Integrating evaluation and forecasting

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ABSTRACT

The UK's Department for Environment, Food and Rural Affairs (Defra) has a policy objective to achieve sustainable, low carbon and resource efficient patterns of consumption and production. To achieve this aim Defra provided approximately £44m to seven bodies to deliver business resource efficiency programmes in England. Following a review of delivery in 2008/09, it was decided to consolidate the programmes into one delivery body.

To coincide with the consolidation of the programmes, the delivery review established a framework for a new approach to evaluation. This comprised a model to forecast impact based on business engagement with activities undertaken in a given year (e.g. number of event attendees) combined with research to verify assumptions used in the model, establish the extent to which impacts could be attributed to delivery activities and identify the degree of overlap between activities and their impacts.

A prototype model was developed in 2009/10 and used to quantify the impact of delivery activities funded by Defra in 2008/09. Going forward, data on the activities undertaken in each year will be used to produce estimates of the impact of each activity; the estimates will then be verified through further surveys and other research.

Integrating evaluation and forecasting in this way is a novel approach to the assessment of the impact of government funded programmes in the UK and embodies a significant shift in evaluation methodology. The resulting output, the model, provides an integrated solution which serves as a business management tool as well as a tool for evaluation.

Policy context

The UK's Department for Environment, Food and Rural Affairs (Defra) has a policy objective to achieve sustainable, low carbon and resource efficient patterns of consumption and production. To achieve this aim Defra provided funding of around £44m to seven bodies in 2007/08 to deliver business resource efficiency programmes in England. This paper describes the resource efficiency delivery activities in England funded by Defra, the approach to evaluation prior to the delivery review in 2008/09, the new approach to evaluation that will be adopted going forward and how the resulting output, the model, provides Defra with an integrated solution which serves as a business management tool as well as a tool for evaluating impact.

What Defra seeks to achieve through resource efficiency delivery activities

The key outcome that Defra is seeking to achieve through the programmes is a more resource efficient UK economy as measured by reductions in CO_2 emissions, water use and waste to landfill per unit of output by UK businesses. Defra's outcomes and targets on resource efficiency, waste and water are part of a wider Government policy landscape in relation to preparing the UK economy and society for the massive transformation that is needed to achieve a low carbon economy consistent with the target of an 80% reduction in greenhouse gas emissions by 2050 set in the Climate Change Act 2008.

The emphasis of Defra's future priorities in relation to resource efficiency is on materials and water efficiency, as Defra is the lead Department in these areas: other Departments in the UK lead on energy efficiency. This is why the overall outcomes Defra is seeking to achieve go wider than just

reducing carbon emissions, as others are responsible for the overall outcome on carbon emissions. That said, Defra has a significant part to play in contributing to meeting the Government's carbon budgets in those sectors of the economy for which it is responsible, particularly food and farming, waste and forestry.

Emissions reductions remain an important indicator of progress of Defra's work on resource efficiency, not least because greater efficiency in use of raw materials and water tends to lead to less embedded carbon and waste minimisation also reduces carbon emissions. However, materials and water efficiency are important to Defra in their own right because no other body will address them in the UK if Defra does not.

Defra believes delivery body activity can add significant value compared to other policy instruments (e.g. fiscal and regulatory). For example, whereas instruments such as the Landfill Tax and product and service standards regulations (e.g. on energy using products and producer responsibility) help to deliver the same policy outcomes, delivery body activity can also be used to promote and exemplify best practice and innovation, by supporting market development where there is a market failure, and through leadership, engagement and awareness raising. Regulatory instruments act directly to shift the incentives in favour of resource efficient behaviour: the priorities for the resource efficiency delivery activities are more about stimulating and enabling responses to those incentives, for example where there is an information failure or other barriers to action or where businesses or consumers are not currently taking a sufficiently long term view.

The current delivery landscape

The key audience for the delivery programmes is businesses in England, with supporting roles in enabling local authorities to improve resource efficiency in their local area and reducing household impacts. The main sectors targeted by the programmes are agriculture/primary production, construction and supply chain, retail and supply chain/manufacturers, business services and recyclers/re-processors. The functions of each body and the range of activities undertaken are set out in more detail in Annex 1.

The activities undertaken by each delivery body, for example through site visits or the provision of on-line advice, are designed to encourage members of the target audience to take steps to improve their resource efficiency through waste prevention, re-use, recycling, energy recovery and improved disposal, as set out in Defra's Waste Strategy 2007 and illustrated in the Waste Hierarchy (Figure 1).

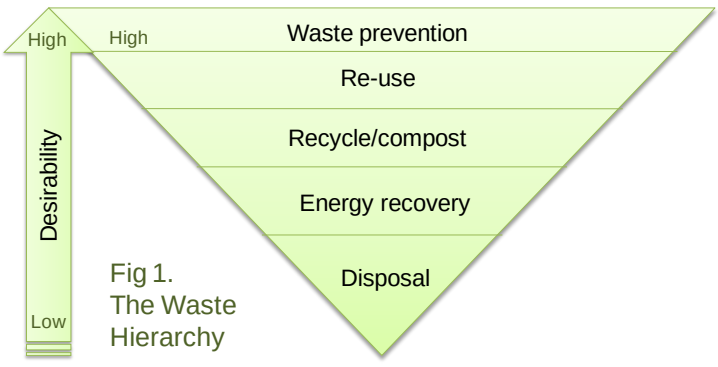

Figure 1. The waste hierarchy

The information about Delivery Body outcomes prior to the review

Prior to a review of the delivery landscape in 2008, each delivery body submitted an annual report to the Department identifying the impact of their activities across a range of pre-specified metrics (carbon savings, reduction in waste to landfill, cost saving to businesses, etc). Each delivery body reported three figures for each metric: the annualised reductions resulting from businesses taking action in the year,

following contact with the delivery body; the amount of those reductions that could be attributed to the contribution of the delivery body; and the expected lifetime reductions from the action by the business that could be attributed to the contribution of the delivery body.

There were a number of weaknesses with this evidence. First, the three main delivery bodies each used a different approach to identify outcomes and to determine the degree to which outcomes were attributable to the programme. This meant that the Department could not be confident that results were consistent or that they could be aggregated together in a meaningful way. Nor could any overlaps, for example where a business accessed the services of more than one delivery body, be taken into account.

Second, the outcomes were only reported at aggregate level, which meant that the Department's understanding of the types of beneficiaries from the programme was extremely restricted. Third, there was no clear link between the funding in any one year and the outcomes reported for that year, which meant that assessments of value-for-money could only be approximate at best. And finally, there was no disaggregated information about the type of activity that was delivering the benefits, which meant that the results could not be used for programme planning.

The rationalisation of delivery and the role of evaluation

Following the review of the resource efficiency delivery landscape, it was decided to consolidate the programmes into a single delivery body in order to improve the efficiency and quality of the services and outcomes. To achieve this consolidation it was decided that from 1 April 2010 all of the delivery activities would be subsumed within the Waste and Resources Action Programme (WRAP), with the aim of improving business resource efficiency in a number of ways including:

- influencing policy and regulations
- changing the behaviour of retailers and construction clients to influence their supply chains
- providing support and guidance to businesses to assist them to reduce resource use and the associated costs
- supporting local authorities and recyclers/re-processors to deliver effective recycling services.

Both Defra and WRAP have roles in the delivery of a resource efficient economy for the UK. Although Defra leads in strategy and policy, through their contacts with industry and through the commissioning of research and sharing of results, WRAP will inform Defra's policy and strategy development going forward and contribute to the wider evidence base. Effective evaluation is essential to inform future delivery improvements.

To coincide with the consolidation of delivery, Defra decided to establish a common mechanism for evaluation across the range of programmes that would:

- generate robust data about the impact achieved by the programmes;
- forecast future impacts to allow alternative approaches to be modelled;
- assist policy makers to develop and improve the package of delivery activities, and
- evaluate return on investment and value for money of different programmes, ensuring that resources are used as efficiently as possible, by identifying opportunities to scale up successful activities, understanding the impact of programmes on groups of particular interest such as small businesses, and identifying gaps in programme coverage in order that new activities can be developed.

An integrated approach to evaluation and forecasting

The resource efficiency delivery logic chain

The following logic model, shown in Figure 2, was adopted as the evaluation framework: the delivery bodies have **inputs**, in terms of Government finance and staff resources. They undertake **activities**,

providing funding, advice, events, information, tools, etc. These activities are used by businesses and can be measured in terms of **outputs** – number of website hits, attendees at workshops, etc. By engaging with the delivery body, businesses are influenced and take actions which result in **outcomes**: environmental and financial benefits. The persistence of those outcomes can be used to estimate the lifetime impacts, which can then be attributed to take account of the factors influencing the action and adjusted for any double-counting where activities or outcomes overlap: the net result can then be assessed in terms of its contribution to **Government targets**.

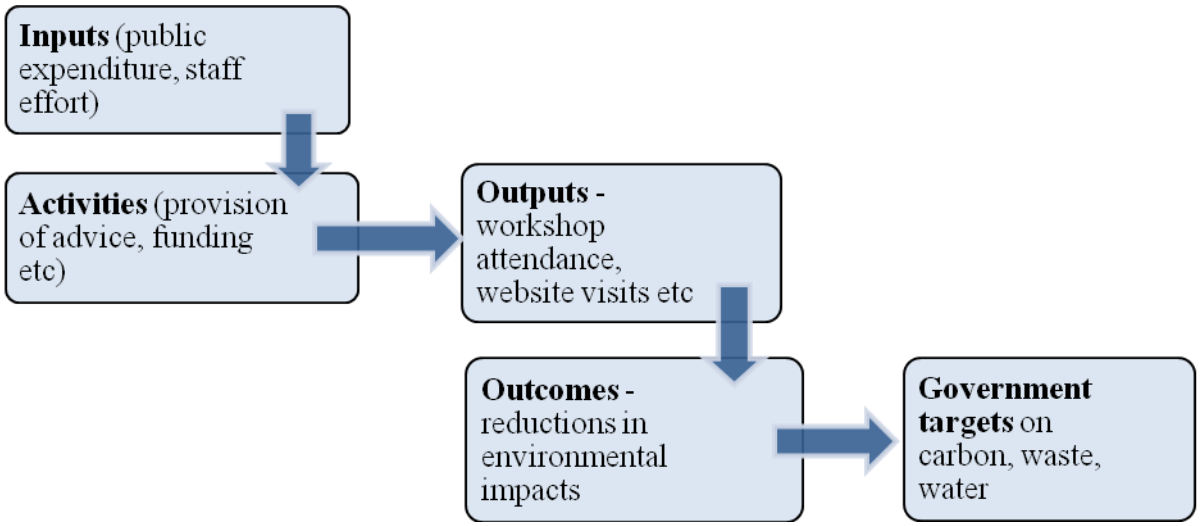

Figure 2. The delivery logic chain

The delivery review set out a framework for the evaluation approach to be adopted going forward. This comprised a model to forecast impact based on outputs produced by programmes (e.g. number of website visits, event attendees) and research to verify assumptions used in the model about the level of use and impact, establish the extent to which impacts could be attributed to the delivery activities and to identify the degree of overlap between activities and their impacts. There are a number of features to the framework which may be of wider interest:

Time reference period

In many evaluation frameworks the outcomes of policy actions are evaluated in terms of the outcomes achieved from actions by businesses in a given year, regardless of the year of intervention. In practice this means that it is challenging for the Government to establish the precise return on investment for the funding allocated in a particular year. In the revised framework adopted following the review, the outcomes from policy activities in a particular year are estimated and then allocated to appropriate years, these estimates are later verified by further research.

This approach represents a significant shift in evaluation methodology. Prior to the delivery review, whilst the delivery bodies employed some assumptions about the impact of their activities over time, the majority of outcomes were estimated ex-post, with limited ex-ante estimation of the impacts arising from the delivery activities being conducted.

Consistent disaggregation using standard classifications

The evaluation framework allows for the outcomes resulting from delivery body activities to be assessed in terms of the size group of the companies taking the action, the location of the company in terms of the relevant English region, and the type of industry taking the action, using the Standard Industrial classification.

Adjustments for overlaps

The integrated approach across a range of delivery activities enables overlaps to be identified, for example where a business has received support from more than one part of the programme.

Confidence assessments

Because the evaluation is forward-looking, in the sense of estimating the future outcomes from current activities, it was important for users to have an understanding of the degree of confidence of the estimates within the evaluation system. This has been achieved by allocating a confidence parameter (ranging from 'Very confident', through 'fairly confident', to 'indicative'), to each estimate of outcome.

Combining modelling with reporting

Another key feature of the evaluation system is the decision to combine the need to report performance outcomes to the Government, with the underlying data collected for the reporting which can be used to analyse particular aspects of the performance and provide a basis for modelling future policy options.

Establishing the degree of influence (attribution)

Prior to the delivery review in 2008, each of the resource efficiency delivery programmes used a different approach to determine the degree to which outcomes were attributable to the programme. Whilst most had made an attempt to assess the degree of influence they had over the target audience, a few assumed that all of the outcomes achieved by beneficiaries of the activity were directly attributable to their intervention. In all of these cases the delivery programmes had limited supporting evidence on which to base that assumption. Some were reluctant to assess attribution because it could not be assessed precisely.

A key aspect of the integrated approach is to verify assumptions by seeking evidence to support informed judgements about attribution. This can be achieved by exploring what beneficiaries believe would have happened if the delivery activity had not existed; specifically whether they would have taken action at all and if so, whether they felt the outcomes were a little or a lot better as a result. The model uses their responses to apply attribution factors to attribute a percentage of the total outcomes to the delivery activity.

If beneficiaries indicated that they would *not* have taken action without the support, then 100% of the total outcomes are attributed to the delivery activity; if the action would have happened anyway, it is necessary to consider whether the outcomes were better as a result of the delivery activity. Where the outcomes are a little better we might attribute 25% of the total outcomes to the delivery activity; where the outcomes are a lot better we might attribute 50% of the total outcomes to the delivery activity. If they would have taken action anyway and the outcomes would have been the same, we should apply zero attribution.

Adopting a consistent approach to attribution enables Defra and WRAP to understand the degree of influence that the delivery activities have and to estimate the outcomes that have arisen as a result of Defra's funding. Whilst it will not be possible to assess precisely what would have happened if the delivery activities had not been in place, attribution provides a means for Defra and WRAP to assess the return on investment by attempting to understand what would have happened anyway.

Establishing lifetime outcomes

At present we have limited understanding of what will happen in future to the outcomes that are influenced by delivery activities in a given year. Prior to the delivery review, where delivery activities had influenced ongoing actions it was either assumed that the annualised outcomes would persist at the same level for a number of years (e.g. 10 years for certain types of capital investment) or that the

outcomes would decline in a straight line to zero by year 5 (which might for example be appropriate for certain types of behaviour change, where businesses revert to old habits after 5 years). We know from anecdotal evidence of instances where this assumption is conservative, as the outcomes of some actions are expected to grow over time, either to different parts of the business or by being adopted by other organisations.

For the initial development of the evaluation framework, the 5 year declining model has been adopted as the default assumption, in the absence of other evidence about likely future outcomes. In future development it should be possible to verify more sophisticated approaches, including the impact of roll-out policies, and incorporate them into the model. This can be done through recruiting, as part of the initial verification exercise, a panel of organisations that have taken action to improve their resource efficiency and are willing to be interviewed in future about how/whether the outcomes of their actions had changed. These organisations can then be re-interviewed as part of later verification studies and to track the outcomes arising from delivery activities funded in the original year.

Development process

The prototype model was developed in 2009/10 and used to quantify the impact of delivery activities funded by Defra in 2008/09. The model forecasts the CO_2, financial and waste savings that will result from the programmes' activities. Databuild was commissioned by WRAP to develop the model and devise the methodology for verifying the assumptions, with a view to producing ex-ante estimates of the impact of resource efficiency delivery activities funded by Defra in 2008/09. The model development and 2008/09 verification comprised 4 stages.

Stage 1 – initial data review

Firstly, Databuild contacted representatives from each of the programmes and initiatives funded by Defra in 2008/09 to identify and review the data captured about their activities and the impact of their activities along with details of working assumptions about attribution and the lifetime outcomes arising from action influenced by their work. Through these discussions Databuild reviewed the definitions of activities, the users and their segmentation by industry and size, and the actions that users had subsequently taken to improve resource efficiency.

Databuild also used the discussions to establish what data were available to inform assumptions about effectiveness rates – the extent to which the activity of a delivery body translates into a beneficiary taking action to improve resource efficiency, and the environmental and financial outcomes arising from actions taken by beneficiaries; focusing particularly on the likely waste reduction and the cost and carbon savings from reduced waste and raw materials avoided, the difference that the delivery activity had made to the outcomes of actions taken to improve resource efficiency (attribution) and the lifetime of measures and whether and how outcomes are expected to change over time.

Following the completion of this work a specification of information requirements was produced to request data from those responsible for the various programmes and initiatives ultimately funded by Defra in 2008/09. This specification covered the five broad categories of data; **activity and output data** – e.g. the number of events conducted in 2008/09, number of attendees for each; **contact details** for those receiving the advice/support in 2008/09 – beneficiaries (where applicable); **outcome data** – the annualised environmental and financial outcomes of action taken by beneficiaries following engagement in 2008/09 (where captured); **expected lifetime outcomes** – the annualised expected environmental and financial outcomes of action taken by beneficiaries following engagement in 2008/09 (where captured); and **supplementary details** about any assumptions used in estimating outcomes.

Stage 2 – developing the model architecture and prototype model

Having confirmed the vision for the model and identified the data that were available to inform the model development, Databuild designed the model architecture and developed an initial prototype model in MS Excel. It was then populated with the data already available from previous evaluations of the impact of the delivery activities and other research.

Stage 3 – verifying assumptions in the model and evaluating the total impact for 2008/09

Databuild then developed a methodology to verify the input data and assumptions and collect activity, impact and attribution data where no data were available – the 2008/09 verification study. The 2008/09 verification comprised a mixture of quantitative, qualitative and desk research to populate and validate the impact model:

- a top-down quantitative survey of the key target audiences for the delivery activities
- a bottom-up survey of known users to verify reported outcomes
- qualitative interviews to confirm the largest outcomes and attribution, confirm general principles where data were not available or quantitative interviews impractical, supplement survey data about the local authority audiences to help us to understand more about WRAP's role, and understand the impact of delivery activities involving strategic engagement
- desk research to confirm the appropriateness of assumptions adopted in the model and collate information about how much of the total budget for each delivery body was allocated to each delivery activity in 2008/09 for return on investment calculations.

The quantitative survey work focused on establishing the impact among businesses in England, concentrating on those with five or more employees. In order to achieve representative samples for specific target audiences, the samples were structured by business sector and size. Fieldwork was conducted in November and December 2009 and analysed in January and February 2010.

A top down (market) survey comprising approximately 1,200 interviews

The market survey was used to identify outcomes where no data are currently available, investigate the impact of strategic engagement delivery activities and provide a counterfactual. We included a larger number of interviews in the top down survey with organisations in the construction and retail sectors and supply chains to reflect the fact that the majority of the intended impact of Defra-funded delivery activities occurs in these sectors.

The results of the quantitative survey needed to be extrapolated to enable conclusions to be drawn for all businesses in the target audience in England. This process of extrapolation involved giving each response a weight to reflect the population that it was drawn from. Each interview was then assigned a weight based on the population for each stratum divided by the number of interviews conducted in that stratum.

A bottom up (user) survey comprising approximately 700 interviews

The user survey was conducted to verify use and confirm outcomes for activities where beneficiary details were captured and impact data were available. A longitudinal panel was also recruited to enable outcomes to be tracked over time for particular organisations to inform model assumptions. As with the top-down survey, the results of the quantitative data needed to be extrapolated to enable conclusions to be drawn for all businesses in the target audience in England. This process of extrapolation involved giving each response a weight to reflect the population that it was drawn from.

Qualitative research

The qualitative interviews were devised to supplement the quantitative study, desk research and information/data provided by representatives from each of the delivery bodies and will act as mini case

studies which provide contextual data for interpreting the results of the quantitative study conducted to estimate the impact of Defra funded resource efficiency delivery activities in England in 2008/09.

Databuild conducted the following sets of interviews: two focus groups with consumers to supplement survey data by exploring attribution and lifetime impacts; six interviews with local authorities receiving funding for waste reduction projects; eight interviews with local authority officers responsible for waste and/or recycling to understand the impact of Defra funded resource efficiency delivery activities among authorities not directly supported; 26 interviews with a sample of beneficiaries of delivery activities where outcomes are tracked to confirm the suitability of assumptions adopted in the model, particularly attribution; and 20 interviews with a sample of respondents from the quantitative study who reported the 50 largest outcomes. In future Databuild will conduct interviews with representatives from audiences with which WRAP has been engaged with strategically.

Stage 4 – finalising the model

The prototype model was revised and populated with the data collected in the verification. Meetings were held with those responsible for each of the delivery bodies to validate the data included in the model prior to finalising the outcomes.

What the model does and what it provides

The 2008/09 model comprises a series of worksheets that use activity and output data for particular programmes along with assumptions about outcomes and how they will change over time and attribution, to produce an estimate of the attributed outcomes for that activity. Figure 3 illustrates the architecture of the model.

The model uses consistent assumptions to calculate the carbon dioxide equivalent outcomes associated with diverting material from landfill, reducing the use of virgin raw materials and energy savings. Factors are also used to calculate the cost savings arising from actions taken to divert material from landfill or reduce energy, water or raw material consumption. Provisional results from the 2008/09 model the relevant metrics are shown in the table below:

Table 1. Provisional estimates of outcomes from Defra Delivery Body activities in 2008/09

Savings in:	**2009/10**	**Lifetime***	**Units**
Waste diverted from landfill	3.2	16.1	Million tonnes
Energy savings	34	84	Gigawatt hours
Avoided carbon emissions European Trading Scheme (ETS)	1.1	10.5	Million tonnes CO_2
Avoided carbon emissions non-ETS	0.7	3.9	Million tonnes CO_2
Cost savings	130	4,400	Million pounds
Sales growth	62	560	Million pounds
Raw materials avoided	1.9	5.5	Million tonnes
Water use reduced or avoided	1.3	5.3	Million cubic metres
Hazardous waste	16	38	Thousand tonnes

* Subject to further verification

The model also provides a series of worksheets to provide aggregate outcomes and breakdowns by activity, size of beneficiary etc. An overlaps sheet is included to enable us to make adjustments when aggregating the outcomes to mitigate the risk of double counting (e.g. where activities are targeting the same audience). A series of worksheets providing details about the assumptions and limitations of the data included for each activity in the model.

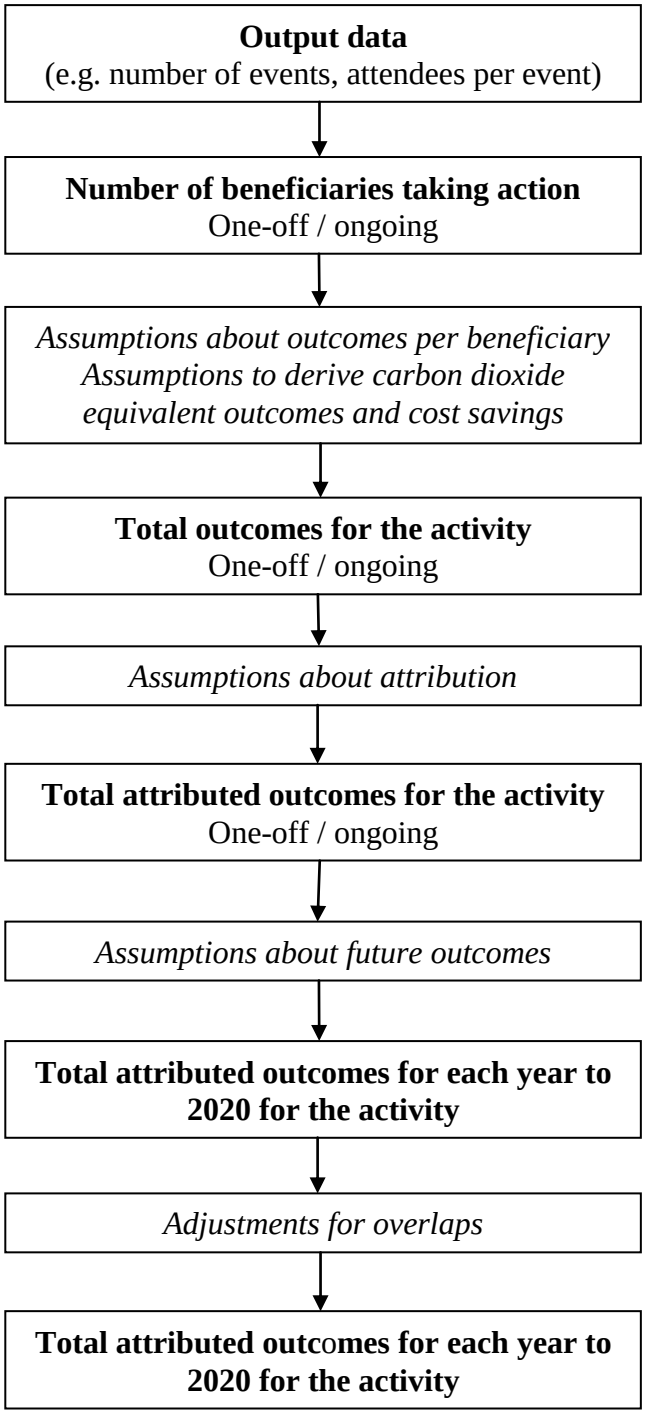

Figure 3. Overview of the model architecture

The evaluation process going forward

The evaluation is intended to be an iterative process whereby survey findings are used to refine and improve the model which in turn will allow subsequent verification surveys to be targeted more effectively. Going forward, data on the activities undertaken in each year will be used to produce estimates of the impact of each activity; the estimates will then be verified through surveys and other research. The evaluation process is illustrated in Figure 4.

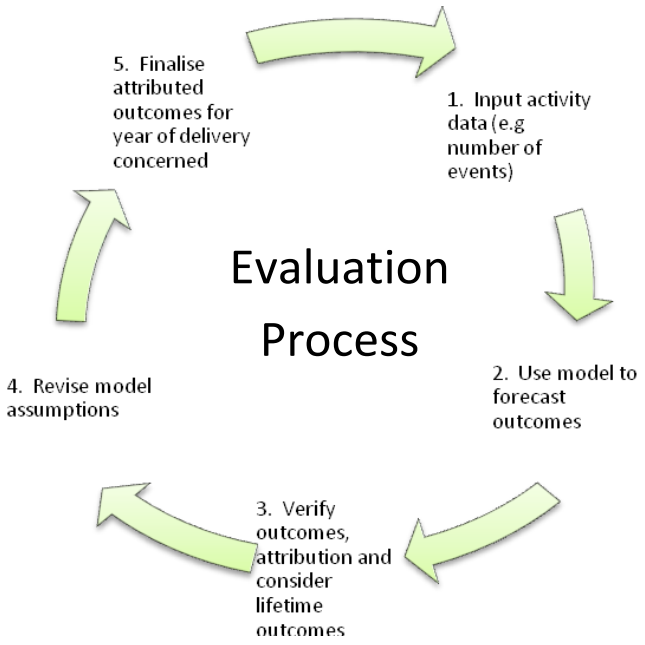

Figure 4. The evaluation process going forward

Defra intends the model to be developed and revised over time into a more robust and sophisticated tool for forecasting impact prior to ex-post evaluation. At this stage, the work conducted provides a proof of concept: in the long term, Defra intends the model to be used to forecast with confidence the likely attributed outcomes to facilitate effective decisions about delivery.

The 2008/09 model is implemented in Excel. As it becomes more established it may be developed into a web-based tool. This will enable the model to be used by other practitioners within the UK public sector, such as regional administrations, to estimate the impacts of their resource efficiency delivery activities.

How Defra intends to use the model

Integrating evaluation and forecasting in the way described in this paper is novel in assessing the impact of government funded programmes in the UK and embodies a significant shift in evaluation methodology. The resulting output, the model, provides Defra with an integrated solution which serves as a business management tool as well as a tool for evaluation.

The work conducted to date has provided significant insights into ways to improve the efficiency and quality of the services and outcomes delivered by resource efficiency delivery activities. For example, the work has identified that, with the exception of activities directed at re-cyclers and re-processors, there is generally limited overlap between the existing activities and that, on the whole, the delivery activities form a coherent package of support. It has also confirmed the need for a strategic change in emphasis towards support for small to medium enterprises (SMEs). However, the project has also identified that much more work is required to evaluate the impact of some of the activities effectively: in particular, those responsible for the delivery activities need to capture data about beneficiaries and outcomes more consistently as there are some instances where the data currently available is insufficient to fully populate the model with verified data.

The model will help Defra to establish with more confidence the return on investment and provide detailed information about the return associated with particular types of activity. This information will be invaluable to both Defra and WRAP in shaping future delivery.

In regard to informing future policy, the model will support Defra in establishing the degree to which delivery activities have led to a more resource efficient UK economy as measured by reductions in CO_2 emissions, water use and waste to landfill per unit of output by UK businesses. These are long term outcomes and the forecasting capabilities of the model will be valuable in considering where and how the delivery activities can contribute, for example, to meeting legal obligations under the Waste Framework Directive, Landfill Directive and other EU legislation, which set out challenging targets for achieving reductions in waste going to landfill by 2010, 2013 and 2020.

Integrating ex-post and ex-ante assessments of the outcomes associated with delivery activities in a given year will provide a powerful evaluation toolkit going forward. However, the real value will be derived in using the model as a tool for business management – a tool which can be used to directly consider how resource efficiency delivery activities can be shaped to assist in the achievement of policy aims.

Conclusions

Integrating evaluation (ex-post) and forecasting (ex-ante) of outcomes provides a comprehensive toolkit for the evaluation of resource efficiency delivery activities and can directly support decision making about delivery by using evidence-based assumptions to draw conclusions about the likely outcomes. The evaluation approach that we have adopted could be applied in other policy contexts to provide an evidence-based business management tool which harmonises business planning and evaluation from the outset.

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Annex 1. Defra-sponsored Resource Efficiency Delivery Bodies in England prior to 1 April 2010, and the industrial sectors covered by their Resource Efficiency programmes

Table A1. Defra-sponsored Resource Efficiency Delivery Bodies in England prior to 1 April 2010

Defra Resource Efficiency Delivery Bodies prior to 1 April 2010	Funding in 2007/08	Description of principal aim
Action Sustainability	£0.4m	Promoting sustainable procurement amongst businesses through events and seminars; advice services to public and private sector organisations
Business Resource Efficiency and Waste (BREW) Centre for Local Authorities	£1.4m	Support for local authorities working with their local business community to become more resource efficient
Centre for Remanufacture and Reuse (CRR)	£0.7m	Promoting remanufacture and reuse
Construction Resources and Waste Platform (CRWP)	£1.2m	Promoting a strategic approach to construction waste through the production of an evidence-based 'road map' for construction resource efficiency
Envirowise	£17.2m	Embedding waste minimisation and resource efficiency into business decision-making through the provision of advice and raising awareness
National Industrial Symbiosis Programme (NISP)	£9.7m	Industrial symbiosis – identifying business waste with value as a raw material for other businesses, and making the links between the two companies
Waste and Resources Action Programme (WRAP)	£12.2m	Encouraging and enabling businesses to be more efficient in their use of materials and recycle more things more often, by providing advice and support direct to business and by developing markets for recyclate

Agriculture/primary

Engagement with the agriculture/primary sector audience was led by WRAP. The focus of WRAP's work with agriculture and horticulture in 2008/09 was on engaging with farmers and their advisors to encourage them to use recycled content compost. This focused principally on attitude and behaviour change and represents a small proportion of the work conducted. WRAP also provided capital funding to stimulate investment in facilities that would reduce the amount of biodegradable municipal waste entering landfill by increasing the capacity to recycle these materials into quality compost (see recyclers/reprocessors).

Construction and supply chain

Because of the large quantities of waste that are generated by the construction sector, there were several activities targeted by the delivery bodies. WRAP worked with the construction sector (clients and policy makers, contractors and designers, manufacturers, and collectors and processors) to increase use of products with recycled content, reduce the amount of waste produced, and reuse and recycle more waste on site. The aim of the work was to contribute significantly to achieving the construction

industry's commitment in England to halve waste to landfill by 2012 compared with 2008. WRAP also provided funding to stimulate investment in facilities that will greatly improve the recovery and recycling of waste materials produced from construction and demolition (see recyclers/re-processors).

Envirowise supported the construction sector in 2008/09 through site visits, events relating to Site Waste Management Plans and through its website and publications. All of these services are designed to encourage organisations in the construction sector to embed resource efficiency into their business decision-making.

Through workshops and proactive engagement with the industry, the National Industrial Symbiosis Programme (NISP) identified opportunities for construction companies to form synergies whereby construction waste could be used as a raw material by another organisation, rather than sending the material to landfill.

CRWP engaged strategically with large contractors and trade associations in the construction sector to encourage resource efficient behaviour through waste minimisation, re-use and recycling, and provided tools for construction contractors to use in planning and managing their waste and conducted research to fill evidence gaps in knowledge about resource efficiency in the construction sector.

Retail and supply chain, manufacturers

Activities targeting the retail sector were designed to encourage large retailers and brand manufacturers to reduce packaging and food waste, as well as supporting packaging and other manufacturers in the retail supply chain to reduce waste through effective design (e.g. lightweighting). The Courtauld Commitment, overseen by WRAP in 2008/09, is a voluntary agreement with just over 40 of the largest supermarkets and brand manufacturers to reduce the amount of packaging and food waste that is thrown away by households in the UK. Furthermore, seven large retailers signed the Carrier Bag Agreement, which is intended to reduce the number of single-use carrier bags given out by 50% by end of May 2009, based on a 2006 baseline.

WRAP also worked with the retail supply chain to improve resource efficiency through the bulk importation of wine for bottling in the UK and by directly assisting in the development of packaging solutions to reduce the use of raw materials and/or reduce food waste.

Through site visits, events, publications and web-based tools, Envirowise has supported both retailers and manufacturers in the retail supply chain to take action to embed resource efficiency in their processes.

The activities of CRR are designed specifically to encourage and promote re-manufacture and re-use as a means of improving resource efficiency in the manufacturing sector. In particular, CRR conducted a critical mass project to implement remanufacturing and reuse in Corporate Clothing.

Business services

Envirowise in particular has targeted the business service sector to improve resource efficiency in offices across England by encouraging waste minimisation, re-use and recycling in the sector. Again this is achieved through a mixture of site visits, events, web based resources and publications and marketing campaigns, all designed to encourage organisations in the business service sector to embed resource efficiency.

Recyclers/re-processors

WRAP has worked closely with recyclers and re-processors in 2008/09 to improve the quality and capacity of recycling and re-processing facilities across England. WRAP has done this through three key mechanisms; 1) capital funding, 2) practical advice and support, 3) work to improve the quality of the recycling process and recyclate produced.

WRAP provided capital funding in 2008/09 to stimulate investment in facilities (e.g. in vessel composting and anaerobic digestion) that will reduce the amount of biodegradable municipal waste

entering landfill (by increasing the capacity to recycle these materials into quality compost) and to stimulate investment in facilities that will improve the recovery and recycling of waste materials produced from construction and demolition. WRAP also provided support to recyclers/re-processors in 2008/09 through the eQuip scheme which provides lease guarantees to enable recyclers/re-processors to lease equipment that they would not otherwise have been able to obtain.

WRAP provides practical help and support to recyclers and re-processors to contribute towards a sustainable and profitable recycling industry. Third sector organisations involved in recycling are supported by WRAP's third sector programme which provides also provides practical advice and support tailored to the needs of those in the third sector.

WRAP has also taken steps to help recyclers and re-processors to improve quality, both through working with recyclers and re-processors directly and through a series of quality protocols which were introduced to remove the waste classification status from recyclate to enable it to be utilised more efficiently by end users.

Local authorities

The BREW Centre for local authorities provided funding to local authorities to undertake projects to support businesses to behave resource efficiently (e.g. by conducting trials of trade waste recycling collection schemes). The intention is that the trial projects, if successful, will be rolled out and achieve significant impacts. The BREW Centre also acts as a source of information and advice to local authorities not receiving funding and used its website and events in 2008/09 to promote good practice in the delivery by local authorities of communications and services to support businesses to behave resource efficiently.

WRAP provided training to local authority officers responsible for waste and recycling in 2008/09 and also offered support with communications to assist local authorities in delivering effective services for households.

Activities targeting all audiences

The activities of Action Sustainability and supporting activities for other programmes such as the WRAP website and helpline are designed to provide advice/support to all of the target audiences for the resource efficiency delivery activities. Action Sustainability facilitates opportunities for buyers in all sectors to meet suppliers of sustainable products and services. Through consultancy services, Action Sustainability also supported two large organisations in 2008/09 to embed sustainability into procurement practices throughout the organisation.