

RESOURCE EFFICIENCY CLUSTERS CASE STUDY RESEARCH

An examination of the activity, outcomes and cost effectiveness of resource efficiency cluster activity through the use of five case studies, secondary research and stakeholder/expert interviews.

About WRAP

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Document reference:

WRAP, 2019, Banbury, Resource Efficiency Clusters Case Study Research,
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Front cover photography:

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Executive summary

Resource Efficiency Clusters Case Study Research

Context, definition and method

The 2017 Clean Growth Strategy sets out the Government's commitment to work towards a zero avoidable waste economy by 2050. This included the intention to explore the development of a network of resource efficiency clusters led by LEPs. This research was intended to inform this development.

The research used the definition: Resource efficiency clusters are geographic or sector-based concentrations of interconnected companies, specialised suppliers, services providers and associated institutions which have a focus on how businesses can improve the way in which resources are used.

WRAP has identified two major barriers to SME adoption of resource efficiency – capability and capacity. Capability barriers exist where SMEs do not have the knowledge, understanding and skills to adopt resource efficiency measures. Capacity barriers occur where SMEs do not have the time and resources to implement resource efficiency actions. There can also be informational market failures where businesses are unaware of the possible savings they could make through resource efficiency measures. Specifically in relation to opportunities for industrial symbiosis, businesses are unlikely to be aware of the resources and needs of businesses in other sectors and thus the potential for industrial symbiosis matches. In addition, market pricing of materials may not take into account their environmental impact and thus may limit incentives to resource efficiency.

The research aims were to identify, recruit and conduct a detailed evaluation of the activities and impacts of five resource efficiency clusters. To provide a broader insight and as context to understanding the findings of these five resource efficiency cluster case studies, the research also sought to: understand what LEPs are currently doing to support resource efficiency; identify and compare the different types of resource efficiency cluster in operation; and examine pre-existing evidence about the impact of cluster activities. This would be followed by a concise but thorough report aimed at policy makers providing recommendations based on the available evidence.

The research consisted of two phases:

- Phase 1: Initial scoping to identify and understand RECs and the feasibility and willingness of potential case studies.
- Phase 2: An impact evaluation of five case studies, secondary research and stakeholder/expert interviews.

Findings

Overall, there was quite a limited focus upon resource efficiency amongst LEPs. Ten LEPs were identified to have some involvement in resource efficiency projects, although this is mainly about channelling European funding to other providers. There was evidence of some informal activity occurring at four other LEPs and three LEPs reported they were considering or in the process of developing activity. The primary focus amongst LEPs has been upon energy efficiency. However, there are a few interesting current local projects, some with and some without LEP involvement.

The following five case studies were used and their activities and outcomes detailed in the report:

1. BESST (the Business Environmental Support Scheme for Telford): a private sector environmental network operating a membership fee located in Telford.
2. IS NET: an industrial symbiosis, network focused, ERDF funded project for the West Midlands, delivered by a consultancy, International Synergies.
3. EREIKS (Embedding Resource Efficiency in Key Sectors): primarily a one to one resource efficiency business support programme delivered through clusters, funded by Defra.
4. Advance London: an ERDF project to help SMEs to either scale up a circular economy business model or transition from a linear business model to a circular business model.
5. SREM (Shared Resource Efficiency Manager): a Defra funded project using a shared resource efficiency manager in SME manufacturing businesses to move them to a continual model of resource efficiency improvement.

The study also identified three large resource efficiency cluster programmes in the UK to draw wider evidence from to inform the conclusions: waste minimisation clubs; resource efficiency clubs; and the National Industrial Symbiosis Program.

The following table shows the minimum and maximum cost to achieve one unit of different resource savings across the resource efficiency cluster projects for which some quantitative impact data was available (RECs, NISP, IS NET, EREIKS and SREM). So this shows, for example, that the most cost effective resource efficiency project in terms of carbon reduction saved 1 tonne of CO₂ equivalent for a cost of £4.44, whilst the least cost effective resource efficiency project in terms of carbon reduction saved 1 tonne of CO₂ equivalent for a cost of £108.97.

Resource Efficiency Clusters Case Study Research

Table 1: Minimum and maximum impacts of resource efficiency cluster projects

	£ cost to achieve 1 unit of outcome	
Metric	Maximum	Minimum
Cost savings £	£0.14	£4.18
CO ₂ equivalent saved (tonnes)	£4.44	£108.97
Virgin materials saved (tonnes)	£2.93	£171.07
Water saved (m ³)	£1.16	£5.53
Waste diverted from landfill (tonnes)	£4.85	£47.84
Hazardous waste eliminated (tonnes)	£20.06	£2,228.05
Jobs created	£12,512.44	£45,840.51
Jobs safeguarded	£9,059.04	£20,771.48
Additional sales £	£0.08	£0.27

The cost effectiveness data reviewed shows that resource efficiency clusters can achieve good cost savings ratios. The industrial symbiosis programmes appear particularly effective in achieving carbon reduction. However, these figures will be influenced not just by the cluster model but by the companies that participated and the opportunities they had (and took) to improve their resource efficiencies. This means there is always likely to be variation in the outcomes achieved by cluster projects. There was evidence that individual local clubs (waste minimisation clubs and resource efficiency clubs) may vary considerably in their cost effectiveness.

The value of a cross sector approach was emphasised and is important in enabling the matching of resource haves and wants. Some stakeholders voiced the opinion that sector-based activity is required to address the specific nature of opportunities available to companies of particular types. The extent to which companies within a sector are prepared to collaborate is likely to vary

Resource Efficiency Clusters Case Study Research

depending upon: the level of the opportunity; the sector in question; and the breadth of the sector.

The qualitative data identified several success factors which cut across more than one cluster. These covered:

- Peer to peer activity. There was a strong emphasis upon the value of this. The opportunity to see what another business had done could stimulate interest from other businesses. Examples of what businesses had done also provided credible evidence to establish the benefits of taking resource efficiency actions.
- Practitioner input. The practitioner involved in clusters was also seen as key. Their precise role would vary but could include providing one to many support, one to one support and liaison with other parties. The practitioner can provide expertise and knowledge, inspiration, drive and a resource to pursue action.
- Involvement of other parties, namely: the Environment Agency; the Wildlife Trust; waste processors/solution providers; and academics.
- Scope of the cluster. It is helpful for a project to start with a broad scope in order not to exclude opportunities. Support also needs to be tailored to respond to businesses' particular needs. It was widely emphasised that it was important to use a business relevant message, for example, about cost savings.
- Use of IT. This can serve the purposes of: evidencing the nature and savings of resource efficiency opportunities; and enabling matching of businesses' resource haves and wants in a symbiosis model.
- Funding. Clusters require funding of some kind to cover the costs and time required to coordinate their activity. There is some business willingness to pay membership fees, but this is not complete.

Wider contextual factors influencing the success of the cluster reported were:

- Economic climate.
- Policy and regulation.
- Local waste infrastructure.
- Funding incentives and continuity.

The longevity of resource efficiency cluster activity varies. In terms of individual business engagement with clusters, this varies from one off interactions to ongoing, but there is some evidence that success breeds success. The lifetime of resource efficiency clusters themselves varies. This can depend on funding. There are likely to be ongoing opportunities for savings. Self-sustaining networks may depend upon a committed, core membership/steering group (generally from larger organisations).

Implications of the research

Resource efficiency clusters are helping to address a number of market failures in terms of: lack of information about opportunities amongst businesses; a lack of capability and capacity amongst businesses; and disincentives in materials pricing. This is occurring through the peer to peer activity but also through the input of specialist practitioners.

We cannot draw definitive conclusions about the most effective type or delivery model for resource efficiency clusters. Self-sustaining private sector networks are unlikely to be widespread. Where more intensive practitioner input is provided, prioritisation would maximise value. The creation of networks and links with waste processors and circular businesses is also an important part of resource efficiency clusters. The industrial symbiosis model appears to be very effective and requires a cross sector approach. There may also be a role for sector-based approaches, again this would probably require some impetus as it does not currently appear to be a high priority. IT solutions may be an important (and potentially cost saving) support for this activity.

Contents

1.0 Introduction	13
1.1 Background	13
1.2 Research objectives	14
1.3 Defining clusters	14
1.4 Report structure	16
2.0 Methodology	17
2.1 Introduction	17
2.2 Phase 1: Initial scoping	17
2.3 Phase 2: Main phase	19
2.3.1 Case studies	19
2.3.2 Secondary research	20
2.3.3 Stakeholder/expert interviewees	21
3.0 Existing activity by LEPS	22
4.0 Case Studies	24

Resource Efficiency Clusters Case Study Research

4.1 Case study 1: BESST (The Business Environmental Support Scheme for Telford)	24
4.2 Case study 2: IS NET	27
4.3 Case study 3: EREIKS (Embedding Resource Efficiency in Key Sectors)	29
4.4 Case study 4: Advance London	32
4.5 Case Study 5: SREM (Shared Resource Efficiency Manager)	36
5.0 Wider evidence	39
5.1 Waste Minimisation Clubs	39
5.2 Resource Efficiency Clubs	40
5.3 NISP (National Industrial Symbiosis Program)	40
6.0 Cost effectiveness	41
7.0 Understanding how clusters 'work'	45
7.1 Comparison of cluster types and delivery models	45
7.2 Success factors	50
7.2.1 Peer to peer activity	51
7.2.2 Practitioner input	51
7.2.3 Involvement of other parties	52
7.2.4 Project scope	52
7.2.5 Use of IT	53

Resource Efficiency Clusters Case Study Research

7.2.6 Funding	53
7.3 Contextual factors of influence	53
7.4 Longevity	54
8.0 Implications	56
8.1 Addressing market failures	56
8.2 Value of different cluster types and delivery models	57
9.0 Appendices	60
9.1 Appendix 1: Findings from phase 1 on resource efficiency activity amongst sector-based clusters	60
9.2 Appendix 2: List of resource efficiency cluster activity identified by LEP area	64
9.3 Appendix 3: Other initiatives including IT solutions	77
9.4 Appendix 4: Cost effectiveness data sources	1

List of tables

Table 1: Minimum and maximum impacts of resource efficiency cluster projects	5
Table 2: Case study data sources and contacts	19
Table 3: Stakeholder/expert interviewees	21
Table 4: LEP involvement in resource efficiency cluster activity	22
Table 5: Case study 1: BESST	24
Table 6: Case study 2: IS NET	27
Table 7: Case study 3: EREIKS	29
Table 8: Case study 4: Advance London	32
Table 9: Case study 5: SREM	36
Table 10: Cost effectiveness of resource efficiency cluster projects	42
Table 11: Cost savings ratios of Resource Efficiency Clubs	44
Table 12: How different cluster models achieve outcomes and limitations	46
Table 13: Resource efficiency cluster activity identified by LEP area	64
Table 14: Cost effectiveness data sources	1

Acknowledgements

Winning Moves Ltd and WRAP would like to thank first and foremost the key contacts for the case studies included in this report for their time and efforts. We are also grateful for the time given by everyone else we spoke to including: representatives of LEPs; representatives of other resource efficiency projects; other contacts at the case study projects; businesses supported by case study projects; and stakeholders and experts who participated in interviews. The work has been critically reviewed by a WRAP Senior Analyst.

1.0 Introduction

1.1 Background

The UK Clean Growth Strategy¹, published in October 2017, sets out the Government's commitment to work towards a zero avoidable waste economy by 2050. A new Resources and Waste strategy² has also been developed for England, which sets out the Government's ambitions for the country to become a world leader in using resources efficiently. As well as achieving resource efficiency in the production process, this is also about re-using products, using by-products and recovery and use of other secondary materials as inputs.

The Clean Growth Strategy committed to: "explore how data can support the development of a network of RECs led by LEPs, whereby LEPs would develop local level strategies to drive greater resource efficiency, supporting processes such as industrial symbiosis and the development of new disruptive business models that challenge inefficient practice".

In practice, this would mean adopting a collaborative approach whereby the LEP takes a role as a cluster organiser with SME members. WRAP has identified two major barriers to SME adoption of resource efficiency – capability and capacity³. Capability barriers exist where SMEs do not have the knowledge, understanding and skills to adopt resource efficiency measures. Capacity barriers occur where SMEs do not have the time and resources to implement resource efficiency actions.

In addition to these capability and capacity barriers, there are likely to be market failures limiting the extent of resource efficiency activity undertaken by businesses. There can be informational failures where businesses are unaware of the possible savings they could make through resource efficiency measures. They may not have time and cost efficient access to relevant, easy to understand information on this. Specifically in relation to opportunities for industrial symbiosis, businesses are unlikely to be aware of the resources and needs of businesses in other sectors and thus the potential for industrial symbiosis matches. In addition, market pricing of materials may not take into account their environmental impact and thus may limit incentives to resource efficiency.

To move towards a locally driven, collaborative approach strategically organised by the LEP, WRAP commissioned Winning Moves to evaluate five Resource Efficiency Clusters (RECs), in depth, to understand how they operate, the extent to which they drive greater resource efficiency, and the impacts (insofar as these can be quantified). The evaluation will inform policy makers about the efficacy of using RECs as a methodology for delivering resource efficiency.

¹ <https://www.gov.uk/government/publications/clean-growth-strategy>

² <https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england>

³ http://www.wrap.org.uk/sites/files/wrap/Competency%20Framework%20FINAL%20Technical%20Report_0.pdf

1.2 Research objectives

The central objectives were to:

1. Identify and recruit a minimum of five RECs to participate in the evaluation
2. Conduct a detailed evaluation of the activities and impacts of these five RECs
3. Provide a concise but thorough report aimed at policy makers providing recommendations based on the available evidence.

The research also sought to:

- Understand what LEPs are currently doing to encourage and/or support resource efficiency, and determine whether they are already developing and/or supporting resource efficiency clusters
- Identify the different types of resource efficiency cluster in operation, and whether particular models are any more or less effective than others
- Examine pre-existing evidence about the impact of cluster activities, to inform our conclusions and provide a broader assessment of the potential impacts.

1.3 Defining clusters

Resource efficiency clusters are geographic or sector-based concentrations of interconnected companies, specialised suppliers, services providers and associated institutions which have a focus on how businesses can improve the way in which resources are used⁴.

There are a number of key distinctions to be drawn in understanding resource efficiency cluster activity. These relate to:

- Whether they are geographic or sector based, or a combination of the two (i.e. sector based but only operating within a particular region or local area). They may also focus on a particular supply chain.
- Whether they have public sector funding or are funded through private sector membership fees. This has an impact on both their delivery structure and number of years they may be in operation⁵.

⁴ This is developed from the definition in Porter, Michael E.; (2000) Location, Competition, And Economic Development: Local Clusters In A Global Economy, Economic Development Quarterly, Feb2000, Vol. 14 Issue 1

⁵ There are a number of ERDF funded projects which are time limited (for example, three years) and delivered by a third party organisation (for example, a private consultancy, university or other public

Resource efficiency cluster activity may also occur as part of broader projects, for example, projects with a wider low carbon agenda or projects focused on product development.

Clusters can operate through a variety of delivery models including:

- One on one advice/audits, workshops and/or grants, delivered by clusters of delivery organisations
- Time limited training with follow on support
- A series of events, workshops or networking opportunities.
- Networks established to identify and support opportunities for specific types of opportunity (e.g. industrial symbiosis)

The five case study clusters were selected to ensure the broad range of cluster-types and activities were represented and illustrated in the research in a way that allowed the relative effectiveness of individual approaches to be compared. However, we also sought to identify the similarities where these existed to enable conclusions to be drawn about resource efficiency clusters in general.

body). A self-sustaining private sector network is unlikely to be time limited or to be coordinated through a particular organisation (though it is also possible for the latter to become involved on a time limited basis in delivering a particular funded project).

1.4 Report structure

The report has the following sections:

- Section 2 sets out the two-phase methodology used.
- Section 3 provides the evidence we have identified about existing activity being undertaken by LEPs.
- Section 4 details the characteristics of the five case studies of resource efficiency clusters.
- Section 5 identifies the nature of wider evidence upon resource efficiency cluster activity.
- Section 6 examines the evidence identified upon cost effectiveness.
- Section 7 provides a comparison of the different cluster types and how these work, followed by consideration of key success factors in clusters, contextual factors influencing their success and the longevity of clusters and business engagement with them.
- Section 8 discusses the implications of this study.

2.0 Methodology

2.1 Introduction

The research consisted of two phases:

- Phase 1: Initial scoping to identify and understand RECs and the feasibility and willingness of potential case studies.
- Phase 2: An impact evaluation of five case studies, secondary research and stakeholder/expert interviews

This section briefly outlines the approach adopted in each phase, and the work undertaken.

2.2 Phase 1: Initial scoping

Following an inception meeting with WRAP and Defra, we conducted initial desk-top research to:

1. Better understand the types of geographic and / or industry-based Resource Efficiency Clusters that exist.
2. Identify stakeholders/experts that may be useful to engage in the research.
3. Understand what existing evidence and impact data are available
4. Better understand the circumstances in which clusters can be effective.

For the desk top research, we reviewed the following:

- LEP strategic economic plans and websites
- Example clusters and evidence provided by WRAP
- Projects funded by the European Regional Development Fund (ERDF) in the current and previous funding rounds
- Sector cluster activities.

We also held initial telephone conversations with LEPs (16 by the end of the project), other possible resource efficiency project leads (11) and other key stakeholders in the field.

During this work we compiled a list of 22 geographically-concentrated 'clusters' in the UK looking at resource efficiency, and a further seven industry-based 'clusters' that were looking at resource efficiency, but not geographically concentrated to the same extent.

One objective of phase 1 was to establish the extent to which review of secondary evidence could be used to support assessment of the impact of resource efficiency clusters.

Unfortunately, very little cost or impact data pertaining to recent cluster-type activities was found in reviewing the information available online. We also confirmed there was no centralised recording of spend and impact data for historic/completed projects funded by the ERDF.

The findings of the initial review were shared with WRAP in two separate documents which were discussed via video conference. (Appendix 1 provides some of the information collected on sector organisation activities for background reference.)

From the initial scoping work, we constructed a shortlist of 15 potential case studies. We then began conversations with representatives from the shortlisted clusters to establish the feasibility of a developing a case study and confirming their willingness to participate.

The selection of case studies proved challenging for the following reasons:

- The list of projects that could be defined as resource efficiency clusters was relatively short.
- We were interested in including a mix of models.
- We wanted to include clusters that were sufficiently mature to allow the identification of impacts. However, this primarily meant projects that had been completed which raised the issue of whether it was still possible to locate and access data and to speak to key contacts at the project.
- The availability of suitable data to consider the impacts and cost effectiveness of resource efficiency clusters was quite limited.
- Potential participants might not be willing or were limited in the time they had available to support this activity.

We were able to identify five case studies to participate, covering a range of different cluster types. However, the data available for some clusters and information they were able or willing to share (e.g. due to GDPR restrictions) placed constraints on what could be achieved in phase 2.

2.3 Phase 2: Main phase

The main phase of the research involved impact evaluation of the selected five case studies, to the extent possible within the constraints, review of relevant secondary research identified and in-depth interviews with stakeholders and experts in the field.

2.3.1 Case studies

The table shows the data sources and contacts interviewed for each case study project.

Table 2: Case study data sources and contacts

Case study	Data sources	In-depth interviewees
BESST (the Business Environmental Support Scheme for Telford) a private sector environmental network located in Telford.	Twelve online case studies and four email accounts of actions taken; one telephone business interview	Network co-ordinator, network chair, 1 other steering group member
IS NET, an industrial symbiosis focused, ERDF funded project for the West Midlands.	Final ERDF project summary report WRAP output returns	Project manager, Project director, a Business Adviser
EREIKS (Embedding Resource Efficiency in Key Sectors) primarily one to one resource efficiency business support delivered through clusters funded by Defra.	Final evaluation report	Project director, Enworks chair, NWDA project champion
Advance London, ERDF project to help SMEs to either scale up a circular economy business model or transition from a linear business model to a circular business model.	Ten telephone business interviews	Business advice manager, CEO of LWARB
SREM (Shared Resource Efficiency Manager), Defra funded project, to using a shared resource efficiency manager in SME manufacturing businesses to move them to a continual model of resource efficiency improvement.	Final evaluation report	Project researcher

It had been intended to undertake further interviews with BESST business members. However, BESST were unable to gain consent from businesses for us to contact them directly for this purpose.

Nineteen businesses supported by Advance London were selected to approach for interview because they had had sufficient support over a period of time to be able to evidence some impacts and were either seeking to improve their own resource efficiency or could facilitate the resource efficiency of other businesses through their activity. Ten of these were interviewed.

Detail on the data used for each case study and its limitations is given where this information is presented later in the report.

2.3.2 Secondary research

The following reports were reviewed for relevant evidence:

- 2011 Defra publication "Business Resource Efficiency and Waste (BREW) Programme Disaggregated Metrics Results for 2007/08"
- WR1403: Business Waste Prevention Evidence Review Waste Minimisation Clubs, (2011) Defra.
- A critical review of the largest Resource Efficiency Club Programme in England (2005–2008): Key issues for designing and delivering cost effective policy instruments in the light of Defra's Delivery Landscape Review.
- Green Action Plan implementation report for SMEs: Addressing resource efficiency challenges and opportunities in Europe for SMEs, February 2018
- National Industrial Symbiosis Programme: The Pathway To A Low Carbon Sustainable Economy
- National Industrial Symbiosis Programme: Economic Valuation Report

2.3.3 Stakeholder/expert interviewees

Table 3: Stakeholder/expert interviewees

Interviewee	Area of expertise/reason for inclusion
Anna Bright, Chief Executive, Sustainability West Midlands	Anna has oversight of the West Midlands Green Business Club Network, a network of networks, which has eight member networks covering different local areas of the West Midlands https://www.sustainabilitywestmidlands.org.uk/networks/cross-sector-green-business-clubs-network/
Ben Walsh, Innovate UK	To explore to what extent innovation clusters consider resource efficiency
Professor Paul Phillips (retired), University of Northampton	Academic expert on waste minimisation clubs to add insight into the effectiveness of earlier models of resource efficiency cluster activity.
Ffion Batcup, WRAP	Leading the EREK European clusters project for WRAP.
Peter Laybourn, Chief Executive, International Synergies	Overview of NISP and related industrial symbiosis projects

Winning Moves also conducted a feedback session at a meeting of the Sustainability West Midlands ‘green business club network’⁶. This gathered attendees’ views on the key topics covered in the stakeholder/expert topic guide. The meeting involved representatives of five different local green business clubs (which could be understood as resource efficiency clusters).

⁶ <https://www.sustainabilitywestmidlands.org.uk/networks/cross-sector-green-business-clubs-network/>

3.0 Existing activity by LEPs

The table below summarises the extent of existing resource efficiency activity we identified amongst the 38 LEPs across England. This shows that ten LEPs have some involvement in resource efficiency projects, although this is mainly about channelling European funding to other providers. There was evidence of some informal activity occurring at four LEPs and three reported they were considering or in the process of developing activity. Nine were not involved in any resource efficiency activity and for another twelve we were not able to identify any evidence of this but have not been able to get a direct response from the LEP.

Table 4: LEP involvement in resource efficiency cluster activity

Involvement in resource efficiency cluster activity	Number of LEPs
Some involvement in a resource efficiency project	10
Some evidence of informal RE activity occurring (e.g. a case study on their website)	4
In process or being considered	3
Not involved in resource efficiency project	9
No definitive evidence collected to determine	12
Total	38

Where it was possible to identify the funding source for project activity, all the LEP activity was funded through European sources (ERDF primarily but also ESIF). Some LEPs commented that ERDF funding did not previously allow inclusion of resource efficiency activity, only energy efficiency. This has now changed allowing some to expand the scope of their projects. There were also some examples of where LEPs have had an insufficient response to calls for delivery partners to run either resource efficiency or energy efficiency projects.

There were four examples of projects that LEPs were currently involved with which were primarily focused on resource efficiency (in London, Manchester, York, North Yorkshire & East Riding and Birmingham & Solihull LEPs). These projects are all quite varied but include cluster-based activity in various forms. The other projects identified mainly focused on energy efficiency but could include resource efficiency. A number of LEPs mentioned proposals to develop energy from waste projects as part of their local energy strategies.

Our initial scoping work also led to the identification of some resource efficiency clusters which the LEP was not involved in. For example, TEVI is a current resource efficiency project in Cornwall involving a partnership between University of Exeter, Cornwall Development Company, Cornwall Wildlife Trust and Cornwall Council. Entress is a current ERDF funded resource efficiency project run solely by the University of Wolverhampton. Appendix 2 lists resource efficiency activity identified by LEP area.

Respondents in the main phase of the project were asked about the role of LEPs in resource efficiency now and in the future, but there was limited feedback as follows.

- The LEP has a funding role in Advance London and BASIS (International Synergies' current project in Birmingham and Solihull).
- Business growth hubs were generally seen as a helpful, established first port of call for businesses to be involved in (signposting) resource efficiency activity.
- One respondent suggested a preference for a national or regional focus on resource efficiency.
- Another respondent suggested a role for regional networks of clusters to share learning and policy information. The value of this can be seen in the existing example of the Sustainability West Midlands Green Business Club network. This is a network of eight local green business clubs who meet to share best practice and policy information. The question was also raised as to whether there might be a useful link with Energy hubs.
- It was pointed out that it would be useful for any future activity to build on existing networks and practice.

Overall, there was quite a limited focus upon resource efficiency amongst LEPs. The primary focus has been upon energy efficiency which is probably partly explained by the earlier restrictions of ERDF funding. However, there are a few interesting current projects, some with and some without LEP involvement.

4.0 Case Studies

4.1 Case study 1: BESST (The Business Environmental Support Scheme for Telford)

Table 5: Case study 1: BESST

Case study 1: BESST
<p>Funding: 100% business member funded.</p> <p>Until about five years ago, BESST received funding from the local authority. It is now self-sustaining through its business membership fees but relies upon the commitment and time given by the co-ordinator and steering group members. It is considering ways in which it may be able to access funding from the local nature partnership or the LEP in the future.</p>
Dates: 2001 – ongoing.
Location: Telford.
Delivery structure: Private sector steering group, partnerships with the Environment Agency and the Shropshire Wildlife Trust.
Scope: presently 45 members.
<p>Aims: “Developing and sharing environmental best practice to improve environmental performance along the triple bottom line - people, planet, profit.”</p> <p>(Chair of BESST, March 2019)</p>
<p>Activities:</p> <ul style="list-style-type: none"> • One to many business events (this is the majority of the support). This includes breakfast meetings, themed workshops, speaker events, site visits, biodiversity employee engagement events and the annual internal awards. Five events per year are organised, ranging from bio-diversity protection to waste minimisation or legislation compliance, and energy efficiency. At least once a year they hold a bio-diversity protection event. This is a "hands on" event where all members join in on one site to help build environmental solutions such as hedgerow planting or bridge building from waste materials/byproducts. • One to one support. BESST will conduct site-walks with members and help them with issues such as energy reduction and waste segregation. BESST will also

support members who raise compliance concerns by acting as an informal contact with the Environment Agency. NB This does not constitute formal advice as BESST is not insured to offer this.

- Online: case studies are shared on the BESST website, specific member requests can be emailed around the network and e-introduction to solutions providers.

Examples of actions:

- Reduction of raw material use
- Increase in use of recycled materials
- Implementation of waste segregation
- Re-use and recycling of waste materials diverted from landfill (sometimes involving the use of third-party waste processor companies)
- Installation of water saving measures e.g. water saving taps and sub-metering leading to a reduction in water charges
- Installation of energy saving measures e.g. LEDs

Impact examples:

StaySafe PPE

- StaySafe PPE washes and repurposes Kevlar sleeves and safety gloves (textiles). It joined BESST in March 2018 with the intent of growing its business.
- Contracts were secured with three other BESST members. These companies have projected a 50-75% reduction in their use of these raw materials per annum. Two of these are projected to save £111k together over a year from this.
- StaySafe PPE is projecting a £66k increase in sales per annum and has taken on one full time and two part time members of staff. This is directly attributable to its BESST membership.

Harper Adams

- BESST members Harper Adams and Ricoh collaborated to divert polystyrene waste from landfill.
- Harper Adams emailed other BESST members with a one-off waste issue.
- Ricoh replied with a local solution by transporting the waste to its on-site recycling centre.
- Harper Adams saved £80 in waste collection charges, and 10kg of waste was diverted from landfill.

Lyreco

- BESST member Lyreco hosted a water audit event at its new office and warehouse site.
- The audit highlighted key areas for water saving.
- Lyreco implemented measures which led to water savings of 2,300 cubic metres per annum and cost savings of £4,600 per annum.
- Other opportunities for water saving identified through the audit were earmarked for investigation.

What difference the cluster is making:

- Enables businesses to learn directly from the credible experience of other businesses on these issues (at a low cost for the business).
- Reduces the isolation of sustainability practitioners (who do not have equivalent colleagues within their business) enabling them to share issues and successes.
- Enables sharing of resources/ collaboration to address particular waste issues by opportunity to send requests out to the network (they would not otherwise have a ready network of contacts).
- Facilitates interaction with the regulator (which the individual business would be wary of approaching directly).
- Enables third party solution providers (e.g. waste processors) to contact the relevant parties (they would otherwise potentially struggle to reach the right people within businesses and get past gatekeepers).
- Responds to business relevant, member raised issues (which they are struggling to address internally).
- Enables access to expertise in the form of guest speakers (who businesses might not otherwise have contact with).

Comments on any specific circumstances likely to be important:

This network continued after statutory funding ended because of the commitment of the individuals involved and the value they placed upon the network. Networks may be more likely to succeed where there are other pre-existing links between businesses or interest in resource efficiency. For example, BESST involved a group of local Japanese companies with high environmental targets.

4.2 Case study 2: IS NET

Table 6: Case study 2: IS NET

Case study 2: IS NET
Funding: ERDF and matched WRAP funding totalling £3 million.
Dates: 2010 – 2015
Location: West Midlands
Delivery structure: Voluntary programme advisory group of industry representatives; delivered by International Synergies Ltd.
Scope: over 500 businesses involved
Aims: “The core objective of this project was to impart regional resource knowledge, specific innovative concepts, and practical techniques to businesses across the West Midlands, thereby extending industrial symbiosis thinking and embedding the approach within a greatly expanded range of industries, sectors and clusters within the region.”
<p>Activities:</p> <ul style="list-style-type: none"> • One to one site visits for resource efficiency audits (the starting point of activity) • Training courses and workbooks on conducting waste audits, overcoming barriers to resource matching • Workshops and events for businesses to discuss resource haves/wants to achieve industrial symbiosis • Facilitative support to progress opportunities (up to 12 hours per company under ERDF funding rules) which could include liaison with the regulator, for example, to understand how waste regulations applied to them or about the possibility of obtaining waste exemption licenses • Events on legislation and compliance <p>This project used International Synergies’ bespoke software SYNERGie which is a resource management database and platform. If a match could not be found immediately, then the resource would stay in the database to be used in future opportunities. (This software is not available for general use and is not expected to be in the near future.)</p>

Examples of actions:

- Creation of synergies between participating businesses
- Linking businesses to (smaller, regional) waste processors to move materials up the waste hierarchy e.g. metals and plastics recyclers increasing their feedstock and leading to their growth and job creation
- Linking businesses (and also sometimes charities) for re-use of resources across a wide range of resources including construction materials and office furniture
- Waste minimisation or elimination (including through signposting to new technologies), segregation and transfer of waste from a cost to a revenue stream
- Installation of environment management systems
- Obtaining environmental site licenses and exemptions to enable the storage and reprocessing of wastes into raw materials
- Energy efficiency

Impact data: Given in the cost effectiveness table (section 6).

What difference the cluster is making:

- Enables businesses to learn directly from the credible experience of other businesses on these issues (at a low cost for the business).
- Facilitates interaction with the regulator (which the individual business might be wary of approaching directly).
- Identifying cross-sector business resource haves and wants (where these businesses would not otherwise be in touch with each other) via networking events (businesses would not normally interact on this topic in this way).
- Practitioner expertise and resource facilitates access to other expertise (for example, academia, waste processors) and provides ongoing support to overcome any barriers to action.
- Use of database of business resource wants and haves allows future opportunities to be identified by the practitioner that businesses would not be aware of.

Comments on any specific circumstances likely to be important:

This project built on the successful experience and knowledge and skills developed through International Synergies' previous national programme, National Industrial Symbiosis Program (NISP). It was noted that it was helpful that there was already a strong waste infrastructure in the West Midlands region.

4.3 Case study 3: EREIKS (Embedding Resource Efficiency in Key Sectors)

Table 7: Case study 3: EREIKS

Case study 3: EREIKS
Funding: ERDF and matched Single Programme funding totalling £8,967,401.
Dates: October 2009 – April 2013.
Location: North West region.
Delivery structure: Governed by an independent partnership board, managed by a central team and delivered through a network of over 10 other organisations (including sector clusters).
Scope: 2,413 in total (1,133 businesses received the higher levels of support)
Aims: "The key objective of the Project was to create a regional programme to cover the full spectrum of environmental impacts generated by a business – from the products it makes, through to the processes it uses and the waste it generates – the full 'lifecycle' of impacts."
<p>Activities:</p> <p>This project operated through a tiered structure to prioritise activity and with different organisations involved in delivering the specific elements of the programme:</p> <p>Tier 1: Businesses in high priority sectors (food and drink, automotive, chemicals and textiles) could access a comprehensive support package to enable companies to improve their competitiveness through reducing their environmental impact at all stages in a product lifecycle, including support on product design (using existing technologies), manufacturing processes and residual wastes and measuring the lifecycle carbon footprint of specific products where appropriate. Four cluster organisations initially delivered this element of the project using a consortium of consultants.</p> <p>Tier 2: Businesses in other sectors with potential for significant improvements/growth, targeting improvements in the efficiency of energy, water and materials usage and the management and avoidance of environmental risk. A sub-regional network of local, third-sector organisations delivered using consultants where needed.</p>

Tier 3: Others that were not in the priority sectors and/or those that did not have the potential to realise savings were offered light touch support through, for example, electronic information updates (ENWORKS “Green Intelligence”) and signposting services (e.g. to Business Link Environment Connect) to access other Regional and National business support provision. Resources were developed by the ENWORKS Central Team and utilised/signposted via the Cluster organisations and Sub-regional partners.

Activities were primarily one to one business support and included:

- Onsite resource efficiency audits
- Ongoing onsite support to implement findings
- Best practice sharing through focused workshops
- Information provision via ‘the Green Intelligence Service’ electronic newsletter

EREIKS used an online toolkit database⁷ which records and monitors a full range of resource efficiency improvement opportunities and their associated financial and environmental savings. Compared to SYNERGie mentioned in the previous IS NET case study, this database is not about matching companies’ haves and wants in terms of resources but is about understanding the nature of resource efficiency opportunities and the savings involved. Companies receiving support can use the database as a means of monitoring their actions. This is useful, for example, to track progress across multiple sites.

Examples of actions:

The majority of opportunities by value were identified in waste (£18,260 million), but there were also opportunities in energy efficiency (£3,820 million) and water (£524 million). A breakdown of these by sector is given in the evaluation report page 50.

The majority of the actions taken related to process change, for example:

- Buying materials in bulk to reduce the number of containers used.
- Not hosing away waste or putting timers on hose pipes to reduce water use.
- Lightweighting and re-using packaging.
- Amending quality assurance so that only waste that needs to be cut off is rather than a standard size.
- Tightening up stock management procedures to reduce waste.

⁷ <http://www.enworksinbox.com/enworks-toolkit>

Impact data: Given in the cost effectiveness table (section 6).

What difference the cluster is making:

- Practitioner motivation, expertise and resource (including use of database of identified resource efficiency opportunities and actual returns) to identify and support implementation of resource efficiency saving opportunities.
- Project links with local solution providers to support resource efficiency actions (businesses might not otherwise be aware of these).

Comments on any specific circumstances likely to be important:

The use of sector clusters as delivery organisations was not continued in this project. This was not reported to be a key ingredient because resource efficiency was a small part of the remit, the sector cluster employees tended to have relationships with HR or compliance (not necessarily those best placed to deal with resource efficiency) and not to have sufficiently intense relationships with businesses to facilitate this activity. It was suggested that business support organisations such as Growth Hubs are better placed to do this.

4.4 Case study 4: Advance London

Table 8: Case study 4: Advance London

Case study 4: Advance London
<p>Funding: ERDF (trickled down via the LEP) and matched LWARB funding, total of £1,257,872.</p> <p>(They are currently applying for another 3 years of ERDF funding.)</p>
Dates: January 2017 – January 2020
Location: London
Delivery structure: Stakeholder advisory group, delivery team of six in-house staff, external investors and corporate partners.
<p>Scope: Over 100 businesses to be assisted.</p> <p>(100 SMEs with a minimum of 12hrs of support each; 80 businesses to receive bespoke support for a minimum of 12hrs - of those 10 should receive around 10 days of support. To create 48 new jobs in London and 30 new products, processes or services.)</p>
Aims: “To accelerate the circular economy in London and to do that by helping SMEs to either scale up a circular economy business model or transition from a linear business model to a circular business model.”
<p>Activities:</p> <p>This project has a broader focus than the other case studies included here as it includes support for circular business growth. Advance London is currently supporting more circular businesses than linear businesses because the former have expressed more demand for support. However, where Advance London is supporting circular economy businesses to grow and linking them to other local linear businesses, this is indirectly enabling other local businesses to improve their resource efficiency, for example, by selling what would otherwise be waste to the circular business.</p> <p>After an initial diagnostic of each business's needs they are forwarded to one of two workstreams.</p>

The growth stream means that businesses will be involved in workshops, activities and bespoke advice on how they can grow their circular innovation to reach more markets and reduce the waste that other businesses are generating.

The second stream is the transition stream where the team works with linear businesses converting them to circular, giving them the tools to develop their circular products or services, or helping them to revise their revenue model hence reducing their own direct waste impact.

Advance London offer:

- Technical advice on circularity which can include, for example, conducting market research on behalf of the business and reporting the results back to them.
- Impact calculations for each business such as the amount of waste diverted from landfill and CO2 savings.
- Comparison of the outcomes of their circular product to traditional products e.g. biodegradable or re-usable packaging compared to plastic bottles.
- Investment guidance and 'Meet the investor' events where circular businesses are matched with investors. These events include facilitation, stakeholder management, and follow-up of introductions.
- Access to London Waste and Recycling Board (LWARB) networks which may include introductions to corporates and academic partners. These partners may be able to provide prototyping facilities for the members.
- Promotion of their product or service, so if a linear business is transitioning to circular or if a business is already offering a circular product or service the team will ensure that they get exposure through all their channels; this may include case study development.
- Business growth workshops e.g. Access to Finance and design thinking masterclasses.
- A regular newsletter.
- Support in engaging with the Environment Agency (where appropriate).

The team is currently piloting an approach which prioritises tiered support, so that businesses with the greatest level of opportunity are offered a more intense level of support (>12 hours).

Examples of actions:

- Use of a carbon calculator tool to assess suppliers/business contacts and for businesses to calculate their own impacts
- Development of business plans and models for circular businesses and to enhance the resource efficiency of linear businesses
- Identification of suppliers for circular business (thereby improving the resource efficiency of the linear businesses supplying them)
- Contact with potential investors in circular business
- Increase in use of recycled materials

There is most interest in reducing raw materials or resource recovery (creating new products from own or other businesses' waste stream) and take back schemes to reduce packaging.

Impact examples:

Cru Kafe

- Cru Kafe is a coffee pod and coffee bean retailer.
- Thanks to R&D support and industry contacts from Advance London, Cru Kafe has switched from plastic (non-recyclable) pods to aluminium (recyclable) pods. It was previously considering aluminium or compostable but the support from Advance London helped it to understand the issues with compostable.
- Use of raw plastic is estimated to have been reduced by at least one tonne for the last six months of 2018.
- This change has also enabled Cru Kafe to increase its sales by selling to supermarkets (who were unlikely to have bought a plastic product).

Biohm

- Biohm collect bio-based waste to create sustainable building products for the construction industry.
- By the end of 2020 it projects to have collected 900 tonnes of food and agricultural waste (although not all of this can be attributed to the support of Advance London).
- Advance London has already connected them with high-profile large-scale clients.
- Networking with other start-up SMEs, identification of waste streams, and advice regarding regulations has advanced its development by "at least 12 months".

KSBC

- KSBC specialises in the relocation of IT and communications equipment during office moves.
- It launched a new service advising clients on refurbished equipment and disposal of unwanted items. Surplus equipment was previously sent to the tip.
- Advance London handed over its deliverables (including advice on disposal companies and buyers) in January 2019 so data is only available from one customer so far. This support came from a chance meeting at a trade event between KSBC and Advance London. Before this, KSBC would not have offered a solution for unwanted equipment.
- 40 laptops and surplus IT gear was diverted from landfill with a cost saving of £900 to the client.

What difference the cluster is making:

- Practitioner expertise and resource to identify opportunities for, build the case for and support implementation of a more circular business model.
- Provision of organised networking opportunities facilitates contact and relationships between investors, suppliers and customers operating more resource efficient business interactions (where these might otherwise not occur).
- Provision of organised networking opportunities facilitates learning and information sharing between businesses (developing a more resource efficient approach or growing a circular business) and enables time and cost savings in accessing this information.

Comments on any specific circumstances likely to be important:

It was suggested that this approach works well when there are strong local sectors which enable the circular economy e.g. government, higher education, digital and communications, as well as when there is an existing and vibrant entrepreneurial landscape which is eager to innovate and increase business competitiveness.

4.5 Case Study 5: SREM (Shared Resource Efficiency Manager)

Table 9: Case study 5: SREM

Case study 5: SREM
Funding: Defra, £263,648
Dates: 12 month project 2014-2015
Location: South West of England, South East Wales, Derby
Delivery structure: led by E&SP (the Environment and Sustainability Partnership Ltd) working with EEF (manufacturers' organisation), Bangor University and Rolls Royce.
Scope: 10 businesses involved across 2 cohorts
Aims: "to research and evaluate the effectiveness of using a shared resource efficiency manager (SREM) in small and medium sized (SME) manufacturing businesses to move smaller businesses from a cyclical approach to resource management to a continual model of improvement which locks in systems to support long-term resource efficiency related behaviour change."
<p>Activities:</p> <ul style="list-style-type: none"> • Two Shared Resource Efficiency Managers worked with individual businesses within their cohort to identify and implement resource efficiency improvements whilst embedding skills and knowledge more widely in the individual businesses. • One SREM worked with a cohort of (predominantly) EEF (The Manufacturers' Organisation) member businesses based in the South West of England and South East Wales. • The second SREM worked with the supply chain of Rolls-Royce plc from Derby.
<p>Actions:</p> <p>These are the actions listed to have been taken. Some of these were given cost savings values in which case they are marked as either actual (achieved) or potential (identified to take in the future):</p> <p>Relating to materials management:</p> <ul style="list-style-type: none"> • Changed materials supplier – improving quality and reducing cost (actual).

- Changed production practices and procedures (actual and potential).
- New materials use monitoring procedures (actual).
- Put in place a packaging reduction plan/ reduction in packaging.
- Instituted packaging monitoring system.
- Change in design to reduce materials use.
- Negotiated a materials take back scheme with supplier.
- Adoption of KPIs to reduce material waste and improve resource use.
- Improved materials stock management.
- Change in company culture towards resource efficiency and waste prevention.

Energy efficiency:

- Adoption of KPIs to reduce energy use (potential).
- System for monitoring energy use put in place (actual).
- Detailed energy use breakdown and identification of energy savings (potential).

Waste management:

- New waste management procedures and/or renegotiation of waste contract (actual and potential).
- Pre-treatment of wastes to increase value (potential).

Water management:

- Alternative treatment method of liquid wastes (actual).
- Renegotiation of trade effluent consent (actual).

Capacity building:

- Resource efficiency integrated into company's programme of staff engagement.
- Revised roles, responsibilities and organisational structure to improve resource efficiency and/ or waste management.
- Staff training to reduce wastage and improve resource use.
- Resource efficiency built into procurement aims and practices.

Impact data: Given in the cost effectiveness table (section 6).

What difference the cluster is making:

- Practitioner motivation, expertise and resource to identify and support implementation of resource efficiency opportunities.

For the sector cohort:

- Encourages participation in resource efficiency activity through the trusted position of a sector body.
- Enables businesses in the same sector to share information and learning.

For the supply chain cohort:

- Encourages participation in resource efficiency activity through pressure from the key client.
- Enables suppliers as a group to have a greater voice on resource efficiency activity with their client.

Comments on any specific circumstances likely to be important:

The 12-month period was not sufficient to see the full potential impacts of the project. Collaboration within a sector is possible where it is not directly commercially sensitive. Suppliers were also reluctant for their customer to know about their cost savings in case this led to pressure to reduce the price of contracts.

5.0 Wider evidence

We identified three large resource efficiency cluster programmes in the UK which are also useful to consider in terms of cost effectiveness alongside the case studies. Each of these is briefly outlined in turn below.

5.1 Waste Minimisation Clubs

Projects generally ran somewhere between one and three years. There was no formal definition of a Waste Minimisation Club (WMC) but two distinct typologies: Demonstration Clubs (early to mid-1990s) and Facilitated Self-help. Either type could be cross-sector or single sector.

Demonstration clubs: These were highly subsidised projects, involving significant amounts of public funding and support from private consultancies, business support organisations or universities. They recruited a small number of companies in a limited range of manufacturing sectors that were high-waste producing and therefore offered significant potential for waste and financial savings. The aim of these clubs was to demonstrate how significant financial cost savings could be made by implementing waste prevention and resource efficiency 'best practice'.

Facilitated self-help clubs: These relied on limited external funding to provide some external expertise, but then relied on training champions within participating companies to build organisational capacity in waste prevention. Self-help modelled clubs were most common from the turn of the century. Clubs are typically initiated and run by a partnership of interested organisations (which may include local authorities, utility companies, central government, private consultancies, business support organisations, Regional Development Agencies, government offices, industry, regulators and universities).

Most clubs linked waste prevention with wider resource efficiency objectives, including energy management, water efficiency, legislative compliance and reduction of greenhouse gas emissions. Services differed between clubs but those of most value to members of clubs appeared to be networking and knowledge exchange with peers, case studies, site visits and one-to-one support.

5.2 Resource Efficiency Clubs

Defra funded the Resource Efficiency Club programme from 2005 to 2008.

The lead organisations of clubs included: government body/chamber of commerce/council; private consultancies; Business Links; Environment Agency; not for profit; Universities; charity trusts; and support groups/forums. Seventy clubs were funded and 1,330 businesses were registered with them. Clubs were either organised with a geographic meeting point (70%) or covered a wider geographic area but with a sector focus.

Advice, guidance and training on resource efficiency was provided by clubs. Event types used included interactive workshops, delegate training, site visits, seminars, networking event, meetings and awards. Interactive workshops were the most commonly used event type. Topics covered included energy, waste, specialist, resource efficiency, legislation and monitoring resources.

5.3 NISP (National Industrial Symbiosis Program)

NISP originated as three pilot schemes in Scotland, West Midlands and Yorkshire & Humberside in 2003. In 2005, Defra provided funding to roll out the programme across all nine English regions. Similar programmes were also initiated in Wales, Northern Ireland and Scotland. The data included on NISP here covers the period of 2005 to 2010.

The project was focused upon delivering industrial symbiosis through establishing a network of member companies of all sizes and sectors (SMEs and micros made up 90% of the membership). This was achieved through networking workshops supported by industrial symbiosis facilitators. Industrial symbiosis facilitators were based regionally but also worked with each other across the national network. For NISP, training materials and courses were developed, along with a framework for delivering NISP facilitated workshops and best practice sharing events. NISP also used a national resource stream monitoring system and data analysis tool - Central Resource for Industrial Symbiosis Practitioners (CRISP), to facilitate opportunities. Each of NISP's regional teams had a Programme Advisory Group (PAG) made up of key business people from each region who know, trust and work closely with the NISP teams. The Environment Agency, Scottish Environment Protection Agency and Northern Ireland Environment Agency also worked with the advisory groups.

This programme worked in a similar way to the IS NET project already discussed (both were delivered by International Synergies). NISP had the benefit of operating in all regions and with national coordination. NISP was also not subject to the ERDF funding focus upon the number of individual businesses supported for a certain number of hours.

6.0 Cost effectiveness

Appendix 4 details the data sources used, the attribution rates used and any other points to note about the data upon which the cost effectiveness table is based. Whilst we have assessed the data sources as fully as possible, they are not all complete and so some assumptions have had to be made. As we do not have access to the primary data, we cannot be entirely sure that savings were measured in the same way and similar calculations used. As such, these figures should be used as an indication rather than a definitive comparison.

This table shows what it cost to achieve one unit of outcome for the different resource efficiency programmes for which we have data. For example, in the Resource Efficiency Club Programme (RECs), to achieve £1 of cost saving, it cost £0.14 and to achieve a reduction of 1 tonne of CO₂ equivalent, it cost £108.97. The lower the cost, the more cost effective the project has been. These costs all take into account attribution and so only show what we understand would not have happened without the project/cluster. Persistence effects (ongoing savings) are not accounted for and as such, these figures are likely to underestimate the long-term achievements of these programmes.

This is not intended to be a full economic valuation and so leakage, substitution and an economic multiplier have not been applied to increased sales or jobs created or safeguarded (or additional employer national insurance contributions).

Table 10: Cost effectiveness of resource efficiency cluster projects

Cluster/project	RECs	NISP	IS NET	EREIKS	SREM actual	SREM potential
Cost savings £	£0.14	£0.30	£0.30	£0.16	£4.18	£0.63
CO ₂ equivalent saved (tonnes)	£108.97	£7.63	£4.44	£48.44		
Virgin materials saved (tonnes)	£144.07	£4.75	£2.93	£171.07		
Water saved (m ³)	£2.09	£4.82	£1.16	£5.53		
Waste diverted from landfill (tonnes)	£24.08	£6.56	£4.85	£47.84		
Hazardous waste eliminated (tonnes)	£2,228.05	£126.73	£20.06			
Jobs created		£12,512.44	£26,829.84	£45,840.51		
Jobs safeguarded		£9,059.04	£14,293.62	£20,771.48		
Additional sales £		£0.26	£0.27	£0.08		

These figures are for a small number of examples. The cost effectiveness figures will be influenced not just by the cluster model but by the companies that participated and the opportunities they had (and took) to improve their resource efficiencies. This means there is always likely to be variation in the outcomes achieved by cluster projects. Our experience on other studies suggests that sometimes there may be a small number of large opportunities that can affect the final outcomes significantly. Thus it is difficult to draw conclusions about the cost effectiveness of different models. Table 11 in the next section of this report provides some insight and comparison of how the different models may achieve outcomes and the circumstances in which they work or may be limited. The implications of this and how this addresses different market failures is then considered further in Section 8.

NISP and IS NET (the industrial symbiosis programmes) appear more effective in achieving carbon reduction. International Synergies has not identified any reasons as to why IS NET should have been more carbon effective than NISP. (Again this suggests that care should be taken in making comparisons with these figures.) It should also be noted that the IS NET data is not based upon the full dataset for this project as this could not be accessed (see

Appendix 4). In terms of achieving industrial symbiosis opportunities, NISP is viewed by International Synergies as a more effective programme because it did not have the funding focus on business assists that IS NET as an ERDF funded project had. Their perception is that IS NET included more energy efficiency savings and fewer true industrial symbiosis matches compared to NISP because of the funding structure.

There is other evidence that individual local clubs may vary considerably in their cost effectiveness. The paper on waste minimisation clubs⁸ reviewed provides the cost saving ratios of some individual waste minimisation clubs given (without any consideration of attribution). These range from 0.8 to 14.1 (in terms of pounds saved per pound spent). The paper on the Resource Efficiency Club programme⁹ reviewed gave an overall actual return of £5.8 per £1 invested (with twice as much in potential savings estimated). This also showed how this varied by club (based upon data provided by 53 of 70 clubs) as illustrated in the table below.

⁸ WR1403: Business Waste Prevention Evidence Review Waste Minimisation Clubs, (2011) Defra.

⁹ A critical review of the largest Resource Efficiency Club Programme in England (2005–2008): Key issues for designing and delivering cost effective policy instruments in the light of Defra's Delivery Landscape Review.

Table 11: Cost savings ratios of Resource Efficiency Clubs

Ratio of actual savings to total grant	Number of Resource Efficiency Clubs reporting this savings ratio
Less than 1	13
Between 1 and 2	8
Between 2 and 5	8
Between 5 and 10	15
More than 10	9

This review also provided a couple of examples of variation within individual clubs over time. In one case, the savings to grant ratio of the county programme varied, over 12 years, from 2.6 to 20.0. In another county programme, the ratio has varied, over six years and 3 phases from 2.6 to 16.8.

There was some qualitative feedback about the cost effectiveness of cluster activity. A one to many approach is seen to be cost effective. In the case of training/workshops/events, it allows greater numbers of businesses to be reached. In the case of industrial symbiosis networking events, it enables more opportunities to be identified. However, one to one support was also required. This was targeted in some projects so that resource was focused upon those with the greatest potential/largest projects (this may depend upon company sector, size and cultural readiness).

Particular cost saving approaches noted within cluster activity were:

- Use of IT: databases of opportunities for industrial symbiosis.
- Members hosting events and promoting the network (BESST).
- Online training. This was suggested but no evidence on its value has been identified.
- Use of in-house resource rather than consultants.
- Training and organisational development rather than direct use of consultants.

7.0 Understanding how clusters 'work'

7.1 Comparison of cluster types and delivery models

The next table provides some comparison of how different cluster types achieve resource efficiency outcomes and the potential limitations of the different models. This comparison is limited given the small number of case studies we have been able to consider and that they are quite diverse.

Table 12: How different cluster models achieve outcomes and limitations

Cluster type	How this model helps to deliver resource efficiency outcomes and the circumstances in which this works	Potential limitations of this approach and limiting conditions
Geographic models		
General points	<ul style="list-style-type: none"> • Some opportunities are geographically based: businesses need to be near to each other to use each other's resources. Water and energy opportunities are more geographically specific than waste which can travel (although doing so involves costs). 	
Private sector network events based (e.g. BESST)	<ul style="list-style-type: none"> • Enables businesses to learn directly from the credible experience of other businesses on these issues • Reduces the isolation of sustainability practitioners, enabling them to share issues and successes. • Enables sharing of resources/ collaboration to address particular waste issues. • Facilitates interaction with the regulator. • Enables third party solution providers (e.g. waste processors) to contact the relevant parties. • Responds to business relevant, member raised issues. • Enables access to expertise in the form of guest speakers. 	<ul style="list-style-type: none"> • These are likely to require an initial catalyst or funding injection to get them started. • Little impact data available to judge effectiveness. • Depends upon a core of committed local businesses. • Limited resource.

Practitioner led training/workshops plus follow on support (e.g. Waste Minimisation Clubs, RECs)	<ul style="list-style-type: none"> • As for private sector networks but with the added strength of: • Practitioner motivation, expertise and resource to identify and support implementation of resource efficiency saving opportunities. 	<ul style="list-style-type: none"> • Impacts vary considerably by individual club.
Cluster of delivery organisations providing mainly one on one advice/audits (EREIKS)	<ul style="list-style-type: none"> • This provides the practitioner benefits of the previous model. It provides a more filtered version of the benefits of the private sector network. These are achieved through the practitioner's contacts and knowledge (via the extensive database and case studies held) rather than through wider business networking. 	<ul style="list-style-type: none"> • Much more limited business interaction.
Industrial symbiosis networks (International Synergies projects)	<ul style="list-style-type: none"> • This approach adds practitioner facilitation of the matching of resource haves and wants between companies from across sectors (who are unlikely otherwise to be in contact or to be aware of each other's needs and resources). 	<ul style="list-style-type: none"> • Greater investment may be required for larger opportunities.
Sector model		
Sector based (e.g. SREM)	<ul style="list-style-type: none"> • Members are likely to have common issues and opportunities bringing particular benefits to information sharing. • This approach may help facilitate some opportunities at higher levels of the waste hierarchy which are specific to a sector. • Sector association is a trusted body able to encourage business participation. 	<ul style="list-style-type: none"> • Competition concerns may limit information sharing and participation. This will work best in sectors which are broad enough to limit competition concerns. • Does not offer the benefits of cross-sector resource matching.

Supply chain model		
Supply chain based (e.g. SREM)	<ul style="list-style-type: none"> • Suppliers can collaborate to have a greater voice with a key client. • Pressure from a key client can encourage suppliers to participate in resource efficiency activity. • A supply chain model potentially overcomes the barrier identified that: if a key client is not engaged, then it can be difficult for supplying businesses to make resource efficiency changes as quality and reliability are key and it can be difficult to get approval for changes to designs or manufacturing processes. 	<ul style="list-style-type: none"> • Suppliers may be concerned about the key client putting pressure on contract prices if they aware of savings being made.

The use of a sector based or cross sector approach has particular implications which are discussed further here. The value of a cross sector approach is particularly in enabling the matching of resource haves and wants. The waste products and resources needed by companies within a particular sector are likely to be too similar to enable this. The benefits of a cross-sector approach are strongly emphasised by International Synergies in terms of broadening the range of opportunities given that businesses of different types have different resources and needs. International Synergies estimate that 80 per cent of the synergies they have completed over the years have been across sectors. Even in construction where there is already a lot of transfer of materials taking place, only about 40 per cent of synergies are within the sector. The planned new Innovate UK resource efficiency innovation project 'Transforming the Foundation Industries' will seek to encourage cross-sector collaboration for the larger opportunities and benefits this potentially brings where a solution can be used in several sectors. It will also lessen competition barriers.

Some stakeholders voiced the opinion that sector-based activity is required to address the specific nature of opportunities available to companies of particular types. For example, the manufacturing processes and water intensive processes in the textiles sector are very specific. EREIKS noted that it is useful to have case studies of organisations of all different types and sizes so that there is something similar that any business can relate to. However, businesses may not want to share information with competitors. The extent to which companies within a sector are prepared to collaborate is likely to vary depending upon:

- The level of the opportunity (in terms of the waste hierarchy), the lower levels are likely to be less of a problem, for example, energy saving opportunities as opposed to process changes.
- The sector: food and software were given as examples where there were lower levels of willingness to share information. One sector cluster reported that they do not find this a problem because the sector is sufficiently broad that competition is less of an issue.
- The breadth of the sector. The broader the sector, the less likely competition is to be an issue.

Sector associations offer a means of reaching businesses about sector based or cross-sector activity. International Synergies view sector associations as another way of spreading the message about resource efficiency opportunities. Innovate UK were also intending to work with sector associations on their new project.

However, there is also some evidence that there is limited capacity or interest amongst sector associations. One sector cluster reported that as they are 100 per cent member funded, they would only cover resource efficiency upon member request or through being

able to access external funding. The European EREK project (in which resource efficiency tools and materials have been developed on a sector basis) is now focusing upon sector clusters as its target audience in partnership with the European cluster collaboration platform. The idea is that the sector clusters disseminate information and opportunities to their members. To date EREK has held one workshop targeted at sector clusters, which did not have much attendance from sector clusters. It is due to hold a resource efficiency session at a large European cluster conference in the coming months, which will offer more of an opportunity to gauge interest and feedback.

Some other points to achieving outcomes were noted in the qualitative data relating to the cluster/project/network delivery model:

- Programme timescales may not fit with business timescales. For example, the project timescale may be too short for resource efficiency measures to be taken as in the SREM case study.
- Data collection requirements. In the earlier waste minimisation club programme, it was difficult getting companies to collect and share data on resource efficiency savings.
- Several respondents made the point that it makes sense to make use of any existing local business networks and relationships, for example, through masons, Lions.

7.2 Success factors

The qualitative data identified several success factors which cut across more than one cluster. These covered:

- Peer to peer activity
- Practitioner input
- Involvement of other parties
- Scope of the cluster
- Use of IT
- Funding

Each of these is discussed in turn.

7.2.1 Peer to peer activity

There was a strong emphasis upon the value of peer to peer activity. This could take the form of case studies, presentations from businesses about their experiences, site visits to see what businesses had implemented, business champions, networking opportunities and resource matching events. The opportunity to see what another business had done could stimulate interest from other businesses. Examples of what businesses had done also provided credible evidence to establish the benefits of taking resource efficiency actions. Peer to peer interaction is obviously required to match resource haves and wants to facilitate exchange. This was important in all the clusters. Peer to peer activity is the principal mode of activity for BESST. In SREM, the opportunity to collaborate was identified as a very positive, not entirely anticipated, outcome. Even in EREIKS where the main mode of delivery was more individualised, individual business support was supported by the use of case studies and the toolkit database of business opportunities for resource efficiency.

7.2.2 Practitioner input

In addition to peer to peer activity, the practitioner involved in clusters was also seen as key. Their precise role would vary in the different provision but could include providing one to many support, for example, training. There was also a significant role for one to one support in the form of resource efficiency audits (including on site walk arounds), ongoing one to one support and liaison with other parties. This input is achieving a number of functions. The practitioner can provide expertise and knowledge in resource efficiency that the company does not have. They can provide inspiration and act as a driver to the implementation of action. They act as a resource where businesses do not have the time to pursue action. The exception was BESST where there was no funded practitioner resource. In this case, the voluntary coordinator and steering group members took on some of this role but to a more limited extent. It was noted that the amount of one to one support required from the practitioner could vary depending on the company's needs and ability to identify and implement actions.

The following characteristics of practitioners were identified as helpful:

- Knowledge/expertise including technical skills
- Being able to build relationships with businesses and having a collaborative approach
- Having an industry background
- Interacting with businesses, not just desk based

- Being inspiring and energetic
- Being considerate and knowing how far to push businesses

7.2.3 Involvement of other parties

The involvement of several other parties was identified to be helpful in cluster activity as follows.

- The regulator, the Environment Agency. A member of the Environment Agency is on BESST's steering group. It was also noted elsewhere that it could be helpful for the cluster practitioner to liaise with the regulator so that a business could remain anonymous (it might be wary of bringing attention to specific issues) and to facilitate a quick decision.
- The Wildlife Trust.
- Waste processors/solution providers. Clusters are often helping businesses by raising awareness of, facilitating introductions and liaising with waste processors or solution providers in this sphere. The Staysafe PPE example given for BESST earlier is an example of this. The support that Advance London give circular businesses in creating business partnerships enhancing other businesses' resource efficiency delivers this. There are case studies in the IS NET project which illustrate the growth of material processors through their involvement in the project.
- Academics. At the level of NISP, academic partners could be involved to provide research to enable an opportunity to use what was previously a waste product to be realised.

7.2.4 Project scope

It was reported that it is helpful for a project to start with a broad scope in order not to exclude opportunities. One respondent argued that it would be important not to exclude energy. At the same time, support needs to be tailored to respond to businesses' particular needs, which might arise from their sector or from the point at which they are on the waste hierarchy.

It was widely emphasised that it was important to use a business relevant message. This would primarily be about the cost saving opportunities but could also include compliance.

7.2.5 Use of IT

Two bespoke IT systems have been identified in the case studies (the toolkit in EREIKS and SYNERGie in the work of International Synergies). These are used in slightly different ways fulfilling the functions of:

- Evidencing the nature and savings of resource efficiency opportunities
- Enabling matching of businesses' resource haves and wants in a symbiosis model.

7.2.6 Funding

Clusters require funding of some kind to cover the costs and time required to coordinate their activity. There is some business willingness to pay membership fees, but this is not complete. As well as BESST, the Meres and Mosses Business Environment Network and Staffordshire Business & Environment Network operate a membership fee. In the SREM case study, three out of 10 participating companies opted to continue paying a fee for resource efficiency support. The beneficiary survey undertaken for the EREIKS project reported that:

- 16% of respondents said they would be willing to pay for a resource efficiency audit (n = 82)
- 16% would be willing to pay for ongoing support that they had had (n = 50).
- 10% said they would be willing to pay for training (n = 48).
- 15% would pay for use of the toolkit (n = 93).

A review of the Resource Efficiency Club programme reported skepticism that businesses would be willing to pay for this type of support, particularly in relation to the SMEs.

7.3 Contextual factors of influence

Several of the wider contextual factors influencing the success of the cluster reported can be seen to be relevant to resource efficiency activity more generally. Factors identified were:

- Economic climate. Other business priorities and pressures, for example, instability, recession or mergers can limit the interest and capacity of businesses to participate in resource efficiency activity. However, pressure on costs can be an opportunity as businesses can turn to resource efficiency for some solution.

- Policy and regulation. Legislative drivers such as new packaging regulations may encourage uptake. Regulation may act as a barrier, for example, where a waste could not be reclassified as a waste for re-use.
- Local waste infrastructure. The existence of a strong local waste infrastructure, for example, plastic and metal recyclers could facilitate cluster activity.
- Funding incentives and continuity. The nature of the funding used by clusters and the particular requirements in terms of outcomes and reporting could influence the type of activity a cluster undertakes. For example, ERDF is focused upon the number of businesses assisted rather than upon resource efficiency outcomes.

7.4 Longevity

The study collected some informative data about the longevity of cluster activity. Longevity can be considered in terms of the length of time a business engages with a cluster and how long a cluster continues to operate.

In terms of individual business engagement with clusters:

- This varies from one off interaction to ongoing, but there is some evidence that success breeds success. The resource efficiency activity of businesses may move up the waste hierarchy over time as they engage with the cluster. One respondent talked about businesses becoming involved in the cluster when they had a business 'pain' that needed addressing but then having had success; the same business may then be more open to other resource efficiency opportunities. Another respondent also reported that the availability of a grant may act as a carrot to business participation, but the business may then benefit from a wider review and advice.
- Business engagement can depend upon the employment of a committed individual at the business and embedding of sustainability as a core business value.

The lifetime of resource efficiency clusters varies.

- Some funded projects are designed to be time limited once the aims are embedded in businesses. Generally, the funded input for waste minimisation clubs was for no longer than two years so that the practitioners could move on to work with other companies.
- However, there is feedback that this does not mean that savings opportunities are quickly exhausted. Some analysis of waste minimisation clubs suggests that after three years, 90 per cent of the potential savings identified will have been turned into actual savings. However, this can vary considerably. (This seems quite a high conversion rate

compared to some other evidence. For example, the EREIKS report identified a 23% conversion rate in terms of the proportion of identified savings that were actually implemented.) Changes in the landscape of environmental legislation also lead to continuing opportunities for resource efficiency.

- There is some evidence of businesses continuing resource efficiency cluster activity themselves. For example, 3 out of 10 SREM businesses opted to pay to extend the activity. Under the Resource Efficiency Club programme, 45 out of 70 clubs were still active at the end of the three-year programme.
- Self-sustaining networks may depend upon a committed, core membership/steering group (generally from larger organisations) and voluntary coordination (in the case of BESST).
- Some industrial symbiosis opportunities were reported to take a long time to come to fruition (they may require academic research and development). NISP Northern Ireland has continued to operate since the earlier national NISP programme and is currently out to contract to operate for future years, suggesting that there are ongoing opportunities.

8.0 Implications

8.1 Addressing market failures

There are high levels of attribution across resource efficiency cluster projects (from a rate of 0.6 upwards where this has been recorded). This shows that they are achieving resource efficiency savings that would not otherwise be happening to this extent. The type of activity identified is likely to be addressing market failures and barriers to resource efficiency measures in the following ways.

Informational failures. Businesses may not be aware of the savings it is possible to make and may not have time and cost efficient access to relevant, easy to understand information. They may also be wary of the risks of changes to business practice. The use of peer to peer activity (in various forms, for example, case studies, site visits, networking) is a key mechanism of clusters helping to address this. This can provide businesses with credible, real life business examples and evidence of the feasibility and cost saving benefits of resource efficiency measures. In the case of industrial symbiosis, there is also an informational failure in that businesses in one sector are unlikely to be aware that a waste product they have would be of interest to businesses in another sector as a resource. The possibility of a national materials datahub and smart waste tracking would also potentially help to address this failure.

Lack of capability. Businesses may not have the knowledge, skills and expertise required to deliver resource efficiency outcomes. This can be addressed by clusters through information sharing between businesses and the input of practitioners. In the case of industrial symbiosis, the process can be quite complex. Wastes may need physical or chemical transformation before they become useful elsewhere. This requires specialist expertise and facilitation to enable use.

Lack of capacity. Businesses will often have other more pressing priorities and limited time to devote to resource efficiency. This is particularly likely amongst SMEs. This is where practitioner input is key. There is also limited willingness to pay and cluster activity often fizzles out when funding ends highlighting the need for a practitioner to coordinate and facilitate.

Materials pricing. There was also some evidence that water and carbon do not currently command a high price in the market. Raw materials are relatively inexpensive, primary raw materials are sometimes more readily and cheaply available than recyclates so that the pricing of raw materials does not take into account their environmental impact. This can mean there is insufficient impetus for action without funded input.

8.2 Value of different cluster types and delivery models

In terms of the value of different cluster types and delivery models, some implications can be identified. It is important to note that the cost effectiveness data presented in individual case studies depend not just upon the cluster type and model, but also upon the businesses that became involved in that cluster and the types of opportunities they took up (or did not take up). Thus, we cannot draw definitive conclusions about the value for money of individual cluster types.

There were no clear reasons to expect any of the different delivery models in a geographic sector NOT to work in particular circumstances, other than that a self-sustaining private sector network will require a number of committed individuals leading it. Different local contexts, for example, in terms of the nature of the local economy (mix in terms of sectors, sizes etc) and infrastructure is likely to influence the nature of the cluster activity and potentially the extent of outcomes. For example, where there are concentrations of manufacturing industry, these businesses may have more to gain and be more used to making process changes than compared to an office-based concentration. It will potentially be hardest for resource efficiency clusters to make a difference the smaller a business is and the less significant its resource costs are.

Whilst self-sustaining private sector networks might be the lowest cost option for government, there is no definitive evidence for their impact. Further, they are unlikely to be widespread and are likely to need some catalyst to kickstart activity.

If more intensive one to one business support interventions are to be funded, then it would seem to make sense to offer tiered support (as in EREIKS or being considered by Advance London) to prioritise the greatest opportunities.

The brief here was not to consider the impact of supporting the development of circular economy businesses as is included in the Advance London model but clearly this offers another route to improving the resource efficiency of all businesses. This project does offer a strong focus upon creating contacts and networks not just between businesses (seeking to be more resource efficient) but also with waste processors and as suppliers and customers in a more circular model. The value of clusters is not just in businesses learning from each other but in linking into local waste infrastructure and a broader circular economy.

This is similar to the network focus of the industrial symbiosis programmes (NISP and IS NET) which appear most effective in terms of carbon reduction. There are strong arguments for cross-sector work to enable the matching of opportunities for one business's waste to be used as another's resource. Opportunities may be higher because of the diversity of needs and resources. Information failures are likely to be particularly strong across sector: businesses operating in one sector are less likely to understand the needs or resources of businesses in another sector. The case for the development of an innovative process to enable use of a waste by product may also become more stronger if it can be applied across a number of sectors.

There is also likely to be a role for sector-based work but this may need an impetus as this does not appear to be a high priority. Local, regional or national cross-sector approaches and regional or national sector-based approaches may offer complementary outcomes. Whilst initiatives in smaller geographic localities will enable particular local opportunities to be considered, geographic funding restrictions could limit the potential for other opportunities, for example, which relate to a supply chain or industrial symbiosis opportunity that cuts across different local areas or even regions.

IT tools have clearly been quite useful in the work of Enworks and International Synergies and may also offer a means to make activity more cost effective. The new national initiatives in the National Materials Datahub and smart waste tracking (noted in Appendix 3) potentially offer good support to future resource efficiency cluster initiatives. The evidence from the pilots of these initiatives should be considered together with potential plans to support resource efficiency cluster activity. Other European initiatives are also noted in Appendix 3 which may be relevant context to the development of new resource efficiency cluster activity.

Whilst limited existing resource efficiency activity was identified amongst LEPs, this appears partly to relate to the nature of ERDF funding and possible gaps in the capacity of third parties to deliver this type of activity. It may also be reflecting the low priority and attention

given to this amongst some businesses. Where there is existing provision, it makes sense to build on this and also existing business networks and business support agencies such as Growth hubs. There could also be benefits to supporting regional networking between local resource efficiency clusters.

9.0 Appendices

9.1 Appendix 1: Findings from phase 1 on resource efficiency activity amongst sector-based clusters

Our initial review of clusters identified 21 clusters (listed below) that operate on a sector basis that we recorded in a spreadsheet and looked at in a little more detail.

- The North East Automotive Alliance
- Cywain Fine Food Cluster (part of a broader set of 7 Welsh clusters focused on different aspects of the food and drink industry)
- Midlands Aerospace Alliance
- Rail Alliance
- Cambridge Cleantech
- Liverpool City Region Cluster
- European Chemicals and Processing Industry Clusters
- Food & Drink Federation
- EandSP (the Environment and Sustainability Partnership Ltd) and EEF (SREM project)
- CleanTech Business
- Aberdeen Renewable Energy Group
- Biovale
- European Learning Network
- Greentech South
- Highlands and Islands Enterprise Energy
- Huddersfield & District Textile Training Co Ltd / Textile Centre of Excellence
- Life Sciences Hub Wales
- North East of England Process Industry Cluster (NEPIC)
- North West Aerospace Alliance

- North West Textiles Network
- Anglia Ruskin University and Opportunity Peterborough water cluster

Desktop research identified that out of these 21 clusters, seven promoted or mentioned resource efficiency. Five are regional and two are national based. These were as follows:

- Cywain – food and drink industry in Wales
- Five Fold Ambition – led by the Food and Drink Federation
- Rolls Royce supply chain – supported by Defra through the Shared Resource Efficiency Manager project
- South West and South Wales geographical cluster (EEF)– supported by Defra through the Shared Resource Efficiency Manager project
- BioVale – food manufacturing
- Huddersfield & District Textile Training Co Ltd / Textile Centre of Excellence - textiles
- North East of England Process Industry Cluster (NEPIC)

Other clusters were identified:

- Those that do not mention resource efficiency but focus on energy efficiency e.g. North East Automotive.
- Those that do not involve organisations from the UK e.g. European Chemicals and Processing Industry Clusters.
- Those that support businesses involved in low carbon products / technologies e.g. the Cleantech clusters and Greentech South
- Those that do not mention anything about resource or energy efficiency (eight cases in total) e.g. Midlands Aerospace Alliance, Rail Alliance, Life Sciences Hub Wales. As WRAP have noted, this type of cluster may have a more implicit rather than explicit focus on resource efficiency.

As part of phase 1, we spoke to individuals from four industry-based clusters identified in the initial desktop review. Findings included:

- BioVale is funded through the European Commission and the UK Government. It focuses on innovation in the bio-economy but there are a couple of projects relating to resource efficiency including unavoidable food waste and anaerobic digestion. There are 420 individual members (number of organisations unknown). There is not any impact data. Unfortunately, the contact implied that they would not have time to assist with collecting impact data.
- Fine Food Cluster (Wales) includes 40-50 companies across Wales. Market development is the main area of support provided, but resource efficiency is a topic of interest. The areas of focus so far are based on helping businesses to get better procurement deals for things like energy and cardboard. There is no membership fee, but businesses pay for services such as mentoring and training.
- The Food and Drink Federation has a plan (Ambition 2015) to improve the sustainability of food and drink businesses in the UK which includes targets relating to waste to landfill and carbon emissions. The FDF provides businesses with advice and guidance and businesses share best practice at committee meetings. The FDF produces a progress report every year, based on a survey of members. It is not clear at the moment whether there is enough / appropriate data for an impact evaluation.
- Shared Resource Efficiency Manager project. The project report states the cost savings achieved although data is not available for resource efficiency outcomes. The project looked at two models (supply chain and geographic based). One of the key individuals involved in the project is now conducting a PhD on the topic. One of the things that they will be looking at in the near future is whether the businesses have continued to work together.

We were not able to make contact with other industry clusters such as Huddersfield Textiles so we were unable to confirm their activities relating to resource efficiency and / or whether any impact data exists for these clusters.

Through the project, we have also identified the following sector cluster resource efficiency activity:

EMTEX, the lead body for Materials in the East Midlands, MatRec, Materials Recycling and Reclamation project. The project is designed to help companies with their waste and put it to better use, recycling or re-using it. Waste audits are available for companies as well as the project having a grant element available for companies making suitable improvements to their waste management. Regular seminars and workshops will be run to highlight the

options available. 3 year ERDF project until September 2013. Specific focus on Food, Construction, Transport and Medical Sectors, along with Plastics, Metals, Technical Textiles, Composites and other groups where a solution is required.

NEPIC are involved in the European Sharebox industrial symbiosis project <http://sharebox-project.eu/>. This will involve an ICT platform to facilitate industrial symbiosis in the process industries. International Synergies are also a partner in this project.

Courtauld 2025 has included the formation of sector based clusters with a shared interest in particular issues.

9.2 Appendix 2: List of resource efficiency cluster activity identified by LEP area

Table 13: Resource efficiency cluster activity identified by LEP area

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations * = lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
Black Country	Yes	No.					<p>Wolverhampton University are running the Entress project focused upon resource efficiency.</p> <p>Groundwork West Midlands offer environmental business services.</p>
Buckinghamshire Thames Valley	Yes.	Yes (via funding).	The lead organisation is the Growth Hub for Bucks Thames Valley LEP.	Low carbon, primarily energy efficiency, but does include resource efficiency.	Individualised business support	Grant funding for SMEs to reduce their carbon emissions.	

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
Cheshire and Warrington	Yes.	In process.		Low carbon.	Individualised business support	<p>Currently looking for a site for a company wanting to build a Carbon Fibre Recycling Facility.</p> <p>Submitted an ERDF application to retrofit businesses with low carbon technology.</p> <p>They have an Energy Fund, currently unallocated due to a lack of sufficient quality applications. One option for this would be harnessing waste energy.</p>	
Coast to Capital	No.	No evidence					<p>Sustainable Business Partnership Community Interest Company (https://sustainablebusiness.org.uk) operates in this area and include resource efficiency in their remit.</p>

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
Cornwall and Isles of Scilly	No.	No evidence					TEVI project focused upon resource efficiency. This is a partnership between University of Exeter, Cornwall Development Company, Cornwall Wildlife Trust, Cornwall Council. https://tevi.co.uk
Coventry and Warwickshire	Yes.	Yes (via funding).	LEP, Council and University*	Low carbon.	Individualised business support plus workshops.	Includes grants to develop low carbon products/services, workshops, one to one business support (including on resource efficiency) and energy efficiency support.	
Cumbria	No.	No evidence					

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
D2N2 (Derby & Nottinghamshire)	No.	Informal activity.				Online evidence of informal resource efficiency activity. An opportunity to visit Wastecycle, a resource management and recycling company. Case study example of a business being linked up with another business via a support organisation to re-use waste.	
Dorset	Yes.	In process.				The LEP is in the process of setting up a Clean Growth Steering Group and resource efficiency and water is one of the elements that they would like to explore further within that.	

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
Enterprise M3	No.	No evidence.					
Gfirst	Yes.	No (only referred to Energy Strategy).					
Greater Birmingham and Solihull	No.	Yes (via funding).	Birmingham City Council, LEP, International Synergies*	Yes, resource efficiency.	Cluster.	BASIS, industrial symbiosis network programme including individual business support.	The Solihull Sustainability Vision Group is a local business network.
Greater Lincolnshire	No.	Yes (via funding).	LEP, Growth Hub, PECT*	Mainly energy efficiency.	Individualised business support	Grants for individual businesses	
Greater Manchester	No.	Yes (via funding).	LEP, Growth hub and Growth Company*	Resource efficiency.	Both.	Resource efficiency support for SMEs, including some supply chain work. Currently	

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
						bidding for future ERDF funding to continue this.	
Heart of the South West	No.	No evidence.					
Hertfordshire	Yes.	No (only energy efficiency)					
Humber	Yes.	In process				Planned project for the Growth hub to deliver business growth which will include resource efficiency amongst other themes.	
Lancashire	No.	No.					Lancashire University (in partnership with the Growth Hub and the Centre for Global Eco-Innovation) offer a 6 month management school on eco-innovation

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *=-lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
							which can deliver resource efficiency, amongst other outcomes (ERDF funded).
Leeds City Region	No.	Yes (via funding).	LEP, West Yorkshire Combined Authority, Growth Hub* with 3 delivery partners.	Mainly energy efficiency.	Individualised business support	They have a Resource Efficiency Fund which offers individual support incorporating technical assessment and part grant funding for changes. Mainly energy efficiency, but also some water and waste work. No collaboration between businesses.	

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
Leicester and Leicestershire	No.	No evidence.					There was previously a lottery funded project, the Efficiency Network, operating in Market Harborough. Based upon business networking and events to share ideas and information on energy and resource efficiency. The project did not continue because they could not find further funding or another network to host it.
Liverpool City Region	Yes.	No.					
LEAP Local Enterprise Partnership for London	No.	Yes (via funding).	LWARB*, LEP, advisory group of representatives of other organisations	Yes, resource efficiency.	Both.	Advance London (used as a case study).	

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
New Anglia	Yes.	No					Groundworks run the energy efficiency project for the County Council. They have recently widened the scope of this to include resource efficiency. It is mainly individual business support plus events. There is a wider initiative - the Carbon Charter (Norfolk and Suffolk environmental certification scheme) which has a network which recently held a plastic waste event.
North East	No.	Informal activity.				Online case study example of a business being supported to make use of its waste product.	
OxLEP	No.	No evidence.					

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
Sheffield City Region	No.	No evidence.					The Advanced Resource Efficiency Centre based at Sheffield University is a large research centre doing lots of projects with industry. https://www.sheffield.ac.uk/arec/projects
Solent Local Enterprise Partnership	Yes.	No.					Southampton City Council ran the CRUMBS project (2013-3015) focused upon reducing business food and furniture waste through a network.
South East	No.	No evidence.					The ERDF LoCASE low carbon project has recently finished https://locase.co.uk , a partnership between the University of Brighton and a number of local authorities.
SEMLEP	No.	No evidence.					

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
Stoke on Trent & Staffordshire	No.	Yes (via funding).	Staffordshire Business Environment Network*, LEP, Staffordshire County Council, in partnership with Keele University and Staffordshire University	Low carbon, primarily energy efficiency, but could include resource efficiency.	Both	Staffordshire Business Environment Network is a membership based business environment network but they also deliver this ERDF low carbon project.	
Swindon & Wiltshire	Yes.	No.					
Tees Valley	Yes.	Informal activity.				The LEP respondent described a number of specific local proposed pieces of work e.g. for recycling scrap steel, an energy from waste power station. He also gave a local example of an	An ERDF funded project 'Resource Efficiency Pathways to Sustainable Growth' was delivered by the University of Teesside 2011-2015.

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
						industrial symbiosis match which the LEP had facilitated.	
Thames Valley Berkshire	No.	Informal activity.				Online case study example of a business being supported to make use of its waste product.	
The Marches	No.	No evidence.					BESST (used as a case study) and Meres and Mosses Business Environment Network are private sector environmental networks in the area.
We Are West of England	Yes.	No.					

LEP	Spoken to LEP itself?	Is the LEP involved in resource efficiency activity?	Partnership of delivery organisations *≠lead delivery organisation	Extent to which resource efficiency is the focus of the project	Primarily individualised business support or cluster-based activity?	Description	Other resource efficiency activity in the area where no LEP involvement has been identified
Worcestershire	Yes.	Yes (via meetings)	Chamber of Commerce*, LEP	Mainly energy efficiency but could include resource efficiency.	Both.	Network meetings are hosted by local businesses and designed to share best practice and offer up case studies. Grant funding for individual businesses.	
York / North Yorkshire / East Riding Business Inspired Growth	Yes.	Yes.	West Yorkshire Combined Authority and LEP	Yes, resource efficiency.	Both.	First workshop held in October 2018 on circular economy. Looking at providing grant support and peer to peer support.	
Cambridgeshire & Peterborough	No.	No evidence.					

9.3 Appendix 3: Other initiatives including IT solutions

During this project, we have become aware of the following other initiatives which may be useful context.

The European Resource Efficiency Knowledge Centre for SMEs includes:

- Database of resource efficiency measures, technologies and good practice
- Resource efficiency self-assessment tool for SMEs
- Library of policy measures and tools.

Innovate UK are currently working up an Industrial Strategy Challenge Fund challenge area called Transforming the Foundation Industries. This will cover: metals (primarily steel), glass, paper pulp, ceramics and chemicals. It will be focused upon innovation in resource and energy efficiency as a tool to improve competitiveness. They will be looking for cross-sector collaboration in applications.

Office for National Statistics National Materials Datahub. DEFRA, BEIS and the Office for National Statistics (ONS) are currently running a pilot project to examine the business case for developing a national materials database to provide industry with information on the availability of material resources, including secondary materials.

A smart waste tracking data collection, storage and reporting service is also currently being piloted.

The EU is about to launch the European Industrial Symbiosis network. For further information on industrial symbiosis at the European level, the following 2018 European Commission publication may be of use "Cooperation fostering industrial symbiosis: market potential, good practice and policy actions" (available at <https://publications.europa.eu/en/publication-detail/-/publication/174996c9-3947-11e8-b5fe-01aa75ed71a1/language-en>).

9.4 Appendix 4: Cost effectiveness data sources

Table 14: Cost effectiveness data sources

Cluster/project	Data source(s)	Attribution	Other points to note
RECs	<ul style="list-style-type: none"> Data for Resource Efficiency Clubs for the year 2007/2008 is taken from the 2011 Defra publication "Business Resource Efficiency and Waste (BREW) Programme Disaggregated Metrics Results for 2007/08". This excludes persistence effects. This data has not been externally verified. 	<ul style="list-style-type: none"> The publication uses an attribution rate of 0.9 apart from 0.74 for cost savings. It is not specified as to how this has been calculated. 	<ul style="list-style-type: none"> The total project cost was £1.7 million (p16 of the report).
NISP	<ul style="list-style-type: none"> NISP Economic Valuation Report by Scott Wilson Business Consultancy attributed data. The data covers: 2005/06 to 2009/2010 and is based upon actual data for years 1 to 4 of the programme and an estimate of year 5 has been made based on data gathered for the first two quarters of year 5, taking into account seasonal effects reported in previous years. It is specified that these figures do not include any persistence effects. 	<ul style="list-style-type: none"> The Economic Valuation report uses an average figure of 60% attribution across the first 4 years of operation based upon previous economic analysis undertaken which assigned individual 'attribution' levels to each synergy based on an audit. 	<ul style="list-style-type: none"> The total project cost was £27,650,000 (p9 of Economic Valuation report).

Cluster/project	Data source(s)	Attribution	Other points to note
IS NET	<ul style="list-style-type: none"> Data source: Figures for cost savings, material savings and additional sales have been calculated using data provided for the WRAP funded element of the project. Data was available for 2010-2013 for waste diverted from landfill, virgin materials savings, additional sales and cost savings. An average per annum figure has been calculated for each output. Data was only available for 2010-2011 for hazardous waste savings and water conservation. The cost per unit of outcome of these has been calculated using an average per annum amount of the WRAP project funding. Data source: Figures for jobs created, jobs safeguarded and carbon savings were taken from the ISNET project summary report for the total ERDF element of the project. The cost per unit of outcome of these has been calculated using the total ERDF project funding. 	<ul style="list-style-type: none"> No assessment of attribution has been provided. We have therefore used the 0.6 attribution rate which was calculated in the NISP project evaluation as this is a similar type of project. This approach is also supported by the qualitative feedback from the three key project contacts that much of the activity identified would not have happened without the IS NET project. 	

Cluster/project	Data source(s)	Attribution	Other points to note
EREIKS	<ul style="list-style-type: none"> • Data source: final evaluation report¹⁰ "Evaluation of the ENWORKS Project: "Embedding Resource Efficiency in Key Sectors" 2009-2013" conducted by ICF GHK. This uses reported output data and data collected through the Enworks Efficiency toolkit, both of which are verified by the business beneficiaries. • Data for cost savings, additional sales, carbon reduction, jobs created and safeguarded has been taken from section 5 of the report as the basis of these figures is clearly presented (whether they are per annum or total and that they are achieved outcomes). • Data for materials saved, water saved and waste diverted from landfill has been taken from Table 3.4, page 20, based on project monitoring data, as this is the only data provided on these outcomes. The report text does not specify the exact nature of these figures. Verbally, we have been told that these are highly likely to be identified savings on a per annum basis as this is the way the organisation collected project monitoring data in line with funding requirements. These figures have had a conversion figure of 23% applied to them (based upon the conversion rate that had been seen throughout the project, page 31 of the report). 	<ul style="list-style-type: none"> • An overall attribution rate of 0.79 has been calculated by the report authors using the beneficiary survey (167 businesses responded of 1080 business beneficiaries, a 15% response rate). 	<ul style="list-style-type: none"> • The data used was correct to January 2013 (results continued to be captured through to April 2013). The project began in October 2009. • Costs per unit of outcome calculations use the total project cost at 31 January 2013 of £ 8,401,649 (page 19 final evaluation report). For those outcomes where per annum figures were reported, the project cost has been divided by 3.33 to provide a per annum cost.

¹⁰ <http://www.enworksinbox.com/evaluation>

Cluster/project	Data source(s)	Attribution	Other points to note
SREM	<ul style="list-style-type: none"> Data source: project report appendices. 	<ul style="list-style-type: none"> The one project contact interviewed argued for total attribution. However, amongst a control group of 9 businesses, one made significant improvements during the year and another more limited improvements and in the main the improvements were related to energy efficiency rather than resource efficiency. Taking this into account, an estimate of attribution of 0.5 has been used. 	<ul style="list-style-type: none"> Impacts are likely to be underestimated because: Other outcomes were identified through the project but cost saving data was not collected. The project timeframe was too short to provide much of an estimate of impacts. This is why potential impacts are also shown in the table, although other research we have undertaken shows that it is highly unlikely that all of these actions would ultimately have been taken.

WRAP's vision is a world in which resources are used sustainably.

Our mission is to accelerate the move to a sustainable resource-efficient economy through re-inventing how we design, produce and sell products; re-thinking how we use and consume products; and re-defining what is possible through re-use and recycling.

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