like to talk to you.

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Giving waste detergent a gleaming future

Cyclone vehicle wash

LOOP 1

Cyclone TFR is available for sale now

Working in partnership with a global consumer-goods company determined to minimise its environmental impact, we have repurposed waste detergent into a high-performance vehicle wash, Cyclone TFR.

Following a complete lifecycle inventory of its products, the company recognised the need for a greener way to handle waste detergent and Veolia was determined to deliver a solution.

We realised that although the product had passed its commercial sell-by date, there was no deterioration in the quality of the waste detergent – it simply couldn't be sold in its current form. So together with our customer, we established a small cleaning products recycling business where the detergent could be repackaged and repurposed into new cleaning solutions.

Cyclone TFR has been trialled for over a year on our Veolia fleet.

Since 2016, our sustainable truck wash is now available for sale to the external market, helping fleets reduce their carbon impact.

Raising a glass to whisky-powered renewable energy

Distilling bio-energy

Scotch whisky is worth more than **£5bn** to UK economy

*Source Scottish Whisky Association

LOOP 2

Working with a large Scottish distillery, Veolia developed an innovative technology to recover energy from the by-products of whisky production. Distillation is an energy-intensive process that traditionally relies on fossil fuels. This means distillers are always looking for sustainable ways to deal with the waste they produce to improve their environmental footprint and save energy.

The organic by-products of whisky making (malt distilling and grain distilling) have great potential as a renewable energy source.

How it works

The 'spent wash'– a mixture of wheat, malted barley, yeast and water – produced during distillation is separated into liquid and dried solids. The liquid is then converted, via anaerobic digestion, into biogas and the dried solids form a biomass fuel source.

Both the biomass and the biogas can be used to create renewable energy in the form of steam or electricity. We also treat the liquid to create clean water. All these resources (power, steam and water) are recycled back into the distillery, providing a sustainable production facility that minimises its impact on precious local resources.

When biomass is burned to generate renewable energy a solid ash is produced. This ash is rich in phosphate, an important non-renewable mineral that is used to produce fertilisers for the agricultural industry.

Find out how we're unlocking the potential of biomass in Loop 3.

LOOP 3

Growing profits from nutrient-rich waste

ReNu fertiliser from waste products

When biomass, such as wood or organic matter, is used as a fuel to produce heat and electricity, a solid residue is produced called biomass ash, which contains many macro and micronutrients. The ash may be rich in phosphate or potash; these are important non-renewable minerals that are used to produce fertilisers for the agricultural industry.

We are trialling a process to unlock the commercial potential of biomass ash by remanufacturing it as a nutrient rich fertiliser which will also contain important trace elements.

Once collected and granulated, it can be repackaged and sold to be used in the agricultural industry. This scheme will help businesses to conserve natural resources and develop more sustainable closed-loop waste solutions to replacing important nutrients such as potassium, magnesium, calcium and trace elements back in to the land.

Creating bags more potential for plastic carriers

Bag2Bag recycling

Working alongside local authorities, we offer a closed-loop environmental solution by recycling used plastic bags into refuse sacks.

In England alone, millions of plastic carrier bags are used each year. A large percentage end up in landfill sites where they take a long time to decompose, or can be found littering our towns, cities, coasts and countryside.

Although England followed in the footsteps of Ireland, Wales and Scotland and introduced a mandatory charge for single-use plastic bags in 2015, the problem is still a big one.

So we have given plastic bags a new life by turning them into refuse sacks. We collect used bags from retailers and at our Materials Recovery Facilities (MRFs) and transport them to our recycling partner. The bags are washed, processed, turned into pellets and made into bin bags. We then deliver them back to the local authority where the used shopping bags were first collected.

Residents in Southwark now use Bag2Bag for their refuse waste as part of a closed-loop solution. We are looking to extend this scheme at a number of our MRFs across the UK.

LOOP 4

Reduced the sites water footprint for salad washing by **75%**

Reducing water scarcity one drop at a time

Recycling water for food production

Working with Bakkavor, a national food producer, we have created a landmark solution that has enabled recycled water to be used in food production.

Despite our reputation for wet weather, you may be surprised to hear that the UK has less rainfall per person than our Northern European neighbours, and London is drier than Istanbul[1]. This is why water supply and wastewater treatment is a national priority.

Our water supply is under great strain from the ever-increasing demand of households, business and industry and the effects of climate change are taking their toll too.

In short, as a nation we are using more water, but there's less to go around.

Tilmanstone Salads is based in Kent, an area of water scarcity and came to us for help in reducing its environmental impact. To achieve this, we created a water recycling facility that took the wastewater from the factory and safely recycled 72% of it back into the food production process.

The system is designed to meet the high standards required for drinking water and is the first example in the UK of recycled water being used in food production. Not only has it delivered significant cost savings and reduced our client's environmental footprint, it has also brought them significant recognition. Tilmanstone has received the prestigious Supplier of the Year award from Marks and Spencer, a title contested by 50,000 companies.

1. www.waterwise.org.uk/data/resources/25/Water_factsheet_2012.pdf

LOOP 5

80
bicycles and 6,000 cans can be made from the metal and aluminium the facility recycles each year

Going flat out to recycle screens

RoboTele TV recycling

Our love of gadgets means it is no longer unusual to have two or even three TVs in a home. And with advances in technology, that means we're producing more electrical and electronic waste than ever before.

At Veolia, we have state-of-the-art facilities that can give flat screens and monitors a second, third or even a fourth life. At our RoboTele facility in Bridgnorth, Shropshire, we dismantle and recycle over half a million screens every year. That's the equivalent of more than 2,500 tonnes of Waste Electrical and Electronic Equipment (WEEE) that is turned into a resource to make new products.

LOOP 6

The process uses robots to remove each screen without damaging the surrounding case.

A second robot safely traps the mercury inside the tubes by injecting a wax mixture, before they are cut and removed for further recycling.

Using a shredding line, we can extract non-ferrous metals such as copper and aluminium and any plastics are segregated by hand and sent to a recycler to be turned into plastic granules to make new TV frames.

Finally, the circuit boards containing gold, silver and platinum are removed by hand and sent to a specialist third party to extract the precious metals and make new circuit boards for new TVs and computers. All of which Veolia is able to recycle to go full circle, closing the loop again and again.

Each gram of recovered platinum saves **14kg** of CO_2 compared with mining

LOOP 7

Lord of the recycled rings

Platinum recovery

Working alongside leading healthcare company, Accord, we have recovered high-quality platinum from obsolete pharmaceutical drugs.
As with all pharmaceutical products, Oxaliplatin, a cancer medication, has a limited shelf life and must be destroyed if it is not used within a certain period.
But with a high platinum content – a valuable precious metal and resource – it was important to unlock the value in this waste stream.

Veolia set about isolating the platinum from the product. This was achieved by the decomposition and chemical reduction of the organic compound. Applying a two-step recovery process, including both solid waste and liquid waste extraction, Veolia successfully recovered a significant amount of platinum.

The high quality of the recovered platinum means it can be reprocessed into other cancer drugs or smelted to produce a range of **consumer desirables such as wedding bands, bracelets and earrings.**

The recovery process practised at Veolia's Hazardous Waste Services' Laboratory is a great example of our innovative approach to unusual and challenging customer requests.

Mining precious metals can be devastating to the environment. Recovery techniques that maximise reuse help reduce reliance on mined ores so make sound economic sense in the highly volatile metals market.

Brewing up a recycling solution

LOOP 8

In the UK, we drink more than seven million cups of takeaway coffee every day. But the nation's love of coffee doesn't just result in a big caffeine hit. It also packs a huge environmental punch.

Working in partnership with Costa and Starbucks, Veolia has launched the very latest coffee-cup recycling scheme, to a wide variety of stores and commercial premises.

The aim is to separate the coffee cup from the general waste as soon as the customer has enjoyed their coffee. This initial separation is key, as one of the biggest challenges to recycling is the food waste contamination and damage caused when cups are mixed with general waste go to a Veolia hub.

Once collected, cups go to a Veolia hub where they are debagged, separated and baled before being taken to a treatment facility. At the treatment facility the coffee cup fibres are recovered and separated from the polymer plastic liner. The paper pulp is then recycled into a range of products such as insulation, egg boxes or even coffee cup holders!

In addition to the collection scheme, we are working with Starbucks to recycle household coffee capsules through 900 of their stores.

Providing recycling bags that can hold up to 75 capsules enables customers of the coffee chain to return any used capsules to the store or post them back free of charge: an innovative solution that will certainly perk up our customer's circular credentials.

Giving contaminated paper a clean bill of health

Pro-Fibre paper pulp

LOOP 9

Pro-Fibre is paper **pulp** produced from once contaminated paper

According to the latest data, **the UK recycles approximately eight million tonnes of waste paper[2]. This represents around 70% of the paper we throw away,** but what happens to the rest? Using prototype technology, we are trialling a process that creates pulp from contaminated domestic paper for use in the construction, packaging and moulded-fibre industries.

Many types of paper are rejected from recycling facilities because they have been contaminated with glass, plastic, metal or, most frequently, food or grease. This could be due to the intrinsic nature of the paper, such as pizza boxes or takeaway lids, or it could be that the paper has been discarded with general household waste.

This contaminated paper is sent to landfill or energy recovery facilities. But although it requires more processing to remove these contaminants, the high fibre content of the paper means it can still have a commercial value.

Our solution extracts the value from this paper source while reducing its environmental impact.

Pro-Fibre is paper pulp produced from contaminated paper. The five-step process we have developed enables us to remove contaminants and create a pulp that can replace virgin materials currently used in the construction and packaging industry, including insulation materials and biodegradable pots.

We have worked closely with a partner specialising in the fibre industry to analyse the properties of our pulp so we can better understand the product's commercial potential. We are now building a facility in Leeds where we will recycle the low grade paper that was previously discarded from over 320,000 homes.

2. www.paper.org.uk

Cultivating a greener solution for gardeners

Pro-Grow gardening range

Pro-Grow is our range of sustainable gardening products. It's an environmentally friendly alternative to peat-based garden products.

Peat is partially decayed vegetation or organic matter that has built up gradually over millennia at peatlands. It's used in potting compost or mixed with fertilisers to help improve soil quality. The problem is that peat takes a very long time to develop, growing at a rate of less than 1mm a year. The commercial extraction of peat is threatening supply and at the current rate of consumption it will soon run out.

Peatland ecosystems are important and unique habitats. They are among the most effective carbon sinks and absorb huge amounts of carbon dioxide from the atmosphere.

Peatlands are also important as a natural flood defence and due to the acidity of the conditions, they are home to species of plants and animals that can't be found elsewhere.

To provide gardeners with a way to help grow strong plants and crops while protecting the UK's peat resources, we looked to our green waste. **Our Pro-Grow products are made from composted biodegradable material we collect from homes and businesses.**

In our composting facilities, hundreds of thousands of tonnes of garden waste are transformed into high-quality compost and nutrient-rich organic soil conditioner. It's a great example of a closed-loop solution – we collect the cuttings and waste from gardens, then compost and repackage it so it can be used to help plants grow.

Our high-quality Pro-Grow Soil Conditioner is sold to retailers and the public for use in landscaping, agriculture and gardening, available online at B&Q and Waitrose.

Due to its success, we have extended our range of eco-friendly peat-free Pro-Grow products to include multi-purpose compost, woodchip mulch, bark chips and lawn conditioner.

100%
peat free compost

LOOP
10

Giving leftover paint a new lease of life

Paint recycling

It is estimated that the average UK household has 17 tins of partially used paint in their sheds and garages. But paint is difficult to recycle and often ends up in landfill, wasting a good-quality resource.

If paint tins are thrown in with domestic rubbish and crushed in a refuse truck, they can leak paint on to the streets. Paint disposed of down the drain can pollute our watercourses.

To reduce its environmental risk, Veolia introduced Community RePaint schemes at our recycling centres. We collect reusable, leftover paint and redistribute it to community and voluntary groups, charities and individuals.

It is then put to good use, refurbishing rooms and buildings, in craft activities or even decorating stage sets in community theatres. However, not all collected paint can be so easily repurposed and the majority still ends up in Energy Recovery Facilities.

Not any more. Our licensed technology turns leftover paint into a new product called NewLifePaint. The remanufactured paint is independently tested to guarantee it meets the same standards as new paint, as well as Environment Agency standards.

The process enables us to de-package old paint pots, recover the leftover paint and turn it into new, high quality, durable, environmentally friendly paint products. So far, we make by hand white and magnolia emulsion for interior walls and ceilings for all types of buildings. We can even offer a matt or silk finish and bespoke batches of paint colours available to sell through retail outlets.

LOOP
11

We collect
2,500
tonnes of waste paint every year

Ensuring our waste doesn't go to waste

Biogas from human sewage

We produce over 11 billion litres of human sewage in the UK every day[3]. Advances in technology mean that capturing the biogas from all of it could deliver an estimated 1,697GWh: that's enough electricity to power over half a million homes.

On average only 66% of sewage is being treated at AD facilities[4], meaning a lot of our waste is going to waste.

By significantly increasing the power derived from the anaerobic digestion of sludge, Veolia's latest innovation boosts sustainability, reduces carbon emissions and lowers costs.

Wastewater treatment plants process large amounts of sludge through AD. The resulting biogas used to generate electricity via Combined Heat and Power (CHP) plants. The new Veolia system reduced hydrogen sulphide (H_2S) and demonstrated a 14% increase in renewable electricity generation – a significant step towards the circular economy.

Today, the potential power from human sewage could keep around 14 million LED/LCD TVs, 112 million phone chargers, 280 million alarm clock radios or ten million games consoles[5] running constantly, increasing the resilience of the National Grid and helping to control energy bills.

Human sewage could keep

14 million

LED TVs running 24/7

3. Waste water treatment in the UK, Gov.co.uk
4. Anaerobic Digestion Strategy and Action Plan, Gov.co.uk
5. Based on each of these household goods being used 24/7/365

Manufacturing opportunities for industrial by-products

Capturing nitrates

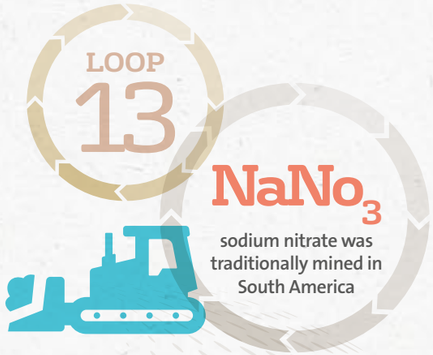
Working with one of our industrial partners, we have identified ways of reusing its manufacturing by-products to deliver energy efficiencies and commercial opportunities.

Many industrial processes create by-products that can be used to make the production process more cost-effective or create new products. We work with a range of businesses to help them harness the potential of their waste streams, reducing their environmental footprint and delivering cost and energy efficiencies.

One of our commercial partners is an industrial chemical company based in North West England. As part of its manufacturing process, it creates a water-based waste product that contains sodium nitrate, discharging at a rate of 1,200 m^3 per day. Sodium nitrate is a versatile substance with many uses. **It is found in fertilisers, pyrotechnics, glass and pottery enamels, dental products and food preservatives.**

Recognising its potential, Veolia designed and built a mechanical vapour recompression evaporation system that we operate and maintain for the company. The system is designed to extract the sodium nitrate solution from the water-based waste so it can be repackaged and sold as a commercial product.

Another benefit of this process is that distilled water produced during the treatment is recycled back into the production process, significantly reducing water supply costs.



Fuelling the supply of renewable energy

Wood-fired biomass

Wood biomass is a renewable fuel that can generate heat and electricity at the same time as reducing environmental impact. Around the world, we manage hundreds of wood-fired biomass energy plants that supply electricity (power stations) or heat (steam, hot water) or both from Combined Heat and Power (CHP) plants.

This renewable energy can either be used to power a specific site or it can be supplied back to the National Grid. There is also the added benefit of using the excess heat for a district heating network or an industrial facility, contributing to cutting carbon emissions and meeting climate-change targets.

Each year in the UK, we turn some 230,000 tonnes of discarded wood (in the form of chips or pellets) into renewable energy. **This generates enough electricity to supply approximately 66,000 homes through the National Grid, and supplies heat to district heating schemes that serve another 3,300.**

Most industrial sites use a processes that has a requirement for heat. Biomass CHP can be an option for these facilities with high steam and electrical loads.

As well as using this biomass resource to generate energy, we also manage and distribute up to 75,000 tonnes of waste wood each year to support the provision of renewable fuel for communities, schools and local authorities. In collaboration with industry, this wood is transformed into construction products such a chipboard and fibre board.

According to the Energy Technologies Institute (ETI), using sustainable biomass as a source of energy could reduce the cost of meeting the UK's 2050 carbon targets; it could also help to make low carbon energy more affordable for consumers and businesses.

Our **90** biogas CHP plants generate renewable electricity, saving 81,000 tonnes of CO_2 each year

LOOP 14

Mining industrial catalysts for precious metals

Catalyst recycling

Working with Veolia colleagues across Europe and the United States, we have developed an innovative technology to recover valuable metals from disused industrial catalysts.

A catalyst is a substance that aids chemical changes in other substances. Many of the catalysts used in the petrochemical and car industry contain precious metals.

For example, catalytic converters in cars use platinum, rhodium and palladium to convert the harmful pollutants in vehicle emissions into carbon dioxide, nitrogen and water vapour.

These precious metals have a significant environmental footprint. They are relatively rare and difficult to mine because the process required to extract and refine them is complex.

Using our global expertise, we are trialling techniques to help harvest the valuable metals from spent catalysts for clients in the oil and gas, chemical and petrochemical sectors and so far the project has generated circa £1.8 million in revenue.

In addition to recovering the metal, our processes are designed to remove contaminants. By doing this, we are not only conserving natural resources, but we're also helping our clients further reduce their environmental impact by maximising the amount of valuable metal we reclaim.

LOOP 15

Only a few **hundred** tonnes of platinum are produced annually

LOOP 16

Bottling the potential of plastic packaging

Recycling plastic polymers

At our plastics sorting facilities in Rainham, Essex and Dagenham, East London, we are sorting plastic packaging to recycle into pellets to be blown back into food packaging or milk bottles.

The UK throws away around 5.5 million tonnes of plastic bottles every year. It is a growing problem with the amount of plastic used in Western Europe estimated to be increasing at a rate of 4% every year[8].

We use many grades of plastic in our households and industry. Some of it is simple to recycle and reuse, such as clear plastic bottles. Other types require more specialist treatment, such as plastic that is laminated, coloured or contaminated with food or chemicals.

Therefore, plastic can be difficult to recycle, with a significant percentage going to landfill or Energy Recovery Facilities (ERFs).

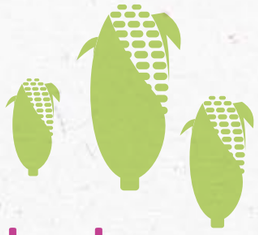
What's more plastic can take up to 500 years to decompose, finding a way to unlock its potential as a resource is an important step on the road to reducing its environmental impact.

Our Rainham and Dagenham facilities receive household plastic packaging from our Materials Recovery Facilities (MRFs) across the country. Using high-tech equipment, we can sort up to nine polymers and colours, and process them so they can be **reused to produce new food-grade bottles.** Other plastics are transformed into flakes, which are then sold on to manufacturers to produce any number of **new products, such as fleeces, pipes and even garden furniture.**

8. www.recycling-guide.org.uk/facts.html

LOOP 17

Leeming biogas generates enough gas to supply more than **3,000** homes



Using food waste to create heat and power

Biogas production

Leeming Bar in North Yorkshire is another Veolia facility where we are putting the circular economy into practice. It's here that we operate one of the largest gas-to-grid energy plants in the UK: a state-of-the-art biogas plant operation that employs the very latest technologies and techniques to provide a reliable and secure supply of green energy.

Our biogas plant helps businesses and industry turn the by-products of their manufacturing processes into a valuable revenue stream.

For example, we worked with a local ice-cream factory to transform the sugar, fat and protein sludge left from its ice-cream production into a nutrient-rich fertiliser for agriculture.

The facility is designed for a capacity of up to 80,000 tonnes of food waste per year. This is used as a feedstock for a 500kW biogas Combined Heat and Power (CHP) engine. The engine generates a methane-rich biogas that can be pumped to the National Grid to power local homes and businesses.

At the end of the process, the facility produces 70,000 tonnes of a nutrient-rich fertiliser that can be used in agriculture: a closed-loop solution for food waste that also helps to aid food production and grow crops.

The future is circular

With more than 160 years' experience in water, energy and waste management, we have the expertise to design environmental solutions that drive the circular economy and deliver exceptional value to customers. Closed-loop recycling accounts for 25% of our turnover and while that represents significant progress, there is still a great deal of work to be done.

If we are to fulfil our aim of conserving precious resources and creating a genuinely sustainable society, we must explore and exploit the potential of valuable recycling materials. At Veolia, we are unique in our ability to lead that change.

We work tirelessly with customers to find greater resource efficiency in manufacturing, industry and business, stimulating the market for recovered materials and helping the circular economy to thrive, so nothing in this world goes to waste.

If you'd like to find out more about how we're helping the UK build the circular economy, visit veolia.co.uk

Do you have a challenge that could benefit from some circular-economy thinking?

Please get in touch with Veolia at:
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Resourcing the world

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