



Department
for Environment
Food & Rural Affairs

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Waste & Resources Evidence Plan

Policy portfolio: Climate, Waste & Atmosphere

Policy area within portfolio: Waste Programme

Timeframe covered by Evidence Plan: 2013/14 – 2017/18

Date of Evidence Plan: March 2013

This evidence plan was correct at the time of publication (March 2013). However, Defra is currently undertaking a review of its policy priorities and in some areas the policy, and therefore evidence needs, will continue to develop and may change quite rapidly. If you have any queries about the evidence priorities covered in this plan, please contact StrategicEvidence@defra.gsi.gov.uk.

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PB 13932

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1. Policy context

What are the key policy outcomes for the policy programme/area?

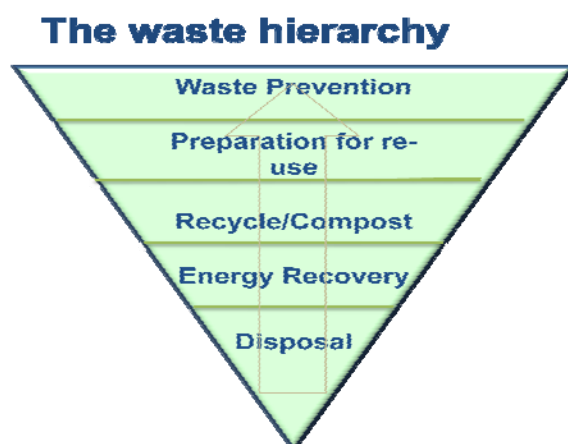
Defra Ministers' overarching priorities include a focus on promoting growth and improving the environment. The overall vision in this area is a drive towards a zero waste economy. The key waste policy outcomes emerging from this are:

- A. Resource and waste management contributing to sustainable economic growth
- B. A reduction in the harmful impacts of resource use and waste on human health and the environment
- C. Households and businesses being satisfied with their resource and waste services

Government's role is to support and enable a thriving sustainable waste management sector, helping to reduce costs for businesses and households and minimise the impact on human health and the environment.

As well as less waste, the vision includes a long-term market for materials extracted from the waste stream, with significant opportunities for growth in the collection, recycling, reprocessing and recovery of waste. The UK's waste and recycling sector is currently valued at over £12 billion and is forecast to grow by approximately 3-4% a year. The 2010 Energy & Utility Skills report estimated that the waste management and recycling industry would grow by 37% by 2020. These industries are central to sustainable economy growth.

Government policy is guided by the 'waste hierarchy' (Article 4 of the Waste Framework Directive (2008/98/EC)) which assists sustainable waste management. The hierarchy gives top priority to waste prevention, followed by reuse, recycling, other types of recovery (including energy recovery), and last of all disposal (e.g. landfill). Defra leads on waste policy in England and in international negotiations. Other government departments, agencies and wider industry bodies have an important role to play in delivering specific aspects of waste policy and the devolved administrations have developed their own specific policy and implementation plans. This evidence plan has been developed to cover English and Welsh evidence interests.



The Review of Waste Policy in England (June 2011) targets those waste streams associated with carbon emissions and wider environmental impacts. In many cases, carbon acts as a good proxy for the overall environmental impacts of waste: generally speaking, the higher up the waste hierarchy waste is treated, the smaller the greenhouse gas impacts. The 2010 Strategy on Hazardous Waste Management in England sets out the principles of managing hazardous waste, including how to move it up the hierarchy and facilitate the provision of infrastructure for its management.

Robust evidence is fundamental to delivering these policy outcomes and to determining when it is necessary for government to intervene. As the resource management sector continues to evolve, the policy that underpins this transformation will be highly dependent on more complete and regularly updated information on the flows and fates of materials through the economy, life-cycle analysis of products and continued investigation of economic and environmental impacts. Social research into individual behaviours has featured in our work on waste prevention but we now need to explore the wider societal and political-economic context.

The key objectives and activities delivering these policy outcomes are outlined below.

Resource and waste management contributing to sustainable economic growth

- *A1. Waste Prevention:* Developing a national waste prevention plan (EU requirement under the revised Waste Framework Directive) to be published by December 2013.
- *A2. Food waste:* Reducing and sustainably managing food and packaging waste in the hospitality and food service sector through delivery of the targets in the Hospitality and Food Service Agreement and action on food waste reduction in food supply chain and in households.
- *A3. Energy from waste (EfW):* Optimising the EfW role in the waste hierarchy through implementing the Anaerobic Digestion (AD) Action Plan, reducing barriers to the development of the AD sector.
- *A4. Driving selected waste streams from landfill and moving waste streams up the Waste Hierarchy:* Improving knowledge on how best to move materials up the hierarchy, understanding the data, waste streams, markets and other issues.
- *A5. Responsibility deals:* Implementing and evaluating initiatives to reduce waste and move it higher up the hierarchy in a number of specific business sectors by helping develop good practice; exploring scope to improve recycling collections for SMEs; improving the environmental profile of sectors with responsibility deals in place; achieving consistent and proportionate performance.
- *A6. Support for the operation of the UK recycling market:* Publishing and implementing a quality action plan to improve the quality of recyclate; finalising regulations for

Material Recovery Facilities (MRFs) to improve the quality and transparency of recyclate output; reviewing all Producer Responsibility Regulations to improve coherence and effectiveness and reduce burdens.

Reduce the harmful impacts of resource use and waste on human health and the environment

- *B1. Reduce single use carrier bags:* Exploring options for reducing single use carrier bags in England.
- *B2. Waste infrastructure policy and delivery:* Implementing the outcome of the infrastructure policy review; providing technical and commercial support and guidance to Local Authority residual waste treatment projects; monitoring the delivery and capacity of infrastructure against future demand; reviewing the performance of Local Authorities receiving infrastructure grants (including identifying cost savings to PFI/PPP infrastructure projects); developing a Waste Management Plan for England to be published by end of 2013.
- *B3. Implementation of revised Waste Framework Directive:* Implementing waste hierarchy review guidance; negotiating criteria for end-of-waste including biowaste; monitoring overall achievement of the revised Waste Framework Directive deadlines and targets, including the 50% household waste recycling target and 70% construction and demolition waste recovery target.
- *B4. Ensuring environmental protection, through the environmental permitting regime for waste and removing unnecessary burdens:* Monitoring the implementation and enforcement of legislation for the determination of applications for permits and the registration of exempt waste operations and associated compliance assessment by the Environment Agency; negotiating, transposing and implementing EU Directives and UK waste policy into legislation while avoiding unnecessary or disproportionate burdens on regulated businesses and other operators; ensuring waste management services remain resilient (through contingency and emergency planning).
- *B5. Compliance with Basel Convention, Waste Shipment Regulations, ship recycling and implementation of the Hazardous Waste Strategy:* Negotiating and implementing changes to the Convention (hazardous wastes); negotiating and transposing the EU Regulation on ship recycling; negotiating and implementing changes to the EU definition of hazardous waste (including concentration limits for Persistent Organic Pollutants); ensuring an acceptable level of compliance with the hazardous waste controls and waste shipment regulations.
- *B6. Better regulation:* Integrating different regulatory requirements; enhancing the evidence base for the proportionate control of waste recovery and disposal operations; understanding the motivations for waste crime and introducing measures that act as a deterrent and incentivise compliance.

Households and businesses being satisfied with their resource and waste services

- *C1. Effective and efficient local authority waste services and procurement:* Supporting more efficient procurement of waste services and reviewing joint working legislation as required (part of the Red Tape Challenge).
- *C2. High quality services to local authorities and SMEs:* Supporting and evaluating reward and recognition schemes along with the weekly collection support scheme; exploring and identifying good practice and reviewing the Local Authority Business Recycling and Waste Services Commitment; ensuring emergency plans cater for disruption to waste management services.

2. Current and near-term evidence objectives

What are the current and near-term objectives for evidence and how do they align to policy outcomes?

Waste policy activities cover a wide range of issues and economic sectors. Our evidence programme reflects the prominence of economic growth and environmental objectives in the rationale for waste policy interventions, the need for better evidence-based interventions further up the 'waste hierarchy' and the delivery of improved customer service. The aim is to achieve less waste as well as improve resource management techniques that contribute to sustainable economic growth.

A number of key players contribute to the evidence base that feeds into policy activities. In particular, the Waste & Resources Action Programme (WRAP) provides the majority of evidence to a new collaborative initiative established with Defra, the Environment Agency, the Welsh Government and DECC to help coordinate evidence gathering. The *Waste, Resources and Sustainable Evidence* (WReSCE) programme is described further in Section 4. WRAP is a not for profit company limited by guarantee funded by Defra and the Devolved Administrations. The work outlined in this evidence plan describes Defra's waste evidence activities whilst drawing attention to important initiatives being carried out by partner organisations in the collaboration.

Defra's waste evidence activities are multi-disciplinary and include R&D and non-R&D (e.g. data collection) investments. Local authority collected waste arisings are well monitored, but data for Commercial and Industrial (C&I), Construction and Demolition (C&D) and mining wastes (which collectively amount to around 90% of the total arisings) are more difficult to obtain. Our most significant and urgent evidence challenge is the generation of robust estimates on the prevention, flow and fate of different waste material streams across the economy. Defra is working with a range of bodies to improve data provision, e.g. with the Environment Agency to ensure that their Electronic Duty of Care project will reduce burdens to business and deliver an important new data source on

business waste generation. Further evidence can then build on those underpinning data to inform policy.

The waste evidence team includes scientists, economists and statisticians, with access to social and operational research expertise. A multi-disciplinary approach is used to inform where government intervention can be targeted to best achieve policy objectives. Increasingly our externally commissioned projects are managed through partnership arrangements, mainly with Defra-funded organisations. We also work with other funders, such as Research Councils, devolved administrations and the EU. Learning from work commissioned elsewhere and coordinating joint evidence activities is a continuing priority.

It is important to keep sight of existing evidence; our own, that of our partners and work funded by others. Maintenance of our extensive internet-based information access system, *Wastenet*, helps ensure we retain access to existing information and focuses our resources on filling gaps and building on our knowledge base.

A key evidence source is the *WasteDataFlow* web-based system which collates real-time data on local authority collected waste arisings across the UK. It is acknowledged as an important monthly source of data on progress towards the revised Waste Framework Directive household recycling rate target. It also provides over 20,000 reports per year to the public and local authorities. Planned improvements will further increase robustness, e.g. a more accurate reject rate at MRFs and its impact on recycling rates.

Near-term objectives for evidence aimed at specific policy issues are summarised below.

Resource and waste management contributing to sustainable economic growth

Our top near-term evidence priority supporting this policy outcome is waste prevention. We recently reviewed the evidence base on business waste prevention, following an earlier review of the evidence on household waste prevention. This showed waste prevention is viewed by businesses as one facet of resource efficiency, rather than an end in itself.

Evidence work on waste prevention is viewed in the context of wider resource efficiency. Initial priority attention has been given to the following areas of evidence work:

- *Supporting choosing the appropriate level of ambition:* Current effort is focussed on preparing a tool drawing on multi-disciplinary evidence to calculate marginal abatement cost (MAC) curves for various aspects of waste prevention, together with a dataset to allow comparison of the effectiveness of a range of policy actions.
- *Establishing a baseline on reuse and repair:* We are estimating the status and size of the UK repair market, examining the diversity and effectiveness of how society gets rid of 'stuff' through reuse and repair channels, leading to an assessment of reuse market demand and potential.

- *Biodegradable content of waste*: Infrastructure development decisions, in particular on energy from waste, depend on work to examine the biodegradable content and degradability potential of residual waste arisings and the potential for carbon sequestration (e.g. wood waste in landfill).

Further work is required to understand the relative economic growth opportunities of different recovery options (e.g. methane capture, incineration, anaerobic digestion) based on the fate of the fossil and biogenic components of the residual stream. This includes modelling the environmental and economic components to allow future analysis of scenarios by varying assumptions and input parameters. This work is being carried out jointly with DECC.

A large portfolio of evidence on food and drink waste, responsibility deals and the recycling market is being managed by WRAP in close co-operation with the Defra waste evidence team. This work covers evidence on food waste prevention, collection and reprocessing; resource efficiency in the construction and refurbishment sectors; boosting reuse, recycling and reprocessing of household and business waste; supporting the creation of high value markets for recyclate; and engaging with consumers and businesses to change behaviour. Much of this work has resonance with initiatives carried out under the Food and Sustainable Economy Portfolio, illustrating the importance of a cross-cutting evidence perspective between different Defra business areas.

The waste evidence team is also looking at the economics of recycling, including the role of quality, exports, and material flow, e.g. using systems thinking to model recycling of plastic packaging.

Reduce the harmful impacts of resource use and waste on human health and the environment

Our main evidence priorities under this heading are centred around three areas of work: *supporting the implementation of the waste hierarchy*; collating high quality *waste arisings and compositional data* in a format that facilitates its use in human health and environmental impact assessments; undertaking a variety of field and laboratory-based studies examining the *environmental impacts of waste derived materials* to inform policy development and regulatory approaches.

Waste hierarchy

Following a call for evidence during the summer of 2012, the Defra waste evidence team, WRAP and Welsh Government have been working with academic and industry experts examining available evidence around the positioning of food waste, glass, paper and card, plastic and residual waste within the waste hierarchy.

Output from this evidence evaluation will help Defra policy colleagues keep current waste hierarchy implementation guidance up to date and relevant.

Waste arisings and compositional analysis

Economists within the evidence team, supported by WRAP, produce forecasts of waste arisings and market developments, e.g. to analyse progress towards meeting Landfill Directive targets. Meanwhile, other specialists are assembling high quality waste characterisation data that can be widely used across the waste policy portfolio, e.g. to set end-of-waste criteria or compliance conditions for disposal.

Field and laboratory studies

Methane from landfill is estimated to account for about 3% of UK greenhouse gas emissions, but with significant uncertainty. We are working with the Environment Agency and DECC to accurately measure methane fluxes at a sample of landfill sites.

Other field studies support environmental permitting. Current studies include long-term field trials examining the benefits of spreading anaerobic digestate to land. This collaborative 3-year initiative led by WRAP and co-funded by Defra waste and food and farming programmes aims to build understanding of the characteristics and benefits of waste derived compost and anaerobic digestate, equipping farmers with skills in how to use it.

Exposures to ambient bioaerosols, whose components include fungal spores, live bacteria, allergens and endotoxins, will rise over the next decade as a result of the increasing diversion of biodegradable municipal waste from landfill to open-air composting sites and use as a fertiliser in agriculture. However the evidence base on health effects of bioaerosols is limited. A collaborative venture managed by Defra and co-funded by the Environment Agency (with expert input from the Health Protection Agency) is providing evidence on bioaerosol emission and dispersion from composting facilities and resulting potential exposures.

There is specific interest in polybrominated diphenyl ethers (PBDEs) used as flame retardants in electrical and electronic equipment and motor vehicles since the 1970s and present in the waste stream. The Commission intend to set limits for these substances in products, so we are measuring trace levels of PBDEs in a range of waste materials to inform the UK negotiating position.

Households and businesses being satisfied with their resource and waste services

Priority evidence work funded by Defra includes evaluation and research activities associated with the second round of Reward and Recognition Fund initiatives. The emphasis is on embedding evaluation into projects, offering tailored support to improve the delivery and impact of their interventions and sharing best practice and key lessons learned. A significant level of Defra social science expertise is deployed to assist this work along with input from our WRAP colleagues.

3. Future evidence needs

What are the longer-term evidence needs for the policy area/ programme?

The policy priorities of the Waste Programme are under review, so it is difficult to be precise about the complete longer-term evidence agenda. Nevertheless we can identify some high priority evidence needs in the longer-term.

- New and innovative ways of deriving and keeping under review the amount and composition of waste, including commercial and industrial, construction and demolition and mining sources.
- Quantitative and qualitative information on waste prevention, reuse and recycling activities, understand trends and provide evidence on how they contribute to growth.
- Project trends and further analyse the long-term relationships between waste and economic growth.
- Track waste flows in domestic and export markets, and improve understanding of the economics and efficiencies associated with different waste systems.
- Investigate key perceptions, attitudes and drivers of public and business behaviour on waste and resources, including the role of civil society, e.g. to different types of waste, prevention, recovery, disposal, risk, infrastructure and new technologies.
- Evaluate opportunities for reducing the amount of biodegradable material entering landfill sites and facilitate improvements to landfill gas capture in both operational and closed landfills.
- Explore the cost effectiveness of options to reduce food and other biodegradable waste to landfill, moving them up the hierarchy.
- Obtain up-to-date estimates of food waste arisings and the throughput of organics processing activities, and provide econometric modelling and forecasting of food purchasing and waste.
- Maintain an internet-based information access system to improve knowledge exchange for decision makers in the public and private sectors.
- Undertake horizon scanning activities with WReSCE programme partners to identify future areas of evidence need.

Areas of increased prominence and analytical challenge are listed below under each of the three business plan outcomes.

Resource and waste management contributing to sustainable economic growth

- Further examination of the economic and environmental aspects of managing resources and waste more efficiently and pushing their management higher up the waste hierarchy.
- Compare environmental performance and market incentives of different energy from waste technologies, including anaerobic digestion.
- Analyse the biodegradable nature of materials going to landfill and determine the potential for methane generation over a range of timescales.
- Use systems analysis to better understand the packaging waste supply chain, including packaging producers, Local Authorities, waste collection companies and reprocessors.

Reduce the harmful impacts of resource use and waste on human health and the environment

Future evidence needs under this policy outcome will be directed mainly towards a better understanding of the potential impacts of key policy drivers, such as the Waste Framework Directive, taking account of progress made towards deadlines and targets. Working in collaboration with the Environment Agency we will seek to:

- Better understand the case for and implications of different options for future waste management infrastructure (moving further up the hierarchy beyond incineration), including understanding the economic drivers of different waste management choices at the local level.
- Explore outlets for residual wastes from waste treatment processes and examine health and environmental impacts of processes and materials in the wider environment. Predict and, where appropriate, encourage outlets for treated waste residue streams.
- Improve understanding of how problematic waste streams can be best managed, e.g. Air Pollution Control residues from Energy from Waste plant.
- Scope the scale of illegal shipments of waste/contaminated materials and investigate the economic drivers, costs and benefits.
- Streamline the regulatory compliance burden and improve detection of waste crime.

Households and businesses being satisfied with their resource and waste services

Future evidence needs under this policy heading involve collaborative working but are mainly the responsibility of WRAP. Some of the main issues include the need to:

- Determine the extent to which enforcement measures result in behavioural change. Investigate challenges to successful implementation of reward and recognition schemes and explore the merits of alternative approaches.
- Explore whether particular arrangements or systems for waste collection and other waste services result in higher levels of satisfaction among householders and businesses while increasing waste prevention, reuse and recycling.
- Examine the extent to which different systems are cheaper/more effective at delivering quality material and high recycling rates.
- Examine revenue flows in relation to recycled and recovered materials, including the incentives/barriers to revenue sharing of recovered materials.
- Examine the extent to which authorities assess levels of satisfaction among their residents and businesses.

4. Meeting evidence needs

What approach(es) will be taken to meeting evidence needs?

Pressures on resources require evidence teams in Defra and our partner organisations to work ever more closely to ensure the best evidence is made available to underpin policy development and implementation.

In response to this challenge a new collaborative initiative has been established between Defra, the Environment Agency, WRAP, the Welsh Government and DECC. The *Waste, Resources and Sustainable Evidence (WReSCE)* programme conducts horizon scanning, sets priorities and makes best use of existing knowledge, as well as being flexible, efficient and creative in how we address new evidence needs. It incorporates all of the Waste Evidence programme's R&D projects.

A Programme Management Group is responsible for setting strategic direction, ensuring that it acts to support and inform government policy and delivery goals. A multi-disciplinary Programme Working Group is responsible for delivery. In addition, an Evidence Advisory Panel of external specialists and evidence stakeholders provides further strategic guidance, including comment on planned work and peer review.

WReSCE offers a clear line of sight into other sources of relevant evidence. For instance, we are currently exploring opportunities with NERC, e.g. through their £6m Resource Recovery from Waste research programme, EPSRC (investments on engineering and sustainable manufacturing, and university-based innovative manufacturing centres such as at Warwick University) and the Living With Environmental Change (LWEC) programme.

We will seek collaboration with other research councils, notably the BBSRC led programme on Global Food Security on food waste and the ESRC on our economic and

social research needs. We will build on existing useful working links with the Technology Strategy Board (TSB), private industry and civil society organisations.

We will also look for opportunities to work with the European Union and other international funders. The Environment Agency is already active on the LIFE+ programme and we have joint venture projects in WReSCE which have attracted significant international funding, notably looking to control methane emissions from old landfill and develop quality protocols for materials extracted from the waste stream. European Research Area networks (ERA-nets) may also provide useful evidence, e.g. on sustainable food.

Key to the success of these partnerships will be the harnessing of the broad spectrum of expertise and resources available across the partner organisations to translate evidence into usable and identifiable knowledge to support policy on waste. There are two elements that will need to be considered in developing knowledge management:

- a. *interaction with external stakeholders* – WReSCE needs to look for efficiencies and cost effective approaches to delivering priority evidence needs, e.g. exploring more sophisticated information technology tools such as electronic knowledge networks or web-based discussions.
- b. *interaction with policy* – encouraging effective dialogue to uncover policy needs, providing an efficient technical information and policy advisory support service, building a shared knowledge bank or communities of practice around specific themes or topics.

One important part of the programme's approach to communications and dissemination is *Wastenet*, a web-based public information portal which now provides access to waste-related research from Defra and a wide variety of other information sources. The creation of this information base helps retain institutional memory and is now moving into a proactive phase of information harvesting which has the potential to deliver significant efficiencies in secondary research analysis and wider impact assessment activities.

5. Evaluating value for money and impact

What approach(es) will be taken to maximise and evaluate value for money and impact from evidence?

We routinely undertake the following approaches: clear alignment of evidence with policy outcomes; use of effective and appropriate methods for procuring evidence; identification of partnership opportunities and leveraged co-funding (one of the key aims of establishing WReSCE); robust evaluation of project proposals and outputs to ensure quality and maximum impact; conduct programme evaluations (e.g. the 2011 SAC report on waste).

Our intention is to conduct an evaluation of the output from WReSCE by March 2014.

Quality assurance

At the individual project level, the programme implements a number of measures to ensure that the research it commissions is of good quality. Independent evaluation of project proposals are conducted routinely and an increasing number of final reports are subject to expert peer review. The programme appoints external experts for some of the more complex assignments to act as critical friends, working alongside teams and providing additional project management as well as front-line technical advice to contractors. In some cases this has included help with articles for academic peer reviewed journals. This has proved successful in recent work on the waste prevention evidence base with publications opening up international interest in Defra's research.

The Climate Waste and Atmosphere portfolio operates a light touch consultation process before evidence is either commissioned or published. This makes all evidence activities visible to the Deputy Directors for Evidence and Policy, provides a route to escalate discussion of work likely to raise media or public interest and allows innovative or interesting work to be highlighted. It also allows the Deputy Director for Evidence to check work being commissioned against priorities, as set out in Evidence Plans and to ensure evidence is robust and quality assured.

Impact of evidence

In 2011, the Defra SAC subjected our programme to additional scrutiny and challenge.

Through WReSCE, the waste evidence team ensures that initiatives providing corporate learning opportunities are communicated more widely across Defra and appropriate partner organisations, e.g. evidence on consumer insights and communications is relevant across a number of evidence and policy areas.

The waste evidence programme carried out a recent review of outcome evaluation approaches. This suggested that evidence and policy colleagues needed to re-examine the objectives and desired outcomes of the evidence programme using a logical framework (logframe), an approach set out in the *Magenta Book: Guidance for evaluation (April 2011)*. This evidence plan sets out the medium-term goals and purpose of the programme. Further action will examine the intermediate outputs and operational objectives of the programme activities. Documenting the logframe will allow identification of possible success criteria attaching to specific desired outcomes. These can then be documented for use in the outcome evaluation planned for completion by March 2014.

WReSCE communicates outputs and exchange information with other evidence providers, industry practitioners and the public using: *Wastenet*, *theme specific knowledge events* (e.g. a recent meeting with policy makers, researchers and other stakeholders to showcase the synthesis review on business waste prevention) and encouraging contractors to disseminate programme findings through *research publications and technical papers*. In addition a bulletin is being developed to alert customers when projects are entering their final reporting stage and new knowledge is soon to become available.