Alex Kanaar Veolia ANZ

The Future of Waste

1. The Road Forward - A Comparison between where Australia (NSW) and the UK are currently positioned on the Waste Hierarchy

2. Briefly Highlight Difficult Pollutants

3. Circular Economy Approach and Imagine 2050

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€24	163,000	45	160+
billion revenue	employees	countries	years

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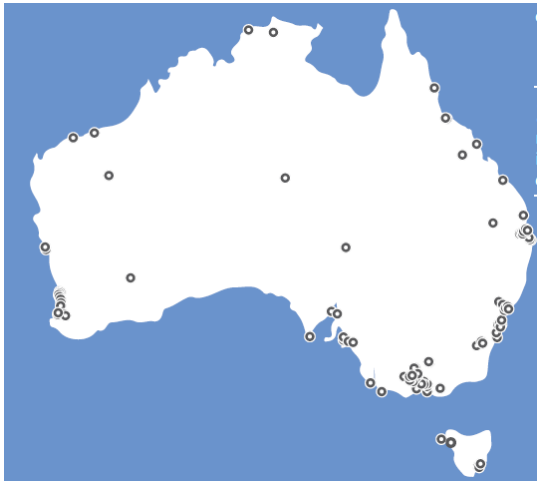
Preserving, Replenishing & Access to Resources

Ambition to double revenue linked to CE by 2020.

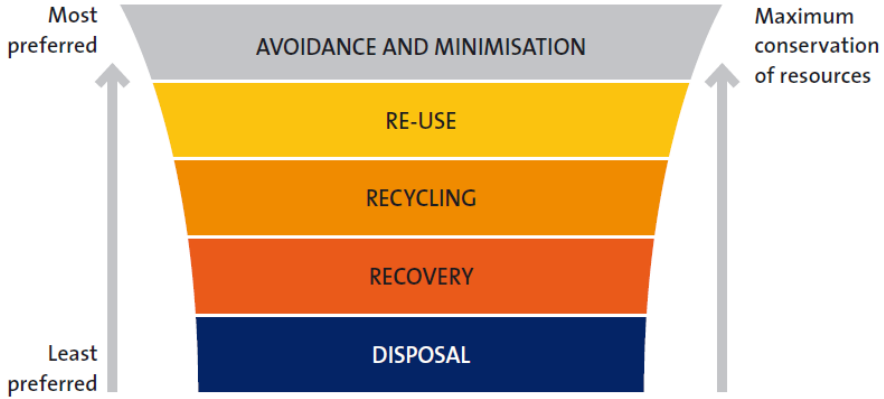
Veolia Australia

Key references and locations.

GLOBAL	AUSTRALIA AND NEW ZEALAND
Revenue (2017): €25.1B	Revenue (2017): A$1.5B
Employees: 163,000	Employees: 4,000
100 million people supplied with drinking water	66 water and wastewater treatment plants in Australia and 57 water and wastwater treatment plants in New Zealand
61 million people connected to wastewater systems	240 waste management, resource recovery and industrial cleaning sites
54 million megawatt hours of energy produced	60,000 customers provided with waste management and recycling services
30 million metric tons of waste into new materials converted	2,800 energy systems maintained

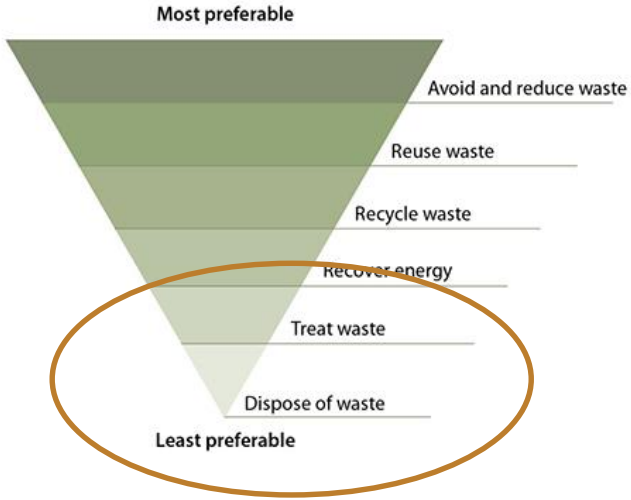


Waste Hierarchy - Australia / NSW



Source: *National Waste Report*, Australian Government Environment Protection and Heritage Council, 2010

**$140 pt Waste Levy*



Source: *Waste Avoidance and Resource Recovery Act 2001*, NSW EPA, Current

Recent Developments that will shape the Future of Waste in NSW

- 19 July 2018 - NSW Government Independent Planning Commission refuses the development application for the Eastern Creek Energy from Waste Facility
- 1 August 2018 - Opening of Wetherill Park Processed Engineered Fuel (PEF) Plant - licensed to receive up to 250,000 tpa
- October 2018 - Mixed Waste Organic Material – Regulatory Change. Mixed waste organic material is no longer able to be used on agricultural land, and is ceasing use on forestry and mining land until further controls can be considered.
- 4 March 2019 - QLD Government Waste Disposal Levy proposed to commence ($70 per tonne)

Where is NSW on the Hierarchy?

	Putre-scible Landfill	Non-putre-scible Landfill	Mixed Waste Treatment	Energy Recovery Facility	Non-putre-scible Waste MRF	C&D Waste Process	Packaging MRF	Garden Organics Process	Putre-scible Organics Process
2021 Known capacity ('000 tpa)	3180	2924	763	143	3765	5242	1299	1133	972
2021 Projected throughput ('000 tpa)	2438	2165	1768	478	2669	4342	1583	1520	984
2021 Gap ('000 tpa)	742	759	-1005	-336	1096	900	-284	-387	-12

2017-21. This table summarises the known expected capacity and projected throughput for waste facilities across NSW in 2021.

The NSW Government is investing a further $168 million between 2017 and 2021 to stimulate investment in new waste processing technologies and capacity across NSW. This is part of the nine-year $802.7 million Waste Less, Recycle More initiative.

Veolia ANZ Current Capabilities

Bioreactors

Woodlawn (900k tpa) - NSW (CHP 30k Homes)

Ti-Tree (500k tpa) - QLD (CHP 10k Homes)

* CHP - Combined Heat and Power

Mechanical Biological Treatment (MBT)

Woodlawn (144k tpa) - Goulburn, NSW

In-Vessel Composting (IVC)

Bulla (85k tpa) - Melbourne, VIC

Anaerobic Digestion (AD)

Earthpower (50k tpa) - Sydney, NSW

Veolia ANZ Current Capabilities

Indirect Thermal Desorption
(Advanced Treatment for Hazardous Waste)
Brooklyn (10k tpa) - VIC

Thermal Destruction Plant
(Hazardous and Bio-Hazardous Wastes)
Dry Creek (2k tpa) - SA

Alternative Fuels
Wood waste - based fuel (WWDF) (30k pta)

Kwinana: Australia's First EfW

Waste to Energy facility in Kwinana Beach, WA

Traditional combustion technology (provided by Keppel Seghers)

Capability to process 400kt of municipal solid waste (MSW) and generate ~40MW of electricity which will be exported to the grid.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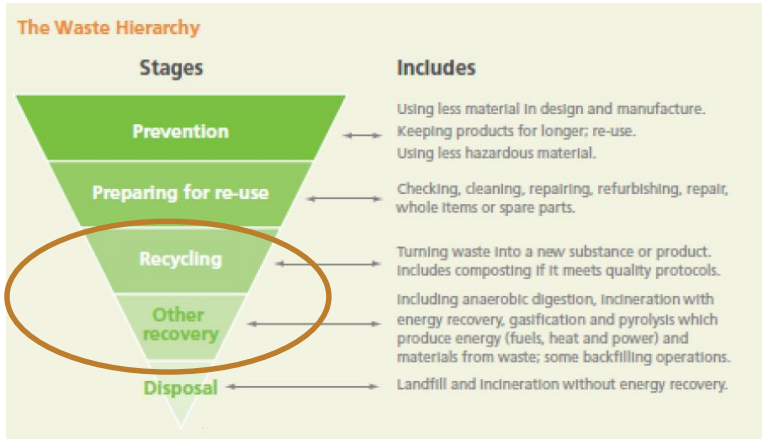
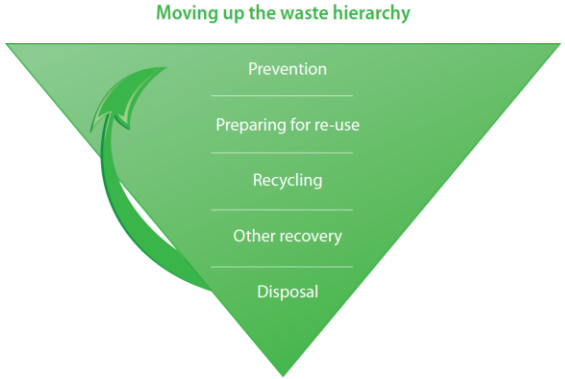
Waste Hierarchy - UK / Europe



Source: *Energy from waste A guide to the debate*, UK Department for Environment Food and Rural Affairs, 2014



Source: *Being wise with waste: the EU's approach to waste management*, European Union Environment, 2010

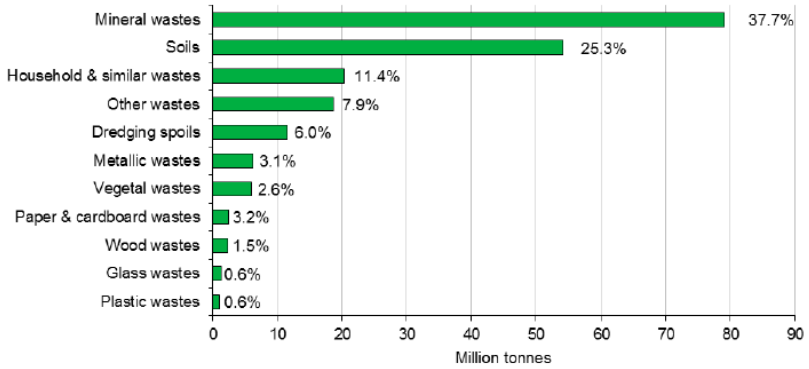
Where is the UK on the Hierarchy?

million tonnes and % change

		Energy recovery	Incinerat--ion	Recycling and other recovery	Backfilli--ng	Deposit onto or into land (landfill)	Land treatment and release into water bodies	Total
2012	UK	1.6	5.9	91.5	14.1	48.6	31.4	193.0
2014	UK	1.9	7.6	96.3	21.7	48.2	29.8	205.4
Change	UK	22.3%	27.7%	5.2%	53.6%	-0.8%	-5.0%	6.4%
2012	England	1.2	5.8	81.6	12.0	41.3	22.7	164.7
2014	England	1.3	7.3	87.0	19.1	41.3	22.1	178.1
Change	England	4.7%	26.0%	6.6%	59.2%	-0.1%	-2.7%	8.1%

Source: Defra Statistics

All waste at final treatment, split by method, UK and England, 2012-14



Waste generation by waste material, UK, 2014

Where is the UK on the Hierarchy?

Facility type	Measure	UK	England
Energy recovery	Number of facilities	29	13
	of which dedicated to the processing of municipal solid waste	5	4
	Capacity (thousand tonnes/year)	4,862	2,803
	of which dedicated to the processing of MSW	2,317	1,967
Incineration	Number of facilities	83	60
	Capacity (thousand tonnes/year)	9,859	9,040
Recovery other than energy recovery (includes backfilling)	Number of facilities	2,660	1,699
	Capacity	:	:
Deposit onto or into land (landfill)	Number of facilities (includes closed facilities)	596	493
	Rest (remaining) capacity (thousand m^3)	592,637	484,370

Source: Defra Statistics

Number and capacity of permitted final treatment facilities, UK and England, 2014

% waste material, by treatment type

Waste material	Energy recovery	Incineration	Recycling and other recovery	Backfilling	Deposit onto or into land (landfill)	Land treatment and release into water bodies
Metallic wastes	0%	0%	15%	0%	0%	0%
Glass wastes	0%	0%	2%	0%	0%	0%
Paper & cardboard wastes	0%	0%	4%	0%	0%	0%
Plastic wastes	0%	0%	1%	0%	0%	0%
Wood wastes	31%	2%	3%	0%	0%	0%
Vegetal wastes	0%	0%	4%	0%	0%	0%
Household & similar wastes	1%	78%	1%	0%	16%	0%
Mineral wastes	0%	0%	54%	6%	6%	58%
Soils	0%	0%	12%	91%	44%	0%
Dredging spoils	0%	0%	0%	0%	0%	42%
Other wastes	68%	19%	5%	2%	32%	0%
All wastes	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Waste Statistics Regulation return

Final treatment methods for waste, split by material, UK, 2014 - proportion of tonnages

Energy from Waste

RETHINK WASTE THROUGH RECYCLING

Plant	Company	Scale (tpa)	Electrical Energy
Edmonton	London Waste	550,000	32MW
Allington	WRG	500,000	43MW
SELCHP	SELCHP/Veolia	420,000	32MW
Lakeside	Grundor/Viridor	400,000	37MW
Dunfries & Galloway	Scotgen CHP	400,000	6.2MW
Tees Valley	SITA	375,000	29MW
Tysley	Tysley Waste/Veolia	350,000	25MW
Sheffield	Veolia	250,000	+Heat 39MW
Cleveland	SITA	245,000	20MW
Coventry	Coventry/Solihul WDC	240,000	18MW
Stoke	MES Environmental	180,000	13MW
Marchwood	Veolia	165,000	14MW
Portsmouth	Veolia	165,000	14MW
Nottingham	WRG	160,000	+Heat 20MW
Kirklees	SITA	136,000	9MW
Bolton	Viridor-Laing	130,000	7MW
Dundee	Dundee Energy Recycling	120,000	83MW
Grimsby	NEWLINKS Development Ltd	120,000	+Heat 6MW
Wolverhampton	MES Environmental	110,000	7MW
Dudley	MES Environmental	90,000	7MW
Chineham	Veolia	90,000	7MW
Isle of Man	SITA	60,000	6MW
Ise of Wight	Energos	30,000	2.3MW
Shetland	Shetland Heat Energy and Power Ltd	23,000	+Heat 25MW
Isles of Scilly		3,500	

Operational

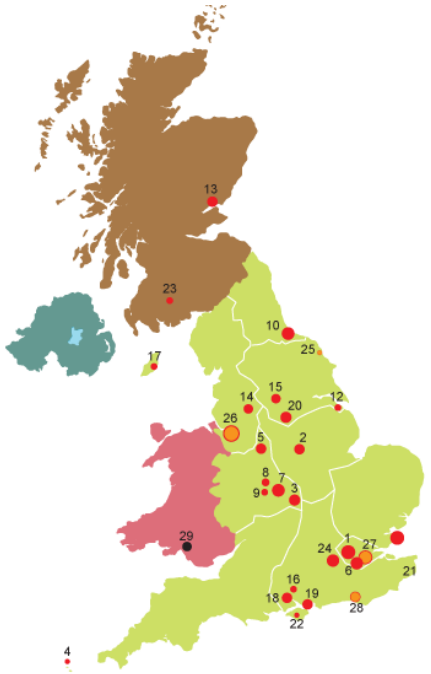
1 Edmonton, London Waste (Built 1974: capacity 550 ktpa)
2 Nottingham, WRG (1974: 150 extension to 260)
3 Coventry, Cov & Solihull WDC (1975: 240)
4 Isles of Scilly (1978: 3.5)
5 Stoke, MES (1989: 180)
6 SELCHP Lewisham, Veolia (1994: 420)
7 Tysley, Birmingham, Veolia (1996: 350)
8 Wolverhampton, Enterprise (1998: 110)
9 Dudley, MES (1998: 90)
10 Tees Valley, SITA (1998: 250. extension to 375)
11 Shetland (1998: 23)
12 NEWLincs. Grimsby, Tiru Groupe (1999: 120)
13 Baldoie, Dundee, DERL (1999: 120)
14 Bolton, Viridor-Laing (2001: 130)
15 Kirklees, SITA (2220: 136)
16 Chineham, Veolia (2004: 90)
17 Isle of Man, SITA (2004: 60)
18 Marchwood, Veolia (2005: 165)
19 Portsmouth, Veolia (2006: 165)
20 Sheffield, Veolia (2007: 250)
21 Allington, Kent, WRG (2008: 50)
22 Isle of Wight, Energos (2008: 30) Gasification
23 Dunfries & Galloway, Scotgen CHP (Merchant) (2009: 400)
24 Lakeside, Grudon/Viridor (Merchant) (2010: 400)

Under Construction

25 Seamer Carr, Yorwaste. Capacity 18ktpa (pyrolysis)
26 Runcorn, Ineos Chlor. 850
27 Belvedere, Cory. 585
28 E Sussex/Brighton PFI, Veolta. 210

Currently Not Operational

29 Crymlyn Burrows, Neath, Port Talbot (2004: 135)



Source: *Incineration Transformation*, A.Metcalfe, CIWM, June 2010

Anaerobic Digestion

RETHINK WASTE THROUGH RECYCLING

Waste-to-Energy in Europe in 2016

- WtE Plants operating in Europe (not including hazardous waste incineration plants)
- Waste thermally treated in WtE plants (in million tonnes)

Data supplied by CEWEP members and national sources

* Includes plant in Andorra

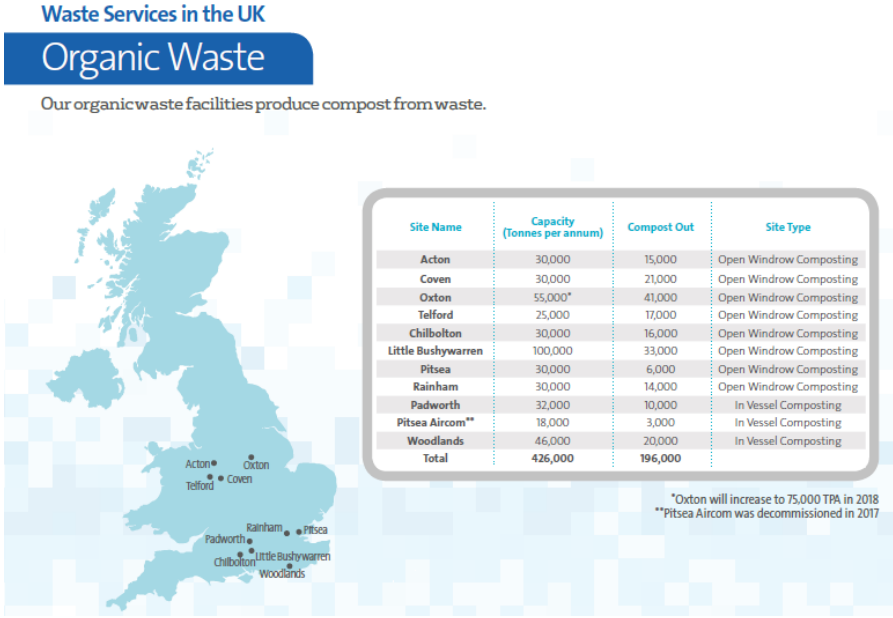
CEWEP Confederation of European Waste-to-Energy Plants

Anaerobic Digestion & Composting

On Farm

Commercial

Industrial



Site Name	Capacity (Tonnes per annum)	Compost Out	Site Type
Acton	30,000	15,000	Open Windrow Composting
Coven	30,000	21,000	Open Windrow Composting
Oxton	55,000*	41,000	Open Windrow Composting
Telford	25,000	17,000	Open Windrow Composting
Chilbolton	30,000	16,000	Open Windrow Composting
Little Bushywarren	100,000	33,000	Open Windrow Composting
Pitsea	30,000	6,000	Open Windrow Composting
Rainham	30,000	14,000	Open Windrow Composting
Padworth	32,000	10,000	In Vessel Composting
Pitsea Aircom**	18,000	3,000	In Vessel Composting
Woodlands	46,000	20,000	In Vessel Composting
Total	426,000	196,000	

*Oxton will increase to 75,000 TPA in 2018
**Pitsea Aircom was decommissioned in 2017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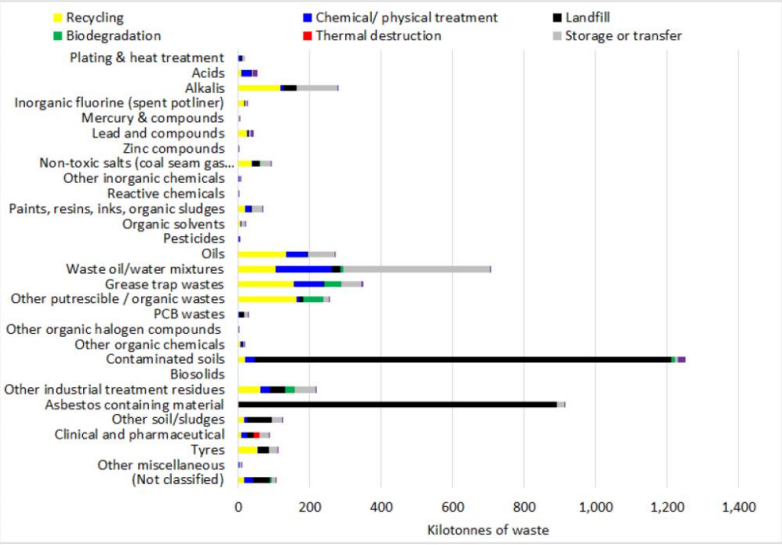
Difficult Wastes

The top 10 wastes[1] produced by weight in 2014-15, were:

1. Contaminated soils [26%]
2. Asbestos [18%]
3. Grease trap wastes [10%]
4. Tyres [7%]
5. Animal effluent & residues [6%]
6. Oil/water mixtures [5.5%]
7. Non-toxic salts [4.1%]
8. Lead waste [3.9%]
9. Residues from industrial treatment [3.7%]
10. Waste oils [3.6%]



In 2014-15 Australia produced around 5.6 million tonnes of hazardous waste, which is about 9% of all waste generated (64 million tonnes) in this period.

Source: *Hazardous Waste in Australia 2017*, Blue Environment PREPARED FOR Department of the Environment and Energy

Difficult Wastes

Old, intractable waste problems persist in Australia due to infrastructure, technology, regulatory or market-economic shortcomings. These so-called ‘legacy wastes’ remain present (often stockpiled) in very large volumes that dwarf annual waste generation figures.

They include approximately:

- 0.7 million tonnes of the aluminium industry’s spent potliner (SPL) waste
- 7.5 million tonnes of dewatered contaminated biosolids at Melbourne’s Western (sewage) Treatment Plant (elevated levels of mercury)
- 225 million tonnes of fly ash from coal fired power stations
- 500 million tonnes of red mud from alumina refining.

Source: *Hazardous Waste in Australia 2017*, Blue Environment PREPARED FOR Department of the Environment and Energy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THAT WE BUILD A NEW TOMORROW
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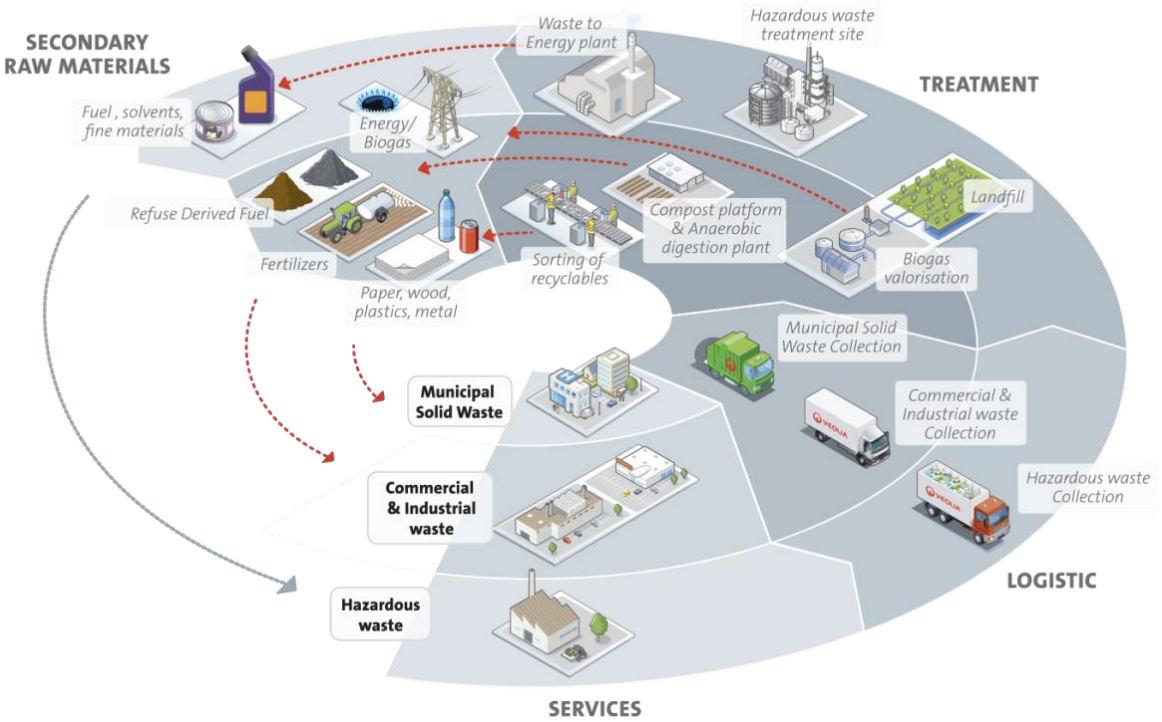
Circular Economy - Veolia's Approach



Key Resources:

Organics:
Food
Green (garden) waste
Wood

Recycling:
Glass
Metals
Paper and card
Plastics

Complicated:
WEEE - waste electrical and electronic equipment
Textiles
Tyres
Chemicals
Manufactured / Composite Materials
Medical Waste

Residual… 'black bag' waste

Imagine 2050

Veolia asked the London School of Economics to explore UK Urban Lifestyle scenarios for 2050.

These are their fascinating conclusions…

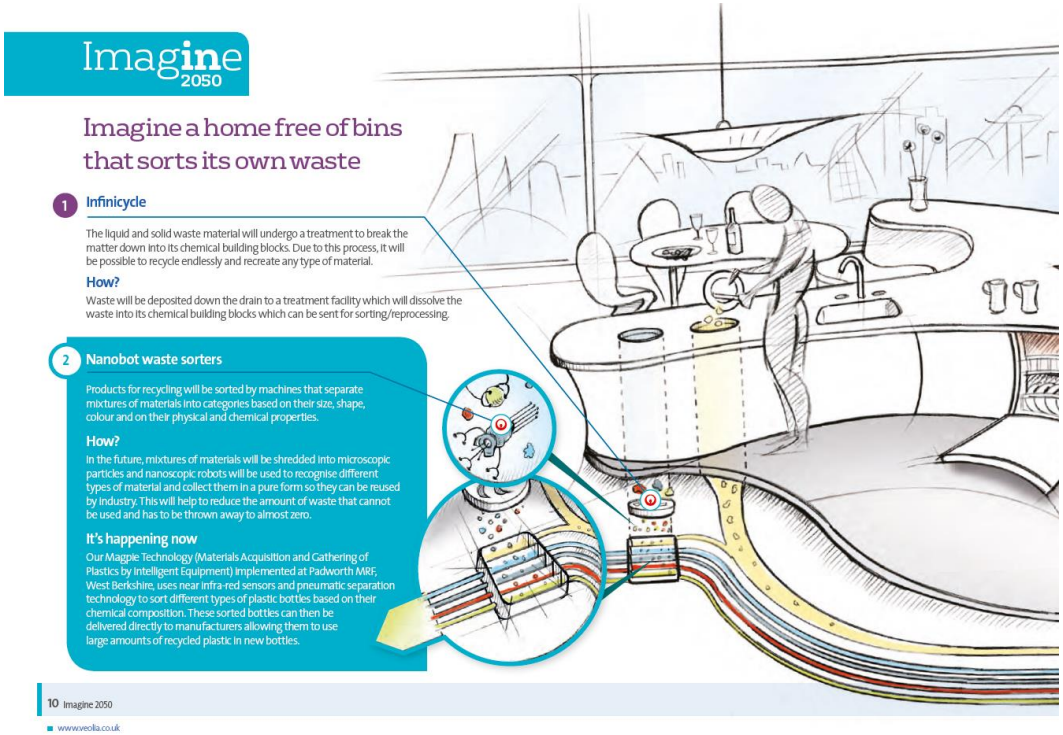
- By 2050 it is estimated that 70% of the world's population will live in cities.
- There are 1 million more urban dwellers in the world every week.

Imagine 2050

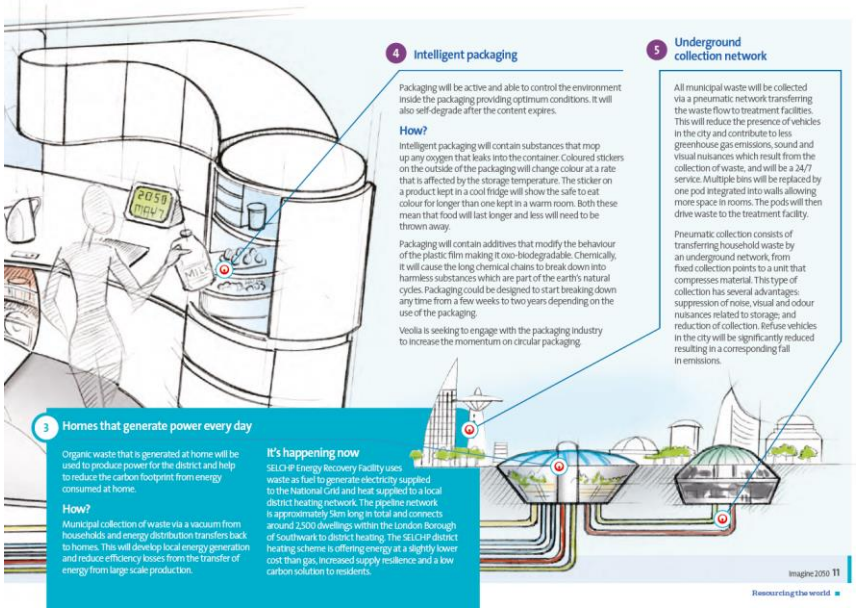
Let's imagine the home of 2050…

A home where innovation will serve householders to make everyday life easier and greener.

Imagine a home where bins, refuse collection and traditional baths will be replaced by intelligent auto bio-degradable packaging, an underground vacuum network or ultrasonic bath.



Imagine 2050



4 Intelligent packaging

Packaging will be active and able to control the environment inside the packaging providing optimum conditions. It will also self-degrade after the content expires.

How?

Intelligent packaging will contain substances that mop up any oxygen that leaks into the container. Coloured stickers on the outside of the packaging will change colour at a rate that is affected by the storage temperature. The sticker on a product kept in a cool fridge will show the safe to eat colour for longer than one kept in a warm room. Both these mean that food will last longer and less will need to be thrown away.

Packaging will contain additives that modify the behaviour of the plastic film making it oxo-biodegradable. Chemically, it will cause the long chemical chains to break down into harmless substances which are part of the earth's natural cycles. Packaging could be designed to start breaking down any time from a few weeks to two years depending on the use of the packaging.

Veolia is seeking to engage with the packaging industry to increase the momentum on circular packaging.

5 Underground collection network

All municipal waste will be collected via a pneumatic network transferring the waste flow to treatment facilities. This will reduce the presence of vehicles in the city and contribute to less greenhouse gas emissions, sound and visual nuisances which result from the collection of waste, and will be a 24/7 service. Multiple bins will be replaced by one pod integrated into walls allowing more space in rooms. The pods will then drive waste to the treatment facility.

Pneumatic collection consists of transferring household waste by an underground network, from fixed collection points to a unit that compresses material. This type of collection has several advantages: suppression of noise, visual and odour nuisances related to storage; and reduction of collection. Refuse vehicles in the city will be significantly reduced resulting in a corresponding fall in emissions.

3 Homes that generate power every day

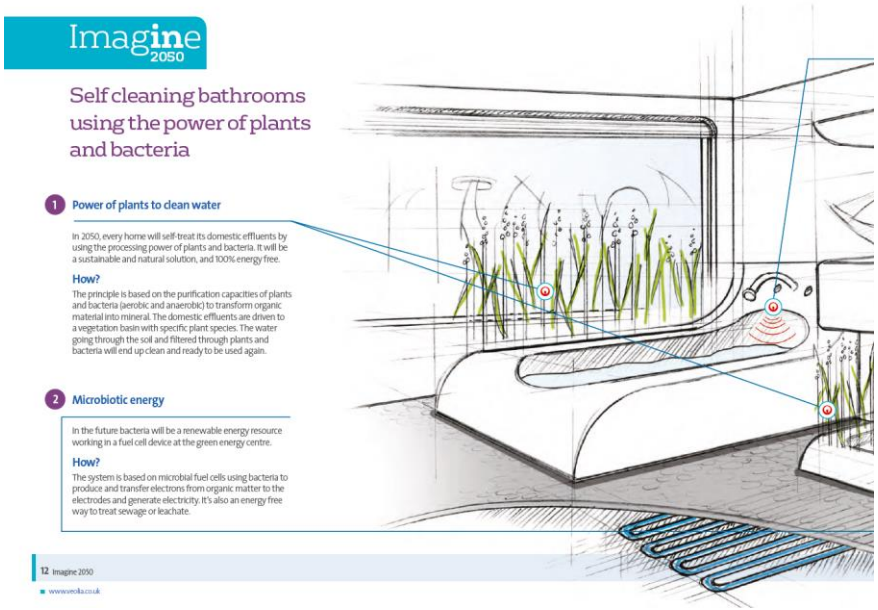
Organic waste that is generated at home will be used to produce power for the district and help to reduce the carbon footprint from energy consumed at home.

How?

Municipal collection of waste via a vacuum from households and energy distribution transfers back to homes. This will develop local energy generation and reduce efficiency losses from the transfer of energy from large scale production.

It's happening now

SELCHP Energy Recovery Facility uses waste as fuel to generate electricity supplied to the National Grid and heat supplied to a local district heating network. The pipeline network is approximately 5km long in total and connects around 2,500 dwellings within the London Borough of Southwark to district heating. The SELCHP district heating scheme is offering energy at a slightly lower cost than gas, increased supply resilience and a low carbon solution to residents.



Imagine 2050

Self cleaning bathrooms using the power of plants and bacteria

1 Power of plants to clean water

In 2050, every home will self-treat its domestic effluents by using the processing power of plants and bacteria. It will be a sustainable and natural solution, and 100% energy free.

How?

The principle is based on the purification capacities of plants and bacteria (aerobic and anaerobic) to transform organic material into mineral. The domestic effluents are driven to a vegetation basin with specific plant species. The water going through the soil and filtered through plants and bacteria will end up clean and ready to be used again.

2 Microbiotic energy

In the future bacteria will be a renewable energy resource working in a fuel cell device at the green energy centre.

How?

The system is based on microbial fuel cells using bacteria to produce and transfer electrons from organic matter to the electrodes and generate electricity. It's also an energy free way to treat sewage or leachate.

Thank You

RETHINK WASTE THROUGH RECYCLING

We can all look forward to a smarter future.

1. Change in attitudes
2. Planning a green infrastructure
3. Engage the circular economy

Thank You

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