

# Welcome to Exeter Energy Recovery Facility (ERF)



Exeter Energy Recovery Facility

GRACE ROAD SOUTH



# House keeping

- **Mobile Phones**
- **Toilets**
- **Health & Safety**



In the event of a fire



Personal Protective Equipment



No Smoking on site

**Stay Close, Stay Alert!**

# Today's talk & tour will cover...

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## Part 1

- Worldwide problem/challenge
- Management of Devon's residual waste
- Site Background
- Energy from waste process

## Part 2

- Visit to control room & viewing platform
- Timeline/Grabber Game/Videos

## Part 3

- Reduce, Reuse, Recycle
- Education & community work
- What can you do?



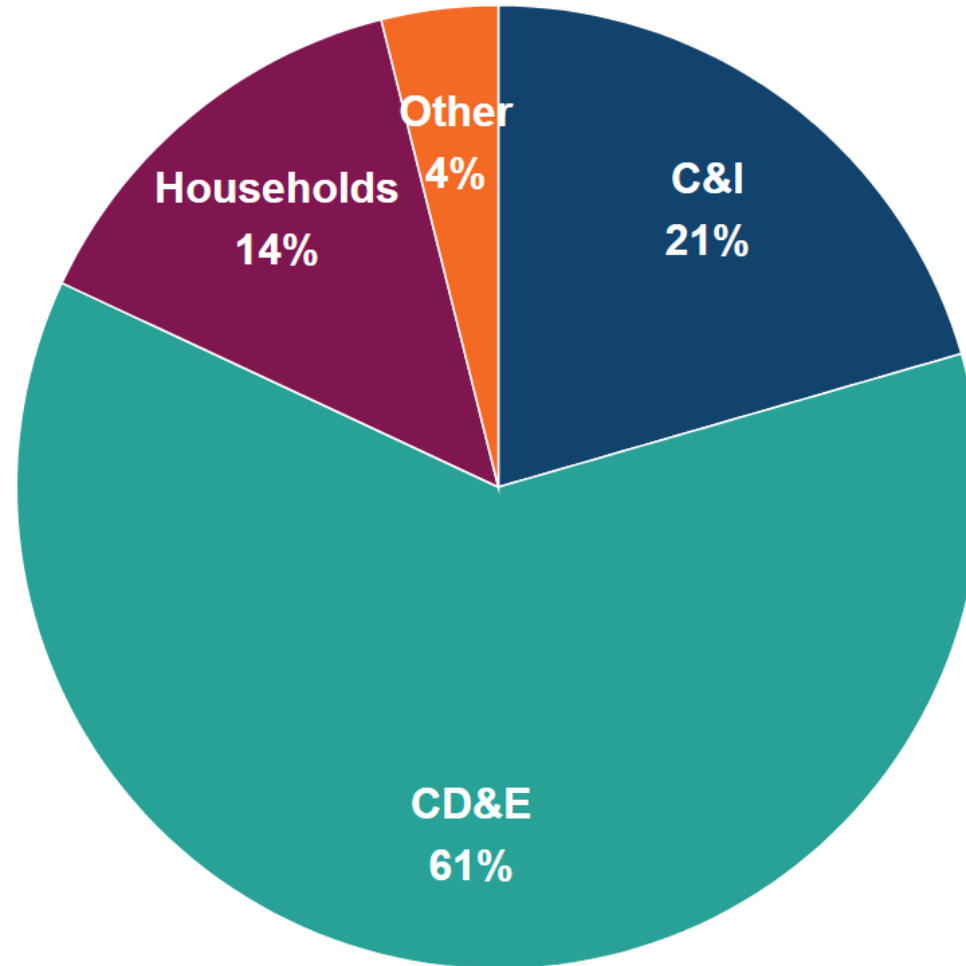
# Waste Management; A Worldwide Issue

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- Over 8 billion people on the planet producing waste every day.
- Resources being depleted at an unsustainable rate.
- Increasing levels of waste from growing economies.
- 1 in 3 people worldwide are forced to dump or burn their waste, causing disease, polluting the oceans, and contributing to the global climate crisis.
- Plastic pollution – including microplastics which have been discovered everywhere and biomagnification through food chains.
- Organised Waste Crime costs the economy in England around £924m/year.



# Waste Generation Split by Source, UK, 2020



## Key

**C&I** = Commercial and Industrial waste

**CD&E** = Construction, Demolition and excavation

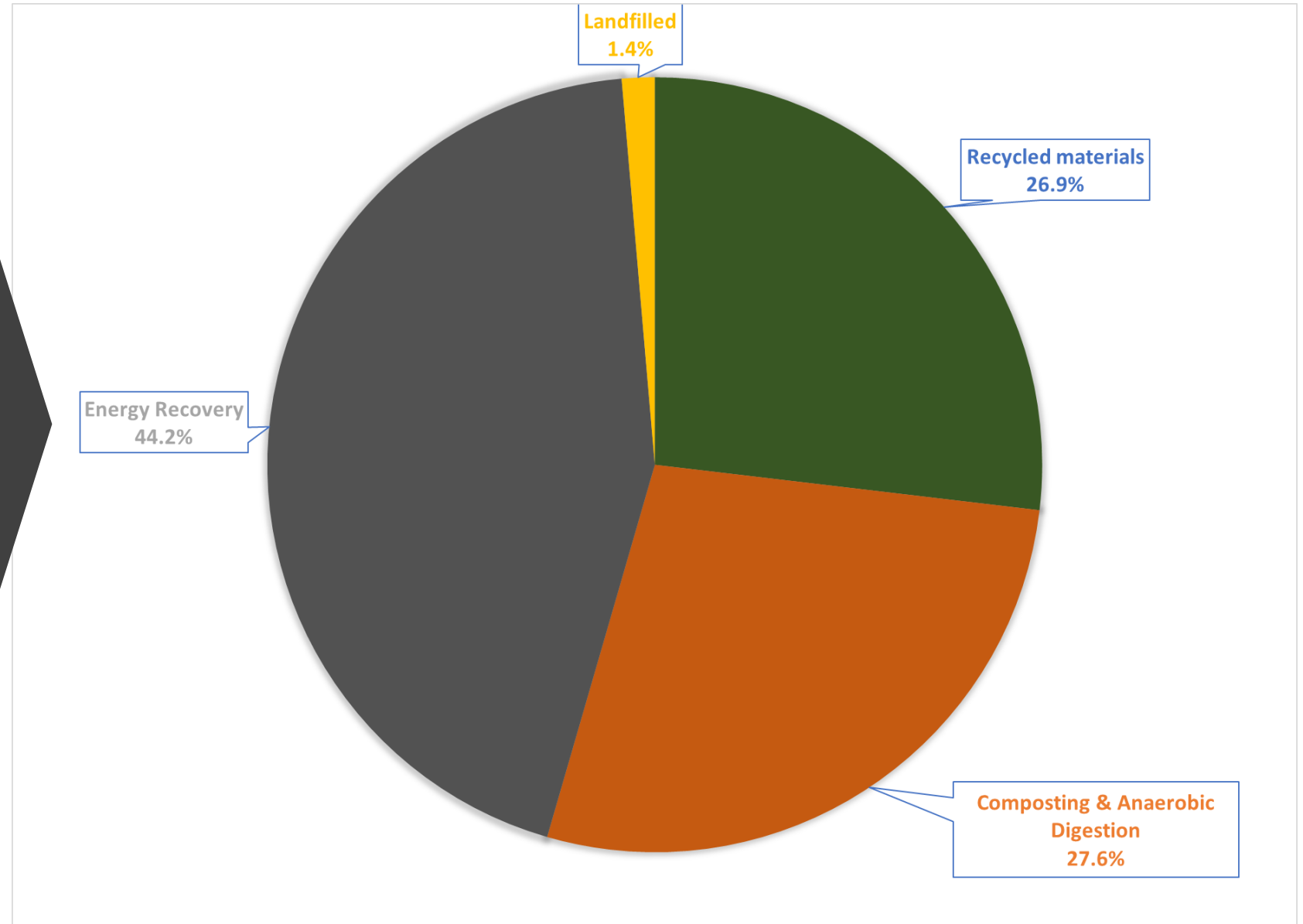
**'Other'** = waste from mining, agriculture, forestry and fishing.

# Devon Waste Statistics 2023/24

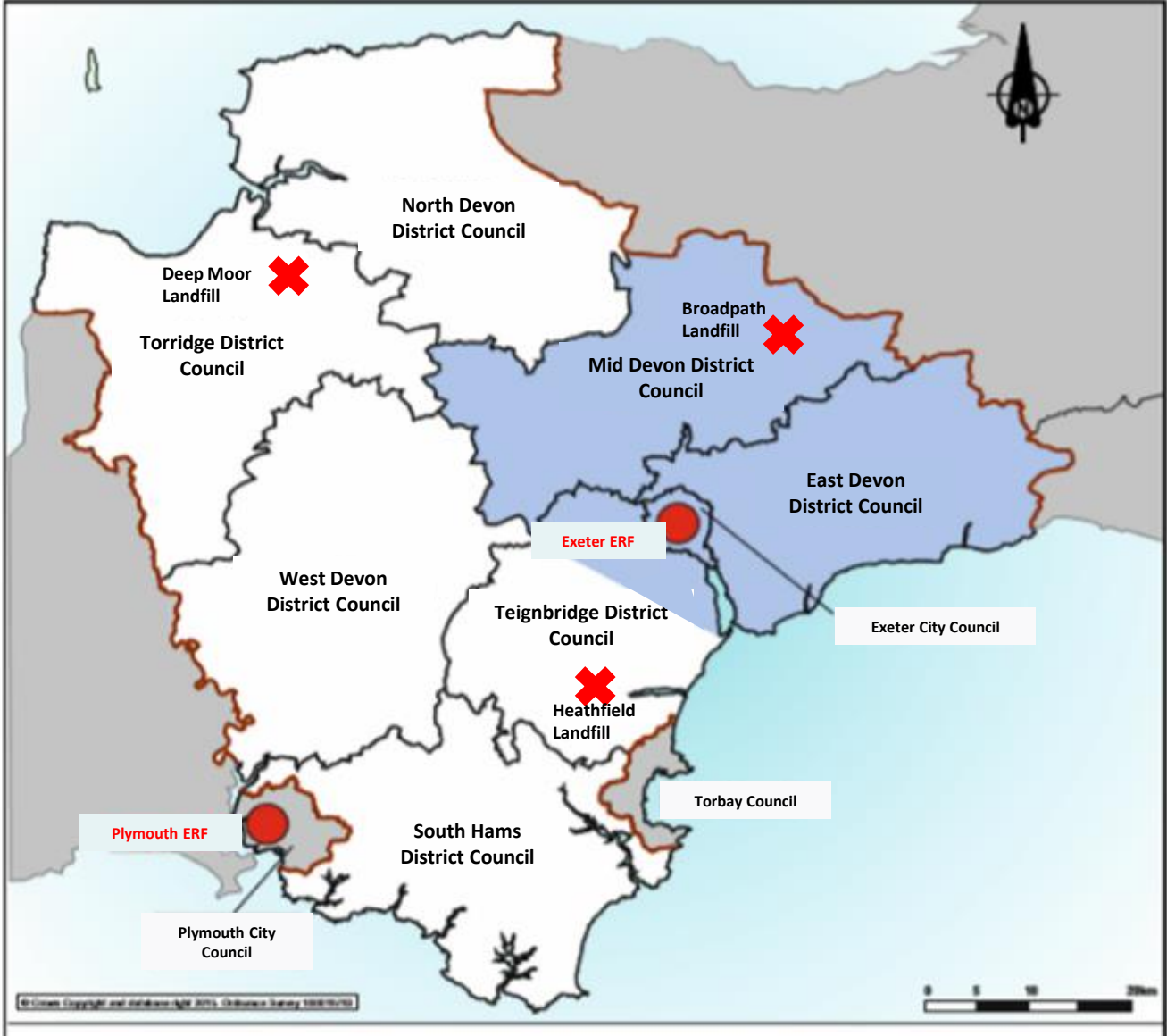
- Devon Two tier local authority area
  - DCC responsible for waste disposal & planning
  - Serving 8 District Councils
  - Excluding Plymouth & Torbay Unitary Authorities
- Population 826,319
- Households 391,200
- Total Household Waste 363,860 tonnes
- Recycled/Composted materials 195,499 tonnes
- Residual waste 168,361 tonnes
- Recycling rate 54.5% (average rate for England 43.3%)
- Recycling target 65% by 2035
- Growth in household waste 2.3%
- Recycling centres 19
- Closed landfill sites 58
- Energy Recovery Facilities 2
- Waste revenue budget £38 million (DCC only)

**Percentage  
waste treated  
by different  
methods  
2023/24**

**Recycling Rate 54.5%**



# Residual Waste Management in Devon



# Redundant landfill sites

- 58 sites across Devon
  - Site specific environmental monitoring & maintenance regimes
  - 20 routinely visited & monitored
  - 3 sites with active landfill gas extraction systems
  - 9 sites have leachate control systems,
- Technically competent and trained staff
- No public access to sites
- Wealth of wildlife on sites



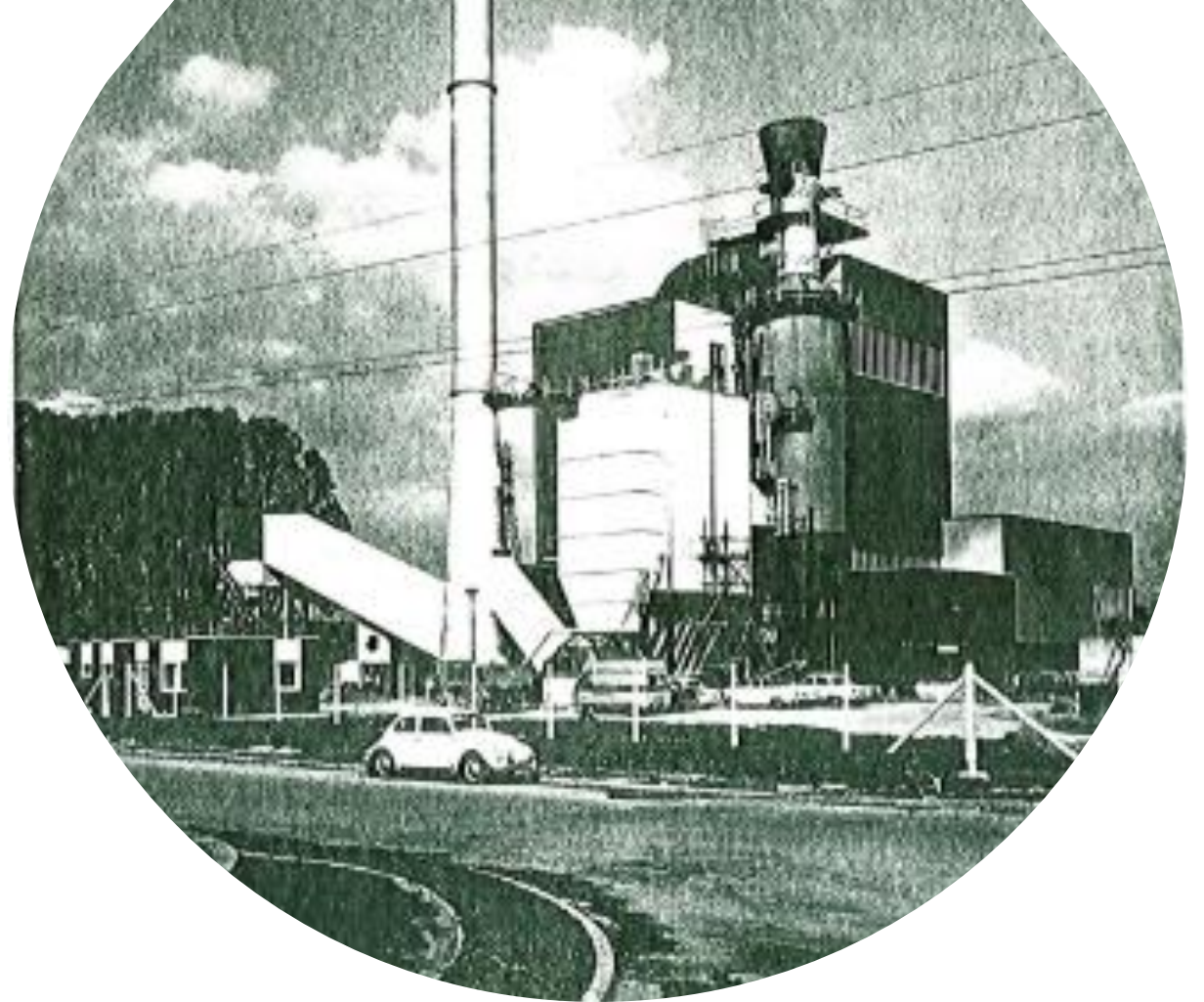
# Energy Recovery Facilities

- **Exeter ERF**
  - Operational 2014
  - 65,000 tonnes/year
  - Exeter and surrounding area
  - 4.2 - 4.7 MW electricity; 24,000 MWh/year; enough electricity for approx. 6,624 homes/year
  - £46million to build
- **Plymouth combines heat and power plant**
  - South West Devon Waste Partnership (SWDWP): Torbay, Plymouth, Devon
  - Operational 2015
  - 265,000 tonnes/year
  - 22.5 MW electricity and 23.3 MW heat per hour; enough electricity for approx. 37,000 homes/year
  - Heat and power exported to HM Naval Base, Devonport
  - €250 million (£210 million at time of conversion)
- **Waste from North Devon & Torridge go to Brynsworthy Transfer station to be bulked up and can then go to either ERF at Sevenside, Avonmouth or St. Dennis, Cornwall.**



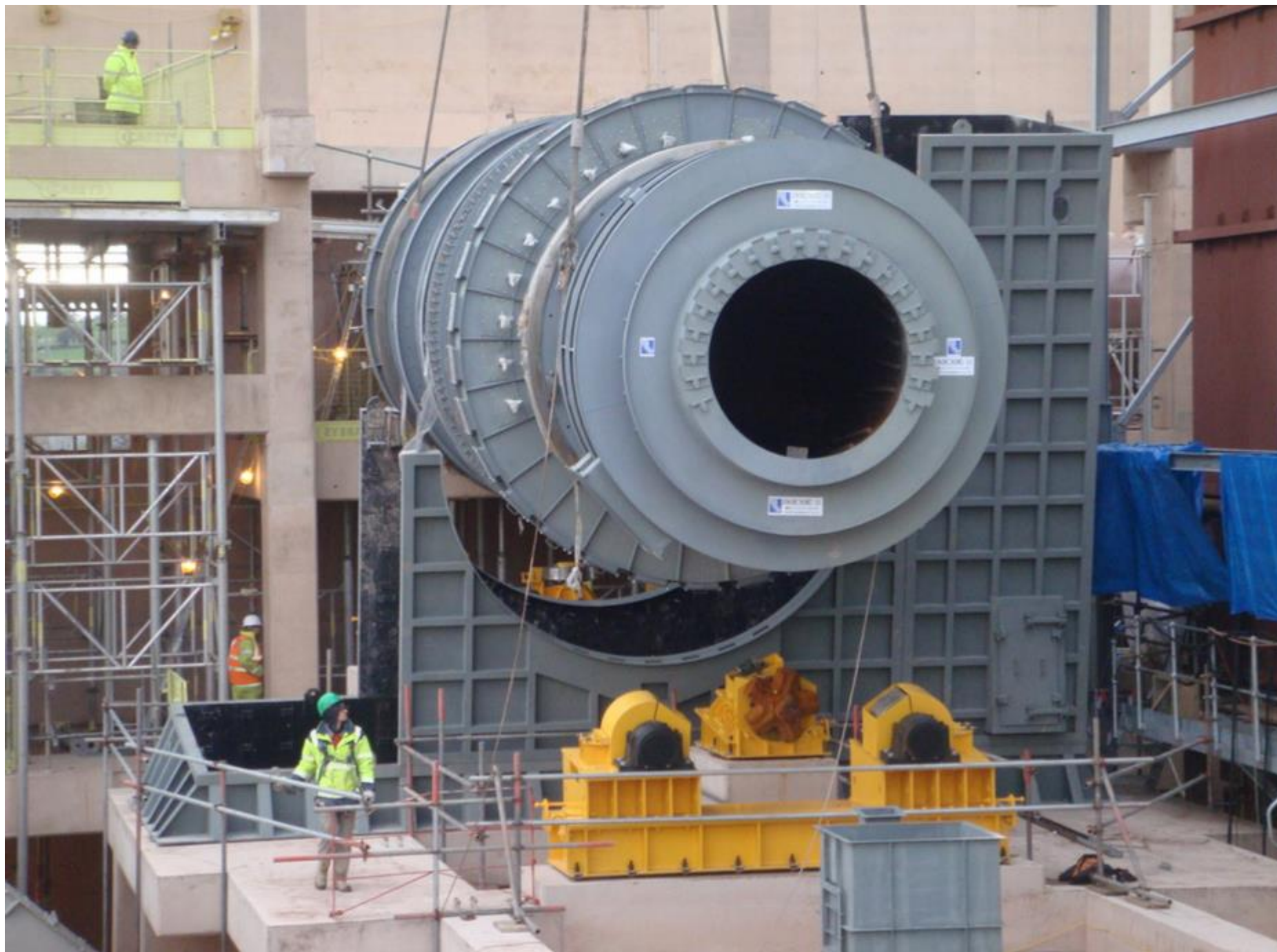
# Site History

- Exeter incinerator originally built in 1970
- Designed to burn 60,000 tonnes annually
- No electricity produced by process
- Very limited emission control
- Closed in 1996 due to Emissions Directive.
- Site became a waste transfer station used until 2010





- Owns the site
- Supplies residual waste to plant
- DCC's contractor for waste disposal for this area
- French based waste management company who own Cyclerval-uk
- Subsidiary of Paprec who run the plant



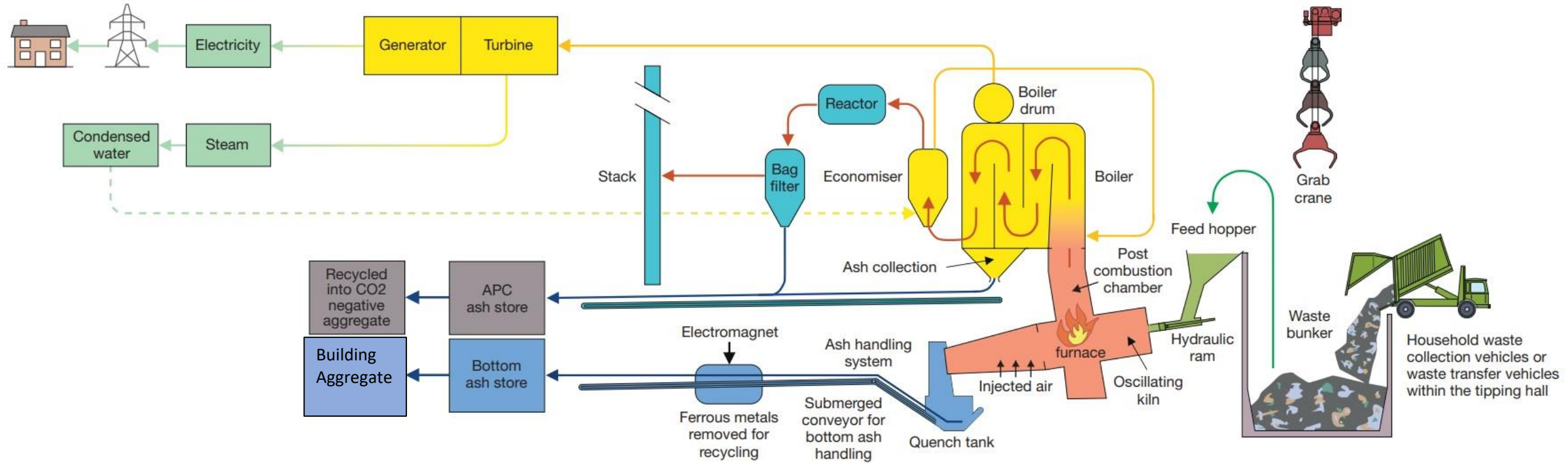
# Plant Operations



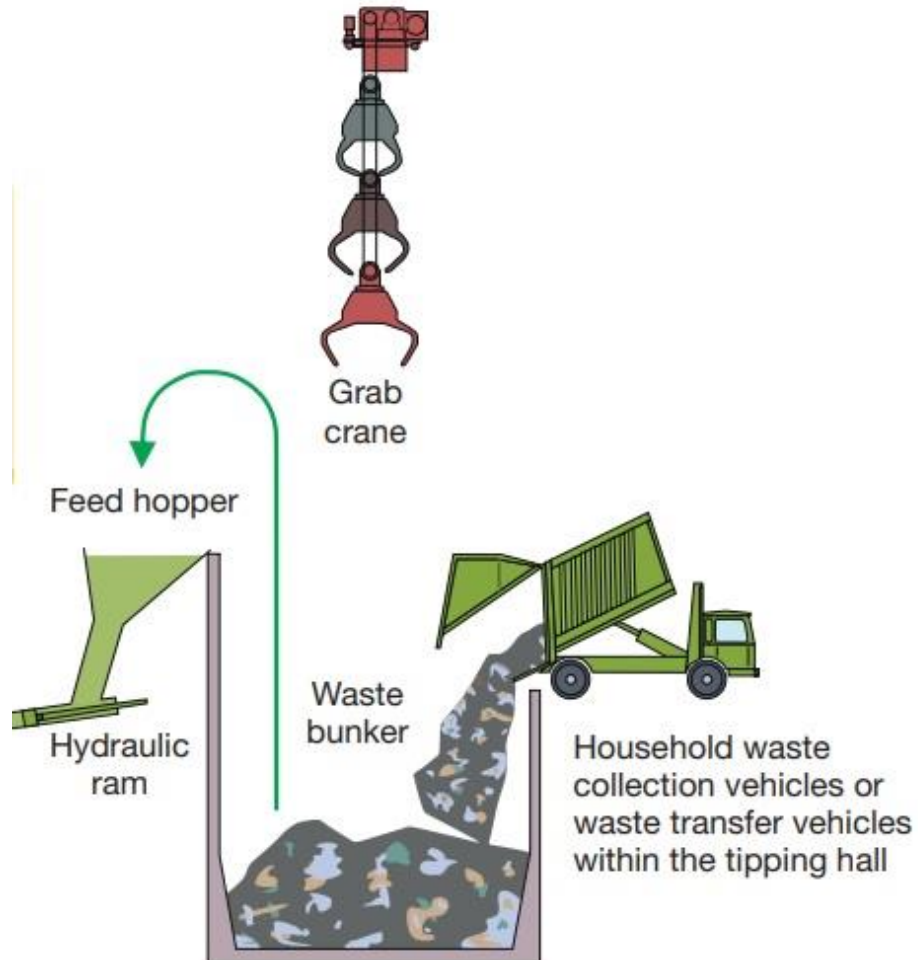
- Licensed and regulated by the Environment Agency
- Operates 8,000 hours a year
- Around 18 people work in shifts at the plant
- The plant is staffed at all times



# EfW Process Diagram



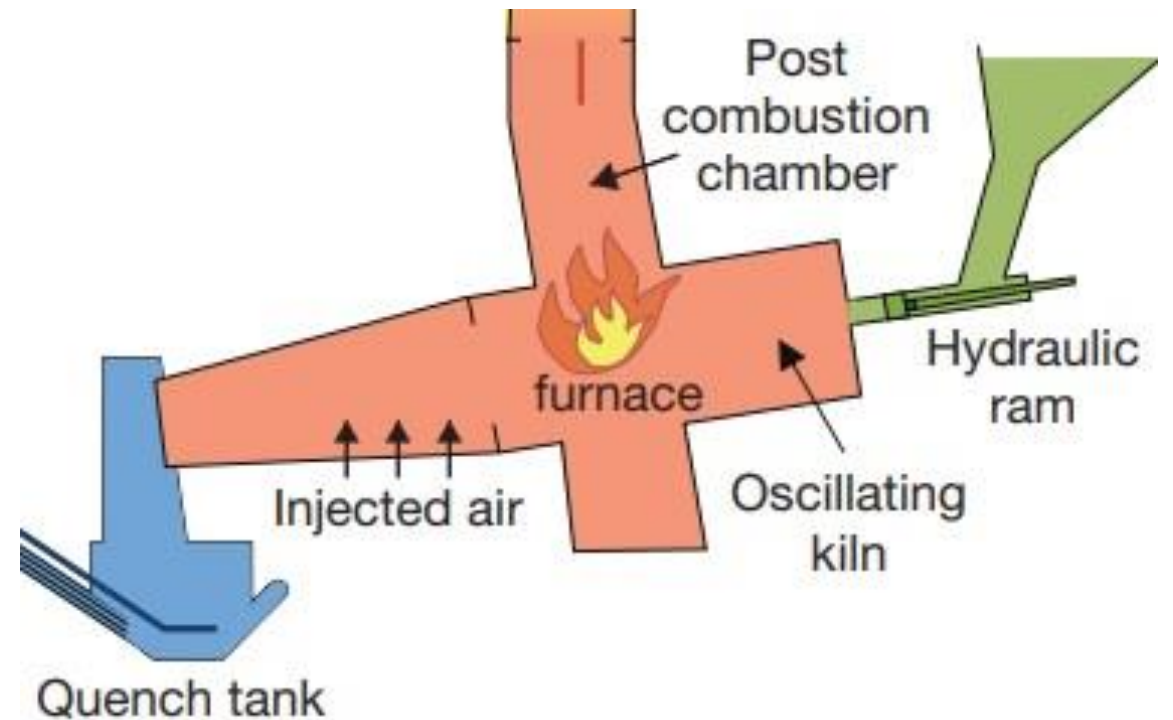
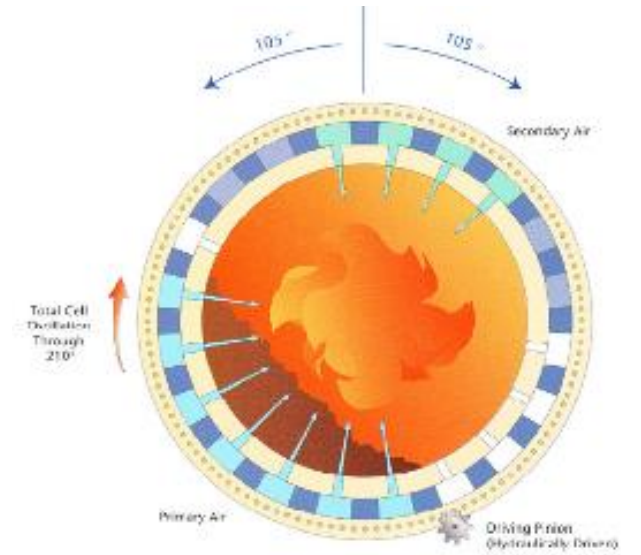
# Waste Delivery



- Waste from Exeter City, East Devon, Mid Devon & Teignbridge
- Vehicle weighed on weighbridge
- Tips into the waste bunker: 7m deep, holds 3-4 days worth of waste (approx. 800 tonnes)
- Large items are shredded
- The grab crane loads the feed hopper regularly (roughly 1 tonne per grab)

# Furnace

- Oscillating Kiln
- Injection of Air
- Must burn at over 850°C to comply with Waste Incineration Directive.
- Two outputs
  - Combustion Gases (carrying heat energy)
  - Combusted Materials (Bottom Ash and Ferrous Metals)



# INSIDE THE COMBUSTOR

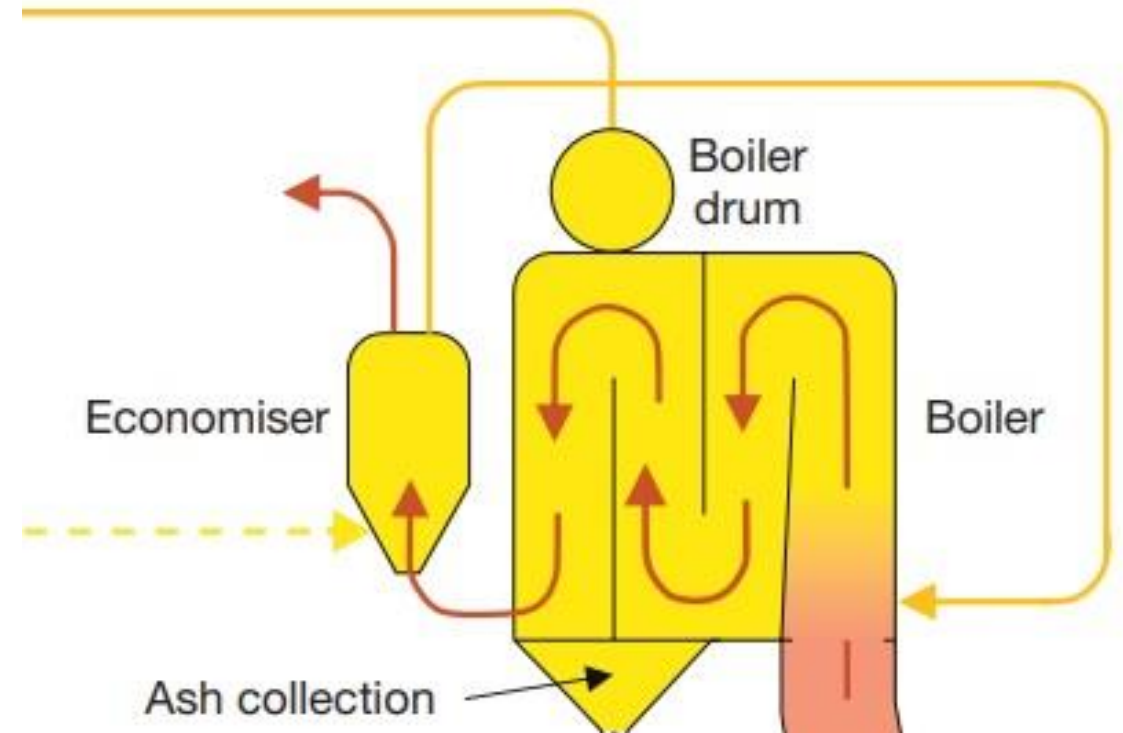




# Boiler & Economiser



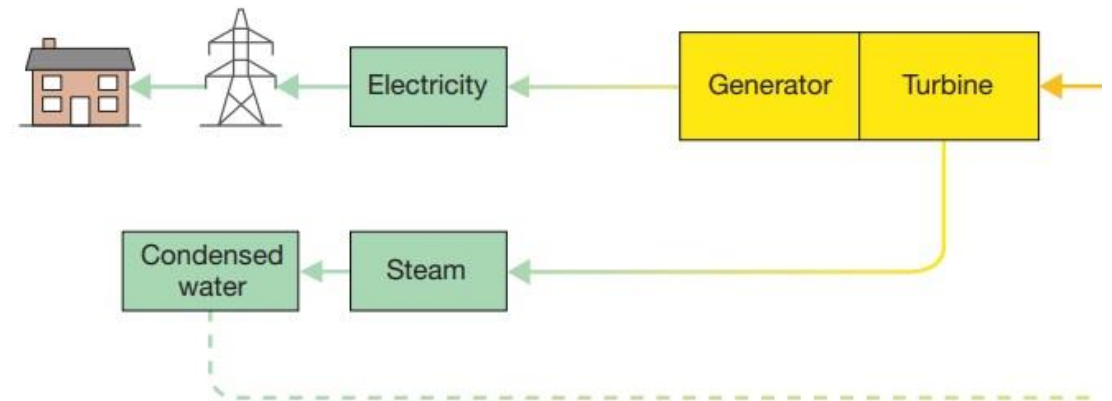
- Combustion gas is passed through boiler
- Boiler lined with pipes carrying running water
- Water heated to superheated steam
- Steam turns turbine
- Economiser : Hot gas leaving boiler preheats water entering the boiler



# Generator

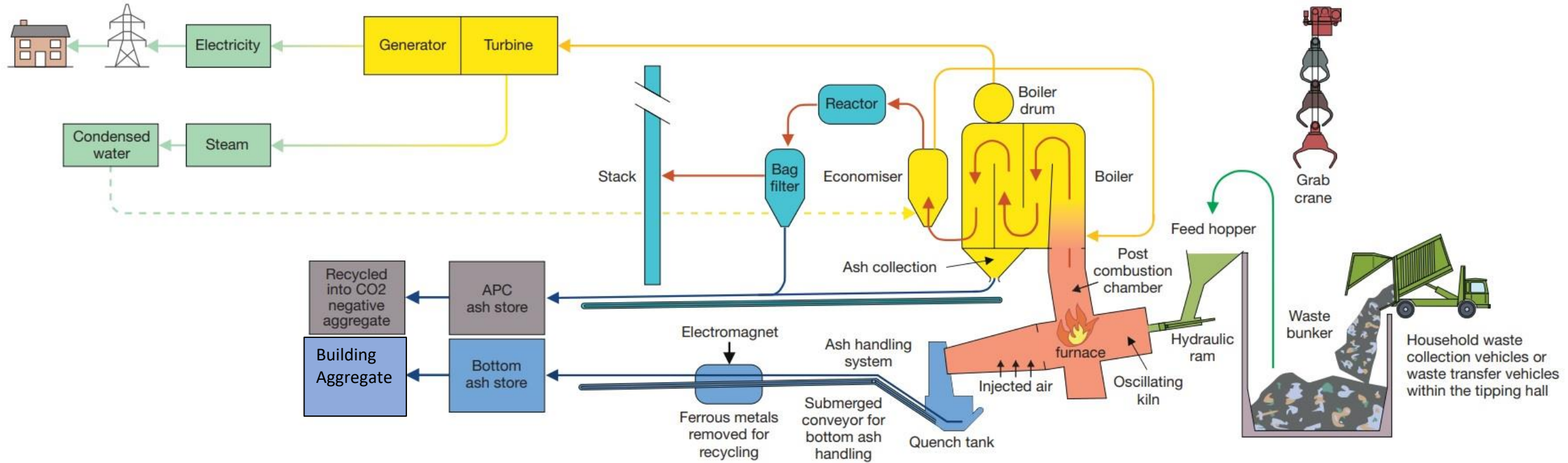


- Typical Municipal Waste CV of 9.3Mj/kg now 10.5 Mj/kg
- 21.7 tonnes of Steam to drive a turbine.
- Approximately 4.2 -4.7 MW electricity produced
- 24,000 MWh/year
- 0.75 MW is consumed by the plant
- Excess enters the National Grid
- Potential for Heat Energy use (District Heating system)





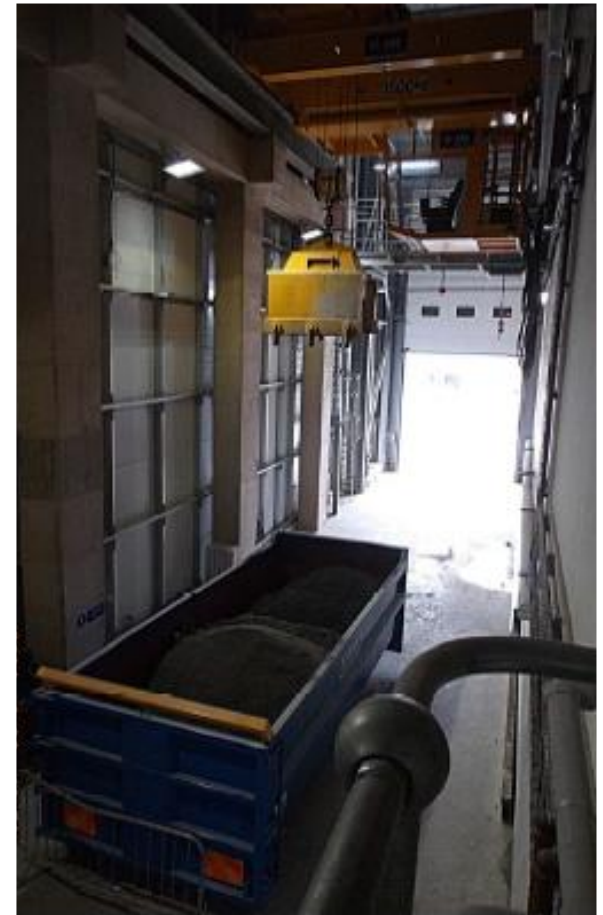
# Process Diagram



# Bottom Ash Treatment



- Bottom ash is the residue that remains after combustion, including metals
- After leaving furnace it is immediately quenched
- Bulked and sent for processing (at which point metals are removed)
- Remaining ash is turned into secondary aggregate for construction



## Reaction Tower

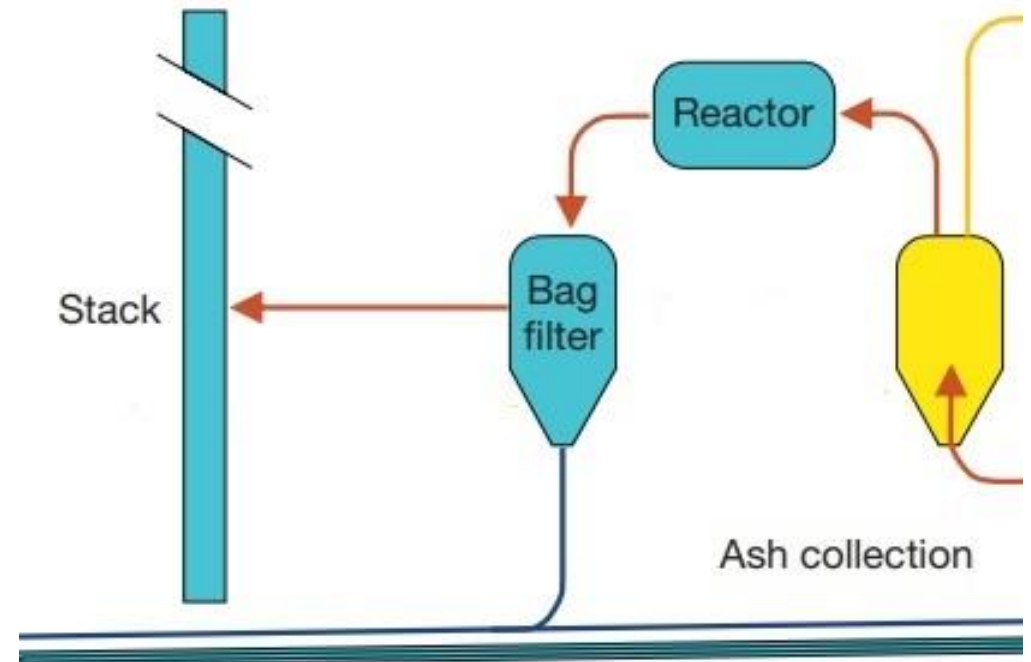
- Injection of Urea to neutralise nitrous oxides (NO<sub>x</sub>)
- Gases rapidly cooled
- Lime and active carbon introduced to neutralise acidity and absorb dioxin and heavy metals

## Bag filter

- 480 filter bags remove the particulate matter

## Stack

- Remaining gases released through the stack





## Fly Ash Treatment

- Dust carried in the fumes + powdered lime + powdered carbon.
- Classified as a hazardous waste
- Collected in sealed tankers
- **Bulked up and transported to *O.C.O Technology Ltd, Avonmouth* (previously known as Carbon8 Aggregates Ltd)**



# Emission Limits

## Continuous Emissions Monitoring

Substance	Units	Maximum Permitted Daily Average Emission	Mean Daily Average Aug 2024
Particulate (dust)	mg/m <sup>3</sup>	5	0.7
Total Volatile Organic Carbon (VOC)	mg/m <sup>3</sup>	10	0.6
Hydrogen Chloride (HCl)	mg/m <sup>3</sup>	8	7.5
Carbon Monoxide (CO)	mg/m <sup>3</sup>	50	2.1
Oxides of Nitrogen (NOx)	mg/m <sup>3</sup>	180	175
Sulphur Dioxide (SO <sub>2</sub> )	mg/m <sup>3</sup>	40	17.3
Ammonia (NH <sub>3</sub> )	mg/m <sup>3</sup>	15	0.5

## Exeter Energy Recovery Facility Extractive Emissions Monitoring January to June 2024

Substance/ Parameter	Emission Limit Value	Result
Hydrogen fluoride	2 mg/m <sup>3</sup> over minimum 1 hour period	<0.05 mg/m <sup>3</sup>
Cadmium & thallium and their compounds (total)	0.05 mg/m <sup>3</sup> over minimum 30 minute, maximum 8 hour period	0.0022 mg/m <sup>3</sup>
Mercury and its compounds	0.05 mg/m <sup>3</sup> over minimum 30 minute, maximum 8 hour period	0.007 mg/m <sup>3</sup>
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	0.5 mg/m <sup>3</sup> over minimum 30 minute, maximum 8 hour period	0.027 mg/m <sup>3</sup>
Dioxins / furans (I-TEQ) <sup>6</sup>	0.1 ng/m <sup>3</sup> over minimum 6 hour, maximum 8 hour period	0.0057 ng/m <sup>3</sup>
Dioxin and Furan (I-TEQ) Continually monitored average (Amesa)	Continuous Monitoring of Dioxin is not a permit requirement and has no emission limit set	0.0068 ng/m <sup>3</sup>

<http://tiru-uk.co.uk/exeter/environmental-reports/>



# Exeter ERF Carbon Emissions

April 2021 – March 2022

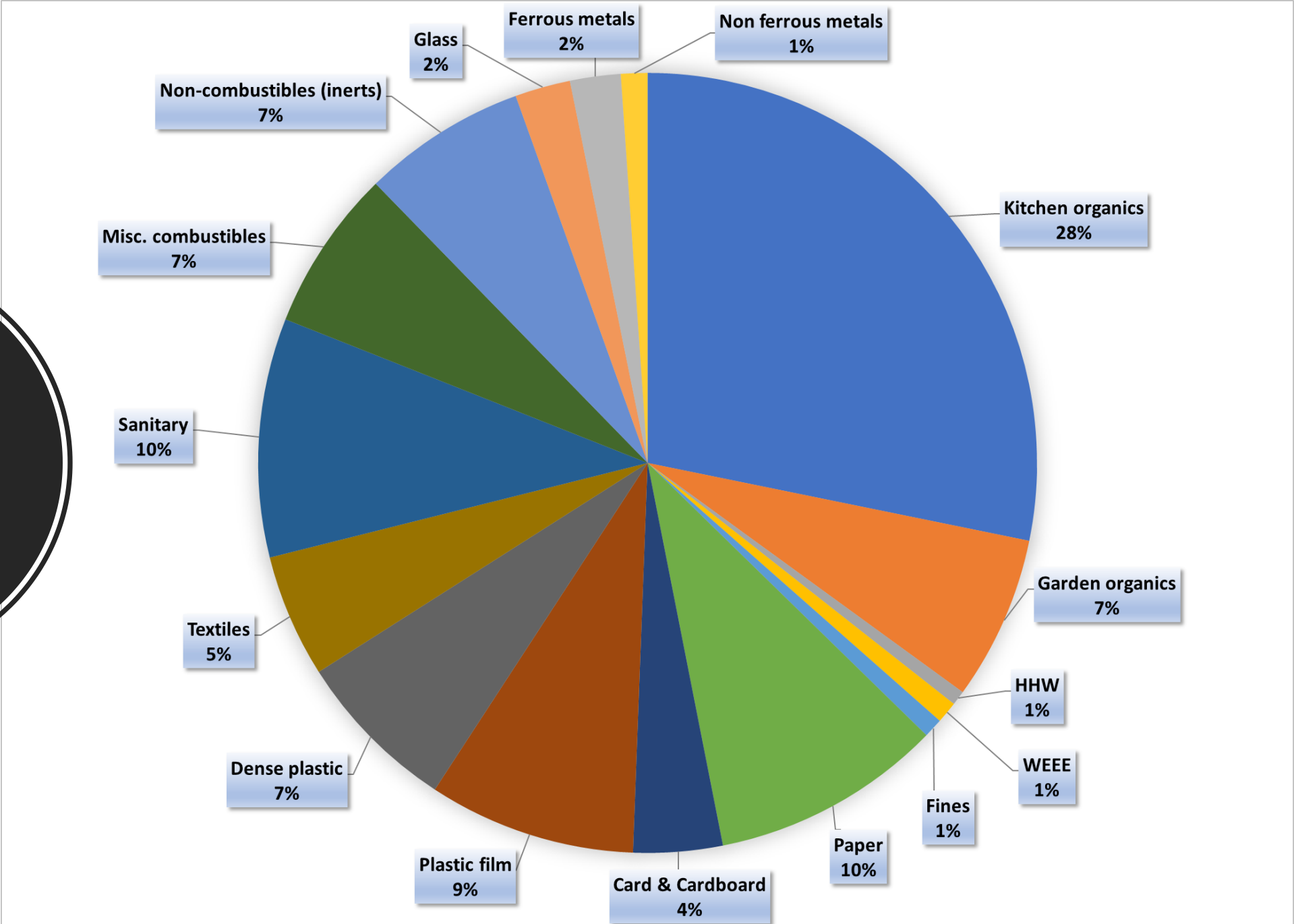
	April	May	June	July	August	September
CO2 Production	3,860	1,454	4,109	4,404	4,408	4,341
Waste treated	4,937	1,909	5,108	5,228	4,970	4,756
	October	November	December	January	February	March
CO2 Production	4,720	4,214	4,950	5,068	4,520	4,964
Waste treated	4,862	4,865	5,141	5,322	4,578	5,130

Total of 51,012 tonnes of CO2 equivalent

## Reducing carbon from the plant

- Reduce plastic in waste stream
- **District Heating System** decarbonised heat - replacing individual boilers in housing stock
- **Carbon Capture & Storage** -R&D stage

Average content  
of residual bins  
in Devon  
2023  
(kg/hh/wk)





## Interesting finding from the analysis...

- 41% of the residual waste is recyclable in Devon
- Most prevalent material in the residual bin is food waste at 28%
- The vast majority of food waste was avoidable with 43.8% still in its packaging!
- If the recyclable waste (41%) had been put in the recycling bins it would have saved approx. £3.9 million.



# Visit to control room & viewing platform





## Household Waste and Recycling Centres (HWRCs)

- 19 sites across Devon
- Wide range of materials accepted
- Average recycling rate at Devon HWRC sites is 71.4% (2023/24)
- In 2023/24 over 1327 tonnes of re-usable items were recovered from the waste stream and sold back to the public at the Devon HWRCs.
- Ongoing programme to upgrade and improve sites
- Keep up to date:
  - [www.devon.gov.uk/wasteandrecycling/centre/](http://www.devon.gov.uk/wasteandrecycling/centre/)
  - Recycle Devon Facebook page



## Recycling Collections

### Details about your collection service

Select the area of Devon in which you live below to find out recycling and food waste collection information.

If you are unsure which council area your address falls under, you can use this postcode checker

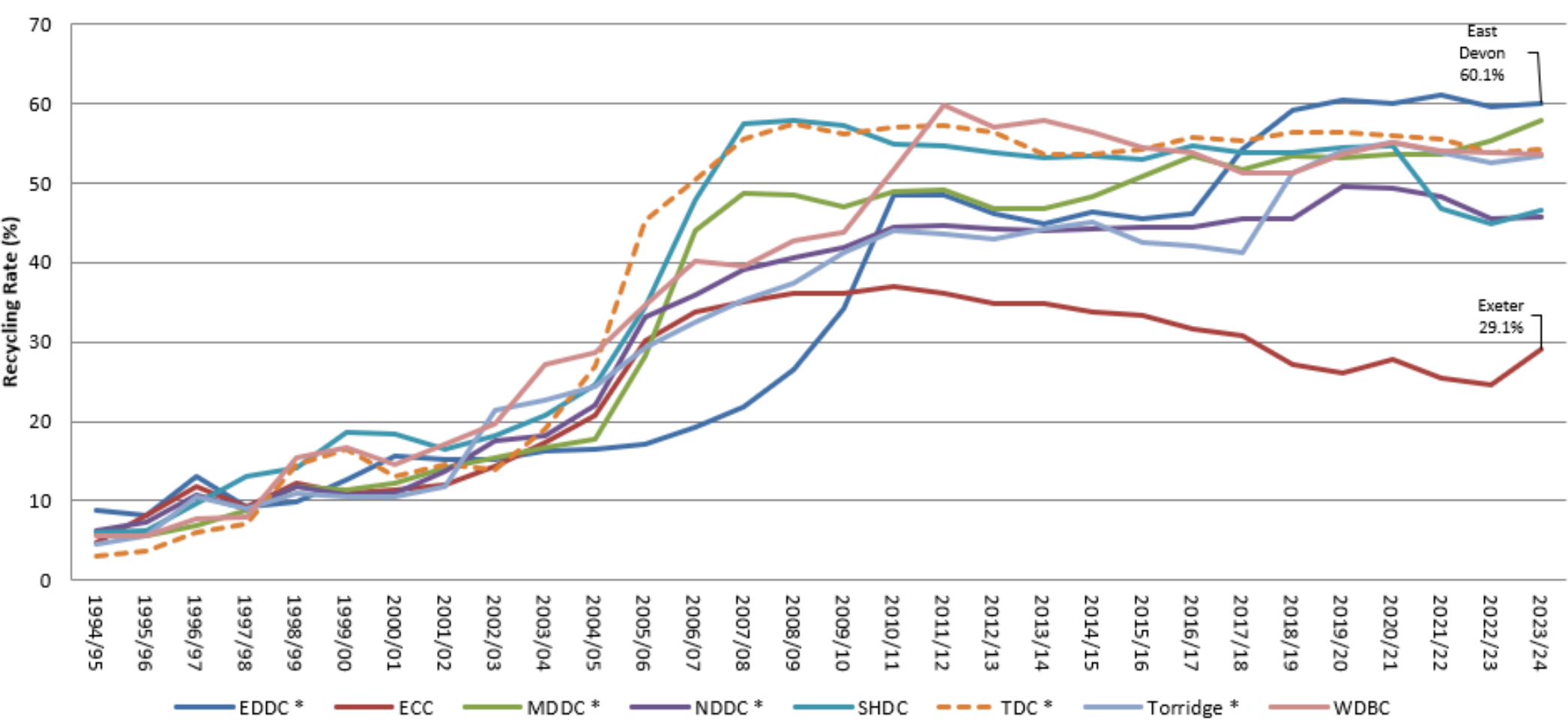


South Hams  
District Council



Householders make around 350,000 tonnes  
of it each year.

# Recycling Rates by District Council (1994/5 to 2023/24)



\* District part of Shared Savings Scheme.

# Organic Waste



# RECYCLING IS GOOD. BUT WE CAN DO BETTER...



# Economy & Resources

Waste contributes 6% to UK GHG emissions BUT...

45% of global emissions can only be tackled by changing the way we make and consume products and food.

Global food systems contribute 30% of global emissions, with a third of food produced being lost or wasted.

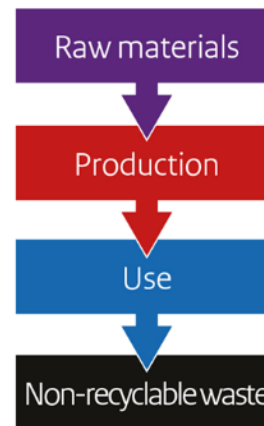
8% of global greenhouse gas emissions come from clothing and footwear.

3% of emissions come from plastic packaging (more than the 2.5% contribution from global aviation.)

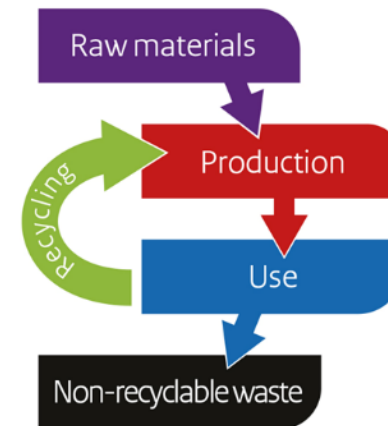
## From a linear to a circular economy

Designing out waste and designing in reuse & repair models

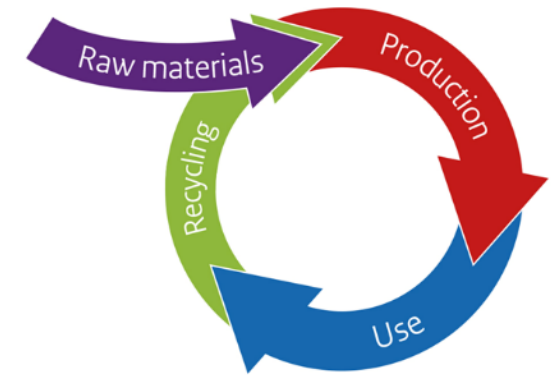
Linear economy



Reuse economy



Circular economy



[How to Build a Circular Economy | Ellen MacArthur Foundation](https://www.ellenmacarthurfoundation.org)

[www.ellenmacarthurfoundation.org](https://www.ellenmacarthurfoundation.org)

# UK Waste Legislation - A great deal of change!

Date	Scheme	Explanatory notes
2022	Plastic Packaging Tax	Came into force on 1 April 2022; charged at a rate of £200 per tonne;
2023	Single use plastics	Ban on single use take away plates, trays and bowls (Ban on single use plastic bags, straws, cotton buds, stirrers already in place)
Mar 2025	Simpler Recycling for businesses	Same materials to be collected from the kerbside including plastic, paper & card, glass, metal cans, drinks cartons and food waste from all businesses including hospitals and schools
June 2025	Single-use Vapes Ban	To be introduced 1 <sup>st</sup> June.
Oct 2025	Extended Producer Responsibility for Packaging	Putting the responsibility of recycling and reclaiming materials back onto manufacturers and brands.
Oct 2025	Mandatory Cup Take-back	Part of EPR. Will apply to sellers of filled, fibre-based composite cups that employ 10 or more employees (FTE's)
2025	Digital Waste Tracking	Voluntary phased introduction during 2024, statutory by 2025
2025	Waste carrier, broker and dealer system reform	Mandatory plus review of Duty of Care Guidance
Mar 2026	Simpler Recycling for households	Statutory duty for all councils to collect the same materials from the kerbside including plastic, paper & card, glass, metal cans, drinks cartons, INCLUDING FOOD WASTE and garden waste.
2027	Simpler Recycling	Plastic film to be included for both businesses and households
Oct 2027	Deposit Return Schemes	For Cans and plastic bottles. Unlike Wales and Scotland's, England and NI are planning to exclude glass.

# Behavioural Change Campaigns

- ✓ Love Food Hate Waste
- ✓ Love Your Clothes
- ✓ Home Composting
- ✓ Reusable Nappies
- ✓ Reusable Menstrual products
- ✓ Clean Devon

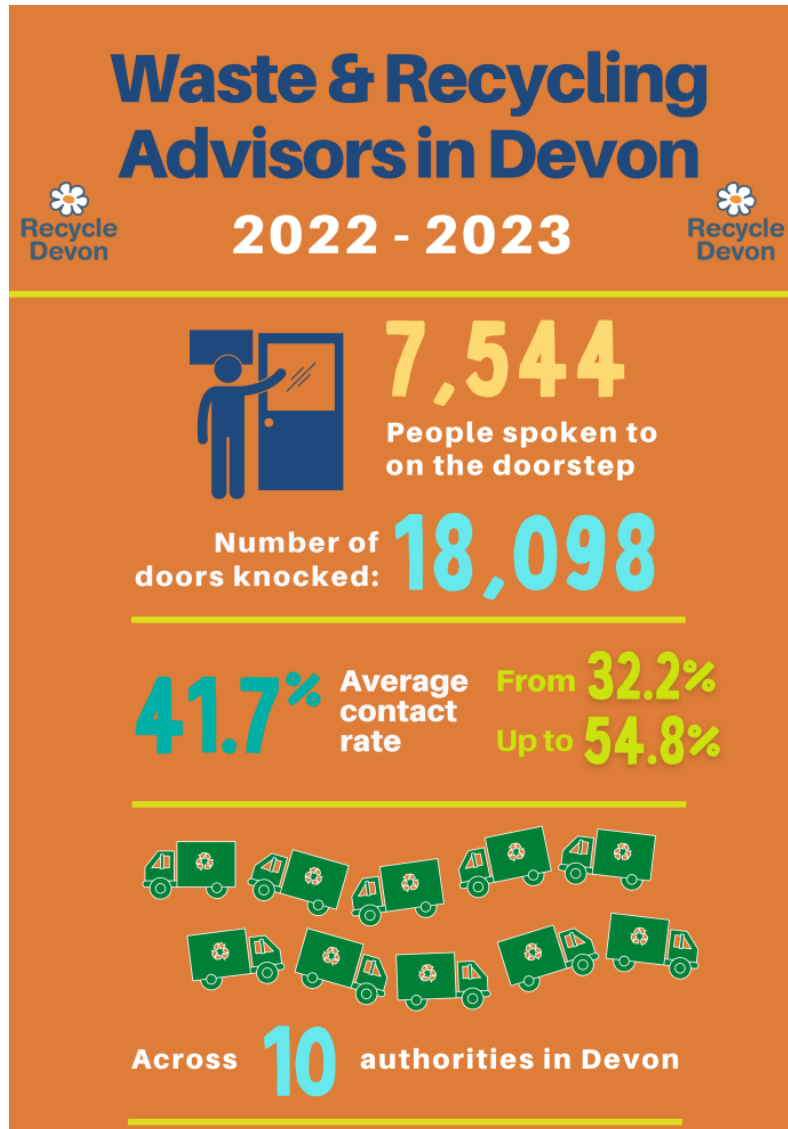


# Behavioural Change Campaigns

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# Waste & Recycling Advisors





## Riverside Recycling Trail

Wait! Before you set off...

Discover the rich history of recycling in and around the Riverside Valley Park and learn how waste and recycling is managed in the modern day!

To follow the Riverside Recycling Trail, just scan the QR code with your phone, download the Go Jauntly app.

**YOU ARE HERE**

**Key**  
Long circular walk (11.2km / approx. 3hr 15mins)  
Shorter circular walk (7.7km / approx. 2hr 45min)  
Optional extra section on both routes

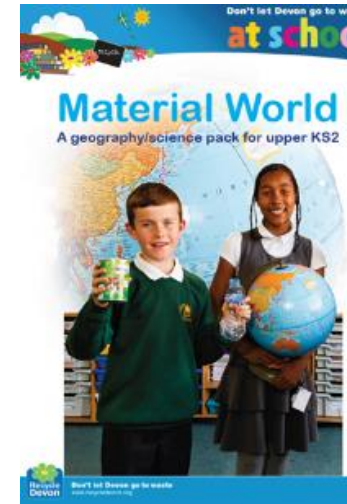
Go Jauntly Recycle Devon Viridor

Exeter City Centre  
Exeter Quay  
Household Waste & Recycling Centre (HWRC)  
Exeter Materials Recovery Facility (MRF)  
Exeter Energy from Waste Facility (EFW)  
Marsh Barton Railway Station  
Marsh Barton  
Bad Homburg Way  
Dog walkers' detour  
Dog walkers' detour

Exeter River  
Trenk Mill Suspension Bridge  
Bella Isle Park  
Topsham Road  
Ludwell Valley Park  
Pylon Field  
Riverside Valley Park  
Mill Wood  
Ludwell Valley Park  
Ludwell Valley Park  
Ludwell Valley Park

# Waste Education in Schools

- In 2023/24 academic year
  - worked with 86 different schools
  - delivered 310 workshops
  - Reached 8,426 children and 880 adults
- Assemblies
- Curriculum linked workshops
- Teaching resources
- School Community Events
- Trips to waste management facilities
- Zone Website
- Videos



## Resources for Teachers & Parents

The Recycle Devon School website provides teachers, parents and youth groups with a wide range of resources to help teach our children how to Reduce, Reuse, Recycle and Compost more of their waste every day.



# Girl Guiding and Scout badges

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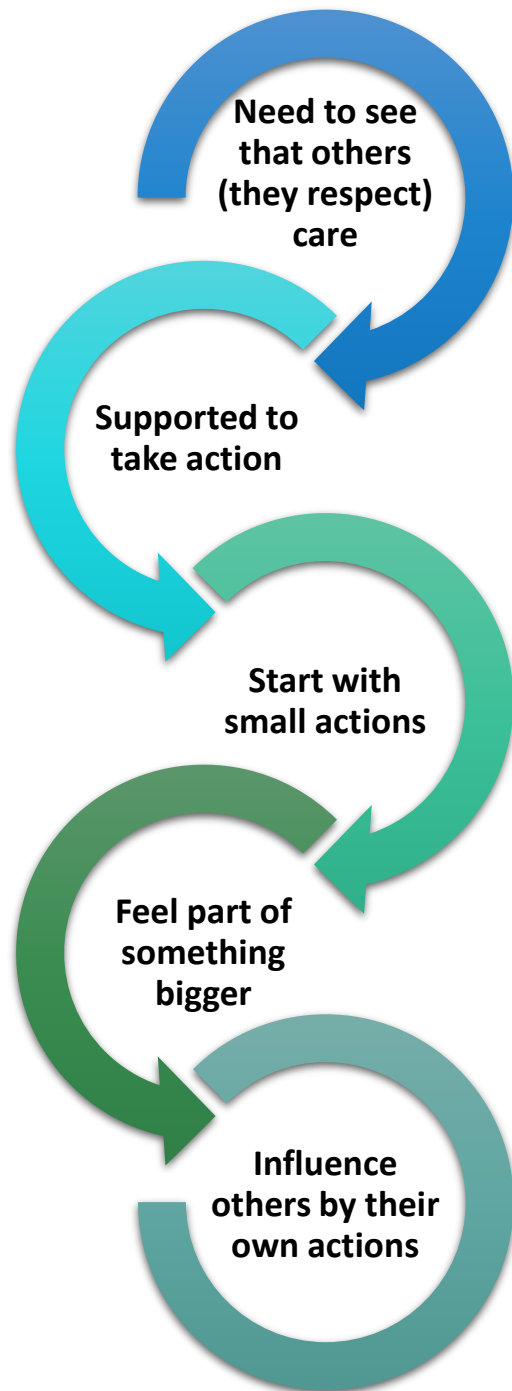


<https://zone.recycledevon.org/youth-groups/>

# When communities come together, great things happen.....

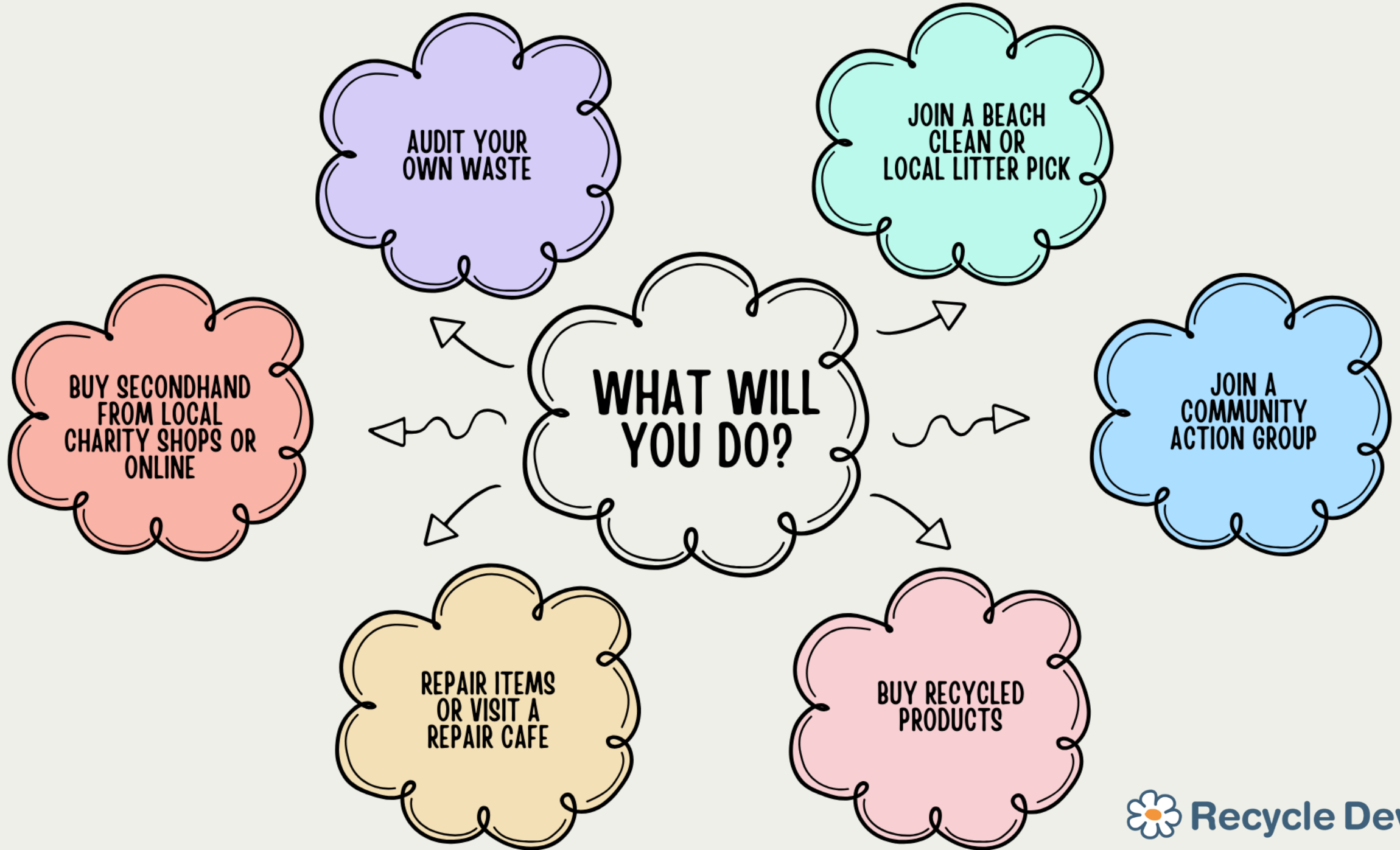
- Food surplus cafés & Community cooking
- Community fridges and larders
- Community Composting
- Repair cafes & workshops
- Libraries of Things
- Clothes swaps
- Jumble trails and 'give or take' events
- Beach cleans and litter picks
- Plastic free events
- Eco-hubs
- Community Reuse Centres
- Furniture Reuse projects
- Scrap stores





## These projects aren't just about being green they ....

- ✓ place based and people focused
- ✓ bring people together & strengthen communities
- ✓ Enable skill sharing & learning new skills
- ✓ improve wellbeing
- ✓ help to tackle isolation
- ✓ Inspires other communities to take action - Ripple effect e.g.: Repair Cafés and Community Fridges
- ✓ Potential to create local jobs & community businesses



# Where does my recycling go?

- East Devon: <https://eastdevon.gov.uk/recycling-and-waste/recycling-the-environment-and-our-responsibilities/where-does-my-recycling-end-up/>
- Exeter: <https://exeter.gov.uk/bins-and-recycling/commercial-waste/end-destination-of-recycling-materials/>
- Mid Devon: <https://www.middevon.gov.uk/residents/recycling-rubbish/what-can-you-put-out/recycling/what-happens-to-your-recycling/>
- North Devon: <https://www.northdevon.gov.uk/bins-and-recycling/where-does-our-recycling-go/>
- South Hams: <https://southhams.gov.uk/WhereDoesRecyclingGo>
- Teignbridge: <https://www.teignbridge.gov.uk/recycling-and-waste/recycling/what-happens-to-my-waste/>
- Torridge: [Final destination of recycling | Torridge District Council](#)
- West Devon: <https://www.westdevon.gov.uk/WhereMyRecyclingGoes>

# Waste Strategy and Statistics

Devon Authorities Strategic Waste Committee:

<https://democracy.devon.gov.uk/mgCommitteeDetails.aspx?ID=294>

Link to Waste Performance Statistics 2022/23 report to committee:

[Waste Performance Statistics 2022-23.pdf \(devon.gov.uk\)](#)

Resource and Waste Management Strategy for Devon and Torbay 2020-2030 [Resource and Waste Management Strategy for Devon and Torbay 2020 - 2030 - Waste and Recycling](#)