

Sustainability issues in the development of eco-industrial parks in Wales

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Abstract

Increasing pressures on our natural resources and growing environmental awareness have resulted in the development of legislative and economic drivers to improve sustainable waste management in Wales. This paper introduces the concept of eco-industrial parks and discusses their potential in the provision of a solution to the growing problem of managing waste sustainably in the Principality. A key issue is the role which eco-industrial parks could play in the promotion of market development and identification of local markets for secondary materials, to change waste into a resource that can generate wealth and employment opportunities. The progress to date on one pilot project is reported, addressing the economic considerations, the pertinent environmental issues and the social implications of the project.

1. Introduction – the waste problem

The past decade has seen a growth in environmental concern fuelled by a number of environmental incidents and disasters. We have also seen an increased understanding of environmental science, increased material prosperity and improved government responses to environmental issues. There has been fast growing public interest in such issues, including waste management and recycling. Correspondingly some major pieces of legislation have been introduced.

Pressures for sustainable waste management practices have been developing in Europe. A Framework Directive on Waste¹ was published in 1991 which set down a hierarchy of waste management options, requiring member states to encourage the prevention and valorisation of waste and to ensure its management at the point of production. There were also requirements that waste disposal plans had to be produced by the competent authorities and waste disposal facilities had to obtain a licence. This prompted a tightening of the control of waste from its production to disposal throughout the European Union (EU), but it is undoubtedly on the issue of recycling that member states have been most active in recent years. This activity was heightened with the introduction of the 1994 EU Directive on Packaging and

¹ Council Directive 91/156/EEC of March 1991 modifying Directive 75/442/EEC of 15 July 1975 on waste

Packaging Waste². The Directive imposed on all member states a recovery target of 50-65% for packaging waste and a recycling target of 25-45%, with a minimum of 15% for each material, to be achieved by 2001. In the UK responsibility is placed on the producers of packaging to ensure that it is recovered or recycled³ and the Packaging Waste Recovery Note (PRN) concept provides evidence of compliance. The targets imposed by the EU are currently under review and are likely to rise, providing an additional incentive to increase recycling efforts.

Furthermore, in 1995 the European Commission introduced the Landfill Directive⁴ in an effort to reduce the amount of waste being disposed of in landfill sites. The Landfill Directive decrees that EU member states must implement strategies to reduce the amount of biodegradable waste that is landfilled to 35% of 1995 levels, by 2013. The former UK Department of the Environment, Transport and the Regions (DETR) estimated that, to comply with the Directive, at least 10 million tonnes of waste per annum will need to be diverted from landfill by 2020 (DETR 2000a). Indeed, this figure could rise to 33 million tonnes if waste arisings continue to grow. Therefore, the challenges facing the UK in terms of improving waste recovery and recycling are significant.

Despite the introduction in the UK of the Landfill Tax, in 1996, insufficient progress has been made to date and UK waste strategy has consequently been revised. The new Waste Strategy 2000 (DETR, 2000a&b) puts even more emphasis on recycling and developing new infrastructure and markets for waste resources. Although Wales is developing its own waste strategy (National Assembly for Wales, 2001a) that has distinctions from Waste Strategy 2000, the precedent for developing traditional and alternative markets for recyclable materials and new reprocessing facilities is maintained. In Wales, the proposed recycling targets for municipal waste are:

- by 2003/4 achieve 15% recycling/composting with a minimum of 5% composting and 5% recycling;
- by 2006/7 achieve 25% recycling/composting with a minimum of 10% composting and 10% recycling;
- by 2009/10 and beyond achieve 40% recycling/composting with a minimum of 15% composting and 15% recycling.

These drivers mean that Wales is faced with significant challenges in creating sufficient infrastructure, reprocessing capacity and end markets to manage the large quantities of recyclate that need be diverted from landfill. Local facilities to reprocess waste resources will also be needed if we are to adhere to the proximity principle, which requires that waste should generally be disposed of as near to its place of production as possible.

² European Parliament and Council Directive 94/62/EC of 20 December 1994 on Packaging and Packaging Waste.

³ Producer Responsibility Obligations (Packaging Waste) Regulations 1997. S.I. 1997/648.

⁴ Council Directive 1999/31/EC on the landfill of waste, (better known as the Landfill Directive).

2. Eco-industrial parks

Recent guidance from the Welsh Assembly on waste management planning (National Assembly of Wales, 2001b) stipulates the need for planning authorities to work in partnership in developing new infrastructure and reprocessing capacity. It also commends to local planning authorities the concept of eco-parks. The term eco-park, however, encompasses three distinct types, namely zero-emission parks, virtual eco-parks and resource recovery parks. The different benefits and challenges of eco-industrial developments have been reviewed elsewhere (e.g. Chertow, 2000; Schlarb, 2001), and the most appropriate type of eco-park for the management of waste in Wales should be considered (Davies et al, 2001).

The zero-emission park is the most common variant and the template for most of the eco-industrial developments around the world. Such parks represent the grouping of companies in order to reduce environmental impacts by using one company's waste as another company's feedstock. Environmental economies of scale are also accessed through the employment of a shared water, energy, information and transport infrastructure. If new buildings are required on a zero-emission park, then every effort is made to ensure that the least possible environmental impact is made. Although the theory of a zero-emission park is a very attractive one, in practice the notion is difficult to establish. Problems may arise in identifying an effective mix of businesses and in recruiting these businesses onto the park as tenants. Prospective tenants must be shown that the benefits from being situated on a co-located site must outweigh the administrative and logistical costs associated with moving there. Too close a link between the supply and demand of resources may also cause problems if one of the companies ceases trading or changes its supply/demand requirements as a result of a change in its products or production processes.

A virtual eco-park is very similar to a zero-emission park, except that the groups of businesses involved are based in geographically different areas. Therefore, although the businesses are not able to share resources, such as energy and water, in the same way that a zero-emission park can, there is a greater opportunity to match companies with similar wastes and feedstock. Other difficulties such as transferring the business on to a new eco-industrial park project are also not an issue, but there is the contention that more transport may be needed in order to move by-products between companies.

The third variety of eco-industrial park is known as a resource recovery park. In this case a group of reuse, recycling and composting business is the focus of the park. The businesses are usually based around a sorting facility and their products either sold on or off-site. There is also the capacity for reprocessing companies to be able to trade their goods to manufacturing companies also based in the resource recovery park. The park residents can also take advantage of the environmental economies of scale available in the zero-emission park. Resource recovery parks also offer their incumbent businesses the opportunity to share facilities such as administration, marketing, research and development, and operating equipment. Unlike the other two varieties of eco-industrial park, the resource recovery park can utilize waste from a variety of sources.

In the framework of an integrated solution for the management of waste in Wales, the main priority is to divert municipal waste away from landfill and the resource recovery park model is the form that most closely aligns with this purpose. Consequently an eco-park following this model is being adopted. The eco-park will be based around a material recovery facility (MRF), accepting municipal waste from the surrounding region, with related small and medium sized enterprises (SMEs) utilising the secondary materials in their production processes. Part of a vision for waste management from the perspective of the Institute of Wastes Management (Wastes Management, 2001) would mean that society at large would have a greater understanding of the need to use materials more wisely and generate less waste in the production, packaging and use of goods and services. One of the targets of the project is to raise consumer awareness of waste and recycling issues and a visitor centre and educational centre is part of the project plan.

3. Sustainability issues in the progress of a pilot eco-park project

The design and implementation of an eco-park in Wales is in the early stages of development. However, it is clearly showing potential to contribute to regional progress in economic, environmental and social terms. The following sections report on the development of the project and the sustainability issues which have emerged to date.

3.1 Economic issues

A number of concerns need to be addressed in order for an eco park to function efficiently in the region, but the primary issue is one of funding. Having an economic underperformance that puts the Principality on a par with the poorest nations in the EU means that much of Wales is eligible for European funding which can facilitate the development of infrastructure, including new waste management facilities. 'Objective 1' funding is available from the European Union to help improve the economic prosperity of the most deprived areas in Europe (Objective 1 areas). Wales is a predominately Objective 1 country, with 15 of its 22 Local Authorities among the poorest in Europe. The Objective 1 area, collectively termed 'West Wales and The Valleys', is home to a population of around two million and covers 63.2% of the landmass of Wales. In order to qualify for Objective 1 funding an eco park would have to be constructed within the Objective 1 boundary and be shown to contribute to the economic and commercial prosperity of the region.

The priorities for this funding focus on the following six key areas (Welsh European Funding Office, 2001)

- Expanding and developing the SME base
- Developing innovation and the knowledge-based economy
- Community economic regeneration
- Developing people
- Rural development and the sustainable use of natural resources
- Strategic infrastructure development

An eco-park could be eligible for EU funding if the project proposal can prove it meets a number of these criteria, and the resource recovery park model can clearly be shown to satisfy these conditions.

The project must also show it is designed as a partnership working together strategically, and the early stages of the project have focused on this aim. Potential contributors include the Local Authorities, private waste sector companies, the Welsh Development Agency, SMEs and community groups. Local Authorities collect and own the waste, private sector waste companies have the expertise to build and run the waste facilities and the potential to contribute finance. The Welsh Development Agency has political influence and experience of preparing development plans, while manufacturing SMEs have the potential to use the secondary materials. The Wales Environment Trust is acting as a catalyst in this process, bringing ideas, contacts and experience in market development.

3.2 Environmental issues

In line with the draft Welsh strategy the Technical Advice Note is clear that recycling and composting should come above energy recovery in the waste hierarchy (National Assembly for Wales, 2001b); the guidance is that recycling and composting should be maximised at every opportunity. In order to create a healthy recycled goods industry and ensure the future prosperity of a Welsh eco-industrial development, the end-markets for secondary products need to receive attention. Markets need to be developed for new products and applications, as well as expanding the markets for existing products (AEA Technology, 1999). Consequently, while the strategic partnership building progresses, work on developing markets is continuing. The Wales Environment Trust has developed a regional market development programme which began in September 1999 (Watts, 2001). Small and medium sized enterprises are important to the success of market development initiatives to ensure a diversity of applications for recycled materials, and such enterprises could be encouraged to relocate onto a resource recovery park. One of the first steps in the programme has therefore been to attempt to identify and catalogue information on local companies using, or having the potential to use, recycled material.

The initiative began with a preliminary study of manufacturing firms in South Wales to identify companies that might be suitable to use recycle or a recycled feedstock in their production (Watts et al, 2001). The study identified 106 manufacturing companies within the region in the priority material markets of paper, glass and plastics alone. Following the survey the market development initiative involved working closely with individual companies that had been identified as having significant potential to use secondary materials, and the progress made with one of these companies is described in the following example (Watts, 2000).

The site of the pilot eco-park is located in the South East of Wales, and the company in question is based in that area. The company produces a range of pre-cast concrete products including paving slabs, medium and lightweight concrete blocks and kerbstones. At the time of the initial study, the company was using approximately 100,000 tonnes of aggregates and sand per year, the majority of the aggregates being supplied by a quarry in South West Wales. The concept of using crushed glass to displace the aggregates was discussed with the production manager who was

generally positive about the potential. He felt that, if crushed glass became available, the management would only have concerns about the quality of the final product. The use of glass should not result in sharp edges jutting out and even in wet cast products, where the glass is bonded into the mix, testing would be required to see what happened when the blocks were cut. Also, using glass should not detract from the required strength properties of the products as product and industry standards must not be contravened. In addition to the quality of product produced, secondary glass aggregates would also have to be an economically viable alternative; the cheaper the materials, the greater the incentive to use them. The company expressed an interest in obtaining some samples of crushed glass to test in the mix.

The study thus identified that this company could potentially use waste glass to displace aggregates but would need substantial support in order to achieve this. Firstly, sample supplies would have to be sought and research information obtained on the properties and impact of glass on the company's products. Potential long-term stable supplies would also have to be located and ensured as the use of glass would require some investment. The need for marketing would be minimal, as the products would not be sold on the basis of recycled content, although public procurement could be an exception to this.

The Wales Environment Trust decided there was significant potential in working proactively with this company. The Trust acquired samples of glass from a Local Authority in South Wales, identified crushing facilities, transported the samples to the crusher and delivered the crushed glass to the company for testing. The samples performed well in the tests and the senior management of the company agreed to invest in setting up a glass processing facility. In order to justify this expenditure it was agreed that the Trust would help supply the plant with 30,000 tonnes per annum of glass cullet from a variety of sources e.g. Local Authority kerbside collections, bottle banks and commercial premises.

In 1999, prior to the market development initiative, glass cullet from South Wales was being transported to various recycling facilities in England or sent to landfill. Prices paid to Local Authorities for the cullet were very low, or even negative, particularly for green glass. This situation has now been reversed; in this example alone 30,000 tonnes per annum of glass cullet is being diverted from landfill and is being processed locally, creating a further environmental benefit. One of the advantages of this particular application is that mixed glass can be used. Hence the glass does not have to be sorted into different colours, which reduces the expense of the scheme and minimises the risk of loads being rejected by quality checks and sent to landfill.

This example illustrates the potential for the use of secondary materials and shows how this has benefited the local economy as well reducing the use of natural resources. As it is hoped that the pilot project in South East Wales will be replicated in other areas of the Principality the crushing machinery, which has been purchased, is mobile and may be used for future, similar ventures in other parts of Wales.

3.3 Social issues

In addition to the environmental advantages, eco-industrial development can generate sustainable employment within a region and demonstrate social benefits. A resource recovery park could provide employment for the area via direct jobs at the site or with related kerbside collection schemes. Some of the jobs created will involve basic sorting and transportation and be suitable for unskilled and disadvantaged workers. The pilot project in South East Wales is already demonstrating potential in this field, illustrated by the following examples in the glass and plastics markets⁵.

A large proportion of the glass collected by the Trust is used in the processing facility in the production of concrete products. However, a joint venture company, Conway Minerals, has now been set up to focus on higher value applications for the glass. Alongside Conway Minerals, a community scheme is coming into operation to process complete glass bottles for the stained glass art and jewellery craft markets. This scheme, to be based on the site of the eco-industrial park, will create sustainable jobs for 20–30 socially disadvantaged members of society.

In contrast to the market which has been developed for glass, a volume market for plastics does not currently exist in South Wales. A priority is therefore to create a facility on the eco-park site to deal with mixed plastics and to sort these plastics into four waste streams. Interest has already been expressed by industries wishing to purchase the sorted plastics produced, but the preference is to place a manufacturing unit on site to produce fences and garden furniture, although a balance will need to be struck between local manufacture and economic requirements. Opportunities would exist for the employment of approximately 75 people, including those with learning difficulties, supervision being provided for these workers through partnership arrangements with Mencap, a learning disability charity. The work programme would have a training element, encourage job rotation and would be a means to enter paid employment rather than simply providing a 'stop-gap'. Due to the numbers required, the Social Services divisions of more than one Local Authority would be involved in the recruitment of workers through this scheme, widening participation in the region.

4. Discussion

Although the project is in its early stages a number of issues have already arisen which are likely to be key to its success. A lead player is needed to take the project forward, and the active involvement of a catalyst in the form of The Wales Environment Trust has been crucial. The aim is for the pilot project to be sustainable, independent of grant aid in the long term and suitable for replication in other regions of the Principality. Consequently one of the prime motivating factors is economic – the need to generate income for the companies, for the Local Authorities and the Trust in order to arrive at the position where the project is economically sustainable without grant aid. Another motivating factor is the desire to accomplish something really positive for small companies in deprived areas. In order to achieve this, there is an overwhelming need for a proactive approach and high levels of intervention to help

⁵ Interview with Dr. Keith Parry, The Wales Environment Trust, January 2002

the companies innovate, illustrated by the practical approach adopted to assist the concrete products company described above.

The environmental advantages are evident in that waste can be diverted from landfill and transformed into useable products, manufactured locally, thus reducing the need to use virgin natural resources. However, one of the main issues in this equation is the supply of waste. In order for the project to be economically viable, significant quantities of waste need to be guaranteed. If the manufacturing companies are unable to obtain the waste as raw material they will revert to their previous feedstock supplies. Local Authorities play a key role as the owners of municipal waste. Providing opportunities for the employment of socially disadvantaged workers brings with it a 'feel-good' factor of social inclusion and in addition, it encourages Local Authority interest in the project.

The element of trust has also emerged as a very important issue. In negotiations between the partners, the understanding is paramount that the best price for materials will always be secured. Key to the economic viability of the scheme is the distribution of revenue for the Packaging Waste Recovery Notes (PRNs). These can be issued by accredited reprocessors, and demonstrate that packaging waste has been recovered or recycled. PRNs carry a market value that forms part of the commercial agreement when waste changes hands. In the scheme that has been devised in this pilot project, the distribution of PRN revenue is totally transparent to all the partners. A proportion of the revenue is re-invested for research and development into higher value applications. If this proves successful and higher value products are developed, then this would be reflected in the prices paid to Local Authorities for the waste supplied, contributing to the economic prosperity of the region.

In conclusion then, economic, environmental and social issues are inextricably interlinked in this project. Success relies on all these elements, and ignoring any one would endanger the viability of the scheme.

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