UK waste minimisation clubs: a contribution to sustainable waste management

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Abstract

The UK waste strategy is based upon the central concept of the hierarchy of preferable options for the treatment and disposal of waste. Minimisation is placed at the top of the hierarchy and the Government seeks to encourage its uptake by industry and commerce as well as householders. It has been accepted that previous waste management policy and practice have not delivered the hoped for movement up the hierarchy. Within the UK, landfill still predominates as the option most commonly used to deal with waste. Movement towards more sustainable waste management practice has been identified as a priority, in the UK, by the present Labour Government. To that end, they have recently produced a series of consultation papers on sustainable issues that set out their vision and confirm waste minimisation as a key strategy for the future. In an attempt to stimulate the uptake of minimisation methodology by industry, waste minimisation clubs have been developed across the UK. There have been around 60 such clubs and they receive support and guidance from a range of organisations, including the Environment Agency and the ETBPP. These clubs have demonstrated that a significant reduction in waste arisings can occur when minimisation methodology is applied. Minimisation strategies often lead to improved resource efficiency and this is reflected in clear financial savings, e.g. the Leicester Waste Minimisation

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1. Introduction

Sustainable development has become a key issue in the UK, particularly since the Earth Summit in Rio de Janeiro in 1992. Following Rio, the UK was one of the first countries to prepare, in 1994, a national Sustainable Development Strategy [1]. The Labour Government, elected in May 1997, has launched a new consultation paper, during 1998, entitled ‘Opportunities for Change’, and this is the basis for discussion about a revised UK strategy for sustainable development [2]. This sets out the vision of the Government; it explores what actions might be taken and poses questions, on which comments and suggestions are invited from a range of players including the general public. This vision of sustainable development is based around four broad objectives:

1. Social progress which recognises the needs of every person;
2. Effective protection of the environment;
3. Prudent use of natural resources;
4. Maintenance of high levels of economic activity.

The management of solid, liquid and gaseous wastes is recognised as central to the sustainable development debate. This is emphasised throughout the document, players are asked to consider:

A central focus of a waste strategy guided by the need for sustainable development is not just how to dispose of the waste that is produced—or even how to recycle it—but also how best to reduce the amount that is created in the first place.

It is emphasised that sustainable development cannot be achieved without a significant reduction in waste production, along with much increased resource efficiency. This will only be achieved through new and dynamic partnerships that include producers, consumers and central authorities.

The current waste management strategy for England and Wales was published by the Conservative Government in December 1995. The White Paper, ‘Making Waste Work: A strategy for sustainable waste management in England and Wales’ [3], was
declared by the then Government to be an advisory document rather than a statutory plan. The Government stated that it was its ultimate intention to draw up such a plan but that this could not occur until 1997, at the earliest, because a range of issues still needed clarification, such as the results from the planned national survey of waste arising. The waste management policy of the UK is not created in a vacuum. Throughout the European Union it is governed by a Framework Directive (75/442/EEC, amended by 91/156/EEC) which sets out the requirements for countries, especially the need to produce a waste management plan.

The present national strategy is based upon a hierarchy of preferred options to deal with waste:
1. Reduction (previously waste minimisation);
2. Reuse;
3. Recovery (including material recycling, composting and energy recovery);
4. Disposal (landfill or incineration without energy recovery).

The 1995 White Paper established a number of targets against which progress towards sustainable waste management could be measured. The targets include:
1. To reduce the proportion of controlled waste going to landfill from 70 to 60% by 2005;
2. To recover 40% of municipal waste by 2005;
3. To recycle or compost 25% of household waste by 2000;
4. Forty percent of domestic properties with gardens to carry out composting by 2000;
5. Easily accessible recycling facilities for 80% of households by 2000;
6. One million tonnes of organic household waste, per annum, to be composted by 2000.

The first two of these targets were described as primary while the third was said to be secondary in that it related to a particular waste stream and supports the first two. The rest are tertiary and support the secondary target. The overwhelming opinion of many in the waste industry is that these targets are arbitrary and random and not likely to be achieved, indeed in a new directive on recycling they are described as only indicative [4].

Widespread dissatisfaction with the 1995 White Paper resulted in the present Government publishing a consultation document on a possible new waste strategy for England and Wales [5]. ‘Less Waste More Value’ describes the policy and seeks informed advice, from a range of players, to enable a more effective strategy to be developed and installed. Following this consultation paper, the Government will receive and consider responses and then prepare a draft strategy by mid-1999. This will be further opened to discussion and a final form will be produced by the end of 1999. The inadequacy of the previous strategy was made clear [5]:

It did not recognise the scale of change required to meet its own targets for recycling and recovery, and it did not place its waste strategy squarely in the context of sustainable development and resource use.
Waste minimisation, particularly for solid and liquid wastes, is seen to be a key element of sustainable development. It is clearly stated that:

The simplest and most effective way of dealing with waste is to ensure that it does not arise. The Government wants waste minimisation and reuse to be an important focus of the strategy. Up until now waste minimisation has taken place within industry and commerce. The new waste strategy will address whether and how to expand and develop such measures, and will consider how waste minimisation for households can be encouraged.

To facilitate discussion, the Government raises a number of questions, such as the role played by local authorities and the potential benefits from variable charging schemes for Municipal Solid Waste (MSW). The seven key commitments, around which the Government will base the new strategy are:
1. Substantial increases in recycling and energy recovery;
2. Engagement of the public in increased reuse and recycling of household waste;
3. A long-term framework with challenging targets underpinned by realistic programmes;
4. A strong emphasis upon waste minimisation;
5. Using the waste hierarchy as a guide, not a prescriptive set of rules;
6. Creative use of economic incentives like the landfill tax;
7. Increased public involvement in decision making.

The requirements of the Statutory National Waste Strategy for England and Wales are laid out in Section 44A of the 1990 Environmental Protection Act (as amended by Section 92 of the 1995 Environment Act) [6]. In order to meet the requirements of Section 44A of the 1990 Act, the Government must produce policies for obtaining its objectives, including a key section on the principles driving waste minimisation policy, the waste hierarchy, the proximity principle, self-sufficiency, resource consumption, best practicable environmental option and life cycle analysis. It is a requirement that they make transparent how these principles interact with each other and influence the instruments used to implement the overall waste policy, including pricing, regulation, direct support and information.

To further strengthen the national consensus on sustainable development, the UK Round Table on Sustainable Development was set up in January 1995, by the then Government, as a forum for discussion on major issues related to this topic. It has already produced two influential Annual Reports, in parts stressing the need for monitoring environmental performance [7,8]. Although it is a forum for discussion, it offers advice to the Government and seeks to build a consensus by identifying acceptable ways of achieving sustainable development. Following along a similar theme, in 1998 the Government launched a consultation paper on sustainable development and business [9]. It is recognised that sound waste
management, particularly waste minimisation, techniques are essential for a competitive sustainable economy. It is pointed out that:

Increasing numbers of businesses now accept that sustainability is a core issue. They monitor their environmental performance and have identified opportunities for cost savings through waste minimisation programmes.

The most far-reaching summary, to date, on sustainable waste management in the UK has been recently produced (June 1998) by the highly influential Environment, Transport and Regional Affairs Committee of the House of Commons [10]. Their wide ranging terms of reference include an analysis of the environmental impact of waste management options and the role that they should play in a future UK strategy. They received written evidence from more than 120 key individuals and organisations as well as hearing oral evidence from 20 organisations. Their first summary point is salutary:

It is important to stress from the beginning of our Report our profound disappointment, on the basis of evidence we have received, that waste management in this country is still characterised by inertia, careless administration and ad hoc, rather than science based decisions. Lip-service alone, in far too many instances, has been paid to the principles of reducing waste and diverting it from disposal. Central Government has lacked the commitment, and local government the resources, to put a sustainable waste management strategy into practice.

The committee reaffirmed waste minimisation as being at the top of the UK hierarchy and, therefore, a key component of a national sustainability strategy, where waste begins to be considered as a potential resource, rather than something to be cheaply disposed of. Industrial waste minimisation is considered a key area for action as this produces around three times the amount from household waste, on an annual basis. The main focus of the committee, however, is on domestic waste minimisation—an area that has been neglected, overall, in the UK [11]. In pointing the way ahead for minimisation, the committee links industrial/commercial developments with domestic. There is a realisation that citizens do not live in a cultural vacuum, if they minimise waste production at home they are more likely to do so at work. The committee recommends:

The Government already provides guidance to industry upon waste minimisation: this guidance should be extended to local authorities and householders. There would be an immediate benefit in raising awareness of the need to reduce wastes universally; and an additional benefit in increasing consumers knowledge of the environmental choices made by industry.
2. Waste arisings in the UK

The UK has, at present, no accurate information about the nature and volume of wastes arising [10]. Because of this, it is difficult to plan for appropriate management options and to set meaningful targets for schemes such as composting. An associated problem in Europe is the lack of a uniformly applied definition of waste, thus hindering international comparisons.

In the UK, waste regulation is carried out by the Environment Agency who are termed the Waste Regulation Authority. County Councils have the function of being a Waste Disposal Authority and have a statutory duty to prepare disposal plans. Within a county, the District or Borough Councils carry out the function of being a Waste Collection Authority and they deal with the collection and transportation of MSW. In the case of Unitary Authorities, the functions of the Disposal and Collection Authority are combined under one layer of local government rather than the more common two-tier approach.

Household waste is that arising directly from households, civic amenity sites and a range of public buildings, as well as the small proportions collected as litter. Commercial waste comes from premises used for purposes of trade or business and industrial waste comes from factories used for transport, supply of water, gas, etc. Each of these has their own definition in section 75 of the Environmental Protection Act 1990 [6].

Household, industrial and commercial wastes are controlled waste and subject to stringent regulatory conditions whereas agricultural and mining wastes are not and classified as non-controlled waste. Household waste, and a certain proportion of commercial waste, constitute MSW. Estimated UK waste arisings are given in Table 1, regional MSW arisings for England in Table 2 and disposal routes for the UK in Table 3 [12]. The statistical database for solid waste is poor [13]. There are a number of reasons for this but primarily it is because managing waste, especially MSW, is a responsibility of local authorities, many who do not have the resources, or requirements, for complete data collection. More than 60% of Waste Collection authorities in England and Wales weigh less than half the loads delivered to landfill

<table>
<thead>
<tr>
<th>Sources of waste</th>
<th>Million tonnes</th>
<th>Dates to which data refer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household</td>
<td>29</td>
<td>1995/6</td>
</tr>
<tr>
<td>Commercial</td>
<td>15</td>
<td>1989</td>
</tr>
<tr>
<td>Construction and demolition</td>
<td>70</td>
<td>1990</td>
</tr>
<tr>
<td>Industrial</td>
<td>69</td>
<td>1990</td>
</tr>
<tr>
<td>Sewerage</td>
<td>36</td>
<td>1996</td>
</tr>
<tr>
<td>Dredged spoils</td>
<td>33</td>
<td>1996</td>
</tr>
<tr>
<td>Agriculture</td>
<td>80</td>
<td>1990</td>
</tr>
<tr>
<td>Mining/quarrying</td>
<td>82</td>
<td>1996</td>
</tr>
<tr>
<td>Total wastes</td>
<td>414</td>
<td></td>
</tr>
</tbody>
</table>
Table 2  
English regional variations in MSW arisings and treatment options

<table>
<thead>
<tr>
<th>Region</th>
<th>% of total MSW</th>
<th>% of total households</th>
<th>% of regional MSW to landfill</th>
<th>% of regional MSW recycled</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Anglia</td>
<td>4.9</td>
<td>4.7</td>
<td>93</td>
<td>7</td>
</tr>
<tr>
<td>East Midlands</td>
<td>11.0</td>
<td>10.8</td>
<td>93</td>
<td>3</td>
</tr>
<tr>
<td>London</td>
<td>9.9</td>
<td>8.6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>North East</td>
<td>3.8</td>
<td>5.4</td>
<td>69</td>
<td>2</td>
</tr>
<tr>
<td>North West</td>
<td>18.7</td>
<td>2.3</td>
<td>95</td>
<td>3</td>
</tr>
<tr>
<td>South East</td>
<td>26.4</td>
<td>36.4</td>
<td>80</td>
<td>4</td>
</tr>
<tr>
<td>South West</td>
<td>8.8</td>
<td>11.6</td>
<td>73</td>
<td>17</td>
</tr>
<tr>
<td>West Midlands</td>
<td>10.4</td>
<td>12.4</td>
<td>77</td>
<td>3</td>
</tr>
<tr>
<td>Yorks and Humber</td>
<td>6.1</td>
<td>7.8</td>
<td>90</td>
<td>3</td>
</tr>
</tbody>
</table>

and around 25% weigh none at all. In Scotland, around 65% of household waste is weighed prior to disposal. Household waste is also poorly characterised with unreliable data on composition. Annual household waste arisings are around 29 million tonnes per annum, some 4–5% of the UK total. Industrial and commercial arisings are around 85 million tonnes per annum.

The UK has started to develop indicators, in the area of waste, for sustainable development but little can be achieved until the results of the national waste survey are published [13]. In retrospect, the cancellation of the National Household Waste Analysis Programme, in the middle of this decade, was a serious mistake. It appears that MSW is increasing, annually, across the UK at values between 5 and 12%, depending on the region. These are levels that are overtaking the present ability to implement recycling schemes in some areas [10].

3. Waste minimisation project clubs

In ‘Making Waste Work’ [3], the Government encouraged industry to adopt better waste management practices, whilst ensuring that its products are designed to take account of the objective of sustainability, being reusable or recyclable with a high recycled content where feasible. Businesses are challenged to meet a range of targets which include:

Table 3  
Disposal routes for UK wastes (1996)

<table>
<thead>
<tr>
<th>Sector</th>
<th>% Household</th>
<th>% Commercial</th>
<th>% Construction</th>
<th>% Industrial</th>
<th>% All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill</td>
<td>90</td>
<td>85</td>
<td>30</td>
<td>73</td>
<td>70</td>
</tr>
<tr>
<td>Incineration</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Recycling</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
1. Seventy-five percent of companies with more than 200 employees to have published environmental policies covering waste issues by the end of 1999; 
2. Fifty percent of similar sized concerns to have management systems in place to realise such policies in the same time scale.

How does the Government help industry move towards these targets? Wide ranging advice is potentially available from a bewildering number of organisations [14]. These include:
1. Environmental Technology Best Practice Programme (ETBPP);
2. Energy Efficiency Best Practice Programme (EEBPP);
3. Energy Technology Support Unit (ETSU);
4. Joint Environmental Marketing Unit (JEMU);
5. Environment Agency;
7. Green Business Clubs;
8. Small Company Environmental and Energy Management Scheme (SCEEMAS);
9. Environment Council;
10. Regional Advisory Groups on the Environment;
11. Regional Government Offices;
12. Business Link;
13. Wastes Management Information Bureau;

The central thrust of the Government’s contribution, however, is underpinned by the activities of the Environment Agency and the ETBPP. In their consultation document, ‘Wastes Management and Regulation Strategy’ [15], the Environment Agency outlines aspects of its future role. The Agency is developing Local Environmental Agency Plans (LEAPs) to integrate delivery of regulatory and environmental management actions at the local level. LEAPs will be the vehicle by which strategies are translated so as to have a real world impact. The Agency acknowledges that their role in Waste Regulation requires:

The proper management of wastes, so as to reduce their overall impact on the environment, is essential to the environmental and economic well being of our society and its sustainable development in the future. These will be achieved by developing strategies for the reduction, reuse, recycling and safe disposal of waste and by encouraging the adoption of these by society.

The Environment Agency is playing a central role in minimisation by helping to sponsor regional waste minimisation clubs. They, as regulators, are in a unique position to draw together, into a functioning group, the many separate organisations that are required for a successful project.

The UK Department of Trade and Industry (DTI) takes action to encourage industrial waste minimisation through the ETBPP and the Technology Foresight Programme (TFP); both aim to spread Best Practice and encourage research,
especially the TFP, into cleaner and more efficient industrial processes. The TFP has been recently criticised in that it still tends to concentrate upon the commercial aspects of new technology with little apparent concern about their environmental impacts [10]. The ETBPP was set up in 1994 and aims to stimulate savings for industry, by 2015, of some £320 000 000 per annum by encouraging sustainable environmental practices that reduce costs. By 1998, total savings of around £28 000 000 per annum are estimated to have been achieved, including a reduction in solid waste production of 131 000 tonnes per annum. This has been achieved through publication of free guides to industry, an Environmental Helpline and the establishment of regional waste minimisation projects, promoting a low cost, self help approach.

There have been around 60 waste minimisation clubs, in the UK, that have been recognised by the ETBPP. Their geographical distribution is shown in Fig. 1. The
actual number is probably well in excess of 60, but very small clubs tend to work in isolation and those that are managed by trade organisations do not link with other projects or agencies [16].

A number of clubs have completed and published a final report. These include: Aire and Calder [17], Dee [18], Hereford and Worcester [19], Humber [20], Keighley [21], Leicester Waste Minimisation Initiative (LWMI) [22], Project Catalyst [23], Waste Elimination from Textiles (WEFT) [24] and West Midlands [25].

A review of three of the early project clubs (Aire and Calder, Leicester and Project Catalyst), containing a total of 35 companies, was published by the Centre for the Exploitation of Science and Technology (CEST) in 1995 [26]. In the report, they place the development of such clubs into a historical context. Much of the early inspiration came from resource efficiency project developments in mainland Europe [27] as well as the UK [28]. In the UK, in 1992, CEST published a report on the efficient use of water, as a scarce resource [29]. The Aire and Calder Project, which followed soon after, ran between May 1992 and March 1993 and was used to demonstrate that companies, based in a restricted geographical area, could work closely together to evolve strategies to minimise the problems, caused by excessive water consumption and liquid waste production.

Following this, Project Catalyst commenced on the Mersey river basin in June 1993 and ran until May 1994. This project adopted a similar approach to Aire and Calder but was broadened to address all types of waste whether solid, liquid or gaseous. Its primary objective was to demonstrate how the planned management of production processes can reduce the reliance of companies on non-sustainable waste management. In 1994, the Leicester Wastes Minimisation Initiative (LWMI) began, completing in 1995; its primary objective was to demonstrate the effectiveness in cost, technical and environmental terms of sustainable waste management.

Aire and Calder and Project Catalyst have been described as the two largest waste minimisation initiatives in the world [30].

The club approach, based upon common goals and mutual support in a limited geographical region has much to commend. Seventy percent of participants in the CEST report found the approach useful overall [26]. The significant benefits identified were:

1. Inspiration, stimulated by the progress of other members;
2. Pressure, caused by obligation, to keep to targets;
3. Reassurance that others had similar problems;
4. Experience of different methodologies;
5. Sense of community.

At the same time, analysis of the clubs has shown that such an approach can create problems. These include:

1. When companies were in direct competition, by being in the same sector, then there was a reluctance to share recently gained Best Practice;
2. Being able to commit staff time to attending the club meetings;
3. Meetings were sometimes badly planned and did not deliver enough novel training.
Although there is no formal definition for the structure of such clubs, they fall, broadly, into the following categories:

1. Demonstration. These have been generously funded by external sources and there is a large input of external expertise. The aim of these is to demonstrate Best Practice to the region and nation, e.g. Project Catalyst. Companies often contribute around £10 000 or greater to the running costs of the club, e.g. Leicester. Project Catalyst cost £1 000 000 and 50% of this was met by the 14 companies.

2. Sector. These are based around an industrial category, e.g. WEFT and the East Anglian Food and Drink Sector;

3. Project. Based, essentially, upon training of the companies teams and champions, in a given geographical area. The champion is the employee who oversees the introduction of waste minimisation methodology into the company and produces the action plan. There is limited use of external funding and the contribution from consultants, for audits, is kept to a minimum. They have often been designed around Best Practice developed by the Demonstration Projects. Company contributions are very small, often being below £1000.

Most clubs have aims that link waste minimisation with resource efficiency and so correctly concentrate upon the environmental and economic benefits for the members. Recent clubs have linked their activities with dissemination of waste minimisation methodology across the wider community. The aims of the Hereford and Worcester Club (Table 4) demonstrate how such clubs hope to catalyse further activities in their region.

There is no overarching definition of waste minimisation adopted, in the UK, by the clubs. The UK Environment Agency defines waste minimisation as [31]:

The reduction of waste at source, by understanding and changing processes to reduce and prevent waste. This is also known as process or resource efficiency. Waste minimisation also includes the substitution of less environmentally harmful materials into the production process.

<p>| Table 4 |</p>
<table>
<thead>
<tr>
<th>Aims of the Hereford and Worcester waste minimisation club</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To promote the efficient use of resources by businesses in the county</td>
</tr>
<tr>
<td>2. To demonstrate the benefits of wastes minimisation to business in the county</td>
</tr>
<tr>
<td>3. To provide expert assistance in undertaking audits to identify the waste minimisation opportunities of individual companies</td>
</tr>
<tr>
<td>4. To achieve reductions in waste arisings by the participating companies</td>
</tr>
<tr>
<td>5. To disseminate locally the results achieved by the club</td>
</tr>
<tr>
<td>6. To encourage companies to develop their own environmental policies</td>
</tr>
<tr>
<td>7. To respond to members of the club</td>
</tr>
</tbody>
</table>
Table 5
Opportunity techniques used by Dee and Humber clubs

<table>
<thead>
<tr>
<th>Opportunity technique</th>
<th>No. of opportunities</th>
<th>Dee</th>
<th>Humber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product modification</td>
<td></td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Input change</td>
<td></td>
<td>7</td>
<td>45</td>
</tr>
<tr>
<td>Technology change</td>
<td></td>
<td>128</td>
<td>103</td>
</tr>
<tr>
<td>Procedural change</td>
<td></td>
<td>106</td>
<td>140</td>
</tr>
<tr>
<td>Good housekeeping</td>
<td></td>
<td>–</td>
<td>77</td>
</tr>
<tr>
<td>Onsite reuse/recycle</td>
<td></td>
<td>22</td>
<td>–</td>
</tr>
<tr>
<td>Offsite reuse/recycle</td>
<td></td>
<td>15</td>
<td>–</td>
</tr>
</tbody>
</table>

The UK Institute of Wastes Management has suggested an alternative definition [32]:

Prevention and/or reducing the generation of waste, improving the quality of waste generated, including reduction of hazard and encouraging reuse, recycling and recovery.

In the UK, waste minimisation has often been used as a broad term for a variety of measures that conserve resources through the reduction of raw materials consumption. It has meant different things to different groups and is often synonymous with a reduction in the amount of material used to make a product or, mistakenly, with a reduction of the amount of waste that goes to landfill [33].

The UK clubs have, therefore, not strictly been based upon waste minimisation alone; this can be seen in the opportunity techniques used by Dee and Humber (Table 5). The clubs have rightly concentrated upon a range of cost savings measures that include: energy management, clean technology, waste minimisation through process modification and control, reuse, recycling and alternative material use as means of dealing with solid and liquid waste. Most projects have adopted a ‘start of pipe’ emphasis for prioritising the options for reducing waste. The hierarchy of methods used by the majority of clubs is to be found in Fig. 2 [26]. Recent developments are often described as being resource efficiency projects rather than waste minimisation.

Fig. 2. Hierarchy of methods used by the majority of waste minimisation clubs.
Waste minimisation methodology is fairly standard across the UK, that used by Aire and Calder has been adopted by many other clubs (Fig. 3). The key component is the waste audit and attention is given here to an analysis of the process review. This culminates in the production of a process diagram (Fig. 4) that is used to facilitate the understanding of the activity and enable suggestions to be made for improved process control.

The reasons why companies undertake waste minimisation activities are many. Rarely is it for cost reduction only; this is because most companies are unaware of the true cost of their waste until they start the project. Reasons given include [26]:

- Regulatory pressure;
- Company image;
- Supply chain pressure from customers;
- Media pressure;
- Cost reduction;
- Environmental concern;
- Sustainable development.
4. Reduction in waste arisings

Methods to reduce solid waste production have grown in importance in the UK as it has been shown that landfill void is of very limited availability in several areas [34]. Added to this has been the introduction of the landfill tax, whereby non-inert solid waste is presently taxed at a level of £10 per tonne and is thought likely to rise in the near future [35].

The reduction in solid waste arisings for eight of the clubs, that have published their results, are given in Table 6, where they are compared to those for liquid waste and water consumption. Because there is no standard means of reporting the results of clubs, it is difficult to directly compare many of the more recent projects with the early demonstration ones. These, highly funded, projects provide a wealth of data but it is a failure in the UK management of these, by the ETBPP and the Environment Agency, that there has not been an insistence on a standard reporting mechanism.

5. Financial savings

The costs incurred and the financial savings from a number of clubs are included in Table 6. As there is no standard method of reporting, the true costs of a project are difficult to calculate and therefore an accurate cost–benefit analysis is not possible in most cases. A large contribution to costs is the time spent by the

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**Fig. 4.** A process diagram used by waste minimisation clubs.
<table>
<thead>
<tr>
<th>Project</th>
<th>Date of report</th>
<th>No. of companies</th>
<th>Project cost (£000s)</th>
<th>Financial savings p.a. (£000s)</th>
<th>Solid waste reduction p.a. (000s tonnes)</th>
<th>Liquid effluent reduction p.a. (000s m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aire &amp; Calder</td>
<td>July 1995</td>
<td>11</td>
<td>400</td>
<td>2000</td>
<td>4.8</td>
<td>4.8</td>
</tr>
<tr>
<td>Catalyst</td>
<td>June 1994</td>
<td>14</td>
<td>1000</td>
<td>2300</td>
<td>–</td>
<td>12</td>
</tr>
<tr>
<td>Dee</td>
<td>1997</td>
<td>13</td>
<td>200</td>
<td>4500</td>
<td>87</td>
<td>130</td>
</tr>
<tr>
<td>Hereford and Worcester</td>
<td>1997</td>
<td>37</td>
<td>17.6</td>
<td>250</td>
<td>–</td>
<td>2.7</td>
</tr>
<tr>
<td>Humber</td>
<td>July 1996</td>
<td>11</td>
<td>200</td>
<td>1100</td>
<td>3.9</td>
<td>17.9</td>
</tr>
<tr>
<td>Leicester</td>
<td>March 1997</td>
<td>10</td>
<td>200</td>
<td>1266</td>
<td>23.4</td>
<td>–</td>
</tr>
<tr>
<td>WEFT</td>
<td>1998</td>
<td>8</td>
<td>–</td>
<td>371</td>
<td>0.02</td>
<td>0.42</td>
</tr>
<tr>
<td>West Midlands</td>
<td>March 1998</td>
<td>17</td>
<td>–</td>
<td>895</td>
<td>1.3</td>
<td>–</td>
</tr>
</tbody>
</table>
Table 7
Potential savings from opportunity categories for Project Catalyst

<table>
<thead>
<tr>
<th>Opportunity category</th>
<th>No. of opportunities</th>
<th>Potential savings (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw materials</td>
<td>149</td>
<td>4,645,790</td>
</tr>
<tr>
<td>Operating costs</td>
<td>121</td>
<td>3,044,616</td>
</tr>
<tr>
<td>Water</td>
<td>107</td>
<td>1,765,823</td>
</tr>
<tr>
<td>Electricity</td>
<td>67</td>
<td>939,452</td>
</tr>
<tr>
<td>Gas</td>
<td>52</td>
<td>936,817</td>
</tr>
<tr>
<td>Oil</td>
<td>9</td>
<td>662,074</td>
</tr>
<tr>
<td>Capital expenditure avoid</td>
<td>4</td>
<td>466,800</td>
</tr>
<tr>
<td>Paper and packaging</td>
<td>24</td>
<td>236,227</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid to landfill</td>
<td>112</td>
<td>3,187,846</td>
</tr>
<tr>
<td>Liquid effluent</td>
<td>151</td>
<td>2,863,258</td>
</tr>
<tr>
<td>Air emissions</td>
<td>32</td>
<td>1,583,250</td>
</tr>
<tr>
<td>Degraded products</td>
<td>14</td>
<td>485,626</td>
</tr>
<tr>
<td>Packaging</td>
<td>7</td>
<td>148,340</td>
</tr>
<tr>
<td>Incineration</td>
<td>2</td>
<td>1,000</td>
</tr>
</tbody>
</table>

company project champion, and other employees, on activities related to waste minimisation. It has been estimated that the time allocated for most companies on three projects was:
1. Aire and Calder—between 0.5 and 2.5 person years;
2. Project Catalyst—between 0.5 and 2.0 person years;
3. Leicestershire—about 0.5 person years.

When the savings of the LWMI are compared to the first two, it can be shown that a fivefold reduction in time spent corresponded to a twofold reduction in savings. There are, of course, a number of factors involved, e.g. consultants’ time, but it needs to be recognised that projects must evaluate how much staff time needs to be allocated before commencement. For Project Catalyst, the potential savings identified for each opportunity category are presented in Table 7. The implementation time-scales and their annual savings are included in Table 8 for the same project. Payback periods for opportunities for the Catalyst and Dee Projects are included in Table 9.

Table 8
Implementation timescales and their annual savings for Project Catalyst

<table>
<thead>
<tr>
<th>Implementation timescale</th>
<th>No. of opportunities</th>
<th>Annual savings (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–16 months</td>
<td>114</td>
<td>2,321,312</td>
</tr>
<tr>
<td>17–22 months</td>
<td>68</td>
<td>976,922</td>
</tr>
<tr>
<td>23–28 months</td>
<td>85</td>
<td>2,730,558</td>
</tr>
<tr>
<td>Over 29 months</td>
<td>120</td>
<td>2,691,609</td>
</tr>
<tr>
<td>Never</td>
<td>12</td>
<td>186,500</td>
</tr>
</tbody>
</table>
Table 9
Payback periods and their annual savings for Catalyst and Dee Projects

<table>
<thead>
<tr>
<th>Payback period</th>
<th>Catalyst (£)</th>
<th>Dee (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero cost</td>
<td>2 488 849</td>
<td>2 500 000</td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>2 927 940</td>
<td>2 500 000</td>
</tr>
<tr>
<td>1–2 years</td>
<td>1 690 751</td>
<td>350 000</td>
</tr>
<tr>
<td>2–3 years</td>
<td>590 175</td>
<td>150 000</td>
</tr>
<tr>
<td>&gt;3 years</td>
<td>430 934</td>
<td>450 000</td>
</tr>
</tbody>
</table>

The results from the LWMI demonstrate that, for the 10 companies involved, their initial perception of their waste cost was in the region of £500 000. Eventually, audits showed that it was £12 870 000, some 4.5% of total turnover. Some, £2 906 000 of savings were considered to be achievable and this corresponded to 1.1% of total turnover.

Year one, for LWMI, resulted in savings of £747 000, which was 0.26% of joint turnover. The total savings for year one and two was £1 266 000 which was 0.47% of joint turnover. But this is for all the companies totalled together, considering the whole club as one company. Some companies only achieved savings, in respect of turnover, of 0.09% after 2 years whereas some achieved savings of 2.6% in year one.

It is important, when examining the outcomes of the clubs, to consider the median as well as the mean of the savings. It has been reported, for many of the early clubs, that with mean savings of 0.38% the median was only 0.27% [26]. For LWMI year one, the arithmetic mean of the individual clubs savings was 0.55% but the median was only 0.14%, the range being between 0.03 and 2.6%. For year two, the arithmetic mean of the individual club savings was 0.65% and the median was 0.30%; the range was between 0.09% and 2.6%.

Is there a clear relationship between savings and company turnover or size? The relationship between year one savings (% of turnover) and financial turnover, for companies from four completed projects, is presented in Fig. 5. The relationship between year one savings (% of turnover) and number of company employees is presented in Fig. 6. The above companies are from a range of industrial sectors and it has been recognised that there was a need to carry out an analysis on a single sector. This has become possible when the results, from the recently completed WEFT, which was based upon the Northern Ireland Textile Sector, were published [24]. Using the limited data in the public domain, the relationship between financial savings and number of company employees, for this one sector, is presented in Fig. 7.

6. Regional variations

There are clear regional variations in MSW arisings and treatment options across the UK (Table 2). It can be seen that some regions, e.g. East Midlands, have low
recycling rates and are very dependent on landfill as the primary waste management option. Despite a national waste strategy there appear to be clear variations in the distribution of waste minimisation clubs; the North West of England having a significant number of successful clubs ahead of other regions, e.g. South West and East Midlands (Table 10). Traditionally, the UK has employed a ‘top down approach’ in which legislative decisions are taken at the centre then executed within
Fig. 7. Plot of savings per annum against number of employees for the WEFT Project.

the constraints of the local context; this means that national policy may have very little impact at the local level if there is not the expertise, or resources, to implement it.

A recent survey of the six counties of the East Midlands of England, a region that contains Northamptonshire and Leicestershire, demonstrated that there can be significant differences between the counties in a given region [16]. In an attempt to determine the extent to which minimisation had become an integral part of the wastes management culture of the East Midlands, 85 key regional environmental organisations involved in some way in waste/environmental issues were asked whether they had a minimisation policy. Only 16% claimed to have a written one

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of clubs</th>
<th>% of total</th>
<th>% of total households</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Anglia</td>
<td>3</td>
<td>5.9</td>
<td>4.7</td>
</tr>
<tr>
<td>East Midlands</td>
<td>6</td>
<td>11.8</td>
<td>10.8</td>
</tr>
<tr>
<td>London</td>
<td>4</td>
<td>7.8</td>
<td>8.6</td>
</tr>
<tr>
<td>North East</td>
<td>5</td>
<td>9.8</td>
<td>5.4</td>
</tr>
<tr>
<td>North West</td>
<td>10</td>
<td>19.6</td>
<td>2.3</td>
</tr>
<tr>
<td>South East</td>
<td>3</td>
<td>5.9</td>
<td>36.4</td>
</tr>
<tr>
<td>South West</td>
<td>7</td>
<td>13.7</td>
<td>11.6</td>
</tr>
<tr>
<td>West Midlands</td>
<td>7</td>
<td>13.7</td>
<td>12.4</td>
</tr>
<tr>
<td>Yorks and Humber</td>
<td>6</td>
<td>11.8</td>
<td>7.8</td>
</tr>
</tbody>
</table>
and 60% had no policy at all (Fig. 8). Such a low figure may explain why the development of clubs has been slower here than in some other regions.

Funding for future project clubs, or company specific schemes, is a major issue. Although there appears a diverse and extensive array of funding sources (Fig. 9), in reality it is very difficult to obtain any external funds, at the present, for new initiatives. It appears that after the initial round of funding, resources are being diverted to a range of other environmental issues. In the competitive world of bidding for public funds, waste minimisation appears to be losing ground. This situation calls into question the role of key facilitators in the region who are responsible for guiding groups to suitable funding sources.

Have successful projects catalysed further waste minimisation developments in the same region? Within the East Midlands there has only been one project club that has satisfactorily completed, the LWMI [22]. Other projects have been initiated, some making very little progress and terminating quickly while others struggled on with a very small group of companies, producing few positive results (North Kesteven). By mid-1997, only one successful club had occurred in the whole region.

The LWMI returned impressive savings for the 10 companies; after 2 years the savings were £1 266 000. Annual reductions for liquid waste were in the region of 8.5% while those for solid waste were 47%. Despite such impressive figures, the impact of the LWMI has been less than expected and it has not produced the hoped for increase in organised waste minimisation in the region. There were a number of design flaws in the LWMI that may account for this and these include:
1. Too few companies to demonstrate the true value of waste minimisation across a range of sectors—only 10 out of a total exceeding 15,000 in Leicestershire;
2. Only five SMEs, so this vital size category was poorly represented;
3. A limited number of industrial sectors;
4. A dissemination phase that occurred, mostly, towards the end or after completion of the project. Interested companies were not able to observe the process taking place.

In an attempt to stimulate waste minimisation in Northamptonshire, and in the rest of the East Midlands, the Northamptonshire Resource Efficiency Project (NREP) was developed. It was designed by a partnership that contained UK regulators, e.g. Environment Agency, facilitators, e.g. Business Link, and a local Higher Education Institution (HEI).

In the early design phase of the NREP, an analysis of the shortcomings of several completed clubs showed that there was a need to restructure projects to incorporate new features. The NREP was designed to improve on the LWMI by:
1. Recruiting more companies—eventually 70 for the initial audit;
2. Recruiting a greater range of company size;
3. Recruiting a greater range of manufacturing categories;
4. Disseminating progress widely, from the start of the project, using every aspect of the regional and local media;
5. Utilising a local HEI to provide low cost/high value expertise in waste minimisation;
6. Utilising dedicated targeting and monitoring software package, based at the HEI;

![Diagram](image-url)

Fig. 9. Sources of funding theoretically available to develop a waste minimisation club for Small to Medium Enterprises (< 250 employees).
7. Developing new industrial and domestic projects to run concurrently with the NREP;
8. Being of lower cost to the companies—£500 as compared to £10 000 for the LWMI. As cost is a barrier to many, this did not discourage companies from joining;

Cost is a significant barrier to waste minimisation uptake by companies in the UK, and daily fees of £700 are common for consultants working on such programmes. This means that only the substantially funded Demonstration Projects have managed to use a significant amount of their time. The NREP has utilised the resources of the local HEI in a very cost-efficient way. Two graduate research assistants have worked on the project at around £60 per day—normal UK rates. They have operated targeting and monitoring software that is used to manage the utilities and material flows in companies. Data is sent from the companies to the HEI and the software used to identify excessive resource consumption. Targets can then be set so as to improve resource efficiency; the external consultant on the NREP then ensures that the company project team introduce the change in procedures that are required.

The research assistants were trained in waste minimisation methodology and in a short period of time were able to:
1. Liaise daily with companies and champions to facilitate change;
2. Visit companies on a regular basis to monitor, advise and run training sessions;
3. Staff a ‘one stop shop’ where all companies could seek general advise on wider wastes issues;
4. Recruit more companies for future projects;
5. Disseminate the project by regularly updating the Internet site and liaising with the local media.

Such an approach has enabled high grade advice to be available to companies, without the barrier of the excessive cost of regularly using consultants for a wide range of tasks. A survey of the NREP companies showed that 81% were very happy with this approach and that 86% felt that the majority of advice could be obtained by the HEI team, at a low cost. Consultants oversee the project and chart its direction but the majority of the day-to-day work is carried out by the HEI team. This fulfills one of the key findings of a CEST report [26]:

If external funding is not available, a mechanism should be sought which provides these benefits without the use of consultants.

The NREP team has disseminated widely during the first year of the project, e.g. some 22 articles in professional journals have been published, 15 broadcasts on local radio and 12 seminars to regional industry. Presently, four other projects are being organised by members of the team, in the same region, as well as two outside of the region.
The expertise of the team will therefore be used to maximum effect and not dissipated. A consortium in Leicestershire have developed a second project, several years after the first one (LWMI) completed, but the time gap is such that momentum appears to have been lost and little progress is being made. To develop a legacy of waste minimisation training in Northamptonshire, the HEI of the NREP is planning to use European Funds to train teams and champions from across a much wider industrial spectrum. The project will then have achieved its main aim of generating a waste minimisation culture based upon extensive, certified training. The lessons learned from the NREP indicate that the Environment Agency and the ETBPP need to be more proactive in importing reflective expertise into a project at every stage of its cycle. Without this, many clubs will struggle as project teams often lack the capacity to review recent research and develop novel strategies to overcome unforeseen problems.

7. Discussion

National waste management policy in the UK is undergoing a period of thorough examination. The requirement to seek sustainable approaches to wastes management [1] has resulted in the production of a consultation document on a possible new waste strategy [5]. It has been frankly admitted that the previous strategy [3] was inadequate. The analysis of the present situation by the Environment, Transport and Regional Affairs Committee of the House of Commons is disturbing [10]. They say:

…wastes management in this country is still characterised by inertia, careless administration and ad hoc, rather than science based decisions…

Future developments in UK waste management must incorporate strategies for sustainable development [2,9]. To that end, the waste hierarchy has been reaffirmed with waste minimisation being placed at the top and being confirmed as a key component in a national strategy for sustainability. The waste hierarchy is increasingly seen as a guide to Best Practice, rather than a static list, in that it informs decision makers who must take into account a range of issues. One such is the proximity principle, this involves the reduction of transport of waste and recyclable materials and so can be used to foster cooperation between different authorities and enhance the role of local processors and operators.

The previous aspirational targets for waste management are no longer supportable [3]. Future targets must be based upon sound data, but there are serious methodological problems in the generation of UK waste statistics [36]. The national waste survey, by the Environment Agency, should produce a sound baseline and yield accurate information that can be used to design strategies for more sustainable waste management [37].
Waste minimisation, within the UK, has primarily concentrated upon industrial and commercial waste. There is, however, a growing awareness that the domestic context has been neglected. There have been calls for an increased emphasis upon domestic waste minimisation [10] and strategies are being developed along with suitable training packages to inform local decision makers [11]. A summary of recent quantitative household waste minimisation projects has been published [38]. Analysis of data revealed that there were small but significant reductions in waste arisings over the lifetime of the projects but this was rarely maintained for longer than 3 months after project completion. A key proposal for the future is the production of a National Minimisation Strategy for domestic waste to be implemented across the UK [38]. Developments in domestic waste must not be allowed to evolve in a piecemeal fashion; future work must take account of industrial/commercial issues to construct a holistic strategy, as employees can feed back to the home context.

Domestic waste minimisation has often been associated with the voluntary sector working in partnership with local authorities. One significant recent development has been the initiation of the Waste Minimisation Bill, which has Government support, and at the time of writing is in its final stages before being adopted [39]. This Bill would, for the first time, give local authorities the formal power to prevent and minimise waste, in addition to fulfilling their responsibility to manage waste through collection, recycling and disposal. Using the proposed new powers, local authorities will be able to promote and assist waste minimisation by providing people with useful information, e.g. about purchasing less wasteful products and the availability of repair schemes for household appliances in an attempt to reduce the amount of waste going to landfill. The Bill has been initiated by the Women’s Environmental Network (WEN) who recognised that there are few established mechanisms in place to encourage minimisation, hence movement towards a low-waste (sustainable) society is unacceptably slow. There is growing momentum, in the UK, to link domestic and industrial projects and the voluntary sector is a key driving force.

A central feature of the UK approach for encouraging industrial/commercial minimisation has been the formation of project clubs. The ETBPP and the Environment Agency have figured strongly in the formation and running of such clubs. There have been around 60 such clubs, in the UK, recognised by the ETBPP (Fig. 1). Data on the number of other clubs outside of the ETBPP management is scarce; some industrial networks and associations have had waste minimisation initiatives, e.g. Chemical Industries Association, but as yet no definitive overview of all of these has taken place.

The distribution of the clubs does give rise to concern as certain administrative regions, e.g. South West, have had few developments whereas others, e.g. North West, have had a greater number per household unit (Table 10). The reasons for this have not yet been fully addressed. The urban/rural ratio appears to be a key factor, predominantly rural areas seemingly lagging behind in club development. A recent history of decline in heavy industry allied to high unemployment and environmental degradation (Project Catalyst) seems to be a spur to the formation
of some clubs, perhaps because of specific grants, e.g. Single Regeneration Budget, being readily available for this activity in those regions.

The club approach has been adopted because of the success of the early Demonstration Projects, e.g. Aire and Calder. These were developed from a model that originated in mainland Europe [27]. This model was adopted by a range of UK organisations, including service providers, that then became the main drivers for many of the early clubs. It could be argued that the introduction of such clubs into the UK came about because service providers sought to create new markets when environmental issues were becoming increasingly prominent in the UK.

The formation of a club has been said to have significant advantages, e.g. inspiration, reassurance and exchanged Best Practice [26]. At the same time, it has been recognised that there are underlying problems; members of sector clubs are often reluctant to share recently developed Best Practice because it is conceived as possibly bestowing a competitive advantage on rivals. Clubs have often concentrated upon training the company champions over a period of time, normally between 6 and 12 months. It has been assumed that they will then import the methodology into the company as they train up the company team, keeping costs down as service provider time is kept to a minimum, e.g. Hereford and Worcester (Table 6). Training over a prolonged period means that the company champion has not been fully inducted into the methodology until almost the end of the project. It is better to train over a short, intensive period early in the project rather than over a prolonged time-scale, then the champion can begin the waste audit, and the formation of the company team, as early as possible.

Where clubs have stated their aims, e.g. Hereford and Worcester (Table 4), it is possible to evaluate their achievements in relation to their stated aims. In the Hereford and Worcester report the results of on-site interviews of companies, using a questionnaire, are included [19]. Some 77% of the participating companies, who attended the training sessions, said that the programme had fully or partly met their objectives. The 23% of companies whose objective had not been met, felt that the training programme was overtly complicated, did not stimulate interaction and gave little opportunity to discuss individual problems. There appears to be acceptable levels of company satisfaction. However, it must be borne in mind that the identified club savings, of £250 000, was for the 37 companies in the club, yet only three companies account for the majority of that sum. Whether the project met a number of its other aims, such as the dissemination of results locally is not clear and there appears to be very little analysis of the success, or not, of the project.

Other recently reporting projects, e.g. Keighley Business Forum [21], have not stated any aims in the final report, they are merely a collection of individual company reports and it is difficult to draw quantitative data from an evaluation exercise. What often happens, even in well documented cases, is that a list of conclusions is given which is felt to be a pointer towards Best Practice [24]. If clubs are meant to be the catalyst for the uptake of waste minimisation by the wider industrial/commercial community then there appears little evidence to support this. The follow up to the LWMI, in the same county, has proved less satisfactory with few companies enrolled and there appears to be little industrial demand for this
development. For clubs to be deemed successful they must be able to prove that
they have stimulated an adoption of waste minimisation methodology by a sig-
nificant proportion of industry in their local region.

The reduction in waste arisings is significant (Table 6). The most comprehensive
analysis of the results from one club has been that for the LWMI [22]. Liquid waste
was reduced by some 8.5% and it is assumed that reductions in water consumption
were in the same order. Solid waste was reduced by some 47.4%, a very significant
figure. Other significant reductions have been achieved (Table 6); in the Aire and
Calder case the reduction in liquid effluent was 31% of the potential and that for
solid waste was 100% of the potential. The reductions have been made by a wider
range of opportunity techniques (Table 5) than just waste minimisation. It must be
recognised that the activities of the clubs have transcended waste minimisation
alone and they could better be described as resource efficiency projects. The
application of a range of opportunity techniques (Table 5) to a range of categories
has shown that the largest savings are made in raw materials, with operating costs
next and water consumption third (Table 7). It has been demonstrated that the
financial savings from the introduction of waste minimisation can be made rela-
tively quickly (Table 8) and this is important when recruiting members for new
projects. Payback period is another key question for companies. A very significant
proportion of savings (84% for Catalyst) are made within 12 months (Table 9).

The clubs have demonstrated that it is possible to move towards more sustain-
able production as raw material input is reduced. This is aided by the adoption of
a sound, quantitative methodology (Fig. 3), however, it would be unwise to equate
the technology modifications in Table 5 to a shift towards clean technology (Fig. 2).
Clubs can make members aware of new, clean technology and so catalyse move-
towards even more sustainable approaches to production.

The evaluation of financial savings is fraught with some difficulty; rarely is it
made clear whether savings are on an annual basis and for how long they are
expected to continue. There is a requirement for a detailed cost–benefit analysis to
be carried out on a future programme that has been designed in such a way that it
yields accurate financial data. Nevertheless, impressive financial savings have been
made in some cases (Table 6). The gains from the early Demonstration Projects are
unlikely to be repeated due to funding constraints as it is not likely that very high
levels of external funds will again be available. Even so, smaller clubs with very
little external money, e.g. Hereford and Worcester, have made savings of 14 times
the stated cost of the programme.

Cost savings cannot be simply predicted from the company turnover, as is shown
by the correlation coefficient ($R^2 = 0.0771$) of the plot of achieved savings (% of
turnover) versus turnover (Fig. 5). The same is true for the size of the company, as
represented by number of employees (Fig. 6). It may be argued that such an
analysis was not possible, on the four projects evaluated, as there was a diverse mix
of company categories so making comparison difficult. The results from the Waste
Elimination From Textiles (WEFT) project [24] has enabled an analysis of a single
manufacturing sector to be carried out (Fig. 7). Even in this case, in a single sector,
the correlation coefficient of the plot of achieved savings per annum versus number
of employees is such \( R^2 = 0.0771 \) that it cannot be used as a predictive tool. Indeed, this is recognised in the report, which concludes:

The tables (data) cannot be used to compare the companies because the results depend upon a number of factors, including the extent of previous initiatives to reduce waste.

It is not the mean savings, stemming from a project club, that matter but the median. This better reflects the actual activity amongst the set of companies in a given project. Nevertheless, savings of 0.5–1% of turnover seems very achievable for a range of company types and size [22].

A national waste management policy must do more than merely inform regional decision makers. It negates a national sustainable development strategy when there are wide regional variations in the uptake of wastes minimisation methodology by industry and commerce. Certain regions of the UK have had very few waste minimisation project clubs and, at the present, the distribution of the clubs is unsatisfactory (Table 10); furthermore, there is little evidence of a regional strategy to remedy this. This is an area that requires urgent attention in the next few years.

The East Midlands of England is a region with little previous history of successful waste minimisation project clubs apart from the LWMI [16]. The results of a survey of key environmental organisation in the East Midlands give an insight into possible reasons why. Of 85 key regional organisations questioned only 16% claimed to have a waste minimisation policy and 60% had no policy at all (Fig. 8). The lack of a clear policy within many of the key environmental organisations is probably a major reason why so few successful developments have taken place. Such organisations should be the focus of well-orchestrated campaigns where local industry/commerce is made aware of the clear benefits of minimising waste, they should act as facilitators.

Funding for future projects may be problematic. Although there appears to be a range of possible funding sources (Fig. 9), in reality it is very difficult to obtain external funds at the present. Future project clubs will have to be designed to be essentially self-funding, where industry/commerce contributes the majority of the costs. Facilitators need to make use of more diverse sources of external funding, in particular those that are available from the UK landfill tax [35].

Advice given to managing project clubs has developed little over the past few years. The early case studies were based upon Demonstration Projects, such clubs had the capacity to overcome a range of problems that were unforeseen by the initial planning process. Less well-funded clubs have had to face similar problems without the resources to deal with them. The NREP underwent rapid organic evolution within the first few weeks of its programme as the management team recognised its shortcomings, it being initially designed on the basis of information from previous, better-funded programmes. What is lacking in the UK is a central authority that regularly reviews the data flowing from clubs in an attempt to identify Best Practice and has the resources to input this into clubs. The availability
of the local Higher Education Institution enabled the management team to utilise a range of academics to produce new and novel insights so that they could respond to altered circumstances. This will not be possible in the case of every club and so the Environment Agency or the ETBPP needs to enhance their role and to provide this expertise. At the present, this does not occur and the support of the Environment Agency and the ETBPP, due to resource constraint, is less than required. Many clubs, therefore, founder through lack of expertise and the inability to respond to new, unforeseen challenges.

Recent UK Government publications outline a range of issues by which we can qualitatively evaluate the contribution of waste minimisation clubs to the development of a national, sustainable waste management culture. In ‘Opportunities for Change’, emphasis is placed upon the prudent use of natural resources as well as the maintenance of high and stable levels of economic growth and employment [2]. Clubs have demonstrated that the application of minimisation methodology results in improved resource utilisation and that the financial savings lead to enhanced company profitability, that could result in enhanced employment security. They have not, however, demonstrated the requirement that such projects encourage producers to design more sustainable products or enter into increased communication and dialogue with key stakeholders.

‘Sustainable Business’, emphasises the need for industry to send the correct signals and information to consumers so as to empower them to move towards sustainable patterns of consumption [9]. This has rarely been a key issue with the clubs and it needs to be addressed in future developments. Market transformations are essential for a sustainable future and consideration must be given to accurate information on labelling, regulated minimum standards, incentive schemes for consumers to replace inefficient appliances and sector agreements for improved environmental performance of product ranges.

In ‘Less Waste More Value’, the hierarchy, with minimisation at the top, is emphasised as a key component of the proposed national strategy [5]. Clubs have demonstrated that the hierarchy is a functional concept and that significant savings can be made by reducing waste at source. Finance, for the development of future projects, is essential if new and original types of clubs are to be developed. Facilitators need to be aware of the request in ‘Less Waste More Value’ that they explore the opportunities for funding through the Environmental Body scheme funded by landfill tax [35]. So far, very little of the available funds have gone towards sustainable wastes management. The planned Regional Development Agencies need to give urgent attention, on their formation, to the linking of domestic and industrial projects so that holistic minimisation strategies are developed that efficiently integrate national policy into a regional context.

The Environment, Transport and Regional Affairs Committee, draw attention to the role of the Environment Agency [10]. They consider that the Agency is contributing little to the present developments and that the lack of direction for waste minimisation is endemic, with little incentive for companies to commence projects. They suggest a way ahead:
This being the case, it would appear to us that the DTI, DETR and the Environment Agency will have to reassess their approach to such projects, perhaps providing for a tougher regulatory approach in cases where no effort is made to minimise waste or alternatively, holding out to companies greater incentives than the promise of cost savings to come.

Waste minimisation clubs have pointed a way ahead and demonstrated that sustainable waste management is a feasible option. The next generation of projects needs to build upon the recently developed Best Practice, recognising the causes of recent failures. Regulators need to be more proactive and set a context so that the majority of industrial and commercial companies are encouraged to implement waste minimisation strategies.

8. Conclusions

The first industrial/commercial waste minimisation clubs were formed, in the UK, during the early 1990s. Since the first, generously funded Demonstration Projects there have been around 60 such clubs across the UK. The clubs receive support and advice from the Environment Agency and the ETBPP, who monitor progress and disseminate the results as case studies of Best Practice. The clubs have demonstrated that significant reductions can be made in waste arisings, especially solid and liquid wastes. The introduction of minimisation methodology has resulted in improved resource efficiency, especially for water, and as such provides a model that points the way to more sustainable wastes management. There are, however, marked regional variations in club distribution and the proposed Regional Development Agencies need to consider strategies to translate national policy into an effective local context. Not all clubs have met their objectives; the Environment Agency and the ETBPP need to develop management expertise, based upon an analysis of recent research, which they make readily available to project teams. Attention must be given to the stimulation of a greater uptake by industry and commerce as well as the linking of such projects to domestic minimisation. This will require a proactive role by regulators.

References


