

Environmental Standards Scotland

Baseline Evidence Review – Resource Use and Waste

(Strategy and Analysis)

September 2022

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Executive summary

This baseline evidence review provides a high level summary of key published information about the current position, recent trends and performance and progress towards relevant targets and standards in resource use and waste in Scotland.

Background

A series of rapid reviews of key evidence sources were undertaken to support the identification of environmental issues of most concern, where Environmental Standards Scotland's (ESS) proposes to focus its initial analytical work.

Eight reviews were produced, covering the environmental categories of air; biodiversity and ecosystem resilience; climate change; cross-cutting environmental governance; land and soil; population, human health and cultural heritage; resource use and waste; and water. These categories are primarily intended to help Environmental Standards Scotland organise, manage and prioritise its work and are based on those used in the Strategic Environmental Assessment and the Environmental Impact Assessment processes. Considering the evidence within each category provides a structure for assessment.

There will be overlaps amongst these categories and to minimise duplication, topics have been covered under what was considered to be the most relevant category. For example, the issue of the application of sewage sludge to land has been considered in the 'population, human health and cultural heritage' review while plastic waste on beaches is covered in the 'water' review.

Rapid reviews were undertaken in each topic area, with a narrow scope of identifying key data sources and summarising what they tell us about how the environment is changing in Scotland. The focus was on National or Official Statistics and Annual Reports and their related data, mainly from Government and other national organisations, to obtain a high-level summary of current environmental conditions and to ensure confidence in the quality of the information.

The approach started with the data, considering whether Scotland is on track to achieve its current environmental targets and objectives. They are not intended to be detailed explorations of individual issues e.g. specific types of waste such as clinical. Similarly, they are not intended to provide exhaustive lists of relevant legislation. If a

topic is not included, it is because it is covered in another review or relevant published data was not found within the scope of the review at this point. However, the topic will still form part of ongoing horizon scanning activity and could be explored in the future with relevant organisations.

Future stages of analysis will consider whether performance trends relate to any issues of compliance with or effectiveness of environmental legislation and scrutinise the detail underpinning trends identified.

ESS' monitoring and analysis work will progress through a series of stages. This will include horizon scanning to identify high-level areas of concern, through to a deepening analysis and understanding of how things are changing, the causes of this, and how policy and regulatory decisions affect this. All of the monitoring and analysis work will be focused on identifying areas where further investigation or use of ESS' powers may be necessary, then supporting active investigations, and assessing whether the changes that have been made in response to ESS' recommendations or use of powers are having the desired impact.

As the analytical priorities are taken forward, it is likely that some will quickly be identified as not having any compliance or effectiveness issues that merit further analysis or investigation at this stage. These can then be returned to horizon scanning in case an issue arises in the future, and a new issue can be added to the list of those subject to more detailed analysis. The list of analysis priorities is expected to be dynamic and regularly updated. The evidence reviews, however, are a snapshot in time as of August 2022 and there is no plan for these to be updated on a regular basis.

Summary of key baseline evidence review findings

The evidence identified suggests that, whilst Scotland is making progress to reduce waste generated, increase recycling and reduce rates of landfill, it is at risk of not achieving its targets in the waste area. The Scottish Government's consultation document on the Route Map to 2025 for the circular economy acknowledges that 'we are not on track to meet our ambitious waste and recycling targets' and that these are unlikely to be 'met in full without large-scale, and rapid system change'. The most recent data suggests that:

- The total amount of waste generated had reduced by 4.2% between 2011 and 2018. A 15% reduction on 2011 is required by 2025 to achieve the target.
- The target to reduce per capita food waste by 33% against 2013 levels is unlikely to be achieved based on the current pace of change and that preventing avoidable food waste is a particular challenge.
- The household waste recycling target was missed (42% in 2020 against a target of 60%) while the most recent data for 2018 for waste from all sources (household, construction and demolition, commercial and industrial) puts the overall recycling rate at 60.7% (against a 2025 target of 70%), up from 52% in 2014.
- Recycling rates are lower in Scotland than other parts of the UK and a number of other European countries including Germany.
- Rates of disposal of waste from all sources to landfill are falling, from 42.8% of all waste in 2011 to 32.1% in 2018, but are some way short of the 5% target by 2025.

In addition, it is too early to tell whether carbon emissions (of which almost all is methane) from waste management (excluding emissions from incineration with energy recovery which are captured under the energy sector) will reduce to the target of 0.9 MtCO_{2e} by 2025. Emissions have remained relatively stable in recent years despite significant declines between 1995 and 2013.

More positively, Scotland had an EU based target to reduce the quantity of biodegradable waste disposed to landfill to less than 1.26m tonnes by 2020 and has met this target since 2013.

Beneath these headline targets, the review found a wide range of data and trends, including:

- Packaging waste generated has increased by over 20% between 2004 and 2020, driven by paper and plastic wastes which have increased by over 40% since 2004.
- The amount of household waste generated has remained between 2.4m tonnes and 2.5m tonnes each year since 2012 but there are large variations between local authorities in terms of the amount of household waste generated per capita.

- The household recycling rate was 42% in 2020, down from 44.9% in 2019 although up from 39.5% in 2011. There is variation between local authorities in rates of household recycling, landfill and incineration. Recycling rates are lower for plastic packaging than most other packaging types.
- Rates of incineration are increasing. Incineration with energy recovery represented 4.2% of waste from all sources in 2018, up from 2.5% in 2011 (an 83.8% increase in this category). While disposal via incineration represented 2.3% of waste from all sources in 2018, up from 1.4% in 2011 (a 67.2% increase in this category). In the most recent years, incineration by disposal has been increasing faster than with recovery. These changes may be partially due to local authorities and waste management companies diverting waste from landfill ahead of the ban on biodegradable municipal waste to Scottish landfills in 2025. Further analysis may be helpful to understand the level of energy generation which takes place at facilities categorised under disposal.
- Exports of waste have increased by 61% between 2012 and 2018, with the majority being exported recycling.
- The carbon impact of a tonne of household waste has been steadily declining since 2011 as a result of improved recycling rates, reduction in waste generated and reduced landfilling of biodegradable waste.
- The top five waste materials by weight in 2018 accounted for 71% of all waste but only 34% of carbon impacts while the top five materials by carbon impact accounted for only 20% of total weight but 71% of the impact. This suggests the need to consider not just reducing overall waste generation but to focus on particular sectors or materials or parts of the waste management process that have the greatest carbon impacts.
- Illegal waste activity appears to be a concern with potentially large costs to the economy. Waste crime can also cause environmental and human health impacts, despite the motivation largely being economic. It also removes the legitimacy of legal waste handling businesses, causing a knock-on effect to the efficiency of waste management practices.

The review also found a number of areas where it was not possible to draw clear conclusions from the available information, for example on waste export outcomes

and re-use of resources and materials. These areas will be included as part of ESS' future horizon scanning activity.

Finally, it is important to acknowledge that there are forthcoming policy developments in the resource use and waste area, such as the proposed legislation and route map on the circular economy. These may impact future target achievement.

Conclusions for initial ESS analytical priorities

This baseline review identified a wide range of possible issues for further analysis, including progress against targets, waste crime, varying trends across local authorities, deep dives into specific areas such as clinical waste and exploring the impact of new policies.

However, for the purposes of setting out initial analytical priorities, ESS will focus on:

- Illegal disposal and management of waste;
- Progress against waste and recycling targets and the development of the circular economy.

ESS' Strategic Plan describes how issues will be prioritised for further analysis according to a range of criteria, including:

- Importance – the size and risk of the potential effect on the environment and/or public health; the urgency with which improvement is required;
- Nature and Scope – recent trends in environmental performance; whether the issue of concern appears to be systematic and/or longstanding;
- Neglect – whether there has been action taken on the issue of concern, or further action is planned in the near future; and
- Added-value – the contribution we could make, considering whether other monitoring, oversight or scrutiny bodies are planning to take, or could take, action to address the issue of concern.

The resource use and waste analytical priorities take account of that scheme and recognise the importance of these issues. For example, the potential impact that waste generation, management and illegal waste activity can have on the achievement of other environmental objectives (e.g. climate change and water) as

well as the fact that most targets are at risk of not being achieved. In keeping with the prioritisation process, the contributions of other actors and the added value that ESS can bring to an area will also be considered, in deciding where to focus future work.

Although ESS intends to focus on two issues in the first instance, other issues will be retained on a list for potential future analysis and horizon scanning in line with the stages of monitoring and analysis work set out in the strategic plan.

Resource Use and Waste Baseline Evidence Review

1. Introduction

This baseline evidence review provides a high-level summary of key published information about the current position, recent trends and performance and progress towards relevant targets and standards in resource use and waste in Scotland.

2. Methodology

A rapid review of key evidence sources has informed this report. This has focussed on scanning across the topic area, identifying key data sources and summarising what they tell us about how the environment is changing in Scotland and whether environmental targets and objectives are on track to be achieved.

The scope of the work was deliberately narrow and was intended to provide a snapshot of the evidence rather than a fully comprehensive picture. Where ESS' initial assessment of the evidence has identified potential concerns or issues that warrant further scrutiny, more detailed monitoring and analysis will be considered.

The work focussed on published analytical reports and datasets, searching for relevant evidence by:

- using the term 'waste' in combination with 'generated / generation', 'managed / management', 'landfill', 'incinerated / incineration', 'recycle', 'impact', 'crime', 'illegal', 'carbon footprint' and / or 'emission'.
- using the terms 'material re-use', 'resource re-use', 'litter'.
- where necessary combining these terms with 'Scotland', 'UK', 'EU' or 'International' to search for comparisons with other countries.

These terms were derived from ESS' environmental categories and sub-categories. Specific searches of key organisations' websites were also undertaken, based on knowledge and understanding of those active in the area. For resource use and waste data this focussed on SEPA, Scottish Government, DEFRA, Zero Waste Scotland and Eurostat. There is some subjectivity in the choice of terms and organisations which may have an impact and was somewhat mitigated by consulting with key stakeholders on sources.

The focus of the reviews was on National or Official Statistics and Annual Reports and their related data, mainly from Government and other national organisations, to obtain a high-level summary of current environmental conditions with a tight scope which allowed the reviews to be completed in time to inform strategic plan development. Only publicly available information was considered. Individual research reports or grey literature on specific, detailed areas of the topic were not within scope. Evidence of issues relating to compliance with or effectiveness of environmental legislation was not the focus at this stage. It is envisaged that this will form part of future analysis activity on priority analytical areas.

The approach started with the data, considering whether Scotland is on track to achieve its current environmental targets and objectives in this area. They are not intended to be detailed explorations of individual issues e.g. specific types of waste such as clinical. Similarly, they are not intended to provide exhaustive lists of relevant legislation.

Baseline evidence reviews have been undertaken in each of the ESS Environmental Categories and there are naturally some topics which could fall across a number of reviews. For example, the issue of the application of sewage sludge to land is considered in the 'Population and Human Health' review while plastic waste on beaches is covered in the 'Water' review.

If a topic is not included, it is because it is covered in another review or no relevant published data was found within scope. However, the topic is likely to still form part of future horizon scanning activity and could be explored in the future with relevant organisations.

Initial drafts of the evidence reviews were shared with the ESS Board and with key identified analytical stakeholders to provide proportionate checks that no key sources had been missed and no information had been misinterpreted. Going forward into more detailed analytical projects and undertaking further horizon scanning, ESS expects to engage a wide range of experts, including academics and specialist organisations.

3. Legislative and policy background

Many policy and guidance documents exist in relation to resource use and waste, including:

- Making Things Last: A Circular Economy Strategy for Scotland¹ which sets out priorities for ensuring products and materials are kept in high value use for as long as possible.
- Food Waste Reduction Action Plan² describing how Scotland can achieve its food waste reduction target.
- Duty of Care: Code of Practice for Managing Controlled Waste³ which provides statutory guidance on the duties that must be complied with by anyone who produces, keeps, imports or manages controlled waste in Scotland.

The Scottish Government and its agencies have also recently issued a number of relevant consultations:

- Delivering Scotland's Circular Economy – proposed Circular Economy Bill: consultation⁴.
- Delivering Scotland's circular economy – A Route Map to 2025 and beyond⁵.
- National litter and fly-tipping consultation⁶ to inform the development of the final strategy (updating the strategy from 2014⁷), which closed on 31st March 2022. The need for a new strategy reflects the fact that new policy areas are now linked to the impact of these issues, COVID has presented new challenges and that litter and fly-tipping should be recognised as separate issues.
- Consultation on Updated Marine Litter Strategy for Scotland⁸, to inform the update of the 2014 strategy⁹, which closed on 22nd March 2022. This sought a wide range of views on the actions which have been identified as priorities to guide work over the next six years.
- Consultation on the Extended Producer Responsibility for Packaging Recycling¹⁰, with other UK nations, which closed on 24th June 2021. The proposals aim to create a scheme which incentivises producers to design packaging that is easy to recycle and ensure that they pay the full net cost of managing this packaging once it becomes waste. The response to the consultation confirmed that EPR will be introduced in a phased manner from 2024.¹¹

A wide range of relevant legislation was found during the review. However, this baseline work was not designed to search for legislation in particular and therefore the information below is unlikely to be comprehensive. Further work would be required to produce a complete list but the below is provided to offer some legislative background.

- Climate Change (Scotland) Act 2009¹² - covering waste prevention and management plans, waste data, facilities for recyclable waste, procurement of recycle, reduction of packaging, deposit return, carrier bag charges, enforcement authorities and penalties as well as overall emissions targets.
- Environmental Protection Act 1990 (as amended)¹³ - duties with respect to the management of waste including that it must be stored properly, only transferred to appropriate persons and that it is sufficiently well described to enable its safe recovery or disposal without harming the environment.
- The Waste (Scotland) Regulations 2012¹⁴ – amends section 34 of above to implement actions from the Scottish Government’s Zero Waste Plan. Producers and holders of waste (excluding households) have a duty to take reasonable steps to increase the quantity and quality of recyclable materials and key dry recyclables such as glass, metals, plastics, paper and card for separate collection.
- The Waste (Scotland) Regulations 2011¹⁵ - amendments to the 1990 Act to transpose aspects of Directive 2008/98/EC on waste.
- The Waste (Scotland) Regulations 2005¹⁶ - ensuring that farms have a duty of care, like other business, to dispose of waste safely with no harm to the environment.
- The Producer Responsibility Obligations (Packaging Waste) Regulations 2007 (as amended)¹⁷ - statutory framework for meeting recovery and recycling targets contained in the EC Directive¹⁸ on packaging and packaging waste. Businesses with a turnover greater than £2m and which handle more than 50 tonnes of packaging per year are obligated to contribute towards the cost of recycling and recovery of a proportionate amount of packaging they have placed on the market.

- Packaging Waste (Amendment) Regulations 2010¹⁹, which extended the above targets beyond 2010.
- Packaging (Essential Requirements) Regulations 1998²⁰ – require that packaging should be minimised, should be capable of recovery and recycling and should contain restricted amounts of certain hazardous substances.
- Waste Management Licensing (Scotland) Regulations 2011²¹.
- Pollution Prevention and Control (Scotland) Regulations 2012²² - regulates energy from waste plans (including the controls required under the European Waste Incineration Directive²³) and the biological treatment of animal waste, including catering waste.
- Animal By-Products (Enforcement) (Scotland) Regulations 2011²⁴ and 2013²⁵ – statutory requirements for processing and disposal of animal by-products, including composting. Enforced by Animal and Plant Health Agency (APHA).
- The Deposit and Return Scheme for Scotland Regulations 2020²⁶.
- Landfill (Scotland) regulations 2003²⁷ and amendments in 2003²⁸ and 2013²⁹ implement the EU Landfill Directive and set standards for design and operation of landfills. Sites must be classified as hazardous, non-hazardous or inert and are regulated by SEPA through a permit system.
- Single Use Carrier Bags Charge (Scotland) Regulations 2014³⁰.

SEPA provides details of legislation relating to other areas of waste including batteries³¹, end-of-life vehicles³², special waste³³, transfrontier shipment of waste³⁴ and waste electrical and electronic equipment³⁵. A full list of waste legislation can be found on the Scottish Government website³⁶. There are also specific policies and legislation focused on radioactive waste³⁷ management covering all activities. This includes decommissioning which relate to the handling, pre-treatment, treatment, conditioning, storage or disposal of radioactive waste, including discharges.

Radioactive waste is devolved³⁸ apart from where it is translocated internationally. The UK Health Security Agency (UKHSA) is responsible for ‘protecting every member of every community from the impact of infectious diseases, chemical, biological, **radiological and nuclear** incidents and other health threats’. It is regulated by the Parliamentary and Health Service Ombudsman’s (PHSO). It should

be noted that the UK HSA and PHSO are focussed on human health rather than environmental impacts. The Office for Nuclear Regulation is responsible for safety of the industry. This includes contributing to UK reports required under:

- Article 32 of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.
- Article 14 of Council Directive 2011/70/Euratom ('Radioactive Waste and Spent Fuel Management Directive')

4. Key targets

The Scottish Government³⁹ has set out targets for reducing waste and increasing recycling by 2025. These are:

- Reduce total waste arising in Scotland by 15% against 2011 levels (building on target of 7% reduction against 2011 baseline by 2017)⁴⁰.
- Reduce per capita food waste by 33% against 2013 levels.
- Recycle 70% of remaining waste (building on target to recycle 60% of household waste by 2020⁴¹ and relating to EU targets⁴² of recycling 50% of household waste by 2020 and of preparing for re-use and recycling of 55% of municipal waste by 2025, 60% by 2030 and 65% by 2035).
- Send no more than 5% of remaining waste to landfill.
- End the practice of landfilling biodegradable municipal waste in Scotland (building on EU target of no more than 1.26 million tonnes of biodegradable municipal waste sent to landfill).

All of these targets are set out in the Climate Change Plan⁴³, including information on plans for delivery. In addition, the target to end landfilling of biodegradable municipal waste is set out in legislation in The Waste (Scotland) Regulations 2012 although the planned full implementation on 1st January 2021 has been delayed to 2025.

There is an additional EU target of 70% recycling and reuse of construction and demolition waste⁴².

The consultation document on the Route Map to 2025⁵ for the circular economy acknowledges that ‘we are not on track to meet our ambitious waste and recycling targets’ and that these are unlikely to be ‘met in full without large-scale, and rapid system change’.

In relation to plastic in particular, the Scottish Government aims to match the EU ambition for all plastic packaging to be economically recyclable or reusable by 2030.³⁹ It has also signed up to the Ellen McArthur Foundation’s New Plastics Economy Global Commitment to end plastic pollution which sets out a vision of a circular economy for plastic in which it never becomes waste.^{44,i}

There is also an emissions reduction pathway within the Climate Change Plan (CCP)⁴⁵ which suggests that in order to meet overall statutory greenhouse gas emissions reductions targets, Scotland must reduce greenhouse gas emissions from the waste sector (excluding emissions from incineration for energy from waste) to 0.9 megatonnes per year by 2025, and to 0.7 megatonnes in each year from 2026 to 2032.

ⁱ This has six key points: eliminating problematic / unnecessary plastic packaging; re-use models; all plastic packaging being 100% reusable, recyclable or compostable and being treated so in practice; use of plastics fully decoupled from consumption of finite resources; and all plastic packaging free of hazardous chemicals.

5. Baseline evidence for environmental areas

In assessing the environmental impact of waste it is important to consider both waste generation and waste management. The EU waste framework^{46,ii} directive sets out a hierarchy which should apply in waste legislation and policy. In order of priority this is i) prevention, ii) preparation for re-use, iii) recycling, iv) other recovery (e.g. energy), v) disposal⁴².

Waste generation

Material consumption (materials used in an economy i.e. those extracted or harvested plus materials and products imported minus those exported) is responsible for over two thirds (74%) of Scottish carbon emissions.^{47,iii} Nearly 1 in 5 tonnes of the material flowing through the Scottish economy is waste⁴⁸.

Statistics on waste generation allow us to track the progress of prevention activities.

All waste

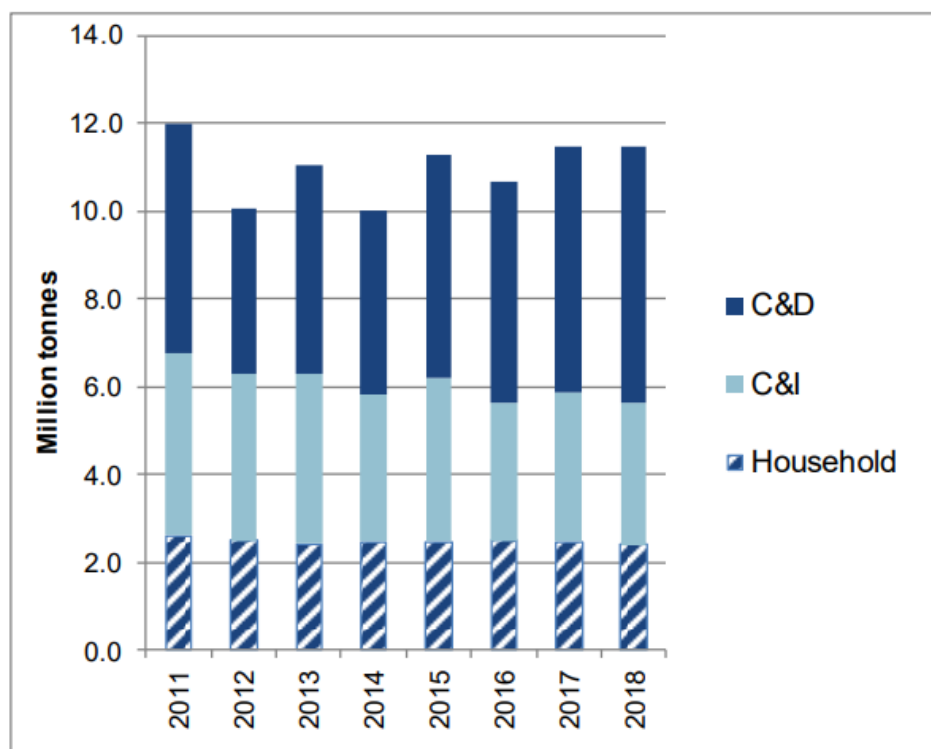
In legislative terms, waste refers to anything that is waste within the meaning of Article 3(1) of the Waste Framework Directive⁴⁶ i.e. 'any substance or object which the holder discards or intends or is required to discard'. Although the amount of waste generated has been gradually decreasing, Scotland is off-track in its targets to reduce waste generation by 7% on 2011 levels by 2017 and 15% on 2011 levels by 2025^{49,50,51,52}. In 2018, the reduction was only 4.2% on 2011 levels.^{iv} In 2012 and 2014, a greater than 15% reduction was achieved compared to 2011 levels but this was not sustained and between 2015 and 2018, the reduction on 2011 levels has varied between 4.2% and 10.7%. This is illustrated in the chart below.

ⁱⁱ The hierarchy was translated into Scottish law through The Waste (Scotland) Regulations 2011 - <https://www.legislation.gov.uk/sdsi/2011/9780111012185/contents>.

ⁱⁱⁱ There are two accounting methods – territorial and consumption – with the former considering only emissions produced within a country while the latter takes account of the emissions required to produce and transport imported products but not those of Scottish exports. Figures quoted here are based on consumption accounting.

^{iv} Calculated from data included in [waste-from-all-sources-summary-document-and-commentary-text-2018.pdf \(sepa.org.uk\)](#)

Figure 1: Waste generated from all sources, 2011 to 2018



Source: SEPA Waste from All Sources Summary Document and Commentary Text 2018⁵⁰. C&D refers to construction and demolition, C&I to commercial and industrial waste sources.

All waste – by sector

By sector⁵⁰, 5.8m tonnes (51%) was from Construction and Demolition (C&D) in 2018, up from 5.2m in 2011 though this has fluctuated in the early part of the period with annual changes ranging from -26.9% to 26.1%. This sector is sensitive to large regional projects, such as the works associated with the St James Centre in Edinburgh.

A total of 3.2m (28%) tonnes in 2018 was from the Commercial and Industrial (C&I) sector (i.e. waste from business and industrial premises but excluding the construction and demolition industry), down from 4.2m in 2011.

A total of 2.4m (21%) was from the Household sector, down slightly from 2.6m in 2011, although waste generated by this sector has been fairly stable over time.

When the C&D sector is excluded, the waste generation trend is less variable and has been generally downward over the period 2011 (6.8m tonnes) to 2018 (5.6m tonnes), an 18% reduction. Therefore there may be value in further analysis of waste

generated by the Construction and Demolition sector although it is worth noting waste management data presented later in this paper which shows that the vast majority (97.4% in 2018) of waste from this sector is recycled.

The Scottish Government's 2016 Circular Economy Strategy noted the need for a focus on preventing waste arising from construction and demolition¹. Its consultation on a circular economy route map to 2025⁵ also recognises this with a proposed package of actions in this sector. This includes coordinating a Scottish Programme for Reuse of Construction Materials and Assets, investigating the potential use of recycling bonds, and working with industry to identify ways to reduce soil and stones going to landfill. The technical annex to that consultation acknowledges that this sector is likely to determine whether or not the overall generation reduction target is achieved in 2025.⁵³

All waste – by category

Soils (mainly from the C&D sector)⁵⁴ generated the most waste in 2018 (4.29m tonnes, 37.5% of all waste), followed by household and similar^v (2.06m tonnes, 18.0%, 1.34m from households and 0.72m from businesses) and mineral waste from C&D (1.28m tonnes, 11.1%).⁵⁰

Household and similar (from both Household and C&I sectors) has decreased by over a third between 2011 and 2018 from 3.14m tonnes to 2.06m tonnes, partly due to implementation of general policies aimed at waste reduction (such as legislation requiring all waste producers to segregate material for recycling, implementation of source segregated recycling services for commercial and public sector, and reduction in frequency of residual waste collections by local authorities). Around one third of that decrease was due to a reduction by households and around two thirds by businesses.⁵⁰ As such, households now account for a larger proportion of household and similar waste than they did in 2011.

^v This category includes waste generated by businesses as well as households, including waste collected by local authorities and private waste management companies. However, not all household waste will be included e.g. separated waste (such as glass and cardboard) will be included under other categories.

Combustion wastes have decreased significantly (by 98%) between 2011 and 2018 from 548,233 tonnes to 10,609 tonnes. This was mainly between 2015 and 2017 corresponding with the closure of Longannet coal power station. On the other hand, mixed and undifferentiated wastes have increased 173% (from 169,869 tonnes to 463,827 tonnes) and separately collected animal and mixed food wastes have increased 145% (from 172,413 tonnes to 423,104 tonnes). The latter is due to C&I sources in line with new requirements for Scottish businesses to source segregate materials, including food waste in urban areas.⁵⁰

Rubber wastes have been increasing (though still represent a small share of all waste) by 6,436 tonnes (26.6%) between 2016 and 2017 and by 4,814 tonnes (15.7%) between 2017 and 2018 to reach 35,403 tonnes. This may reflect changes to licensing from 2016 which meant tyres could no longer be accepted at sites exempt from waste management licencing.⁵⁰

A total of 0.45m tonnes of hazardous waste was generated in 2018 down 16.5% on 2017 and 26.0% on 2011. Most of the reduction is in the construction and demolition waste sector. Most hazardous waste generated in 2018 was from Commercial and Industry (82.6%). The main waste category was Chemical (23.6%), primarily oil / water wastes from offshore oil activities. Next most common were other mineral wastes (11.7%) and discarded equipment (excluding vehicles, batteries and accumulators) (10.9%).⁵⁰

A total of 12.4m tonnes of packaging waste was produced in 2020 in the UK⁵⁵ and, taking a 10% share of the DEFRA UK figures, SEPA estimate that 1.3m tonnes of packaging waste was produced in Scotland in 2020^{56,57,vi}, up over 20% on 2004. Just over two fifths of this packaging waste was paper and around one fifth each was glass and plastic. Paper and plastic wastes generated have increased by around 40% since 2004.⁵⁷

^{vi} SEPA exclude the 'other' packaging category from their reporting. SEPA's publication of the Scottish estimate was made before updated 2020 data was released in the UK report. Therefore, the UK and Scottish figures here do not quite match.

Household waste

Data on household waste is available for 2020, a more recent year than for 'all waste' above due to issues relating to SEPA's cyber-attack. Scotland's National Indicators⁵⁸ (based on data produced by SEPA⁵⁹) show that 2.43m tonnes of household waste was generated in Scotland in 2020, up 0.3% from 2019 but down 7% from 2011, the first year of comparable data. Waste generated by households has fluctuated between 2.4 and 2.5 million tonnes since 2012^{51,59}.

There was variation across local authorities too, with 17 seeing increased household waste generation (typically large urban centres) and 15 showing a decrease (typically rural local authorities) compared with 2019. In 2020, Orkney Islands generated the lowest total volume of household waste (8,481 tonnes), rising to the highest total volume of 265,910 tonnes in Glasgow City^{60,61}. However, it is probably more helpful to consider these values per person to allow for the variation in population sizes between these local authorities. A total of 444kg of household waste was generated per person in Scotland in 2020, ranging from 376 kg per person in Inverclyde as the lowest to 510 kg per person in Perth and Kinross as the highest.

Business waste

SEPA also produces detailed business waste data⁶². A total of 3.2m tonnes of business waste was generated in Scotland in 2018, varying from 9,299 in South Ayrshire (majority common sludges, 22%) to 366,756 in Aberdeenshire where nearly two thirds was from animal and mixed food waste (32%) and vegetal wastes (32%).

Across Scotland, the most common business waste type was 'household and similar wastes' (22%) followed by vegetal wastes (19%) and animal and mixed food wastes (10%). Almost half of all waste (49%) is from the commerce sector with the next most common being manufacture of food and beverage services at 21%. In 2018, business waste was 5% lower than 2017 (3.4m tonnes) and 22% lower than 2011 (4.2m tonnes)^{vii}.

^{vii} Detailed 2018 data is taken from the Business Waste Spreadsheets. Overall trends are taken from the most recent 'Waste from All Sources' publication since this appears to revise prior years' data with each update.

Food waste

The Climate Change Plan Monitoring Report published in 2022⁴⁹ reports that the target of reducing household and non-household food waste by 33% by 2025 from a 2013 baseline, is assessed as off-track. Similarly, the Route Map to 2025 for the circular economy consultation states that ‘while there is a high degree of uncertainty around food waste data, we are clear that we are not seeing the speed and scale on change we would need to meet the 33% target’⁵.

Food waste tonnage is very difficult to measure and is not reported annually. Data is available for the 2013 baseline and as a 2018 estimate which can only be used as an approximate indicator of progress and is not directly comparable to the 2013 data due to methodological differences. This data suggests that there is not enough progress, with the 2018 data representing 96% of the 2013 baseline⁵³. A full analytical assessment of progress is expected as part of the updated Food and Waste Reduction Action Plan due this year (2022). In the meantime, a report by the non-governmental organisation WRAP, suggests a reduction of 4.8% between 2015 and 2018 in UK food waste⁶³.

The original 2013 baseline estimates were revised in 2016 based on an improved methodology. The revised baseline for 2013^{64,65,66} estimates that 0.99 million tonnes of food and drink waste (185 kg per capita²) was disposed of in Scotland that year. Of this approximately 599,000 (61%) tonnes is from households and consumers while approximately 248,000^{viii} (25%) tonnes is from food and drink manufacturing. Estimates are subject to further change as methodologies continue to improve and, indeed, the 2018 data suggests that 59% is from households and 28% from the food and drink manufacturing sector⁵³. The Food Waste Reduction Action Plan² notes that meeting the target will require a reduction of 297,000 tonnes or 61 kg per capita in 2025, based on expected population numbers.

^{viii} Initial estimates for 2013 have been significantly revised down due to UK research from WRAP showing that non-food content makes up part of some waste categories previously assumed to be wholly food.

Based on 2018 estimates, animal and mixed food waste from Scottish households generated 1.887 MtCO₂e while non-household animal and mixed food waste generated 0.762 MtCO₂e – 18% and 7% respectively of total carbon footprint⁶⁷.

Focusing on household food and drink waste, Zero Waste Scotland have also considered change between 2009 and 2014. Using a comparable methodology and allowing for population change, there was an estimated reduction of 5.7% (37,000 tonnes) between 2009 and 2014, of which 30,000 tonnes represented savings in avoidable food waste (7.7% of that total).⁶⁸ Of the 600,000 tonnes in 2014^{ix,68}, 390,000 tonnes was estimated to be managed by local authorities, 140,000 by disposal down the drain and 62,000 composted^x. 60% (360,000 tonnes) was classed as avoidable (12% of all food purchased by weight), having a financial cost on average of £440^{53,xi} per household. Avoidable food waste from Scottish households generated 1.6 m tonnes of carbon dioxide equivalent, 2.1% of Scotland's total carbon footprint.⁶⁸

Summary

Although the amount of waste generated (across all sectors) has been gradually decreasing, Scotland is off-track in its target to reduce waste by 7% on 2011 levels by 2017 and 15% by 2025. In 2018, the reduction was only 4.2% on 2011 levels.

The construction and demolition sector is the largest contributor to waste generated and fluctuates year on year depending on large projects.

Packaging waste generated has increased by over 20% between 2004 and 2020, driven by paper and plastic wastes which have increased by over 40% since 2004.

^{ix} Household estimates are adjusted to 2013 to match the commercial and industrial data for combination in the overall total, providing a 2013 baseline for the target.

^x Originally reported as 71,000. However, in line with the revised methodology report, for the purposes of this report 9,000 tonnes is removed as 'fed to animals' is no longer counted for alignment with international definitions.

^{xi} Also confirmed with Zero Waste Scotland as differs with £460 quoted in their 2014 household food and drink waste estimates.

The amount of household waste generated has remained between 2.4m tonnes and 2.5m tonnes each year since 2012 but there are large variations between local authorities in terms of the amount of household waste generated per capita.

Data on food waste tonnage is not available annually and is difficult to measure. However, the available evidence indicates that the target is unlikely to be achieved based on the current pace of change and that preventing avoidable food waste is a particular challenge.

Waste management

Waste management concerns the other parts of the EU waste policy and legislative hierarchy. With the first step being prevention and reduction of waste generated, waste management then concerns how the remaining waste generated is handled with the aim of more being prepared for re-use and recycled and less being disposed of.

In Scotland, there are currently 45 operational and 224 closed landfill sites as well as six incineration facilities permitted to accept municipal waste and three more in construction.⁶⁹ In addition, there are a further 10 incinerators which accept non-municipal waste⁷⁰. SEPA's waste sites and capacity tool provides more detail⁷⁰ on sites supplied by operators subject to Waste Management Licences (WML) or relevant Pollution, Prevention and Control (PPC) permits. This includes relevant material recovery facilities. In total, 1,255 licenced sites are recorded in the tool for 2020.

The data presented in this review focusses on the operational sites. There was limited information found on the status of the closed landfill sites and this may be worth further analysis in the future.

It is important to be aware that there are methodological differences across SEPA publications in terms of what types of data are included. For example, some concern all Scottish waste (waste generated in Scotland regardless of where it is managed, whether within or outwith Scotland) while others concern all waste managed in Scotland (regardless of where it originated). The narrative below attempts to make definitions clear. In 2018, the total amount of Scottish waste managed was 11.65 million tonnes^{xii,xiii,50,51,57}.

^{xii} This was 0.20 million tonnes (1.8%) more than the amount of waste generated. These data are derived using different methodologies explaining why the totals do not match. Historically the gap has been much wider (between 15% and 30% higher generation than managed) but revised methodologies mean that the difference is now less variable – ranging from 8.6% more waste generated than managed in 2011 to 3.1% less in 2017).

^{xiii} Waste types managed do not necessarily correspond to waste types generated because waste can change form following collection and final management e.g. in 2018 there were 2,293 tonnes of

Waste from all sources - recycling

Of the waste managed in 2018, 60.7% (7.07m tonnes) was estimated to be recycled^{50,51}. Scotland has a target of 70% of waste from all sources being recycled by 2025. It does not appear to be on track to meet this based on most recent trends (59.4% in 2016 and 59.6% in 2017^{50,51}) where progress has slowed (although this does not consider impact of any planned policy actions) despite big increases between 2011 and 2016.

The technical annex to the circular economy consultation indicates that it will be challenging to meet the target without further interventions. It notes that, on average the recycling rate increased by around 1 percentage point in each year between 2011 and 2017 but would need to increase by 1.3 percentage points in each year from 2018 to 2025 to meet the target.⁵³

The majority of recycled waste in 2018 was soils (2.9m tonnes), followed by Mineral waste from construction and demolition (1.02m tonnes)⁵¹. Recycling in composting or anaerobic digestion facilities accounted for 0.63m tonnes of organic wastes. This is a long-term increase corresponding to the roll out of separate food waste collections. Animal and mixed food waste comprises the majority of composted organic waste (50%).⁵⁰

Of the 7.07m tonnes of waste recycled, 5.83m tonnes was recycled in Scotland and 1.27m tonnes elsewhere (18%). In addition, 0.03m tonnes of non-Scottish waste was recycled here.⁵¹

The EU target of 70% recycling and reuse of construction and demolition waste has been achieved every year since at least 2011 with the latest data showing a 97.4% recycling rate in 2018.⁵⁰

UK provisional data⁵⁵ indicates that 63.2% of packaging waste was recycled in 2021. Recycling rates were greatest for metal (aluminium and steel) and glass packaging (over 70% for each) and lower for plastic (44.2%) and wood (44.1%) packaging. For paper and cardboard packaging the recycling rate was 70.6%. The Producer

Sorting Residues generated but 0.96m tonnes managed because sorting residues are typically produced as the result of the mechanical treatment of waste.

Responsibility Obligations (Packaging Waste) Regulations 2007 set material specific recycling targets for businesses.

Data is available for 27 EU countries for 2018 and shows that 66.4% of packaging waste was recycled compared to 62.1% for the UK with a similar pattern of higher recycling rates for metal, paper and cardboard and glass packaging and lower for plastic and wood packaging.⁷¹

The data submitted to the EU suggests that the UK recycling rate for packaging has not changed greatly from 61.5% in 2008 but up from 39.9% in 2000. Plastic recycling increased from 15.1% in 2000, glass from 38.6%, metal from 41.6% and paper and cardboard from 50.3%. However the recycling rate for wooden packaging fluctuated year on year from 44.2% in 2000, increasing to 76.9% in 2009 before dropping to 28.6% in 2015 and then increasing again⁷².

Waste from all sources – recovered – incineration with energy recovery or co-incineration^{50,51}

Wastes incinerated by recovery is defined as being waste used principally as a fuel to generate energy at an incineration facility where the energy efficiency has been demonstrated to meet the R1 energy efficiency criteria specified in the EU Waste Framework Directive. Co-incineration refers to wastes used principally as a fuel and incinerated at a facility in which the main purpose is the generation of energy or production of material products (e.g. cement) and which uses waste as an additional fuel.

Currently, in Scotland, no municipal waste incinerators have applied to become accredited to the R1 energy efficiency standard and therefore all recovery in Scotland is by co-incineration though recovery elsewhere may meet the R1 standard⁷³.

In 2018, 495,201 tonnes of Scottish waste (4.3% of waste from all sources) were recovered by incineration with energy recovery or co-incineration, down 29.6% on 2017 mainly due to Sorting residues managed outside Scotland. The longer-term trend is increasing – up 83.8% since 2011.

In 2018, recovery of Scottish waste outside Scotland represented a reported 31% of all Scottish waste managed in this way although this varies year on year.⁵⁰

The most common type recovered in 2018 was reported to be wood (242,103 tonnes) followed by sorting residues (121,804 tonnes). Rubber waste recovery increased by a reported 117.8% since 2017 likely due to changes in licensing through which used tyres are no longer permitted to be managed at sites exempt from waste management licensing (which have no requirement to submit waste data returns).

In addition to Scottish waste recovered, 190,233 tonnes of non-Scottish waste was recovered by incineration in Scotland. This fluctuates year on year.⁵¹

SEPA have published 2019 data⁵⁷ but have had to include estimates for Scottish waste managed outwith Scotland due to the 2021 cyber-attack. Estimation has been carried out by multiplying quarter 1 and 2 data by a factor of two and suggests that there may be a need for some caution in comparing the data with previous years. It is not possible to present data as a percentage of all Scottish waste managed since it has not been possible to produce recycling information.

The available data suggests a small increase to 518,699 tonnes of Scottish waste recovered by incineration in 2019 and no change in the materials most commonly recovered.⁵⁷

Waste from all sources – disposed – incineration^{50,51}

Waste disposed by incineration is handled at a facility which is not accredited as meeting the R1 energy efficiency criteria mentioned above. This does not necessarily mean that no energy recovery is taking place. It may be that the operator has not applied for accreditation or that energy recovery occurs but not to the R1 standard. Although no municipal waste incinerators in Scotland are classified as R1, SEPA note that at least two are likely to meet the standard but have not applied while energy generation in some form will take place at them all⁵².

Scottish waste disposed by incineration in 2018 was reported to be 263,946 tonnes (2.3% of all waste), an increase of 85,133 tonnes (47.6%) from the 178,813 tonnes disposed in 2017 and of 106,083 tonnes from the 157,863 tonnes disposed in 2011.

Households and similar wastes (54.2%) and Sorting residues (43.5%) make up the overwhelming majority of the total disposed by incineration. Both categories are reported to have increased since 2017 (51% and 46.4% respectively) and 2011 (64% and 287% respectively).⁵⁰ The majority of Scottish waste is disposed of in

Scotland rather than elsewhere. Similarly, only a very small amount of non-Scottish waste is disposed of here (not counted in the above figures)⁵⁷.

The available 2019 data suggests an increase to 831,553 tonnes of Scottish waste disposed of by incineration – a 215% increase. This suggests that in the most recent years, the reduction in landfilled waste is resulting in an increase in disposal by incineration rather than recovery. Further analysis may be useful to understand whether this is an issue of categorisation (i.e. most sites meet the recovery standard but haven't applied for accreditation) or whether more waste is being processed in sites with energy recovery at poorer levels of efficiency or no energy recovery at all.

Waste from all sources – disposed – landfill^{50,51}

Scotland remains some way off its 2025 target of 5% of waste from all sources sent to landfill and the most recent Climate Change Plan monitoring report describes it as off-track.⁴⁹ The recent technical annex to the consultation on the circular economy routemap also indicates that the target is at risk and that there has been insufficient progress to meet the target on current trends.⁵³

Data from 2018 suggests that 3.74m tonnes (32.1%) of waste was sent to landfill, down from 4.68m tonnes in 2011 (42.8%) and from 7.01m tonnes in 2005 though fairly stable since 2016.^{50,51} Soils represent almost two fifths (1.4 million tonnes) of the Scottish waste landfilled, followed by household and similar wastes (1.2 million tonnes) and sorting residues (0.7 million tonnes).⁵⁰ The majority of waste landfilled in Scotland in 2018 was of Scottish origin.

The available data for 2019⁷⁴ suggests a further decrease of 0.7 million tonnes (20% lower than 2018) of Scottish waste being disposed to landfill, with household and similar wastes decreasing by 36%. Using 2018 data on tonnes of recycling as a proxy (since this has changed slowly in recent years) suggests that landfill is likely to still represent in the region of 26% of all Scottish waste managed. In 2019, this reduction was particularly due to a shift towards disposal by incineration (which is still at the lower end of the waste hierarchy).

A total of 60,118 tonnes of Scottish Hazardous waste were disposed to landfill in 2018, 1.6% of all Scottish waste landfilled. The majority category was other mineral wastes e.g. asbestos (22,452 tonnes, 37.3%) followed by mineral waste from waste treatment and stabilised wastes (20,375 tonnes, 33.9%).⁵⁰

It is estimated that two thirds of packaging waste which currently ends up in landfill could be recovered.⁵⁶

Comparing to other countries (with caution since methodology differences have not been explored in detail), the EU 27 sent 20% of waste generated to landfill in 2018, down from 23% in 2010. However, the rates vary depending on waste category.

Household and municipal waste in particular decreased by 51% while sorting residues landfilled increased by 111%. The EU Landfill Directive⁷⁵ contains a 2035 target for 10% of municipal waste to be disposed to landfill. Austria, Belgium, Denmark, Finland, Germany, Luxembourg, the Netherlands, Norway, Slovenia and Sweden were already below this threshold in 2019 while the highest rate was over 90% in Malta.⁷⁶ In 2018, Eurostat estimated that around 15% of UK municipal waste generated was disposed to landfill compared to around 24% for the EU 27⁷⁷.

Waste incinerated in Scotland

This data considers all waste incinerated in Scotland, regardless of origin and excluding Scottish waste incinerated outwith Scotland. It includes both recovery and disposal.

The total quantity of waste incinerated in Scotland in 2020⁷⁴ was 1.26 million tonnes, up 38,000 (3.1%) from 2019 and up 855,000 (208%) from 2011. Over two fifths (41.8%) of this was recovered by co-incineration and the remainder by disposal. The share of incineration which is co-incineration is 33.3 percentage points down on 2018 due to new facilities becoming operational without an R1 licence. As noted previously, although they do not have an energy recovery accreditation this does not mean that none is taking place.

Wood was the largest category of waste incinerated (415,000, 32.8% of all waste incinerated) although less so than in 2019 (490,000, 40.0%) which is likely due to COVID-19 restrictions. Of the wood incinerated, 44% originated in the UK outwith Scotland compared to 4% in 2011.⁷⁴

Incineration of household and similar wastes has been increasing over the last four years and this is expected to be due to local authorities and waste management companies diverting waste from landfill ahead of the ban on biodegradable municipal waste to Scottish landfills in 2025^{14,78}.

The Scottish Government has recently published a number of reports relating to an Independent Review Of the Role Of Incineration in the Waste Hierarchy⁷⁹. These identify a short-term capacity gap when the ban on biodegradable municipal waste (BMW) entering landfill comes into force, which would be exacerbated if extended to non-municipal waste too. However the gap is reported to be short-term as Scotland moves towards more recycling and a circular economy. There is a likelihood of over-capacity in the longer-term and as a result, the independent review recommended that Scotland should limit further planning permissions for incineration infrastructure with the exception of remote and rural areas where a small amount of additional capacity could be justified to help meet the BMW ban.

Zero Waste Scotland's report on the Climate Change Impacts of Burning Municipal Waste⁸⁰ in Scotland suggests that incinerating municipal waste for energy recovery in Scotland led to 27% less carbon emissions in 2018 than landfilling the same waste. This is supported by other evidence on environmental impacts discussed in later sections of this report. It is important to note that this could change in future if the composition of waste itself changes, becoming less favourable over time.

Waste landfilled in Scotland

This data considers all waste landfilled in Scotland, regardless of origin and excluding Scottish waste landfilled outwith Scotland.

The total quantity of waste landfilled in Scotland in 2020⁷⁴ (excluding Scottish waste landfilled elsewhere) was 2.6m tonnes, a reduction of 390,000 tonnes (13.0%) from 2019 and 4.4m tonnes (62.9%) from 2005. The reduction was mainly due to a reduction in soils landfilled, decreasing by 340,000 tonnes (29.0%) since 2019, likely as a result of reduced construction due to COVID-19. The top three categories in 2020, combining to cover over four-fifths of waste landfilled were soils (834,000 tonnes, 31.9% of total); household and similar wastes (736,000 tonnes, 28.1% of total) and sorting residues (689,000 tonnes, 26.4% of total).

The amount of biodegradable municipal waste disposed to landfill was 691,000 tonnes, 26.4% of total (a decrease of 8,000 tonnes, 1.1% from 2019) and of hazardous waste was 28,000 tonnes, 1.1% of total. Scotland had an EU based target to reduce the quantity of biodegradable waste disposed to landfill to less than 1.26m tonnes by 2020³⁹ and has met this target since 2013. The Scottish

Government also plan to ban non-household biodegradable waste from entering landfill by 2025.⁷⁸

Waste imports and exports

In 2018, 606,874 tonnes of waste was imported to Scotland with 97% coming from the rest of the UK⁷⁴. This figure has increased 135% since 2012 and will capture only waste which passes through a waste management site. The true figure may be higher. Wood wastes are the most common type imported, representing over half. The 2019 data suggests this has continued to increase to 688,501 tonnes with other patterns being the same as 2018.⁵⁷

In 2018, 1.66 million tonnes of waste was exported (with the majority being recycling) from Scotland with 55% going to the rest of the UK and 41% to Europe⁷⁴. The amount of waste exported from Scotland has been increasing, by 61% from 2012 and by 331% since 2004. Ferrous metallic wastes (35%) and sorting residues (17%) are most commonly exported⁷⁴. The 2019 data suggests a reduction to 1.5 million tonnes mainly in exports to Europe. Other patterns remain the same as 2018.⁵⁷

International and European laws govern the import and export of waste and this is not an issue devolved to Scotland. Waste can only be exported for recovery and / or recycling and none of the material should be landfilled or dumped. Some news stories have suggested that this may not be the case in practice⁸¹ though it is not possible to source official information on this.

Household waste

Household waste is defined in the Zero Waste Plan – Guidance for Local Authorities⁸² as household collection rounds, other household collections such as bulky waste collections, waste deposited by householders at Household Waste Recycling Centres (HWRCs) and recycling points/bring banks.

SEPA publishes an annual official statistics summary of household waste generated in Scotland and managed by or on behalf of Scottish local authorities. This data⁶¹ is used to monitor Scottish Government household recycling targets and indicates that in 2020, 1.02m tonnes of household waste was recycled (including organics and preparation for re-use). However, the Scottish household waste recycling rate was 42.0%, down from 44.9% in 2019 although up 2.5 percentage points from 39.5% in 2011. This is the lowest on record since 2013 and is expected to have been

impacted by the COVID-19 lockdowns and other restrictions. The Scottish Government target of a minimum 60% recycling of household waste by 2020⁸³ was therefore missed.

Evidence from Zero Waste Scotland relating to 2014-2015⁸⁴, suggests that just under 60% of waste thrown into the non-recyclable kerbside bin could have been recycled using existing kerbside services. Even with changes in waste generated and recycling rates, it is still likely that a large amount of recyclable waste is being thrown away in non-recyclable collections.

The SEPA data⁶¹ shows that household recycling varies by material category with reductions for construction and soils (down 26,000 tonnes, 22%) and wood wastes (down 18,000 tonnes, 22%) and increases for glass (up 15,000 tonnes, 14%) and plastic (up 5,000 tonnes, 8%) between 2019 and 2020.

Household recycling rates in 2020 (including organics and preparation for re-use) varied from 18.4% in the Shetland Islands to 57.9% in Angus.⁶¹ Considering recycling alone, rates varied from 18.4% in Shetland Islands to 44.4% in Scottish Borders. Organics recycling ranged from 4.0% in Orkney Islands to 26.6% in Perth and Kinross. Prepared for re-use ranged from 0% in Clackmannanshire to 4.8% in East Lothian⁶⁰.

Of the waste recycled in 2020, 388,000 tonnes was composted up from 332,000 in 2011 but a reduction on 405,000 in 2019. The majority of composted household waste is vegetal.⁶¹

SEPA data indicates that the amount of Scottish household waste landfilled was 660,000 tonnes in 2020, down 98,000 tonnes (13%) from 2019 and 794,000 tonnes (55%) since 2011. The decreasing trend is primarily due to more waste being diverted from landfill to incineration and in part less waste being generated. Landfill rates varied from 0.3% in Scottish Borders to 65.1% in Na h-Eileanan Siar.⁶¹

A total of 748,000 tonnes of household waste was managed by other diversion from landfill, an increase of 171,000 tonnes (29.7%) on 2019. Most of the diverted waste was incinerated (606,000 tonnes, 81%, up 33.6% on 2019). Rates of diverted waste ranged from 0% in Moray to 59.8% in City of Edinburgh.

UK comparisons can be made on the basis of a slightly different harmonised definition of household waste. DEFRA have published a note explaining the

differences in recycling measures between UK countries⁸⁵. The main differences when compared to the Scottish data presented above are:

- Scotland's household waste measure includes soil, rubble and plasterboard while the UK harmonised measure does not.
- The UK measure includes waste sent to non-PAS 110 / non Anaerobic Digestion Quality Protocol facilities, waste sent to non-PAS 100 / non Compost Quality Protocol facilities and metal recovered after incineration which the Scottish measure does not.

The UK harmonised data suggests that in 2020, Scotland recycled 956,000 tonnes of waste from households, 41.0%. Within the UK, Scotland (41.0%) and England (44.0%) have lower household recycling rates than Wales (56.5%) and Northern Ireland (49.1%).⁵⁵ This measure is in line with the Waste Framework Directive (Directive 2008/98/EC)⁴⁶ which specifies that member states must meet a recycling target of 50% by weight for the recycling of waste materials such as paper, metal, plastic, and glass from households. The data suggests that Scotland and the UK are not achieving that target. Within Europe, Germany (68.3%), Austria (61.8%), Slovenia (59.3%), Netherlands (56.9%), Switzerland and Luxembourg (52.8%), Belgium (52.0%) and Italy (51.4%) had achieved the target in 2020⁸⁶.

Illegal dumping / exporting of waste

There have been a number of recent news stories relating to criminal activity in the waste sector⁸⁷. For example, reports by the BBC about organised crime gangs illegally burying thousands of tonnes of waste across Scotland.

As at 31 January 2022, SEPA was investigating 234 cases of waste crime with 31 of highest concern due to organised crime links or potential for severe environmental damage⁸⁸. SEPA estimate that 15% of organised crime groups in Scotland now have interests in environmental businesses.

In 2015, illegal waste activity was estimated to have cost over £600m to the economy (e.g. lost tax revenue) in England alone with the cost of fly-tipping to the private sector the biggest contributor (£166m)⁸⁹. The most recent report⁹⁰ found that this had increased to £924m in 2018/19 (up 53%) with the contribution from fly-tipping costs to the private sector rising to £330.9m and the cost to the public sector

of illegal waste sites being the second greatest contributor at £185.6m (up from £75m in the 2015 study).

An Independent Review into Serious and Organised Crime in the Waste Sector commissioned by DEFRA in 2018⁹¹ found that perpetrators are often involved in other serious criminal activity.

The Environment Agency undertook a National Waste Crime Survey in 2021⁹² (sample self-selected and answers subjective) and concluded that waste crime in England was perceived to be widespread with 18% of all waste estimated to be illegally managed.

From 1 April 2014, there are fixed penalties of £80 for littering and £200 for fly-tipping with police, local authorities and public bodies able to issue penalties.⁹³ If a case goes to court, someone caught littering could have to pay up to £2,500 and someone convicted of fly-tipping up to £40,000 and / or imprisoned for up to 12 months. SEPA and Revenue Scotland may also recover landfill tax from illegally deposited wastes⁹⁴.

In relation to fly-tipping, data published by the Scottish Government indicates that there were 2 convictions for fly-tipping offences in 2019-20, down from 13 in 2014-15. In addition, there were a further 15 non-court disposals i.e. direct measures issued by either Police Scotland or the Crown Office & Procurator Fiscal Service, down from 62 in 2011-12. Information on fixed penalty notices issued by other public bodies is not held by the Scottish Government.⁹⁵

In terms of littering, there were no convictions in 2019-20 and 3 in 2018-19, down from 22 in 2010-11. A total of 69 people received a non-court disposal for littering in 2019-20, down from 2,123 in 2010-11.

In addition, Keep Scotland Beautiful undertakes annual environmental quality surveys in partnership with Scottish local authorities⁹⁶. In 2020/21, less than a fifth of the 10,869 sites sampled were litter free, over half had food and drink litter and 1 in 10 residential areas have unacceptable levels of litter. They also found that more deprived areas have higher levels of unacceptable litter. Keep Scotland Beautiful also conducted a Scottish Litter Survey in 2021⁹⁷ which found that 88% of respondents agreed that litter was a problem in their nationally and 70% agreed that it was a problem in their area.

Limited data was found on the illegal export of waste but this may be worth further analysis in future given news and interest in the topic such as the case of a recycling company being fined for the illegal export of household waste⁹⁸. The extent of the problem is unclear. However, DEFRA has been consulting (on behalf of the UK and devolved administrations) on the introduction of mandatory digital waste tracking⁹⁹ to make it easier for legitimate companies to comply with reporting as well as harder for rogue operators to commit waste crime, including illegal waste exports. This is referred to in recent Scottish consultations on a circular economy which is discussed in more detail in the resource and material use / re-use section. Improvements in waste tracking should also lead to improvements in data quality.

This review considered only publicly available, official sources of data on waste crime. There may be other illegal activities, e.g. travelling across borders to dispose of waste, that are not captured here. Further analysis in the area of illegal waste activity would be useful.

Summary

Scotland missed its target of 60% of household waste being recycled by 2020 and is off- track to achieve its target of 70% of waste from all sources (household, construction and demolition, commercial and industrial) being recycled by 2025. The most recent data for 2018 puts the rate at 60.7% up from 52% in 2014. Recycling rates are lower in Scotland than other parts of the UK and a number of other European countries including Germany.

The household recycling rate was 42% in 2020, down from 44.9% in 2019 although up from 39.5% in 2011. There is variation between local authorities in rates of household recycling, landfill and incineration. Recycling rates are lower for plastic packaging than most other packaging types.

The data also shows that Scotland remains some way off its 2025 target of 5% of waste from all sources being sent to landfill although rates of disposal via landfill are falling, from 42.8% of all waste in 2011 to 32.1% in 2018. More positively, Scotland had an EU based target to reduce the quantity of biodegradable waste disposed to landfill to less than 1.26m tonnes by 2020 and has met this target since 2013.

Rates of incineration are increasing. Incineration with energy recovery represented 4.2% of waste from all sources in 2018, up from 2.5% in 2011 (an 83.8% increase in

this category). While disposal via incineration represented 2.3% of waste from all sources in 2018, up from 1.4% in 2011 (a 67.2% increase in this category).

In the most recent years, incineration by disposal has been increasing faster than with recovery. These changes may be partially due to local authorities and waste management companies diverting waste from landfill ahead of the ban on biodegradable municipal waste to Scottish landfills in 2025. They may also mask the fact that disposal via incineration has a particular definition which does not necessarily mean that no energy recovery is taking place. Further analysis may be helpful to understand the level of energy generation that takes place at facilities categorised under disposal.

Exports of waste have increased by 61% between 2012 and 2018, with the majority being exported recycling. Further analysis would be required to analyse export outcomes.

Illegal waste activity appears to be a concern with potentially large costs to the economy. However, further analysis would be needed to understand the issues in more detail.

Impact of waste

This review has focused on health and environmental impacts. However, there are a range of other impacts such as odour and noise which could be considered in future analysis.

Health

WHO¹⁰⁰ note that there a range of different ways in which waste can present a risk to population health. However, unlike other issues, such as air pollution, any health impacts from waste management are likely to only affect a small part of the population such as those living in the vicinity of the waste sites.

Living near landfill or incinerators can present health risks through inhalation of substances emitted by the site or contact with water or polluted soil (either directly or through consumption of products or contaminated water).¹⁰⁰ However, there are strict regulatory controls requiring that modern facilities are designed and operated in a way which has no significant impact on the environment or human health.

Reviews by the Health Protection Agency¹⁰¹ in England have concluded that living close to a well-managed landfill site does not pose a risk to human health although they emphasise the importance of continuing research. However, there have been instances of issues relating to landfill sites. For example, in Staffordshire where Walley's Quarry was found to have exceeded WHO hydrogen sulphide guidelines at points with an impact on local health.^{102, 103, 104, 105}

The Independent Review Of the Role Of Incineration in the Waste Hierarchy discussed above included a Rapid Evidence Review on Reported Health Effects of Municipal Solid Waste Incineration undertaken by Public Health Scotland¹⁰⁶. This considered whether the conclusions from Health Protection Scotland's 2009¹⁰⁷ study should be amended in light of more recent evidence.

The rapid review reaffirmed the conclusions of the original work that there was a lack of consistent or conclusive evidence to conclude whether there is an association between (health effects to the general population and waste incineration. However, the risk to human health from newer incinerators, operating under current regulations, was likely to be minimal. Both reports advised taking account of

background ambient air quality and wellbeing in assessing the potential impact of any new facilities.

Public Health England and Public Health Wales's current view on incineration facilities are similar and find that 'modern, well run and regulated municipal waste incinerators are not a significant risk to public health. While it is not possible to rule out adverse health effects from these incinerators completely, any potential effect for people living close by is likely to be very small'^{108,109}.

Each of the above reports summarises a range of research which is not repeated here. This evidence review was not designed as a systematic review of health literature and further analysis could be undertaken in the future to review the range of evidence from an ESS perspective.

Environment

The main environmental concerns in relation to waste management is that emissions might contribute to climate change or, historically, cause increases in acid rain. Waste may also be a pressure on species, habitats and water quality.

Climate change impacts arise due to carbon emissions from the waste generation and management industries. A study by Eunomia on behalf of Client Earth, published in 2021, found that incineration recovery / energy from waste (EfW – 4.3% of Scottish waste from all sources in 2018) has significant carbon benefits over landfill (32.1% of Scottish waste from all sources in 2018) and this could be further improved by pre-treatment to remove plastics for recycling. This could lead to a change from EfW being a net contributor of emissions in 2035 to having a net benefit. The report also recommends developing heat networks to maximise the benefits of energy generated through EfW¹¹⁰.

A recent independent review⁷⁹ has recommended that Scotland should limit further planning permissions for incineration infrastructure given plans to increase recycling and move to a circular economy which should reduce waste generation and the amount of waste reaching recovery or disposal management options. This made an exception for remote and rural areas where a small amount of additional capacity could be justified to help meet the BMW ban.

Zero Waste Scotland analysed the impact of all waste produced and managed in Scotland (not just household waste) over 2011 to 2018⁶⁷. The data takes account of

the carbon benefits from recycling (avoided production of virgin materials) and energy from waste (avoided fossil fuel generation) but reuse and repair activities are largely unaccounted for.

In 2018, the overall impact was nearly 10.6 metric tonnes of carbon dioxide equivalent (Mt CO₂e) (of which 2.6 Mt CO₂e was food waste), down from 15.2 in 2011 (30% reduction), with the decrease most pronounced for non-household waste and largely coming from reductions in the carbon impact of production of materials.

Between 2011 and 2018, 21% of Scotland's waste (in weight terms) originated from households. However, the share of its carbon impact was substantially higher (55% in 2018) as household waste has a significantly higher carbon intensity than non-household waste, being made up of a higher proportion of high carbon materials such as food, waste, paper and plastics. Between 2011 and 2018, the carbon intensity of non-household waste fell by 41% compared to just 7% for household waste.

Zero Waste Scotland's report also considers which materials have the greatest carbon impacts. It finds that the top five waste materials by weight in 2018 account for 71% of all waste but only 34% of carbon impacts. Meanwhile the top five materials by carbon impact account for 20% of total weight but 71% of impact. Animal and mixed food waste alone accounts for 25% of carbon impacts but 5% of waste by weight. Next is textile waste with 17% of carbon impacts but 1% of waste weight. The remaining three in the top 5 carbon impact are plastic wastes, paper and cardboard wastes, and discarded vehicles.

SEPA data⁶¹ indicates that the carbon impact of Scottish household waste generated (contributing the majority of carbon impact) and managed^{xiv} in 2020 was 5.8 million tonnes of carbon dioxide equivalent (TCO₂e), which is equivalent to 1.07 TCO₂e per person. This was an increase of 179,000 TCO₂e (3.2%) from 2019, and a reduction of 0.92 million TCO₂e (13.6%) from 2011.

^{xiv} SEPA's measure of carbon impact refers to the whole-life carbon impacts of waste, from resource extraction and manufacturing emissions, right through to waste management emissions. Most carbon impacts are associated with the waste generated (around 90% - table 14 of above report).

Carbon impacts per person ranged from 0.89 TCO₂e in Angus to 1.35 TCO₂e in Argyll and Bute. Overall, carbon impacts ranged from 34,628 TCO₂e in Na h-Eileanan Siar to 788,987 TCO₂e in Glasgow City.

The carbon impact of a tonne (carbon intensity) of household waste⁶¹ has been steadily declining since 2011 (down 7%). This is largely a result of improved recycling rates, particularly for high impact waste materials such as non-ferrous metallic wastes and glass wastes, and a reduction in waste generated^{xv} and reduced landfilling of biodegradable waste.

Data from the Greenhouse Gas Inventory¹¹¹ focuses only on the carbon emissions from waste management (waste disposed of to landfill or incineration excluding incineration with energy recovery but including waste from commercial and construction sectors as well as household and waste water handling). This is the data which will be used to monitor climate change targets and is a different definition and source to the SEPA information above.

In recent years, around 3% of Scottish Greenhouse Gas emissions come from the waste management sector. The latest data indicates that these emissions declined significantly from 5.8 MtCO₂e per year in 1990 and 6.1 MtCO₂e per year in 1995 to 1.4 MtCO₂e per year in 2013, and have remained relatively stable in recent years, with a value of 1.5 MtCO₂e in 2019 and 1.4 MtCO₂e in 2020 (representing around 3% of overall emissions). The reduction of 76.9% over the longer term (between 1990 and 2020) is largely due to methane capture and oxidation systems within landfill management. Almost all emissions in the waste management sector in 2020 were from methane (1.2 MtCO₂e).¹¹²

To achieve the emissions envelopes set out in the 2020 Climate Change Plan update, which set out updated emission envelopes for the years from 2020 onwards, this must be reduced to 0.9 MtCO₂e by 2025 and 0.7 MtCO₂e by 2032.⁴⁹ The most recent monitoring report notes that the sector was outside its emissions envelope for

^{xv} Household waste generated was 2.6m tonnes in 2011, reducing to 2.5m tonnes in 2012 and then remaining stable between 2.4m and 2.5m in every year since.

2019 with a value of 1.6 MtCO₂e^{xvi} compared to the aim of 1.2 MtCO₂e^{xvii}. Scottish Government data shows that emissions from waste management have been relatively static in recent years following large reductions.¹¹³

The monitoring report on the climate change plan also suggests that four of the five policy outcome indicators for the waste sector are off track⁴⁹. These include the indicators for total amount of landfilled waste, household and non-household food waste reduced and total waste generated as well as an indicator on the number of closed landfill sites with exploratory landfill gas capture / flaring. Only the indicator on the total amount of landfilled biodegradable waste was found to be on track.

Carbon emissions from incineration with energy recovery or co-incineration are not included in the waste management sector in the Greenhouse Gas Inventory and are, instead, covered in the energy sector. It is important to be aware that incineration with energy recovery or co-incineration made up almost two-thirds of waste generated in Scotland that was incinerated in 2018. However, only 11% of all Scottish waste managed other than via recycling. It has not been possible to separately identify carbon emissions for incineration with energy recovery or co-incineration.

DEFRA's 2004¹¹⁴ report found that management of waste contributed less than 2.5% to UK emissions to air and less than 0.5 % of UK emissions to water (though acknowledged that water data quality was poor). Exceptions are methane emissions to air where waste management accounts for 27% of the UK total emissions to air and cadmium where waste management accounts for 10%.

The UN Environment Programme finds that methane is the primary contributor to the formation of ground level ozone, exposure to which causes 1m premature deaths globally every year. It is also a powerful greenhouse gas and, over a 20-year, period

^{xvi} 1.5 MtCO₂e is reported in the Scottish Greenhouse Gas Statistics 2019 publication at <https://www.gov.scot/publications/scottish-greenhouse-gas-statistics-1990-2019/pages/8/> (accessed August 2022).

^{xvii} The emissions envelopes for 2020 and beyond are contained in the CCP update published in 2020. Given the lag time in producing emissions statistics the most up to date data is for 2019. As a result, comparison is currently made to the envelopes published in the earlier 2018 plan. When the 2020 data is published, comparison can be made to the new envelopes.

is 80 times more potent at warming than carbon dioxide. They note that methane has accounted for roughly 30 per cent of global warming since pre-industrial times and is proliferating faster than at any other time since record keeping began in the 1980s.¹¹⁵

SEPA also produces experimental statistics from the Scottish Pollutants Release Inventory¹¹⁶. In 2020, the second most common release of emissions (in terms of number of sites) 'above reporting threshold' (ART) was methane from waste / waste-water management. However, in terms of volume, methane emissions ART from the waste / waste-water management sector were the greatest at 20,926,548 kg.

ART emissions to air of carbon dioxide, methane and nitrous oxide from the SEPA regulated sites which report to the SPRI have been decreasing since 2007 (methane is down 60% to 2020), though have been more stable since 2016. Carbon dioxide emissions ART from the waste / waste-water management sector have, however, been increasing and this is reported to be partly due to increases in incineration of waste.

Waste crime

Illegal dumping or exporting of waste have particular health, environmental and cost implications. For example, mislabelling of waste sent to landfill can result in criminals cheaply disposing of hazardous substances (which should cost £99 a tonne in tax on top of the landfill charge rather than just £3 for less polluting materials) causing pollution to the environment which could last decades and potential health impacts. While some wastes can be legally exported for processing and recycling, it is illegal to export untreated waste from the UK for disposal and to export hazardous waste to non-OECD countries.

Misrepresentation of illegal waste can be attractive to criminals for cheaper processing elsewhere. If that waste is not then managed properly, it can result in significant damage to the environment and human health. Illegal landfills can result in run off causing pollution to rivers and drinking water supplies as well as air quality and human health impacts.^{117,118}

Summary

Most recent studies suggest that the health impacts of living near a modern, well-managed landfill or incineration site are likely to be minimal. However, continued evaluation of sampling and analysis, including wider air quality and wellbeing impacts is needed, alongside the consideration of risks posed by sites that are not modern or well managed.

The carbon impact of a tonne of household waste has been steadily declining since 2011 as a result of improved recycling rates, reduction in waste generated and reduced landfilling of biodegradable waste.

The top five waste materials by weight in 2018 accounted for 71% of all waste but only 34% of carbon impacts while the top five materials by carbon impact accounted for only 20% of total weight but 71% of the impact. This suggests the need to consider not just reducing overall waste generation but to focus on particular sectors or materials or parts of the waste management process that have the greatest carbon impacts.

Carbon emissions from waste management (excluding emissions from incineration with energy recovery which are captured under the energy sector) have declined significantly between 1995 and 2013 and then remained relatively stable. Almost all emissions in the waste management sector are from methane. It is too early to tell whether the target of reducing to 0.9 MtCO_{2e} by 2025 will be achieved.

Waste crime can cause environmental and human health impacts, despite the motivation largely being economic¹¹⁸. Waste which is not managed properly, for example illegal landfills, can result in run off causing pollution to rivers and drinking water supplies. It also removes the legitimacy of legal waste handling businesses, causing a knock-on effect to the efficiency of waste management practices.

Resource and material use / re-use

Circular economy

Limited data was found on levels of progress in re-use of resources and materials. In 2016, the Scottish Government published 'Making Things Last: A Circular Economy Strategy for Scotland' which set out priorities for using resources more efficiently, reducing waste, encouraging re-use and increasing recycling over the period to 2020¹.

A consultation on the Scottish Government's proposed Circular Economy Bill took place in 2019 with a Scottish Government response in 2020. However, the COVID-19 pandemic meant that the Bill is now expected to be introduced in the current session (2022-23). A new consultation (building on the previous one) was launched on 30 May 2022 together with a consultation on a Route Map to 2025^{4,5}.

Although 3% of Scottish Greenhouse Gas emissions come from the waste management sector, around 80% stems from consumption of materials, goods and services. This illustrates the importance of sustainable resource use. The proposals in the consultation include introducing statutory targets on consumption reduction, reuse and recycling with a supporting monitoring framework which would help track progress in this area going forward. The consultation document includes more information on its range of legislative proposals.

The Scottish Government's Resource Efficient Scotland programme with Zero Waste Scotland also supports organisations to use energy, materials and water more efficiently.

Prior to the Circular Economy consultations, a single-use carrier bag charge had already been introduced in 2014; microbeads were banned in 2018 and plastic-stemmed cotton buds from October 2019. The carrier bag charge doubled from 5p to a minimum of 10p in April 2021 and legislation introducing restrictions on certain single-use plastic items came into force on 1 June 2022.

From August 2023, a Scottish Deposit Return Scheme will also be implemented although the date of introduction has been delayed from an original plan of April 2021¹¹⁹.

The Scottish, Welsh, Northern Irish and UK Governments have consulted^{10,120} on introducing a UK Packaging Extended Producer Responsibility (EPR) System, as a way of ensuring that producers are financially or operationally responsible for the environmental impacts of their products in line with the polluter pays principle. The response to the above consultation and the new circular economy consultations indicate that the Scottish Government plans to develop legislation to fully implement EPR schemes with the first, for packaging, expected to begin from 2024.

Some of the concerns about the current system noted in the Scottish¹²¹ and UK¹²² Impact Assessments relating to the extended producer responsibility consultation include:

- System transparency e.g. actual fate of materials and visibility of how PRN/PERN fees are used.
- Over-reliance on export markets.
- The system was designed to encourage an increase in recycling, not the design and use of more sustainable and recyclable packaging.
- Reporting by material type and not greater detail e.g. polymer type.

Material flow accounts

In 2021, Zero Waste Scotland published a new report called 'The Scottish Material Flow Accounts'. This report considers the size of Scotland's consumption footprint and the headline finding was that, on average, in 2017 each Scottish person consumed 18.4 tonnes of materials every year. This is higher than the 13.3 tonnes global average and the EU-28 average of 14.2 tonnes. This can be also compared with 8 tonnes per capita a year which Finnish research suggested as a sustainable level of material use¹²³.

The UK does not publish data for the measure above but does provide data on domestic material consumption^{xviii}. This was 8.5 tonnes per capita in the UK compared to 12.2 tonnes per capita in Scotland and 13.3 tonnes per capita for the EU-28. The study undertook regression analysis to attempt to understand why

^{xviii} The mass of materials consumed including only the physical weight of traded goods. In contrast the earlier data relates to raw material consumption which also includes the raw material requirements of traded goods.

Scotland's figure is higher than that for the UK. This found that population size and the number of days average temperature falls below 18 degrees Celsius were the most significant factors. Thus the report suggests that colder countries need more fuel to heat their homes, contributing to a higher domestic material consumption per capita. Similarly, it suggests that Scotland's smaller, more rural population may need more materials for shared amenities.

The work was independently peer reviewed and found to be appropriate and robust although the report does recognise that there are areas of uncertainty which it intends to improve in the future. A better understanding of material flows is one way in which the transition to a circular economy can be supported.

Summary

Limited data was found on levels of progress in re-use of resources and materials beyond the recycling statistics covered in other parts of this review. However there are a number of policy proposals underway in this area relating to the circular economy, deposit return scheme and extended producer responsibility which will be important to follow going forward.

Waste data

Throughout the baseline evidence review, some data challenges were identified which are acknowledged by the producing organisations. For example, data on waste generation and waste management from all sources are derived using different methodologies, leading to slight differences in the total values and the possibility of double counting of some data such as incinerator outputs. This is, in turn, different to the methodology for producing household waste data where there is an attempt to balance the volumes generated and managed. Similarly, other sections of this review have described the issues faced in monitoring the food waste target.

SEPA, Zero Waste Scotland and Scottish Government have been considering how to address issues and gaps in the waste datasets and it will be important to follow developments and to further explore the methodologies used in ESS analysis going forward.

6. Summary of Next Steps

This baseline review identified a wide range of possible issues for further analysis, including progress against targets, waste crime, varying trends across local authorities, deep dives into specific areas such as clinical waste and exploring the impact of new policies.

However, for the purposes of setting out initial analytical priorities, ESS will focus on:

- Illegal disposal and management of waste;
- Progress against waste and recycling targets and the development of the circular economy.

ESS' Strategic Plan describes how issues will be prioritised for further analysis according to a range of criteria, including:

- Importance – the size and risk of the potential effect on the environment and/or public health; the urgency with which improvement is required;
- Nature and Scope – recent trends in environmental performance; whether the issue of concern appears to be systematic and/or longstanding;
- Neglect – whether there has been action taken on the issue of concern, or further action is planned in the near future; and
- Added-value – the contribution we could make, considering whether other monitoring, oversight or scrutiny bodies are planning to take, or could take, action to address the issue of concern.

The resource use and waste analytical priorities take account of that scheme and recognise the importance of these issues. For example, the potential impact that waste generation, management and illegal waste activity can have on the achievement of other environmental objectives (e.g. climate change and water) as well as the fact that most targets are at risk of not being achieved. In keeping with the prioritisation process, the contributions of other actors and added value that ESS can bring to an area will also be considered, in deciding where to focus future work.

Although ESS intends to focus on two issues in the first instance, other issues will be retained on a list for potential future analysis and horizon scanning in line with the stages of monitoring and analysis work set out in the strategic plan.

7. Summary of key sources

The end notes to this review provide details of the references and sources used throughout the document. This section is intended to provide a shorter note of those reports (in future iterations) and data sources which have been identified as likely to be important for an ongoing understanding of resource use and waste in Scotland.

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