Title   Household Waste Recycling in the UK and The Netherlands: A Comparative Study of Sheffield and Amsterdam

Name    Jane Price

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HOUSEHOLD WASTE RECYCLING IN THE UK AND THE NETHERLANDS: A COMPARATIVE STUDY OF SHEFFIELD AND AMSTERDAM

Jane Lesley Price

A thesis submitted to the Faculty of Science and Computing, University of Luton, in partial fulfilment of the requirements for the degree of Doctor of Philosophy

May 1996
Abstract

Waste and its management is a dynamic subject that has far reaching implications. These extend beyond basic practical issues of producer responsibility and consumer behaviour, and encompass pollution and environmental problems in a global context. Economic concerns, such as scarcity of resources and the emergence of environmental issues such as sustainability, have influenced the need for a waste management strategy that will increase material re-use and recycling, and energy recovery. Increasing quantities of waste and changes in its composition have placed an ever increasing pressure on traditional disposal routes, namely landfill, giving impetus to the development of alternative management options.

The emphasis on management through a waste hierarchy has resulted in a trend throughout Europe of striving towards numerical targets to induce movement away from landfill. In 1990 the UK government set a target of recycling 25% of household waste by the year 2000. The Dutch have set a general waste target to separate 65% of waste for recycling, by the year 2000. Currently, achievement of the UK target is unlikely. Explanations for this do not stem from the target being too high, as it has been illustrated in Europe and more specifically in the Netherlands, that more stringent targets are already being attained. Therefore this research is of importance in developing a greater understanding of the barriers and alternative policy incentives that exist in achieving materials reclamation and energy recovery, and aims to contribute to the development of suitable policies and strategic options.

Previous research has focused on specific aspects or singular concepts within the field of waste management. Although this has proved useful in specific contexts, the results and applications have been limited. This research extends such experience further in developing a model that can link the barriers that exist with regard to the 'successful' implementation of waste management strategies. This model focuses on evaluating data gained from the case study, having identified causal relationships and underlying pressures. It introduces a way of relating national data with local data, and it is at this interface that the 'success' of a waste management strategy can be determined, or barriers to its application can be identified and policies developed to overcome such barriers.
The research design has been developed within the framework of a comparative embedded case study. The methodology enables a fuller understanding of the current situation at national, regional and local level, incorporating a number of different data collection techniques. The selection of Sheffield and Amsterdam allows a greater focus on cross-cultural issues with specific reference to environmental awareness, recycling behaviour and implementation strategies within each local political framework. These results can then be placed within the context of the model to identify the feasibility of policy targets, and propose modifications to the policy or strategic options available.
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Preface

Due to the dynamic nature and international consequence of waste production and disposal, waste management and specifically recycling, have provided an ideal focus for numerous papers and academic studies. However this research is novel and unique in its approach, incorporating a European perspective to analyse and evaluate national waste management issues. Previously, analysis has been focused on specific influences such as political changes (Gandy 1993), economic viability or technical innovations (Roberts 1987). In contrast, this current research extends previous approaches, choosing not to focus on a single influencing issue or factor, or one policy initiative but emphasising the importance of a holistic approach.

This research provides a comprehensive account of the issues involved in household waste recycling, developing a model for household waste recycling, which is defined specifically for the UK and the Netherlands. It is relevant to the understanding and development of waste management in the UK. The results of this study have the potential to be nationally important in the further development of policies and implementation strategies for household waste recycling in the UK.

The thesis is structured to represent three specific stages of research. Chapter 1 justifies the selection of the research topic and introduces the research design, focusing on the methodological approach chosen to undertake a critical evaluation of household waste recycling. The research design is crucial to provide a framework for data collection and analysis, particularly due to the dynamic nature of waste management. Parameters used for choosing the case studies are defined, and similarities and differences between Sheffield and Amsterdam are illustrated.

Chapter 2 provides an introduction to waste management and focuses on the key issues of waste management from a historical context. Preference for specific routes of disposal and waste management forms the framework of the chapter, emphasising the changing role from a
public service moving increasingly to a privatised commercial activity. Changes in quantity and composition of household waste are evaluated with particular reference to their significance for waste management. Environmental degradation as a result of mismanagement and lack of awareness is highlighted, as an external pressure on waste management.

Chapter 3 places waste management within an environmental perspective. That is, the role played by environment and resource issues in the development and conception of waste management. An understanding of the emergence of environmentalism is essential to fully comprehend the evolution of waste management, and the variations that are present in the UK and the Netherlands.

The stages of environmental development including changing philosophical concepts, external pressures and influences, economic and political responses, and their impact on waste management, are fully discussed. Indicators of environmental change such as formation of pressure groups, environmental publications, and political interest, are assessed with regard to their role in the development of waste management in the UK and the Netherlands.

Relevant aspects of waste and environment legislation at national and European levels are assessed in Chapter 4. Roles and responsibilities in terms of private sector involvement and public service provision and their influence on the development of policies and implementation structures, are comparatively evaluated in the UK and the Netherlands. External influences on national policy makers, for example the European Union, are addressed and their significance in terms of waste policy development evaluated.

The second stage of the research, covered in Chapters 5 and 6, represent the local evaluation, providing more detailed information. Quantitative data gathered from each of the case studies is presented in Chapter 5 to enable local comparisons to be made. The data provides evidence as to whether differences in recycling activity do exist between Sheffield and Amsterdam, and where these differences lie.
The role of incineration is assessed with regard to its possible influence concerning recycling activities in each city. Policy frameworks at a local level are assessed, including the roles of local government, voluntary groups and industry. Implementation methods and their success are evaluated with regard to their influence on the success of recycling schemes in operation.

Chapter 6 evaluates the concept of recycling behaviour. Quantitative results were obtained using questionnaire surveys, and a model of recycling behaviour for Sheffield and Amsterdam is developed.

The final stage of the research is represented in Chapters 7 and 8. Local and national issues evaluated throughout the research are brought together in the penultimate chapter to evaluate their interrelated nature. Specific issues addressed in previous Chapters, but regarded as very significant in terms of their influence on waste management are further evaluated. This includes areas of potential conflict that may affect the implementation process of the waste policies, and either cause barriers to recycling, or provide an incentive to overcome potential barriers.

The model for household waste recycling is presented in Chapter 8 and refined for the UK and the Netherlands. It is within this Chapter that all the key themes and issues discussed and evaluated previously, are brought together and their holistic impact assessed in terms of barriers to recycling, and also possible solutions to overcome these barriers. The model enables the significant issues to be presented in a structured and systematic manner, and clearly illustrates the differences between the UK and the Netherlands with regard to the existence of incentives to overcome the barriers to household waste recycling.

The thesis ends with a number of general conclusions and suggestions for further research.
Acknowledgements

The author would like to thank all the people who assisted with this research, specifically contacts in the Netherlands and the UK who were willing to take the time to respond to questions and queries throughout the research.

The author would also like thank her colleagues and friends within the Faculty of Science and Computing, University of Luton, who gave the constant support necessary for the completion of this thesis.

Special thanks go to the authors' parents Fay and Tony Bone, her brother Stuart Bone, and husband Alan Price, for their kind words, encouragement, and belief in the authors capability to complete the thesis.

Last, but by no means least, kind thanks go to Chris Coggins (Director of Studies) for his patience, knowledge and assistance through all stages of the research.
Authors' Declaration

I declare that this thesis is my own unaided work. It is being submitted for the degree of Doctor of Philosophy at the University of Luton. It has not been submitted before for any degree or examination in any other University.

Jane Lesley Price

May 1996
Chapter 1: Research Design - The Development of the Case Study

1.1 Introduction to the Research

In modern pluralist societies such as the UK and Netherlands, there is a significant amount of pressure placed on policy makers from an environmental perspective. Stakeholders, with different demands and expectations of the environment, include the general public, who have an assumed 'right' to a clean and healthy environment. Consequently these stakeholders are also paramount to the success of policies and strategies introduced to manage to the environment. The successful management of waste forms a crucial component in the achievement and maintenance of high environmental standards.

Increasing quantities and changing composition of waste streams, and environmental awareness have all led to pressures on traditional systems of waste management, which were specifically aimed at cheap and easy disposal. Issues of global importance, such as resource and energy usage have become particularly significant in the development of waste management, their roles increasing under the 'umbrella' of sustainability. Nationally, increasing public and political awareness of pollution and degradation of the environment, as a direct consequence of waste disposal practices, have resulted in pressures placed on policy makers with regard to the development of waste management. These policies and strategies are being implemented at a local level, affecting traditional approaches management of waste.

Recycling has become not only a 'buzz word' for the 1990's, but also a significant component of evolving waste management strategies. Although it is not a new phenomena (as discussed in chapter 2), it is regarded as providing an environmental alternative (in terms of protecting, conserving or preserving the environment) to traditional disposal routes. The implementation of recycling strategies has been
slow in some cases and recycling targets have been set in developed countries to add impetus to the option and increase its role. The UK is no exception, with recycling now forming a focal point within waste management options. Throughout Europe the waste management hierarchy is promoted providing a clear indication of preferred waste management options. However, in the UK movement up the waste hierarchy is presently limited, as landfill, which is at the bottom of the hierarchy, is the major waste management option presently (1995) utilised. This is in contrast to the Netherlands where prevention, reduction and recycling strategies are commonplace, with minimal reliance placed upon landfill. It is essential that the underlying reasons for the lack of success with regard to household waste recycling in the UK are evaluated and recommendations made, if this is to prove a viable environmentally acceptable and economic alternative to traditional routes.

The purpose of the research is to critically evaluate household waste recycling and recovery (including energy) in the UK and the Netherlands, with the inclusion of a comparative study of Sheffield and Amsterdam. Recycling within the context of this research is assumed to be a 'good' practice in environmental terms. The ultimate aim of the research is to develop a model for recycling, identifying the barriers and incentives to household waste recycling in the UK and the Netherlands. Successful recycling is defined in this case as extensive progress being made towards the achievement of national recycling targets. The criterion by which the research can be judged to have achieved the aims is the completion of the model for recycling.

The selection of a comparative analysis as the methodological approach arose when it was perceived in the preliminary stages of the research that it would be less effective to evaluate household waste recycling in the UK in isolation. That is, it would be difficult to propose feasible incentives to overcome any barriers identified without adequate information of a comparative nature. The importance of a comparative study in the case of policy evaluation is highlighted by Heidenheimer et al. (1990) who state that guidance can be obtained in
both a negative and positive perspective when a comparison is made between different approaches to similar problems.

The Netherlands was selected as an ideal choice of study due to its strength in environment policy development, its commitment to recycling and its focus on integrated waste management strategies. The Netherlands as a country continues to be under significant environmental pressure. This is as a direct consequence of its industrial and agricultural activities, a high population density of 407 people per km$^2$, and its geographical position at the mouth of two great rivers. Therefore the policy plans drawn up to tackle the problems, have needed to be both ambitious and innovative.

The selection of the UK and the Netherlands in the broader context of the study is not because they are representative of other countries in Europe. Interpretative research is concerned with the selection of case studies for specific reasons. In this research the current situation in the UK holds great interest with regard to the fact that aims and ideals in the form of legislation and targets, do not reflect the practical reality of the waste management situation. Therefore it is of concern to policy makers that this 'gap' is bridged, to identify the true feasibility of targets, and propose possible incentives that can be used to overcome the barriers.

The Netherlands represents a contrast to the UK. In Europe it is generally accepted as an example of good management practice with regard to waste. Therefore, in establishing how and why the Netherlands has attained this position could be fundamental in improving the waste management system in the UK. The research does not in any way suggest that the two countries are comparable with regard to their demography and geography. Their similarities occur in terms of political and economic stability, and continual pressures placed on the environment from national, European and international perspective. Both countries are subject to changing European and national waste policy and legislation, introduced in response to the increasing environmental awareness, and the resulting requirement for pollution control and prevention. The UK and the Netherlands
are similar in their continued growth in waste generation, which requires management incorporating environmental needs. However, of interest to the study are the issues that influence waste management, specifically the successful adoption of household waste recycling or barriers to its implementation.

For the purposes of this research, when discussing the UK it is necessary to define the geographical parameters. Although the term UK represents England, Wales, Scotland, and Northern Island, in this particular case the focus of the study will be on England and Wales. This is simply a reflection of the administrative structure of national environmental legislation, and more specifically waste policy. Within legislation such as the Environmental Protection Act 1990 and the Environment Act 1995, the target group is England and Wales, with modifications included specifically for Scotland. With regard to the Environment Agencies, one operates within England and Wales, whilst the other is specifically for Scotland, highlighting the distinction made between the areas of the UK. The national waste strategy is focused on England and Wales with a separate waste strategy being proposed for Scotland. In Scotland, implementation of waste management policies and legislation is through the Scottish Development Department (Read 1990), therefore any waste issues that are discussed on a general level would not be directly applicable to Scotland. Northern Island represent a similar situation in that environmental control comes under the remit of a specific environment department based in Northern Island. For ease of comparability, and application of the final analysis the study is focused on England and Wales. The occurrence of any specific distinctions between England and Wales is clearly identified in the thesis. Therefore when making general conclusive comments regarding polices and strategies, specifically their implementation, the reference is towards England and Wales only.

Within the field of waste management there are numerous problems with regard to standard definitions, therefore it is necessary to state exactly what is meant by the term household waste recycling. For the purpose of this research recycling can be defined as "the collection and
separation of materials from household waste and subsequent processing to produce marketable products" (Department of the Environment 1991, p. 5).

Targets have been set in both the Netherlands and the UK, and these targets are used as a basis of comparison for the performance indicators. National and local recycling rates are compared to the national targets to ascertain the current success of recycling schemes in the UK and the Netherlands, and to establish the likelihood of achieving such targets within predetermined time scales.

In 1990 the UK government set a target of recycling half of all recyclable household waste by the year 2000. This equates to approximately 25% of all household waste (HM Government 1990, p. 190). In the Netherlands targets were set in 1989 for specific components of the waste stream. However, a general target for all waste streams has also been set, to recycle 65% by the year 2000 (Ministry of Housing Physical Planning and Environment 1989).

There are three main areas to the research. Initially, there is an analysis and evaluation of waste management in the UK and the Netherlands. This includes a historical perspective tracing the evolution of waste management, identifying the key issues and influencing factors, which then progresses into an evaluation of current and proposed policies and strategies. The second part of the research is more focused into particular issues of concern, including a specific comparative analysis of recycling in two cities, namely Sheffield and Amsterdam. Finally, there is an evaluation of the quantitative and qualitative data, from both the national and local level to form a model of evaluation identifying the barriers and incentives to successful recycling in the UK and the Netherlands. Performance indicators and relevant parameters are utilised in the overall framework of evaluation for recycling.

Extensive literature reviews of waste management throughout Europe, America, Canada, and a number of developing countries in the initial stages of the research, identified underlying factors that clearly
contribute to the development of waste management and the evolution of recycling. These factors provide the focus for the analysis and discussion.

To place the research in any sort of context it is necessary to reiterate some of the issues already acknowledged in the preface to the thesis and which are further addressed in subsequent chapters. As the quantity and composition of the waste stream has changed, there has also been greater awareness of the source, scale and impact of environmental degradation and pollution, acknowledging the pollution problems caused by waste mismanagement. Also, the importance of resources, in particular non-renewable resources, has placed an increasing pressure on the production of waste from a different perspective. Concern has been focused on the potential consequences of increasing production and the effect on scarce resources. Emphasis has been on environmental and resource protection which is of direct relevance to waste and its management. This incorporates the concept of sustainability, defined as development that "...meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission for Environment and Development 1987, p. 8).

It is important to consider both the direct and indirect response to these issues when assessing the current relevance of the research. It is evident that household waste recycling has become a focal point in reaction to increasing waste production and resource scarcity. This is illustrated national (both UK and the Netherlands) policies and legislation developed over the last decade (examples include National Environment Policy Plan 1989; Environment Protection Act 1990). A great emphasis has been placed on the inadequacy of the traditional routes of waste disposal in their present form, as an effective management technique. A waste management hierarchy was proposed, initially by the EC, and then incorporated at national levels within the member states. This has been developed further into a community waste management strategy as shown in Figure 1.1.
To promote the integration of the options higher up the hierarchy, national governments have set recycling targets to be met by the year 2000; often with intermediate targets to be achieved prior to this date. The UK is no exception and in the White Paper 'This Common Inheritance' (HM Government 1990), a national target of recycling 25% of all household waste by the year 2000 was set, which was further confirmed in the national waste strategy for England and Wales in December 1995 (Department of the Environment 1995b). The UK is finding achievement of this target difficult judging by the average figure of 5% recycling at national level in 1993/94 (Audit Commission 1995).

The Netherlands have set targets for individual materials, but there is also a national target of recycling 65% of all waste by the year 2000 (Ministry of Housing, Physical Planning and Environment 1989), which is much more stringent than the UK target. However it is anticipated that if the Dutch fail to achieve 65% recycling, they will attain higher levels than the UK.

Figure 1.1: A Community Strategy for Waste Management

This research attempts to utilise the Dutch experience and apply this to the UK, and identify possible approaches necessary to achieve the recycling target of 25% for household waste. Due to the holistic nature of the research, careful consideration of the development and application of the methodology is necessary. The approach essentially
needs to enable extensive qualitative and quantitative data gathering. It is important at this stage to discuss and evaluate the research design, to obtain an understanding of how all the issues are considered and incorporated in the approach.

1.2 Introduction to the Methodology
In empirical research such as this, the research design is crucial to ensure that only relevant information is obtained. Also, as the study has the potential to be infinite with regard to data collection, a systematic approach to the methodology is required within predetermined parameters.

Time and resource constraints define the parameters to a certain extent and although it was anticipated initially that data access may prove to be a limiting factor, this was not the case. The initial data and information required, for the UK and the Netherlands, encompasses both historic and current issues in waste management; including policy and target development, technological innovation, participation, and economic and political pressures. More detailed information is provided by the in-depth analysis of two cities, focusing on issues such as local government control, implementation structures, practical aspects of the schemes in use, and behavioural analysis. Therefore a number of approaches are undertaken within the design framework, to ensure access to all the relevant qualitative and quantitative data.

The information required for this research is utilised from both a top-down and bottom-up approach, therefore the research design incorporates access at both levels. That is, both national level strategies, policies and influences; and local level interpretation, implementation and pressures are fundamental to the research, and the development of a framework model of recycling.

The conceptual framework that the methodological approaches are based within is the case study, incorporating the traditionally positivist approach of the survey (refer to Figure 1.2). Case studies, by their very nature utilise a wide range of data from both quantitative and
qualitative sources, ensuring their appropriateness as a methodology in this research.

Figure 1.2: Methodological Design

The design is specifically an embedded case study, whereby more than one unit is evaluated and then compared. Numerous definitions have been applied to the concept of case studies (see Feagin et al. 1991 p.2, Hoaglin et al. 1982 p.126) however, that proposed by Yin (1994) illustrating the scope of a case study, is the most apt in understanding its application. "A case study is an empirical enquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin 1994 p.13).
The case study as a research strategy represents a comprehensive holistic method that can be thorough and systematic (Agranoff & Radin 1991). Its detractors in the past have mainly been as a result of poor application and interpretation, often due to the fact that "most people feel they can prepare a case study, and nearly all of us believe we can understand one" (Hoaglin et al. 1982 p.134). Its supporters have emphasised the point that a case study can be regarded as a real life situation, in contrast to an experiment which is fundamentally artificial (Orum et al. 1991).

It is acknowledged that the case study strategy is the preferred research method, when there are 'how' and 'why' questions to be examined and evaluated, especially when events cannot be manipulated by the investigator (Yin 1994). Hoaglin et al. (1982) summarises some of the main aspects of a case study, including attempting to explain why an innovation was a success or failure, which is fundamentally the essence of this research. The case study technique can also illustrate the sheer complexity of the issue being dealt with, and allows identification of influential factors. The use of multiple sources of evidence, such as archive material, interviews and documentation (which individually have their own disadvantages and advantages) is a major strength of case study data collection; enriching the research whilst requiring a systematic approach to the methodology.

The use of a survey within the sub-unit analysis formed part of the case study in design terms and was not treated as a separate entity (refer to Figure 1.2). The application of the survey was evaluating one concept within the framework of household waste recycling, namely recycling behaviour. Therefore, it was acknowledged that as the survey only formed one component of the research design, it should not be treated as a unique method separate from the overall approach of the case study.

The concepts illustrated in Figure 1.3 give an indication of main issues at global, national and local levels, that are intrinsically related to waste management in terms of pressures, incentives, opportunities or barriers. It is these concepts that form the essence of the evaluation in
respect to their significance and role in the final framework model of evaluation for the UK and the Netherlands.

Figure 1.3: Concepts Under Investigation in the Data Collection Stage

1.3 Case Study: Main Unit Analysis
This comparative case study of the UK and Netherlands with a specific focus on two cities, has met what Yin (1994) describes as the requirements of an exemplary case study whereby there are issues of national importance, or the cases are interesting and unusual. This enables an identification of similar or different trends, relationships and experiences in waste management within the UK and the Netherlands.

General information, regarding environmental issues and the role of waste management in the UK and the Netherlands, was obtained through archive material, documentation and literature reviews as stated in the case study methodology. The Centre for Waste Management, based at the University of Luton, has a well established library and archive on the UK and the Netherlands, although specific material with respect to this area of research had to be obtained from
direct sources. Access at this stage was not problematic and data was readily available. Any information from the Netherlands not available in English was translated. Data was gathered from extensive site visits in both the UK and the Netherlands. This included visits to sites where examples of good practice, technological advancement and innovative schemes could be found in operation.

Specific information was sought via direct contact through telephone or personal interviews. It was anticipated that this stage could have impeded the study as release of data is a pre-requisite for research, and in an area that could be regarded as potentially sensitive there could have been restrictions of access. This may occur at any stage in such research and so it must be firmly established prior to the data collection that access will be available. 'Gate-keeper' issues, as they are sometimes referred to, may cause problems of research validity if there are significant areas where up-to-date material is absent. Up-to-date material is essential as a consequence of the dynamic nature of waste management. Within the field of waste management, specific issues that may relay economic or business information could be regarded as commercially sensitive. This is more pronounced in the current climate in both countries due to an increased amount of privatisation and competitive tendering in this area. To overcome this problem a specific approach was taken when requiring interviews. On initial contact with the organisation an unambiguous statement was put forward with regard to the aims of the research and application of the information that was being acquired. Once reassurance was gained that the study was for academic use and not commercial exploitation, access to representatives was readily granted. Some organisations expressed a great interest in receiving the final analysis and evaluation, regarding it to be potentially either complimentary or beneficial to their operations.

Representatives were chosen from a list of established contacts, plus those developed from the initial stages of literature reviews. Representatives were chosen from a variety of sectors involved in waste management, including national and local government, industry, voluntary sector, and non-government organisations, (to
ensure that widespread views were obtained, refer to appendix 1). This encompasses the 'actors and players' philosophy that has recently been introduced in UK legislation, when identifying areas of responsibility for action. Referring to 'actors and players' involved within the waste management industry allows a concise approach to illustrating the roles of the different groups and organisations.

The telephone interviews were unstructured in that the discussion was not restricted to a rigid set of questions. However, they were oriented towards the respondents specific subject area. The respondent was not contacted 'cold', that is to say they had some knowledge of the research from earlier mail correspondence. All had previously agreed to be contacted by telephone and in most cases an appointed time was not required. These interviews were extremely useful in acquiring essential data and information, without the need for time and money for travel. Obviously, this is an important consideration in a study that involves overseas collaboration. The telephone interviews also served the purpose of identifying those representatives with whom a further, in-depth personal interview would be productive.

The personal interviews were carried out with either a single representative of the organisation, or a small group. These included local authority, government bodies, voluntary organisations, and private industry, thereby ensuring representation of most sectors involved with decision making and policy development in the waste industry. The personal interviews enabled the conversation to be guided in order to extract very detailed information that could be used in qualitative analysis (Lofland & Lofland 1984). Interaction of this kind is extremely important when acquiring views and perceptions. The interviews were often lengthy, enabling the representative to gain an insight into the basis of the research before developing into the discussion.

1.4 Case Study: Sub-unit Analysis

The scope of the research (concerning the collection of specific data on household waste recycling) was refined to focus on a comparative study of two cities, namely Sheffield and Amsterdam. This approach
enabled very detailed information to be gathered within the time and financial constraints of the study.

Selection of the two cities occurred within a set of parameters that stipulated essential requirements. These included the need for the cities to be active in the field of recycling, preferably incorporating energy recovery as a disposal option. The inclusion of parameters concerned with demographic and geographic issues was also a prerequisite. This ensured the viability of the study in a 'real life' context as issues such as a large and diverse population located in an area containing geographically challenging aspects may influence implementation of recycling strategies. In a research study such as this, realism of the case study selection may be influential in the potential applications of the model of evaluation.

Sheffield was the chosen city for the UK, primarily because it represents an example of good practice. It was selected to be the UK's first Recycling City in 1989 and has well established recycling schemes in operation, including an expanding innovative kerbside scheme, and drop-off programmes. It was important that a city with a proven history of recycling activity was selected for local study as most areas in the UK have a low level of recycling and would therefore be limited in terms of availability of quantitative data for comparison. The involvement of the Centre for Waste Management ensured provision of data and contacts, as they played a role in the monitoring of the Recycling City initiative in Sheffield.

In the Netherlands there are numerous towns and cities that have a history of recycling practice, however, the limiting selection factor was population size. As the Netherlands only has a total population of approximately 15 million, there are only a limited number of cities that could be comparable in size to Sheffield. It would not be viable to carry out a local comparative analysis of household waste recycling if the populations were not of similar size. It is widely acknowledged that smaller populations are advantaged in some respects with regard to the implementation of specific schemes. Therefore, Amsterdam was finally selected to be the comparative city in the Netherlands. It differs
from Sheffield in being a capital city, but it has a similar population size and waste production per capita as Sheffield. Amsterdam has a number of successful recycling schemes in operation and considers itself to be similarly innovative in the implementation of recycling schemes. Within the Netherlands, Amsterdam is not considered to be an example of good practice as it is subject to a number of operational difficulties, such as high density housing and narrow streets. However, despite these issues, the recycling success is far greater than that of Sheffield. Both cities operate incineration as the main disposal option, Sheffield recovers the heat energy in the form of super heated steam, and Amsterdam converts the heat energy into electricity. They differ considerably in terms of scale and technical aspects, including the emission control facilities, however a comparative evaluation of incineration provision in the two cities is discussed in Chapter 5.

The main comparative features are illustrated in Table 1.1. Chapter 5 provides greater detail on the two cities involved in the local study.

Table 1.1: Similarities of the Cities within the stated Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sheffield</th>
<th>Amsterdam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Production</td>
<td>0.268 per capita</td>
<td>0.264 per capita</td>
</tr>
<tr>
<td>Recycling Options</td>
<td>Kerbside &amp; Drop-off</td>
<td>Kerbside &amp; Drop-off</td>
</tr>
<tr>
<td>Disposal Options</td>
<td>Incineration with energy recovery, landfill</td>
<td>Incineration with energy recovery, limited landfill</td>
</tr>
<tr>
<td>Population</td>
<td>531,000 (1992 figure)</td>
<td>724,000 (1994 figure)</td>
</tr>
<tr>
<td>Geography</td>
<td>Undulating areas with steep hills. Some overlap with the National Park. Urban and rural areas.</td>
<td>Narrow streets, abundance of canals, high water table. Dense urban areas.</td>
</tr>
</tbody>
</table>

Retaining the framework methodology of a case study, the research programmes within Sheffield and Amsterdam followed a similar data collection approach as the UK and the Netherlands. Archive material,
documents and research papers were obtained to identify past and present trends within waste management in the two cities. Policy frameworks and implementation structures were also identified. In order to obtain actual tonnage figures, contact had to be made with local authorities as published reports often presented the data in percentage or graphical format; a format inadequate for comparative purposes.

Semi-structured interviews were carried out with selected representatives in Sheffield and Amsterdam, whereby a set of predetermined questions were developed, but in the interview allowance was made for deviation from the questions. The main aim was to discover the respondents experience and perception of the issues raised. Many of the contacts made from the national study were utilised to gain entry to localised and more specific organisations. Again, selection was based on obtaining a diverse sample to reflect differing opinions based on differing perspectives (refer to Appendix 1).

1.5 Survey Development, Design and Application
The concept of recycling behaviour was analysed within the case study framework, but required a more specific approach to data collection. The phenomena of behaviour in any field are difficult to measure and the choice of approach, to identify and quantify the concept, necessitated significant research into the options available. It was determined that a questionnaire survey would be most applicable. Such surveys aim to draw causal influences towards a phenomenon such as recycling behaviour, by looking at variations in a particular variable across cases (Vaup 1993). The use of questionnaire surveys as a research tool has existed as a social science technique for many years. It enables factual and quantifiable data to be obtained from representative samples, for analysis and evaluation based within a predetermined framework.

Using a quantitative method was more useful for an investigation of this scale and aided comparability. Many quantitative approaches, such as surveys have been criticised for being inherently positivistic (Vaup 1993). The concept of positivism has been negatively perceived, for
reasons which include its limitations to subject matter that can be physically measurable (Williams 1990), and for dealing simply with "surface appearances" (Harvey 1990 p.19). Also, positivism has been deemed as a method inducing the development of law-like findings within the social sciences, which reflects the processes in the natural sciences (Silverman 1993). However, whilst considering these interpretations of the methodology, there was more concern about identifying limitations of the survey methodology with regard to the application of the results.

The use of the survey technique in evaluating behavioural aspects of waste management has been extensively utilised in the past (refer to Pieters 1989; Kok & Siero 1985; Hopper & Nelson 1991; Oskamp et al 1991), and it cannot be disputed that it is a useful mechanism for comparing and contrasting quantifiable responses between two or more case studies.

The application of questionnaires in the UK and the Netherlands is by no means a new or unique phenomena. On a national level there is a compulsory census in the UK, and in the Netherlands there are continual population sample surveys (Dale & Marsh 1994). Also, market researchers utilise questionnaires on a regional and local level in both countries. The types of questionnaire surveys are numerous and include postal, telephone, door-to-door and on-street. In this case it was determined at a very early stage that within the confines of the research on-street surveys would enable the collection of random, representative and manageable samples. Postal questionnaires rely on the availability of postal addresses, application of a large number or questionnaires, and the respondents desire to complete and return the questionnaire. Previous research has indicated that generally the majority of returned questionnaires reflected only those experiencing positive behaviour. On this basis and its high cost, it was rejected for this research. Similarly, the telephone approach was discounted, mainly due to cost, access and language issues. Once the style of application had been determined the planning stage could incorporate specific considerations unique to on-street surveys.
1.5.1 Planning Component of the Questionnaire

Figure 1e4 illustrates thematically, the quantitative research process used to analyse the concept of recycling behaviour.

Figure 1.4: The Quantitative Research Process

The initial stage of developing a theory was an important aspect of the research as it represented the very essence of explaining the phenomena of recycling behaviour. From this theory a hypothesis or hypotheses are developed which propose relationships that can be tested. This is the stage where a set of conceptual propositions are derived. A concept is simply a way in which a name can be given to express common elements (Bryman & Cramer 1992) and, as stated, the concept under investigation primarily is recycling behaviour.
The operationalisation of the concept was undertaken through the use of questionnaires, enabling data collection to be made for comparative and associative specifications of the concept of recycling behaviour. The conceptual components that contribute to, or influence, recycling behaviour were predetermined from detailed research into behaviour, including the results of in-depth interviews. This was supported by extensive work carried out by Thorgersen 1993, who devised a frame of reference for behaviour (refer to Figure 1.5).

Figure 1.5: A Behavioural Science Frame of Reference

Thorgersen clearly supports the theory of an intrinsic relationship between motivation issues, ability and opportunity in respect to behaviour. This research acknowledges the roles of these factors but also further defines knowledge, attitude and awareness as individual conceptual components. Their importance as contributory factors is supported by a number of researchers to whom more detailed reference is made in Chapter 6.
The development of theories and hypotheses are an essential component of the survey design, which influence the structure and content of the questionnaire. It is imperative that the questions reflect the aims and objectives of the survey, so that essential information is gathered to prove or disprove the hypothesis and theory. This information can then be used in conjunction with data already collected from the other approaches, shown in Figure 1.2, to propose and infer further theories with regard to recycling behaviour and influential factors.

1.5.2 Question Design
The design of a questionnaire is probably the most important stage in the survey methodology. The technique of question wording is crucial to ensure that the data is valid (Sudman & Bradburn 1982; Oppenheim 1992). It is widely acknowledged that minor changes in the context of a sentence can result in significant differences in response. The wording of a question is also a recognised technique in reducing 'social desirability bias' which is one of the detractors from the worth of survey as an instrument of research.

With any type of questionnaire it is imperative that the initial contact a respondent has with the survey does not discourage them from cooperating. It is a common technique in survey design, to initially present socio-demographic type questions that are not associated with sensitive or personal information, so that a profile can be gained in the first instance, leaving the more demanding or personal questions until the respondent is less threatened by the prospect of answering questions.

People may be cautious of participating in surveys. This can stem from an underlying suspicion of the initial reasons for the questionnaire being conducted and also with regard to the final use of the data. Sensitive or controversial questions may result in the respondent declining to answer, especially if they do not perceive the questionnaire as confidential. With a self-administered questionnaire the purpose of the study can be fully explained with the result of
possibly negating any misconceptions that the interviewee may hold. Also, the confidentiality of the material can be assured.

The actual structure of questions chosen can vary and can have an impact on the response received. Closed questions with pre-coded response categories were used for this survey as their advantages far outweighed their disadvantages (Table 1.2).

Table 1.2: Advantages and Disadvantages of Closed Questions

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Require little time</td>
<td>• Loss of spontaneous response</td>
</tr>
<tr>
<td>• No extended writing</td>
<td>• Bias in response categories</td>
</tr>
<tr>
<td>• Low Costs</td>
<td>• Occasionally too crude</td>
</tr>
<tr>
<td>• Easy to process</td>
<td>• May irritate respondents with choice</td>
</tr>
<tr>
<td>• Minimum of interviewer interference</td>
<td></td>
</tr>
<tr>
<td>• Group comparisons are made easy</td>
<td></td>
</tr>
<tr>
<td>• Useful for testing specific hypotheses</td>
<td></td>
</tr>
<tr>
<td>• Less interviewer training is necessary</td>
<td></td>
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</tbody>
</table>

Source: Based on information from Oppenheim 1992

With closed questions, predictable responses covering a range of answers must be anticipated, and also it must be assumed that the target sample has some knowledge of the subject covered by the questionnaire (Black & Champion 1976). In this particular case it was presupposed that everyone within the sample range would have some awareness of recycling as an activity, whether they participated in the behaviour or not, and this view was supported by the pilot process.

The structure and components of the questions used in the survey were based on conceptual components and definitions illustrated in Chapter 6, Figure 6.1. This gives the construct of the survey its
originality. As previously stated, questionnaires have been utilised within waste management to examine the same or similar concepts. However, fundamental differences lie within the question design.

It is acknowledged that, within the scope of the questionnaire survey there are a number of negative aspects. Misinterpretation can occur at any stage irrespective of the type of question that has been selected for use. However, with correct procedures, these disadvantages can be minimised; including the use of a 'question bank'. As questionnaires have previously been utilised in the field of waste management, there exists a wide variety of questions that have been successfully applied. The Centre for Waste Management contains such a bank of questions, therefore it was possible for the purposes of this research to adopt question styles that have been fully tested previously, in combination with modified or original questions.

1.5.3 Piloting and Problem Solving
If existing survey questions are not to be used, it is essential that a thorough piloting programme is undertaken to alleviate any bias or minimise misinterpretations, as this will enhance questionnaire validity. Issues such as: length of time the interview requires, attitude to questions, understanding and willingness to participate can be evaluated. Perception of questions has to be analysed for being threatening, personal, or too vague.

Sudman & Bradburn (1982) identified four main concepts in the question structure that could lead to misinterpretation or lack of validity in the response: memory, motivation, communication and knowledge. In particular, recalled material may not be factually correct, depending on the time scale used in the questions. It is often recommended to refer to usual behaviour initially prior to any attempts to inquire about behaviour in a specific recent period (Belson 1986). Also, particularly associated with environmental based questionnaires, responses can be based on what the interviewee anticipates as the 'correct' answer. Questionnaire surveys rely on declared behaviour which may be very different from actual behaviour (refer to Rathje & Murphy 1992). The piloting process may establish
discrepancies in the responses, which may indicate that the question structure requires modification.

Ease of communication is essential both in terms of the interviewer and the respondent, and any difficulties will be discovered during piloting of the survey. The piloting process will also identify any errors in the presumed knowledge base at which the questions were set.

Piloting of the questionnaire survey in Sheffield and Amsterdam did not identify any problems in the design and structure of the questions. Extra care was taken regarding the questionnaire used in Amsterdam as errors could have occurred when the questions were translated into Dutch. However, this was overcome by the use of a number of independent environmental academics at the University of Amsterdam, first translating the questionnaire into Dutch and then passing them onto a colleague to translate them back into English. This reduced any errors considerably that may have arisen due to differences in terminology and definitions, and this aided investigation into interpretation of the questions. In both piloting programmes, interpretation of questions by respondents was evaluated in respect to justifying how they arrived at the response to a particular question. Once again, this did not highlight any faults or errors in the questionnaire design.

The surveys were carried out by small research teams in both Sheffield and Amsterdam, using a single page question sheet plus three viewing cards. The fact that the respondent was able to view the questions reduced the possibility of interpretation bias from the interviewer. In Amsterdam any potential problem with the difference in native language was negated by both the presence of a Dutch student on the survey team, and the questions card being available in English and Dutch.

1.5.4 Sampling Framework
In a study such as this, time and resource constraints dictate the size of the investigation. As the population of Sheffield and Amsterdam are
both very large, it was not feasible to include all individuals in the survey, therefore a representative sample was required. To ensure this there are certain techniques that can be adopted, such as systematic sampling whereby a predetermined system is in place to ensure the interviewer is not biased in selection of respondent. An example of such a technique is to operate a predetermined selection procedure, for example every third person that passes by the interviewer will be asked to participate in the survey. Another technique is to ensure the survey is not solely carried out on a single day and time as this may possibly exclude a section of the population. Also the spatial location of the survey teams has to be specifically considered for each city (Lofland & Lofland 1984). The sampling frameworks for Sheffield and Amsterdam differed based on the geographic and demographic differences between the two cities. Where it was possible in Sheffield to obtain a random sample, in and around the city centre and main shopping areas; this was not the case in Amsterdam. In the central area of the city problems occurred during the piloting stage due to the significant proportion of tourists and commuters. This reduced the percentage of eligible respondents, and therefore it was decided to adopt a more formalised approach to the sampling framework and predetermine locations for the interviewers.

The surveys in Amsterdam were carried out in May and September, each for one week. To ensure a random viable selection the surveys were also carried out at different times of the day so as not to bias the selection towards any one type of person. The areas covered included Oud-West, Westerpark, Centrum (in three different locations), Oud-Zuid (in two different locations), and Bos en Lommer (refer to Figure 1.6).

The surveys in Sheffield were carried out in September by a much larger research team on a Thursday and a Saturday, and during different times of the day. There were two main areas where the research teams were based: St region in the centre of the city, and Meadowhall Shopping Centre (refer to Figure 1.7).
Figure 1.6: Outline Map of Amsterdam

Key to the Districts of Amsterdam

1. Binnenstad (City Centre)
2. Westelijk Havengebied
3. Westerpark
4. Oud-West
5. De Pijp
6. Oost
7. Zeeburg
8. Bos en Lommer
9. De Baaarsjes
10. Zuid
11. Rivierenbuurt
12. Watergraafsmeer
13. Amsterdam-Noord
14. Geuzenveld/Slotermeer
15. Osdorp
16. Slotervaart/Overtoomse Veld
17. Buitenveldert
18. Zuidoost

Source: Adapted from Amsterdam Bureau Voor Onderzoek Statistiek (1995)
Figure 1.7: Outline Map of Sheffield

Key
1  City Centre (questionnaire survey site)
2  Meadow Hall (questionnaire survey site)

Source: Adapted from Recycling Evaluation Consortium 1993

The location within S1 included the bus station, town hall, Fargate pedestrian area and the City Plaza. There were two main locations at Meadowhall, one of the major entrances from the car park, and the main entrance from the tram/train station. Care had to be taken at the
Meadowhall location in particular, that residents living outside of Sheffield were not mistakenly interviewed.

It was decided that whilst a small sample size was acceptable it was imperative that the sample had to be representative of the sample population for evaluation purposes. Although randomness could not be guaranteed using the systematic sampling procedure, it is possible to be satisfied that the sample is representative by comparing independent variables such as gender with the proportional percentages of the city as a whole. However, even when a random sample is obtained from a particular site, in this case Sheffield and Amsterdam, there may be a lack of generality. That is, the evaluation can be generalised only for the sample site, although confidence can be expressed statistically in its representation of the population.

External factors such as weather can interrupt a precise timetable allocated for the surveys, therefore some degree of flexibility needs to be applied. This was of particular relevance to Amsterdam where the duration of the visit was confined by financial and time constraints.

A high response rate was achieved in both Sheffield and Amsterdam of 82% and 91% respectively. This could be symbolic of a number of factors. An eagerness to respond to the questions, regardless of whether its a positive or negative reply, could indicate that 'everyone' has an opinion about the subject. That is, recycling could represent a subject matter that generates a response due to the increase of attention and interest placed in environmental matters over the last few years. As greater onus has been placed on the public with regard to recycling, it is a subject on which people feel inclined to be in a position to comment.

1.5.5 Evaluation of the Survey Data
The evaluation of the survey data serves the purpose of proving or disproving, the theory or hypotheses proposed initially, and attempts to infer reasons for the findings. Obviously, this is an important aspect of the research as any errors at this stage will have implications for the development of the final recycling model.
The results of the survey were not evaluated in isolation. This reflects the case study design, whereby the surveys form one component of the overall approach to the local study. The findings from other data sources supplemented the evaluation of the survey, supporting or negating the proposed theories, as did previous research into recycling behaviour. Although a statistical package proved to be an essential element of the evaluation, caution was placed on the selection of the appropriate statistical tests. This is discussed in further detail in Chapter 6.

1.6 Conclusion

Selecting the appropriate methodological design is crucial to the success of the research. If the methodology is inappropriate it would be difficult to achieve the ultimate aims and objectives proposed. It must be realised that although previous research provides guidance, the selection of the methodology remains unique in each case as it hinges on the proposed ultimate achievement of the research. In this case the overall aim is the development of a framework model of evaluation of the barriers to household waste recycling and the possible incentives used to overcome these barriers. This requires a vast range of information. The holistic nature of the study incorporating national analysis of UK and the Netherlands with a more focused comparative analysis of Sheffield and Amsterdam, requires the methodology to provide a systematic framework for data retrieval at both national and local levels. The embedded case study design provides such a framework, allowing a structured approach to the potentially infinite process of data gathering.

The selection of the questionnaire survey as a technique within the framework methodology is an essential component to establish barriers and incentives at a local level. Although consideration has been given to the limitations and problems experienced with this technique, there is confidence that these can be minimised to ensure its usefulness to the research
Chapter 2: A Review of Waste Management, with Specific Reference to the UK and the Netherlands

2.1 Introduction
The importance of the concept of waste management has only been fully recognised during this century. Prior to this waste generation was minimal, and as populations clustered in small isolated groups, waste could easily be accommodated. Its composition was mainly natural organic waste which, when disposed of on a small scale, created few environmental problems. It was deemed unnecessary for a structured system of waste management to be in place as the basic disposal routes did not raise any cause for concern, either economically or practically.

However, the significant changes that the industrial revolution introduced in the 19th century had a major impact on waste. Demographic issues, such as the growth of towns and cities, caused an increase in the scale of waste generation. In the developing towns and cities public health became a concern and within this the impact of waste accumulation was acknowledged.

Economic, political and social philosophies, have continued to change and develop throughout the 20th century, and a new concern for environmental and resource protection has emerged. This has had a profound effect on waste and a paradigmatic shift in waste management philosophy has been the result. Subsequently, increasing concern over the suitability of traditional disposal routes has emerged, as the increased quantity and changing composition of the waste stream requires management within the context of environment protection and enhancement. The original philosophy of disposal by any means at the least possible cost, has become an outdated concept. However, this has not always been the case. To understand the significance of recent developments within waste management, it is necessary to evaluate its history which provides an insight into the
fundamental issues of concern from a global, European and national context.

This chapter aims to give a concise review of the significant changes in waste management with regard to its conception, practical application, and development.

2.2 Historical Résumé
The practice of waste management can be traced as far back as 500 BC with the Greeks' crude attempts at developing 'municipal dumps'; the first recorded in the Western World (Neal & Schubel 1987). More inventive uses of waste for central heating and fertilisers were introduced by the Romans but these systems became 'lost' for over 1000 years (Warmer Campaign, date unknown). In the centuries that followed, there were no organised systems for managing waste, it was simply dumped outside or buried in holes dug in the kitchen floor, often referred to as middens. Middens are a valuable source of historical information, illustrating lifestyles, and the composition and quantity of waste produced. One of the largest middens excavated from the Neolithic era had accumulated over centuries of time, but measured no more than a few thousand cubic yards. Any current town large enough to have its name on a road map of a country the size of the USA will produce as much as this in only a week (Wylie 1959).

It was not until 1848 in the UK, when legislation was introduced as a consequence of industrialisation and urbanisation, that waste management featured as a component of the public health service. Primitive methods of discarding waste in the streets became unacceptable as mass migrations of populations, from rural areas to towns and cities occurred. The sheer scale of the accumulating waste caused not only practical problems such as access, odour and visual intrusion, but also "biological health hazards" (Grogan 1993) with disease often reaching epidemic levels. As a consequence of its impact on public health the priority became the collection and removal of waste from the community, and disposal generally was open dumps on the edge of the community. This hailed the onset of official waste collection services throughout Europe (Wilson 1993), displacing the
individual role of the scavenger, reaping what little value there may be in the waste (Rathje & Murphy 1992), and replacing it with the local authority sector in Europe. However, the systems of disposal were very basic and standards were low. The main school of thought with regard to waste disposal was 'out of sight out of mind' (Wilson 1981) and this continued for the next 60-70 years, with only limited technical expertise available to enhance the management of the waste. The focus of waste management was disposal via the traditionally accepted routes: landfill (formerly open dumps), incineration and sea disposal. With cheapness, ease of disposal and the advent of disposable products, industrialisation represented the onset of the throw away society that was to become commonplace throughout the developed world.

2.3 Waste Quantity and Composition

The weight of household waste produced per capita in developed countries, has seen a steady decline over the last few decades (although the population has continued to increase). However, compared to less developed countries the production of household waste remains considerable. This is explained, in part, by a possible link with Gross Domestic Product per capita of a country (GDP/capita). Table 2.1 refers to a selection of OECD countries and compares their GDP/capita with municipal solid waste production per capita. Expressed graphically it becomes clear that although a mathematical relationship exists, this cannot be expressed in purely linear terms. The relationship between GDP/capita and the production of municipal waste is most influential at the extremes. When the GDP/capita is low the waste production is minimal, as compared to when the GDP/capita is high there is a significant increase in waste produced (see Figure 2.1).

However the data used to illustrate quantities of municipal waste in developed countries should be treated with some degree of caution. The definition of what constitutes municipal solid waste differs from country to country. It is acknowledged that the USA include commercial waste in their definition, so this will account for the significantly higher amount stated. Without an internationally recognised standard for defining concepts within waste, data will have its limitations. However, Table 2.1 and Figure 2.1 remain useful as
providing a general illustration of the effect of increasing GDP/capita on municipal waste production.

Table 2.1: Gross Domestic Product per capita (GDP) Compared to Municipal Solid Waste in Kilograms per capita (MSW) in Selected OECD Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP/capita at current prices (1989)</th>
<th>MSW/per capita (late 1980's)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>20.8</td>
<td>864</td>
</tr>
<tr>
<td>Canada</td>
<td>19.6</td>
<td>632</td>
</tr>
<tr>
<td>Switzerland</td>
<td>17.8</td>
<td>427</td>
</tr>
<tr>
<td>Norway</td>
<td>16.7</td>
<td>475</td>
</tr>
<tr>
<td>Japan</td>
<td>15.6</td>
<td>394</td>
</tr>
<tr>
<td>Sweden</td>
<td>15.6</td>
<td>317</td>
</tr>
<tr>
<td>Finland</td>
<td>15.1</td>
<td>608</td>
</tr>
<tr>
<td>France</td>
<td>14.7</td>
<td>304</td>
</tr>
<tr>
<td>Denmark</td>
<td>14.4</td>
<td>469</td>
</tr>
<tr>
<td>UK</td>
<td>14.4</td>
<td>353</td>
</tr>
<tr>
<td>Italy</td>
<td>13.9</td>
<td>301</td>
</tr>
<tr>
<td>Netherlands</td>
<td>13.8</td>
<td>467</td>
</tr>
<tr>
<td>Austria</td>
<td>13.5</td>
<td>228</td>
</tr>
<tr>
<td>Spain</td>
<td>10.2</td>
<td>322</td>
</tr>
<tr>
<td>Ireland</td>
<td>8.9</td>
<td>311</td>
</tr>
<tr>
<td>Greece</td>
<td>7.2</td>
<td>314</td>
</tr>
<tr>
<td>Portugal</td>
<td>7.0</td>
<td>231</td>
</tr>
</tbody>
</table>

Source: Thorgersen 1993

The decline in actual tonnage of waste produced per household can be explained by significant changes in waste composition. Originally, at the end of the 19th century and into the early part of this century, the main constituents of household waste throughout Europe were dust and ash. The method of heating in most homes was open coal fires, thus any combustible material was burnt. There were fewer disposable products and minimum packaging. Steel cans and glass had become the predominant method of food preservation. However as increases
in standards of living occurred throughout Western Europe and the USA, modern appliances such as refrigerators became prevalent in most peoples homes thus reducing the requirement for steel cans.

Figure 2.1: The relationship between GDP/capita and MSW/capita in OECD countries in the late 1980's

Technological breakthroughs in packaging materials, increasing affluence, changing characteristics and demography of households all had a significant impact on waste composition (refer to Figure 2.2).

Although Figure 2.2 is illustrative of the changes that have occurred in the UK, it is fair to say that any developed country would have experienced the same pattern. That is, all countries that become economically more stable, and develop in technology, will experience an increase in the quantity of material found in household waste, and also the emergence of modern packaging and disposable products, such as plastics and polystyrenes (Kivell 1992). Paper and cardboard remain
the largest component of household waste in industrialised countries, with other types of waste such as plastics displacing traditional materials (Young 1991).

In less developed countries, household waste composition with respect to certain components, reflects the position of Western Europe and USA at the beginning of this century (Figure 2.3). However, it is important to consider when evaluating the extent of the waste problem globally, that as other countries start to become more developed they in turn will experience patterns of change in their waste stream.

Figure 2.2: Typical Changes in Composition of Household Waste in the UK from 1930's to 1980's

Factors that will have a significant impact on quantity and composition of household waste in the present day are varied. The size and composition of a household, will directly contribute to changes in quantity and content of material in the waste stream. There is a
continuing trend towards single person households in the UK (Table 2.2), which are recognised as producing high amounts of waste, with a significant presence of packaging material. The attitudes of a household can vary depending upon the type of family living there, for example if there are young children of school age present they are more likely to influence their parents purchasing and disposal behaviour; particularly if the children are receiving an environmental education. This is commonplace within the Netherlands, and in the UK it is becoming increasingly evident that the environment as a specific subject area is forming a specific component of the National Curriculum.

Figure 2.3: A Comparison of Waste Composition in Industrialised, Middle-Income and Low-Income countries

Purchasing behaviour has a significant impact on the waste stream. Increased affluence has often resulted in less regard for products durability and an increased tendency to replace as opposed to repairing and recycling existing products. Marketing strategies have been more focused on changing this behaviour pattern by using recycled material
in the packaging, as well as the ability of the material to be recycled, as a promotional asset. Currently, marketing strategies are focused on reducing packaging and, in particular reducing the use of packaging material that is difficult to recycle. If fully incorporated, this will have a significant impact on the composition of the household waste stream. However, evidence suggests that a considerable amount of work remains to develop current marketing strategies, in particular packaging, prior to implementation (refer to Chapter 4 for an evaluation of current policy approach with regard to packaging material).

Table 2.2: Household Groups in the UK (expressed in millions and percentages)

<table>
<thead>
<tr>
<th>Year</th>
<th>1-person</th>
<th>2-persons</th>
<th>3 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>2.3 (14%)</td>
<td>4.9 (30%)</td>
<td>9.1 (56%)</td>
</tr>
<tr>
<td>1971</td>
<td>3.3 (18%)</td>
<td>5.8 (32%)</td>
<td>9.1 (50%)</td>
</tr>
<tr>
<td>1981</td>
<td>4.3 (22%)</td>
<td>6.2 (32%)</td>
<td>9.0 (46%)</td>
</tr>
<tr>
<td>1991</td>
<td>5.9 (27%)</td>
<td>7.4 (34%)</td>
<td>8.5 (39%)</td>
</tr>
<tr>
<td>1993</td>
<td>6.2 (27%)</td>
<td>8.0 (35%)</td>
<td>8.7 (38%)</td>
</tr>
</tbody>
</table>

Source: Kooijman 1995 p.20

Throughout Europe industries are now being required to take more of a positive stance with regard to waste issues and if legislation is introduced to enforce proposed changes, this will have an impact on both the composition and the quantity of waste ending up in the waste stream for disposal. In the Netherlands for example, the development of the packaging covenant will have direct repercussions on the waste stream.

Issues such as the waste management services offered by the local authority or private contractors, such as the type of receptacle offered to householders and the frequency of collection, can have impacts on the quantity of waste produced. The transition from dustbin or plastic sack, to the wheeled bin, has resulted in an increase in the volume of waste for disposal as a consequence of increased capacity from 90 litres
to 240 litres (Warmer Bulletin 1995). It has been proposed that the introduction of the wheeled bin has affected the recycling of specific components of the waste stream (Bacon 1995). It has also affected the use of Civic Amenity Sites as more bulky and garden waste can now be placed in the wheeled bin. This has implications for traditional disposal routes. However, if a local authority is particularly proactive with regard to recycling and has introduced a dense network of recycling centres, then this may result in an increase in the types household waste being diverted from the waste stream for disposal, as is currently the case in the Netherlands.

Currently the composition of household waste in the UK and the Netherlands is very similar in that paper and putrescibles are the main constituents, however even between these two developed countries differences occur (Table 2.3).

Table 2.3: Typical Composition of Household Waste in the UK and the Netherlands (1991)

<table>
<thead>
<tr>
<th>Item</th>
<th>UK (% by weight)</th>
<th>Netherlands (% by weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper, cardboard</td>
<td>33</td>
<td>27</td>
</tr>
<tr>
<td>Plastic</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Glass</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Ferrous Metal</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Non-ferrous metal</td>
<td>1.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Textiles</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Putrescibles</td>
<td>20</td>
<td>49</td>
</tr>
<tr>
<td>Bread</td>
<td>-</td>
<td>2.5</td>
</tr>
<tr>
<td>Hazardous Waste</td>
<td>-</td>
<td>0.5</td>
</tr>
<tr>
<td>Other waste</td>
<td>17.5</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Central Bureau of Statistics 1994

The reasons for these differences will be examined in more detail in subsequent chapters. However, caution is needed when making a
direct comparison. Methods of household waste analysis differ in each
country. The UK system of placing the trommel at the beginning of
the sorting process results in a greater percentage of fines and smaller
residual waste appearing in the composition. The Dutch prefer to sort
the waste with the trommel not being present until towards the end of
the process. Therefore there is very little waste left by the time it
reaches this stage, thus a smaller compositional percentage of fines.

2.4 Traditional Routes of Waste Disposal

2.4.1 Landfill

Landfill was, and still remains in some countries, the predominant
method of waste disposal. Originating as small and usually
uncontrolled open dumps, their cheapness and availability ensured
their predominance. They would only cater for a specific location and
therefore were not required to have a very large capacity. However,
poor management caused by lack of knowledge and technical expertise
has resulted in both short term local environmental damage and quite
long term pollution problems (Table 2.4). The impact of these
pollution issues has been dependant upon the scale of the landfill
operation, and also composition and quantity of the waste.

Table 2.4: Environmental Side-effects of Landfilling Waste

<table>
<thead>
<tr>
<th>Short Term Effects</th>
<th>Long Term Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic changes</td>
<td>Landfill gas</td>
</tr>
<tr>
<td>Increased traffic flow</td>
<td>Leachate</td>
</tr>
<tr>
<td>Mud and dust</td>
<td>Health impairment from the waste itself</td>
</tr>
<tr>
<td>Litter</td>
<td>Health impairment from contact with dust</td>
</tr>
<tr>
<td>Increased noise level</td>
<td></td>
</tr>
<tr>
<td>Scavenging birds</td>
<td></td>
</tr>
<tr>
<td>Possible vermin and odour</td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted from Hurst 1992
As illustrated in Table 2.4, landfill sites pollute through several routes, however, it is the leachate and methane components of landfill gas that have caused the most significant environmental damage. The composition of leachate is often varied, depending on the constituents of the waste in the landfill, and can take an unpredictable amount of time to emerge. Fresh leachate can contain heavy metals and toxic chemicals, and because of the presence of organic material (such as kitchen and garden waste) has potential to deoxidise any water that it comes into contact with. This can have significant results if seepage occurs into streams or rivers (Price 1987).

Until the 1970's, specifically in the UK, landfill sites were normally small and so consequently the quantities of leachate released were insignificant, avoiding detection to a certain extent. It was not until larger sites were in operation and the effects were no longer localised that the severity of the situation was realised. In the Netherlands, specific problems have occurred with ground water contamination as the water table is so high. Also, lack of documentation of previous disposal sites has led to problems with toxic leachate emerging after the site has been closed and the land reclaimed for a different purpose. Numerous articles and reports were published in the late 1970's and throughout the 1980's highlighting incidents relating to leachate contamination (for example Lekkerkerk in the Netherlands, refer to Chapter 3), although specific policies in dealing with the problems were not implemented in the UK and the Netherlands until the late 1980's and early 1990's. Leachate was not contained within the sites due to the 'dilute and disperse' philosophy of operation. This is significantly different to modern sites which operate under the containment approach.

The other main area of concern is landfill gas, which is dependant upon the nature of waste disposed in the site, in terms of the composition and quantity of gas produced. A large percentage of household waste is organic material, that is kitchen waste and putrescible material, and the decomposition of this produces large amounts of methane and carbon dioxide. Methane is highly explosive and there have been a number of well documented cases where levels
of gas have become dangerously high, and even cases where explosions have occurred, for example Loscoe in Derbyshire (Ardill 1988, Brown 1991, Clover 1989). Methane also poses a threat to the global environment as it is 30 times more effective than carbon dioxide as a greenhouse gas (Pearce 1993, Donovan 1989). Landfill sites in the UK account for approximately 21% of total UK methane emissions (Warmer Bulletin 1991).

As evidence of problems attributed to leachate and landfill gas emerged in the 1950's and 1960's, efforts were taken to curb the environmental damage by upgrading or replacing the basic open dump with sanitary or controlled landfill sites. The focus now being on operational management, whereby site selection and day to day activities endeavour to reduce both short and long term effects. This includes the provision of liners, leachate and methane gas control mechanisms, and daily cover of the site. Currently basic open dumps tend to only exist in countries outside Western Europe and other OECD countries (Wilson 1993).

Globally, landfill capacity is becoming limited whether in actual physical terms or as a result public opposition in the form of NIMBY (Not In My Back Yard). In some countries, for example USA and the Netherlands, there is an acute shortage of easily accessible and cheap landfill sites. There are a variety of reasons for this including: major sites reaching capacity; increased environmental standards resulting in premature closure; few viable new sites available due to unacceptable environment risks; high cost of locating, designing and operating the site; and increasing public opposition (Dennison & Ruston (eds.) 1990; Congress of the United States 1989).

With increasing pressure to improve standards, landfill sites have evolved from small, localised uncontrolled and often unlicensed points for disposal, to large high technology engineered containment sites, with the inclusion of monitoring equipment for leachate and landfill gas emissions. Leachate can now be removed and treated to prevent seepage occurring, and landfill gas is being extracted and either treated or used to supply energy in the form of electricity. This has
resulted in increasing costs to develop and operate a site. Also, as sites increase in size, servicing whole regions, waste from towns and cities will have to travel greater distances to the landfill, thus adding to the cost of final disposal.

Throughout the European Union landfill remains a prominent part of waste management as it is estimated that approximately 60% of household waste is taken to landfill (Hopfenbeck 1993). In the UK landfill also remains a popular option with approximately 80 - 90% of household waste being disposed of in this way (in contrast to 50% in the Netherlands) at prices ranging from as little as £5 per tonne up to £30 per tonne (Coopers & Lybrand 1993). Supporters not only emphasise the economic benefits of landfilling waste but also draw attention to its role in land reclamation. The dumping of waste in areas such as derelict quarry sites and disused railway cuttings can be considered as a useful method of reclaiming the land for reuse.

One distinguishing factor that separates landfill practice in the UK from the rest of Europe is co-disposal. This is currently used extensively in the UK and is the practice of dumping industrial liquid, with commercial and household solid wastes within the same landfill site. The UK is facing increasing opposition from the EU, as other countries such as Germany, France and Denmark have all tried this method but experienced varying results. It is argued that co-disposal forms a vital and integral component in the management of certain types of waste in the UK (Anon. 1993, Hawking 1992), however it seems likely that the EU Directive on landfill will force the phasing out of co-disposal in the UK (ENDS 1994).

In the Netherlands only 50% of household waste is landfilled and there is a target to ban all household waste being disposed of in this way by the year 2000 (Ministry of Housing, Physical Planning and Environment 1988). However, this target date has been brought forward and is now set at 1996. Prices currently average at £20 to £30 per tonne although this is expected to increase in the near future. Due to the high population density and high water table of the Netherlands, landfill is not a practical option and those involved in
the field of waste management have found it necessary to take alternative action much earlier than their European neighbours.

General unease about the viability of landfill both in the UK and the Netherlands has put increasing pressure on the political sector to take action. Long term environmental protection offered by liners and caps is in question as natural deterioration is bound to occur. Also, aftercare required to stabilise the site can mean monitoring the landfill for up to 30 years or more after it has closed which is not very practical and will require enforcement. The Duty of Care policy (Chapter 4) aids enforcement of after care, as it applies to anyone who has control of, or responsibility of controlled waste at any point from its production to its disposal. Therefore, landfill operators have to ensure that the waste is disposed of within the stated guidelines, and must prevent escape of that waste. This measure attempts to safeguard against derelict landfill sites being the cause of pollution in the future.

Innovative techniques are being proposed to extend the life span of existing landfill sites, for example increasing compaction, and incorporating bioreactors. Also, new approaches to cover the waste are being developed to utilise as little space as possible. This includes degradable plastic films and compressible foam spray (Warmer Bulletin 1995a p7). Technological measures, coupled with regulatory instruments such as the landfill tax, are deemed to increase in prominence over the next decade as landfill capacity continues to decrease. This is discussed in further detail within the context national policies and strategies in the UK and the Netherlands (Chapter 4).

2.4.2 Incineration
Like landfill, incineration is a historical method of disposal. It has been documented that waste from Jerusalem was burned at Gehenna thousands of years ago, and the original Turkish baths were heated by burning refuse in Giro (Wylie 1959). It was often the case that when a dump became full the waste was set alight to reduce the volume. In the USA this practice only ceased in the early part of the 20th century (Neal & Schubel 1987).
Mass burn incineration was developed in the UK at the end of the 19th century, and by 1912 there were 338 municipal waste incinerators (Tucker 1977). Mass burn is simply a process of reducing the amount of waste using incineration, without extracting energy from the heat produced. It was pioneered initially as a means of sanitary disposal in urban areas, and complemented other forms of disposal, such as landfill, by reducing the volume of waste by 90%, and reducing the weight by 70% (Porteous 1992). The residue remaining still requires landfill sites for final disposal.

However, due to lack of knowledge and technical awareness, emissions from many of the original incinerator plants caused significant air pollution. Public opposition to incinerators grew, and their popularity decreased, until by 1970 only 8% of UK household waste was being disposed of via incineration. Pollution from incineration is complex as even when individual components of waste are known to be harmless, when they are burnt together the release of certain substances can lead to toxic emissions (Gatrell & Lovett 1992). The crucial point is the temperature when the incinerator is heating up or cooling down, when incomplete combustion of material leads to emissions of substances, for example dioxins, that may have otherwise been destroyed in complete combustion. The evidence is conflicting about the health implications of the emissions, however public opposition to this form of waste management has continued to increase.

The EC Directive on incineration has particular implications for the UK as the emission standards and controls are more stringent than most existing sites operate. This is resulting in the closure or upgrading of sites by the end of 1996 in order to comply with the legislation. Table 2.5 illustrates the current situation and future plans for existing or new sites in response to direct pressure from the European Union.

In the Netherlands a shortage of dumping space, particularly in the Western region where a high proportion of the population live, led to the development of incineration plants out of necessity, and in 1912
plants were established in Amsterdam and Rotterdam (Ministry of Housing, Physical Planning, and the Environment 1986). Problems occurred as a consequence of the poor public perception of incineration, and even in the present day the anti-incineration lobby remains strong (de Jong 1994). Lack of control over emissions have led to pollution problems, the most common being dioxins (Dejong 1991).

Table 2.5: Current and Future Plans for Incineration in the UK

<table>
<thead>
<tr>
<th>Situation</th>
<th>Number in 1990</th>
<th>Number in 1996</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants already closed (no plans for upgrading or replacing)</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Plants already closed, with plans to replace at existing site</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Plants already closed, with plans to replace elsewhere in the UK</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Plants to be upgraded</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Plants to be replaced at the site</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Plants to be closed by 1996, but replaced at the site</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Plants to be closed by 1996, but replaced elsewhere in UK</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Plants to be closed by 1996, and not replaced</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>New additional plants (forecast 1994)</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Total plants in 1996</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

Source: Exportradet London 1994

In the Netherlands there was a well documented incident in 1989 where dioxins were found in milk, cheese and other dairy products from cows grazing in the vicinity of Rijnmond waste incineration plant, in Rotterdam (Anon. 1992). The media attention this incident caused was acute. The site had to be closed down, and the incinerators upgraded or replaced completely. Against a lobby of protests from the general public ambitious plans were put in place to upgrade or replace incinerator sites nationally, in as short a time as possible, as well as to
develop additional sites throughout the country. In 1989 waste incineration guidelines were introduced which stated that by January 1995 all existing waste incineration sites must comply with the rigid emission control standards. All new facilities are being developed to incorporate the latest strategies.

Increasingly, incineration of municipal solid waste has been regarded as an apt means of energy production. In fact, of the 338 mass burn incinerators in 1912 in the UK, over 80 of them generated electricity to supplement the towns' supply (Tucker 1977). Presently the importance of recovering energy from waste with incineration is being realised as an alternative energy source, reducing the reliance on fossil fuel and thus reducing carbon dioxide emissions. New facilities being developed in the UK and the Netherlands and some of those already operating are being upgraded to recover energy from the waste.

In the UK waste to energy projects are being actively encouraged by the prospect of large subsidies under the governments Non-Fossil Fuel Obligation (NFFO) (ENDS 1993), and also on the grounds that lower greenhouse gas emissions are produced compared to landfill (Royal Commission on Environmental Pollution 1993). NFFO requires an obligation by the electricity supply companies to obtain a specified capacity of electricity from non-fossil fuel sources, which include energy from waste schemes (Department of Trade and Industry 1995). The scheme is funded from a 10% levy placed on domestic fuel bills (ENDS 1995). Currently NFFO 3 is operating from the period April 1995 to March 2014, with a greater emphasis played on its role to reduce carbon dioxide emissions (Anon 1995).

Also the calorific value of typical household waste composition is approximately 8 - 10 MJ/Kg (gross) making it ideal for energy production (Prosser 1991). Specific components of the household waste stream have higher calorific values (Table 2.6), which has implications for energy recovery when source separation removes recyclable from the waste stream (refer to Section 2.6).
Within member states of the European Union incineration of household waste is increasingly taking a leading role (refer to Figure 2.4). More countries are opting for an integration of this method of waste management as landfill sites become increasingly less viable. There are now over 500 incinerators for municipal solid waste within the European Union, of which more than 80% have energy recovery facilities (Warmer Bulletin 1990). These issues are being influenced by the presence of the EC Directive on Incineration.

Table 2.6: Typical Municipal Solid Waste Composition and Calorific Value

<table>
<thead>
<tr>
<th>Component</th>
<th>% Weight</th>
<th>Gross Calorific Value (MJ/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper, board</td>
<td>33</td>
<td>12</td>
</tr>
<tr>
<td>Plastic film</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>Dense Plastic</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Textile</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Misc. Combustible</td>
<td>5</td>
<td>13.5</td>
</tr>
<tr>
<td>Putrescible</td>
<td>20</td>
<td>5.6</td>
</tr>
<tr>
<td>Fines (-10 mm)</td>
<td>10</td>
<td>3.6</td>
</tr>
<tr>
<td>Glass</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>Metals</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Misc. non combustible</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>8.5</td>
</tr>
</tbody>
</table>

Source: Warren Spring Laboratory 1994

The major disincentive for incineration with energy recovery, in a development and operational context, is cost. The scale of investment required initially to build an incinerator has meant that, in some countries, it is only possible for incinerators to be developed by the private sector. This is the case in the UK where, as landfill sites become scarce in some regions, the major waste management companies are seeing the potential and developing large scale incineration plants. To recoup money invested and to maintain high
operational standards, the current price charged for disposal via incineration is higher than the cost per tonne for landfill (Table 2.7). However, it is anticipated incineration will be in a position to compete with long-haul road and rail transport required in some areas as landfill access becomes limited to other regions (Porteous 1990).

Figure 2.4: European Waste into Energy Comparisons

![Bar chart showing percentage of MSW incinerated in European countries](image)

Source: Porteous 1992

Table 2.7: Cost of Landfill and Incineration in the UK and the Netherlands

<table>
<thead>
<tr>
<th>Option</th>
<th>UK Current cost (per tonne)</th>
<th>Netherlands Current cost (per tonne)</th>
<th>UK Future cost (per tonne)</th>
<th>Netherlands Future cost (per tonne)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill</td>
<td>£7-22</td>
<td>£13-19</td>
<td>£11-47</td>
<td>£35-73</td>
</tr>
<tr>
<td>Incineration</td>
<td>£15-30</td>
<td>£60-100</td>
<td>£20-25</td>
<td>£80-120</td>
</tr>
</tbody>
</table>

Source: Coopers & Lybrand 1993, Masterson 1995, Jonkhoff 1993

In the Netherlands the situation is different as the government is the major investor in developing this option. The availability of landfill
sites for disposal is limited for the majority of urban populations and therefore the government has introduced a programme to build new incinerators. The government are in a position to secure household and commercial waste for disposal from their local authorities, thus guaranteeing an income in order to cover the development and operational costs.

The scale of development in the Netherlands differs from the UK in respect to incinerator capacity. The Dutch favour very large incinerators capable of servicing a number of towns and cities. The initial investment required is therefore greater, however the number of facilities that will need to be developed will be reduced. An example of this is the new incinerator in Amsterdam, where the investment required in the first instance was approximately £340 million, with a maximum design capacity of 840,000 tonnes of waste per annum, accommodating a large number of towns in the region (AVI-Amsterdam 1993).

The commitment made by the Dutch government to invest in incineration reflects its position on the waste hierarchy (refer to Figure 2.5) and the commitment to utilise preferred options. The percentage of household waste being processed by incineration has increased over the last six years from 10% in 1988 to 25% in 1994, and this figure will continue to rise as capacity increases (Ministry of Housing, Physical Planning and Environment 1989).

As a preferred strategy incineration needs to be conceptualised not as a direct competitor with landfill, but as an option for alternative energy production within the holistic perception of waste management. That is, incineration needs to be integrated with waste minimisation and recycling as part of a comprehensive waste management package (Santen 1993), if the waste hierarchy (refer to Figure 2.5) is to be implemented. Its role is changing from that of a disposal option to more of a waste processing technology (Denison & Ruston ed. 1991). It is recognised that it is not viable to promote incineration with energy recovery as the single scheme to manage the household waste stream.
in its entirety, as some materials are more suited to burning than others.

Figure 2.5: Waste Hierarchy

Also, as changes in legislation occur preventing specific disposal routes, incineration is being increasingly targeted to manage 'difficult' waste. Advances in technology to prevent or reduce environmental impacts are increasing its feasibility as an appropriate method. 'Difficult' wastes include sewage sludge which is unsuitable for landfilling and can no longer be disposed of in the sea, and also some forms of hazardous waste, including household hazardous waste, are being targeted for incineration as a consequence of emission control technology decreasing environmental impact.

2.4.3 Sea Disposal
Although a traditional route, sea disposal has only played a minor role in waste management. It proved a useful way of removing waste, particularly sewage, from the population of coastal towns or cities. Environmental impacts of this method were not considered for some time, as the sea 'absorbed' any evidence of it being dumped there in the first place. This general feeling was reflected in a statement made in the Encyclopaedia Britannica in 1902 which described sea disposal as a 'clean method' of waste disposal with the view that human activities would not be affected by it (Neil & Schubel 1987).
It is now known all too well the effect dumping at sea has had on the marine environment. Issues such as increases in quantity and changes in composition of waste have contributed to pollution incidents attributed to waste disposed at sea.

There is now legislation in both the UK and the Netherlands, as well as agreements within the EU and internationally which will effectively put an end to waste disposal in the North Sea by 1998.

2.5 Emergence of Recycling
Recycling is often regarded as a modern phenomenon in the developed world, a new idea introduced in response to environmental damage caused by historic waste management practices. This is not the case, as recycling and re-use have been present in a variety of forms throughout the centuries. Most of the recycling and re-use that occurred in pre-industrialised UK and the Netherlands was a result of endemic poverty. With the initial onset of industrialisation, standards of living remained low and a prerequisite of any product made was that it was durable. Items that became damaged or broken were repaired and re-used.

Informal recycling has also existed within family groups and friends for many years, with traditional handing down of 'cast-offs' or possessions. Traditionally, jumble sales provided an ideal outlet for reuse and recycling and, in the Netherlands, the 'schillenboer' (waste food collector) was a common and acceptable sight, offering an outlet for kitchen and garden waste to be reused (Klugt 1993). Very few items were actually disposed of and with the emergence of scrap metal merchants and 'rag and bone' men, an opening was provided for the bulkier items of household waste, enabling them to be re-used or recycled.

During and after, the First and Second World Wars there was a shortage of material and resources, in particular metal and wood, which resulted in recycling and re-use becoming an essential necessity. Industrial recycling, which has been an ongoing practice for purely
economic reasons, increased during the periods of shortage in the late 1940's and 1950's. Recycling practice expanded during the period of energy crises in the early and late 1970's, as a consequence of concern over the depletion of raw materials. This is illustrated by the installation of the first bottle bank in the UK in 1977 (SCRIB). Recycling and re-use had emerged as an issue based within the context of economics and resources. This was in contrast to the original role of recycling as a product of poverty.

However, the interest in recycling declined to a certain extend during the 1980's as economic prosperity increased once again. The philosophy and manufacture ethic of producing goods built for durability was more or less dismissed (Barton 1979). This was coupled with a lack of traditional routes of re-use and recycling where objects were repaired or put to another use.

From a global perspective, developing countries reflect the position of the UK and the Netherlands prior to the 20th century. In India waste is a luxury that only few can afford, and collection and recycling is a matter of survival for the 'rag pickers' (Brace & Dodd 1993). Although achieving commendable rates of recycling, the conditions that they work under are of low standard and give low rewards. In Egypt, however, the work of the 'Zabbaleen' is slowly being recognised as an essential part of waste management in Cairo, and the government has collaborated with them to develop a waste management system to deal with Cairo's rapidly increasing waste stream (Jenson 1991).

It is evident that changes in philosophy (which are evaluated in Chapter 3) played an important role in the re-emergence of recycling once again, during the late 1980's in the UK and the Netherlands. Heightened concern over environmental issues, such as the conservation of natural resources and reduction of pollution, added to the appeal of the 'environmentally friendly' option of recycling. The real significance of the re-emergence of recycling during this period, however, was the political interest generated within European and national environment legislators. The presence of recycling within the waste hierarchy indicates the nature of the stance being taken towards
the implementation of recycling as a waste management strategy. This hierarchy now forms the basis of all waste legislation and polices developed within the UK and the Netherlands, and all other member states of the European Union (EU). It is clear from this hierarchy that national governments must adopt a more environmentally responsible waste management strategy.

The UK will require increased action with regard to policy development and implementation, to achieve integrated waste management and a balance of activities subject to Best Practicable Environmental Option (refer to Chapter 4). Current waste management practices are oriented towards the less preferred end of the waste management hierarchy, with traditional disposal routes still favoured.

In the Netherlands, the situation is different in that high levels of recycling are already being achieved, and there are targets in place to increase waste reduction and also implement prevention of certain types of waste. The banning of household waste disposal via landfill will be enforced during 1996, and incineration with energy recovery is being actively promoted to complement recycling and re-use activities.

Innovative attempts to collect material for recycling have been implemented since the early 1990's in both the UK and the Netherlands, incorporating both kerbside and drop-off schemes. These systems have a number of advantages and disadvantages, which are illustrated in Table 2.8.

Kerbside collection schemes for specific components of the waste stream, often adopting innovative techniques or technology, have undergone trials in towns and cities in both the UK and the Netherlands. However, it is only the Netherlands that has adopted a mandatory separate collection scheme on a national level, from 1st January 1994, for the collection of organic waste from households. This type of scheme is expensive to initiate and is subject to limitations from socio-demographic and geographic parameters. These issues will be discussed in more detail in the specific local case studies.
### Table 2.8: A Comparison of Different Organisational Approaches to Recycling

<table>
<thead>
<tr>
<th>Method of recovery</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerbside Schemes</td>
<td>• high levels of materials recovery</td>
<td>• high capital costs</td>
</tr>
<tr>
<td>blue box</td>
<td>• wide range of materials can be recovered, including putrescibles and toxic</td>
<td>• high labour costs</td>
</tr>
<tr>
<td>green bag</td>
<td>• low levels of materials contamination</td>
<td>• reliant on continuous public cooperation</td>
</tr>
<tr>
<td>split wheeled bin</td>
<td>• high levels of public participation</td>
<td>• difficult in congested urban areas</td>
</tr>
</tbody>
</table>

| Drop-off Schemes            | • low labour costs                                                          | • low levels of materials recovery                     |
| on-street collection        | • low capital costs                                                          | • local environmental impact                           |
| facilities                  | • local government can take a purely enabling role                           | • difficult in congested urban areas                   |
| recycling centres and      |                                                                               | • difficult to provide high density of facilities in    |
| civic amenity sites         |                                                                               | areas of low population density                        |
| component recycling        |                                                                               | • contamination of materials                           |
| systems                     |                                                                               |                                                       |

Source: Gandy 1993

Drop-off schemes have been in place in both countries since the 1970's. They have often been considered as a more acceptable form of separate
collection, as the general public regards it as a traditional approach for the collection of certain materials, specifically glass.

In the UK the density of drop-off sites has been low in relation to the size of population they serve. Promotion and support for this approach has been irregular and thus demand for the 'service' has been limited. This is in direct contrast to the Netherlands where there has continued to be extensive investment into the provision of sites, and public involvement in this scheme is regarded as the norm.

From an economic perspective drop-off schemes are cheaper to initiate than the kerbside scheme, although the quantity of material collected is often less. The impact and acceptance of both types of schemes is evaluated in further detail in Chapter 5.

Although in both the UK and the Netherlands there have been numerous national pilot programmes throughout the early 1990's, (Recycling City representing a major UK project) the greatest coordinated activity has been in the Netherlands. To increase the recycling rate to a sufficiently high standard, the Dutch have recognised the need to develop and experiment with the type of recycling systems that can be incorporated. The pressure to overcome geographic and demographic barriers has resulted in a need for a national approach to pilot programmes. During 1991 and 1992 a number of pilot projects were undertaken as part of the ADC-programme (Action Programme for Waste Separation of Dry Components). They incorporated innovative and varied approaches to the collection of recyclables, and a comparison was undertaken of the response, purity and costs for collection of a fraction, and also the cost for the separation of mixed fractions. To date the different approaches have shown separate collection rates as high as 90% for some fractions and purity as high as 95% (Hanemaayer 1993), which has encouraged the continuation of the pilot schemes in some areas. Concerted effort has been oriented towards limiting disadvantages with the adoption of strategies such as the novel underground 'metro' system, which defies location constraints by utilising areas for storage underground (refer to Chapter 5). The success of such schemes has been evaluated at length by the
national government, statutory bodies and also NGO's, and discussion and evaluation can be found in subsequent chapters.

This brief introduction to recycling has illustrated that there is not a single particular system that is being promoted as the ideal to achieve the recycling targets in both countries. There is a necessity for an integration of the different schemes, dependant on the material to be collected, the location and cost implications. This approach can be extended to the complete waste management strategy, whereby an effective and efficient system is dependant upon an integration of the options available. This is evaluated further within Chapter 5, where the comparison of Sheffield and Amsterdam allow for greater detail.

2.6 The Incineration Versus Recycling Debate

It is crucial at this point, to introduce the debate which has been ongoing since the hierarchy of waste management promoted the integrated role of incineration and recycling. The concept of energy recovery has an intrinsic relationship with material recycling and valuing their relationship is an important component in ascertaining barriers and incentives to successful recycling.

Incineration in this section is referring to incineration with energy recovery, and not simply mass burn facilities, as it is the energy provision that ensures their favourability. Most existing developments have been, or will be, upgraded to incorporate energy recovery facilities, and all new developments integrate energy recovery as a matter of course.

Proponents of recycling have been cautious of the effect increased incineration may have on the implementation of recycling schemes. This was compounded to a certain extent by mistakes early in the promotion of the 25% recycling target for household waste in the UK. Initially it was perceived that incineration with energy recovery would be an acceptable option to achieve the target. Although in principle the act of recovering and utilising energy can be conceived as a recycling practice by definition, this ideal was discouraged as an easy option to meet the 25% target. As incineration with energy recovery continues
to be promoted as the preferred management option for residual waste, scepticism remains whether recycling schemes can effectively operate within the same area without a negative impact. As the average calorific value of the waste stream by weight is 8.5 GJ/tonne, any changes in the composition, for example as a direct consequence of recycling, will affect this value (Burnett 1995). These changes to calorific value are the main area of concern for those players involved within the incineration industry. This is in contrast to the concerns raised by players within the recycling industry who focus on the belief that incineration with energy recovery will be regarded as an 'easy' option, to the detriment of recycling strategies. This is an issue of interest to this research, particularly with regard to Sheffield, and is evaluated further in the local study (Chapter 5).

There has been considerable research recently into this debate, and the Department of Trade and Industry (UK) initiated a study into the effect of different recycling strategies on incineration. The concluding remarks of the report indicate a confidence in incineration to accommodate changes in the compositional waste stream as a consequence of recycling activity. There were no significant detrimental effects on emission constituents and fuel capability of the waste, and therefore the research supported the theory that recycling activity did not adversely effect the potential to recover energy from the residual (Warmer Bulletin 1996). This is illustrated in Table 2.9 which highlights the implications of recycling specific components, on the overall calorific value.

There are instances when the removal of components from the waste stream is favourable in terms of calorific value, and recycling and incineration become mutually beneficial. In fact when a percentage of all the major components of the waste stream are separated for recycling, the calorific value is the highest.

Both recycling and incineration can be considered as processing techniques, since neither prevents the need for disposal of a certain proportion of waste, regardless of how small the percentage. There is some waste that is not suitable for incineration, conversely some waste
can be impractical or expensive to recycle. Local circumstances may be unfavourable to a specific scheme, in contrast to other areas. It is for these reasons that an integrated approach of incineration and recycling is being promoted. The Dutch already favour incineration, despite an active anti-incineration lobby by environmentalists, and are also investing in national recycling strategies. The UK government has illustrated their support towards the utilisation of incineration in numerous government papers, such as Royal Commission on Environmental Pollution: Incineration of Waste, and most recently in the national waste strategy (refer to Chapter 4). The promotion of recovery as a major concept in waste management signifies the current support given to incineration in energy recovery capacity. Although placing incineration on par with recycling has disturbed environmentalists, it does illustrate the commitment given to integrating the management approach.

Table 2.9: The Implications of Recycling on the Gross Calorific Value

<table>
<thead>
<tr>
<th>% Material separated for recycling</th>
<th>Diversion Rate %</th>
<th>Gross Calorific Value MJ/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper 0</td>
<td>Glass 0</td>
<td>Metal 0</td>
</tr>
<tr>
<td>Paper 10</td>
<td>Glass 50</td>
<td>Metal</td>
</tr>
<tr>
<td>Paper 50</td>
<td>Glass 50</td>
<td>Metal 50</td>
</tr>
<tr>
<td>Paper 50</td>
<td>Glass 50</td>
<td>Metal 50</td>
</tr>
<tr>
<td>Paper 50</td>
<td>Glass 50</td>
<td>Metal 50</td>
</tr>
</tbody>
</table>


To conclude, the evidence is available throughout Europe, of high technology incineration plants operating within areas achieving high recycling rates. The Netherlands is a prime example where investment has been intense in the development of incinerator plants, whilst retaining some of the highest targets in Europe for recycling.
2.7 Conclusion
This chapter has attempted to address the implications of waste and its management, and the needs and requirements of society. The historic perspective has illustrated the emerging issues that have influenced the development of a waste management system. Practical requirements and consequences from a global perspective have been evaluated in comparison with the UK and the Netherlands from an environmental perspective, and this has highlighted the demand for changes in the traditional structure.

The issue of integrated management strategies has been introduced, although subsequently it will form a major component of discussion in the following chapters. Its relevance to the success of recycling is paramount, and as such the role and influence of integrated management needs to be addressed.

It is clear from the focus of this chapter that as increasing pressure is being placed on traditional disposal options, whether it be the increasing costs of landfill as the number of viable sites decrease, or the high investment needed for incineration plants to meet the pollution control standards, the appeal of other systems such as recycling will continue. However, there must be a consideration of utilising the appropriate method for different components of the waste stream and this includes the different components of household waste. As stated by Coghlan (1995), although innovative methods to manage household waste are being promoted, there remains little doubt that an integrated system is required.

In the UK the government has indicated the need for consideration to be given to individual circumstances prior to the incorporation of a waste management strategy (House of Lords Select Committee 1993; House of Commons Environment Select Committee 1994). Whilst in the Netherlands the current action by the government indicates that they are already relating theoretical frameworks for integration, into reality.
Chapter 3: Environmentalism and Waste Management

3.1 Introduction

An holistic review of waste management strategies, with particular reference to the UK and the Netherlands, has been addressed in Chapter 2, encompassing general pressures and influences on traditional routes, and introducing the concept of integrated waste management. However, what has not been evaluated in any great detail, are the fundamental reasons for the evolution of waste management. To present a critical evaluation of waste management strategies it is imperative that the significant underlying reasons for the development of waste management, and in particular the concept of recycling are clearly understood. This will enable future predictions to be made more clearly and trends to be established.

This chapter addresses the emergence of one of the most influential concepts with regard to waste management, and that is environmentalism. In tracing the development of the environment movement, it is also possible to identify important episodes that have influenced the evolution of waste management throughout the century. This will explain, to a certain extent, the existence and role of a number of influential factors identified in the research design.

Currently, from an environmental perspective, traditional routes are not generally accepted as the ideal environmental solution to managing waste. It is, of course, acknowledged that political and economic pressures have had a significant influence on waste management during this century. However the importance of environmentalism must not be underestimated. There has been an increasing awareness of environmental deterioration as a consequence of waste management practices, and a greater understanding of resource use, as mentioned briefly in Chapter 2. The fact that these issues are important and that it is widely acknowledged that waste
must now be managed in a manner that is not detrimental to the environment, could in fact be as a consequence of the evolution of environmentalism throughout this century. As stated by Petts and Eduljee (1994), "the rise in concern over waste disposal, parallels an increased appreciation of the concept of man as a custodian of the environment" (p. 5).

This chapter endeavours to place the concept of environmentalism within the contextual framework of waste management, with specific reference to the UK and the Netherlands.

3.2 The Phases of the Environment Movement
From the onset of industrialisation in the 19th century, and throughout the 20th century, the philosophy in dealing with environmental and waste issues can be described in three phases. Although rather simplistic to assume these were distinct phases, it is clear that the philosophy at each stage influenced the emergence of waste management. These three stages form the basis of this chapter.

Technological responses were the focus of the first stage, whereupon it was believed that technocentrism was the ideal philosophy in dealing with the pollution issues caused by developing industries during the industrial revolution. In the early stages of environmental deterioration there was no evidence of its severity, and effects were usually experienced locally. There was little notion given to any interactions in the environment, and there was absence of knowledge of any accumulative effects. Technical responses dealt with the problems, and environmental pollution was placed firmly within the realms of public health, as was waste management. This continued until the middle of the 20th century when controversial publications started to emerge, such as Rachel Carsons 'Silent Spring' (1965). This portrayed the devastating effects "wrought by technological abuses of the natural environment" (Cairns & Crawford 1991) and was one of the first pieces of literature to offer any criticisms of the technology based ideology.
The second stage was highlighted by the emergence of a different type of philosophy. By the 1960's, population growth was continuing to rise and affluence in the Western World was increasing. Coupled with the ensuing energy crises of the 1970's the result was the emergence of other rather doom-laden publications, heralding the arrival of a philosophy based on neo-Malthusianism. Neo-Malthusianism is a philosophy centred around the school of thought practised by Thomas Malthus in the 18th Century. Malthus was concerned with increasing population growth and perceived inadequacies in accommodating these increases in terms of resources. The second stage reflects this philosophy to a certain extent as increased concern over the depletion of resources, coupled with questions posed over the carrying capacity of the world, focused on the consequences in terms of social issues. This period represents a stage of environmentalism when awareness and concern for the environment became paramount. However, this stage of ecocentrism was soon to be succeeded by a more modified and conservative environmental orientation in the 1980's.

The philosophy of the final stage represents an integration of ideals enabling different sectors of society to work together in trying to achieve environmental protection and enhancement. As evidence of global incidents of environmental pollution became widely available, environmental issues were placed for the first time on the political agenda.

The issue of environmentalism and waste management evolution within the parameters of the three main stages highlighted above, forms the focus of discussion throughout the chapter.

3.3 Technical Responses
Although the industrial revolution presented opportunities in development and economic growth, it also resulted in environmental deterioration due to pollution and an increased waste stream. The initial response in the late 19th and early 20th centuries to deal with these environmental issues was based on a rational and objective idealism, that relied on managerial efficiency and control using a technological response (O'Riordan 1976). As technocentrism is a
function of a particular type of existence relying on economic and political strength, it seems a reasonable assumption that this philosophy would emerge during the industrial revolution. With regard to the environment, it was generally recognised that new technology introduced with industrialisation was in part responsible for increased pollution levels, however, no attempts were made to deal with the source of the problem. Technocentrics firmly believe in progress, and so science-based responses were called for to 'clean up the mess' caused by these 'necessary processes' (Pepper 1993). This ideology focused on managing the environment, and the people within it, and as this was non-participatory, the public health reforms simply called on scientific expertise to deal with the environmental issues once they had occurred.

With regard to waste, increasing production processes and greater demand for consumer products resulted in an increase in the volume of household waste generated. No effort was made to reduce the quantity or change the composition of the waste stream as this would have seemed to have been detrimental to the new wave of industrialisation. Instead the technical response was to employ civil engineers and others with technical expertise in a new role in the removal and disposal of waste, using the best available technology necessary to reduce the health risk to the population. This technical response did not accommodate for any environmental 'side-effects' that may have occurred from the disposal option.

Following the First and Second World Wars, there was increasing stability throughout the industrialised world, and by the 1960's this stability was demonstrated by increasing affluence, and greater standards of living. There were vast increases in economic wealth and greater demands for a material quality of life. Publications as early as 1960, such as The Waste Makers by Vance Packard (1963), acknowledged this and highlighted the 'throw away' society that was emerging. Although primarily based on the USA, this book gave an insight into the ideology that was becoming applicable throughout Europe. The laissez-faire attitude towards the use of resources was sustained by encouraging disposability of products in order to support
an economy based on increased production. Planned obsolescence was commonplace within certain industrial sectors and this was having an increasing effect on waste production and the depletion of raw materials. At the same time there was an increase in population growth which, coupled with increasing affluence and complacency regarding resource availability, placed increasing pressure on an environment that was slowly registering the effects of deterioration.

The technical response with its roots placed firmly in economic development was singular in its goal to protect the health of the nation and improve material standards of living without hindering development. Protection of the environment was only given a secondary consideration. As a result the undifferentiated approach of the technical response was not sufficient to deal with environmental issues and only succeeded in transferring the problem elsewhere.

Environmental deterioration and pollution incidents were becoming more widespread, and were no longer simply the concern of small localised groups. Hardin (1968) extended the theory of Tragedy of the Commons to a global level to represent the pollution world-wide. The atmosphere, oceans and land masses represented the 'commons', which different nations polluted freely out of their own self-interest. As deterioration of these 'commons' occurred, the concept of exceeding the carrying capacity was introduced, illustrating the emerging conflict between national economic self-interest and environmental needs. This incorporates the company, individual and even city level self-interest in terms of minimising personal cost to the expense of others over the environment. These conflicting issues have never been fully resolved and they are unlikely to be in a short term context. Economic and environmental interests succeed together in relationships based on compromise and manipulation. This is certainly the case with waste management and recycling.

3.4 Emergence of Neo-Malthusianism
For nearly half a century, environmental protection and within that waste management, was simply an extension of public health policies. However, by the 1970's all this changed. Increases in pollution during
the 1950's and 1960's were attributed to post-war advances in industry, technology and science. Waste, by its very nature, was directly affected by these developments in technology and the traditional methods of disposal were no longer environmentally suitable for all components of the waste stream. However, the perception of waste being unwanted, useless material, with little or no value dominated options available.

The environmental movement that was emerging became more and more preoccupied with the issue of resource availability, and the 'carrying capacity' of the world. Direct relationships were drawn between increasing population and its effect on quality of life. The underlying dissatisfaction over insufficient management to deal with environmental deterioration emerged in the form of doom-laden theories and ideologies. These moved away from purely technocentric idealism and recognised different virtues offered by ecocentrism.

The concepts of Thomas Malthus adopted by neo-Malthusians proved to be very influential in the development of environmental philosophy, and controversy was caused in both political and scientific circles with the publication of two key documents: Blueprint for Survival (1972), and Limits to Growth (1972) (O'Riordan 1976).

Limits to Growth (Meadows et al. 1972) was a result of the Club of Rome's project on the predicament of mankind. The report had both ecocentric and technocentric characteristics (Pepper 1993). Problem areas were identified that were thought to affect all countries globally and mathematical modelling was used to explore the interactions between selected variables. The general conclusion drawn was unsurprising, in that unlimited growth cannot continue without having external implications. These external implications included the increasing use of resources to provide for the growing population, resulting in increased quantity of the waste stream. This waste, when disposed of in the traditional routes led to pollution on a regional and even national scale.
The Blueprint for Survival (Goldsmith et al. 1972), whilst incorporating some material covered in the study by the Club of Rome, went beyond the analysis and proposed changes needed to solve issues that the Limits to Growth brought to light. The Blueprint was a totally ecocentric document, declaring biotic rights, low-impact technologies, and environmentally acceptable production processes (O'Riordan 1976). It may have appeared naive in some circles as the authors attempted to deal with a great number of specialised fields, but it was successful in forming the basis of environmental debates and forums. However, with regard to waste management there still lacked awareness and knowledge of the true environmental impact of traditional routes. Although recycling was promoted, this was as a response to the depletion of raw materials and not as an environmentally preferred option to disposal in the holistic sense.

Although both documents caused a great deal of debate throughout the developed world, they were considered by some as extreme, over anxious and rather doom-laden. Specific critics, such as Maddox, were sceptical over the resource issue proposed by neo-Malthusians and particularly scathing over Paul Ehrlich's extreme views expressed in 'The Population Bomb' (1972). Maddox supported the view that technology would supply the alternatives if necessary and, of course, it is possible now to acknowledge that in part this was the case. However, it is important to note, that although they had their critics, 'Blueprint for Survival' and 'Limits to Growth' were very influential in these initial stages of the environment movement. Also in emphasising the resource issue, they played a fundamental role in the development and acceptance of recycling in the early stages.

1972 had been designated 'World Environment Year' by the United Nations and the Stockholm Conference on the 'Human Environment' was the high point of the year. This simply added more basis to the discussion and was successful in bringing the environment debate to the forefront internationally.

Waste management, as an issue in its own right, emerged with the energy crises of 1973 and 1979. As oil prices dramatically increased,
recycling and the conservation of raw materials became paramount. Once again, this was not due to environment philosophies, but was in response to an energy issue, and as an economic solution to a crisis. Materials recycling was carried out by virtue of necessity rather than for purely environmental reasons (Chandler 1983). The first bottle bank was installed in the UK in 1977 (SCRIB 1993) as the practicalities of using old glass to make new products made economic sense and resulted in energy savings. In the Netherlands, attempts at recycling household waste were focused on the separate collection of glass and encouragement of the separate collection of waste paper. The first attempt at 'light weighting' and substituting material - which may have been conceived as an innovative attempt at environmentalism - was developed as a resources issue, concerned mainly with economic factors. Examples of this include the reduction in weight of glass milk bottles, from 538g in the 1950's, to 245g in the 1990's, and metal drinks cans have reduced from 91g to 17g over the same period (Biffa 1993, p8).

A positive outcome of the 1973, and subsequent 1979, oil crises was that developed countries were forced to use energy resources more efficiently, and to investigate alternative energy supplies. Without this impetus there would not have been such rapid development in the quest for north sea oil, and growth of the nuclear power industry. Energy efficiency increased throughout Europe, with a 19.7% improvement in energy productivity in the UK and 22% improvement in the Netherlands from 1973 to 1983. The overall figure for Western Europe was 18.9% representing a dramatic adjustment to the use of energy, in line with the high prices at that time (Odell 1985). The provision of energy has always been a contentious area and it is possible that the crises in the 1970's added impetus to the developing role of incineration of waste with energy recovery.

However, the subsequent economic depressions that followed the oil crises rapidly set aside any environmental gains and targets previously made. There was a reluctance to impose extra costs on companies during the economic depressions. With regard to waste, the
investment needed for developing and improving management systems was no longer readily available. In terms of household waste, negligible effort was made to influence lifestyle changes in terms of the quantity and composition of waste being produced. The UK government did not act quickly in implementing all policies and legislation with regard to pollution and waste management. This in part explains why earlier legislation such as Control of Pollution Act 1974 (UK) was still not fully implemented by the mid 1980's.

3.5 Environmental Impact

On a global level pollution incidents continued to occur and received increasing media attention. These varied from localised incidents, to more widespread ecological disasters which appeared to warrant increased attention. These included: oil spills, such as Torrey Canyon (1967), Amoco Cadiz (1978), Exxon Valdez (1989), Braer (1993), and Sea Empress (1996); industrial accidents such as Flixborough (1976), Seveso (1976) and Bhopal (1984); and nuclear incidents such as Windscale (1956), Three-Mile Island (1979) and Chernobyl (1986) (Barrow 1995). Insufficient knowledge in dealing with the incidents once they had occurred often exacerbated the problem. Widespread environmental damage, and in some cases fatalities, gained the incidents increasing media coverage bringing the plight of environmental deterioration to a wider audience. Evidence of issues with more serious implications on a global scale were emerging, such as: global warming, ozone depletion, decreasing biodiversity, deforestation and acid rain; although media attention given to such issues was often limited. However, general public awareness of the continuing threat to the environment was increasing and this simply added more impetus to the growing environmental movement.

There were notable environmental incidents directly as a result of waste management practices. The most damaging of these incidents were often caused by hazardous waste and its treatment, and can be seen in Table 3.1.

At a national level, England became infamous for its air pollution in the 1950's and 1960's when London's smog caused the deaths of
thousands (Porrit 1991). The response to this was in the form of policy to control the situation. More recently, water pollution, especially sewage disposal in the North Sea, has received significant media attention. As the impact of this pollution is far reaching, the legislative controls installed have been European.

Table 3.1: Waste Related Environmental Incidents from 1950 - 1990

<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
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</thead>
<tbody>
<tr>
<td>1950's</td>
<td>Minamata Bay, Japan. Mercury poisoning kills thousands.</td>
</tr>
<tr>
<td>1960's</td>
<td>Yusho incident, Japan. Leak of polychlorinated biphenyl into rice oil.</td>
</tr>
<tr>
<td></td>
<td>Rhine is severely polluted by discharges of endo-sulphan.</td>
</tr>
<tr>
<td>1970's</td>
<td>Irish sea. Estimated 10,000 sea birds killed by polychlorinated biphenyls.</td>
</tr>
<tr>
<td></td>
<td>German lake. 3000 tonnes of arsenic and cyanide waste dumped</td>
</tr>
<tr>
<td></td>
<td>Cornwall, UK. Indiscriminate dumping of cyanide wastes, and the discovery of toluene di-isocyanate waste found on a beach.</td>
</tr>
<tr>
<td></td>
<td>UK. Two rivers polluted by cyanide waste discharges</td>
</tr>
<tr>
<td></td>
<td>Finnish state oil company. Attempted sea disposal of arsenical waste.</td>
</tr>
<tr>
<td></td>
<td>Love Canal, Niagara Falls. Chemical waste leachate and toxic vapours affect domestic properties built on an old disposal site.</td>
</tr>
<tr>
<td>1980's</td>
<td>Lekkerkerk, Netherlands. Drinking water and under floor voids of housing estate built on old landfill site affected by hazardous chemicals.</td>
</tr>
<tr>
<td></td>
<td>Italy. Drums of dioxin-contained waste associated with Seveso TCP plant incident disappeared en route to undisclosed disposal site.</td>
</tr>
<tr>
<td></td>
<td>Ontario, Canada. Truck containing hazardous wastes overturned and 200 litres of polychlorinated biphenyls spilled.</td>
</tr>
<tr>
<td></td>
<td>Loscoe, UK. Methane from landfill explodes destroying a house</td>
</tr>
<tr>
<td></td>
<td>UK. Karin B refused permission to unload cargo of unspecified wastes</td>
</tr>
<tr>
<td>1990's</td>
<td>Romania. German government has to retrieve pesticide wastes found dumped in Romania.</td>
</tr>
</tbody>
</table>

Source: Adapted from Petts & Eduljee 1994

In the Netherlands there have been a number of localised pollution incidents, some so severe that in one particular case an entire housing estate built on an old landfill site had to be completely demolished as it
was unsafe for human habitation (Ministry of Housing, Physical Planning and the Environment 1991).

As it became possible to trace environmental problems to their source it became clear that a great number of incidents could be attributed to waste and its disposal. Landfill and incineration were placed under ever increasing scrutiny and it was being recognised that it was environmentally beneficial to treat the source of the pollution problem, namely waste, as opposed to dealing with the effects. There was a re-alignment of thought and the focus increasingly started to be placed on an integrated waste management system, as opposed to purely disposal oriented options.

3.6 Environmental Response
Nationally, there was increasing political activity in response to the vast array of publications and intensifying public interest in the environment. Governments in developed countries made efforts to set-up specialised groups and departments in which strategies and policies to deal with environmental issues could be formulated. However, many aspects were not fully understood with regard to cause and effect, which often resulted in a piecemeal approach and did not deal with environmental issues fully. In the UK, the Department of the Environment was established in 1970. However the early focus was not very specific and the most important work covered by the Department was the formation of Local Authorities and the development of housing projects, which had only tenuous links with environmental issues (McCormick 1991).

3.6.1 Environmental Groups
Both in the Netherlands and the UK, voluntary environmental organisations have a tradition of being involved in nature conservation. Dutch environmental organisations were first established as early as 1900 (Stichting Natuur en Milieu 1990). The main objective was the protection of nature, however, since the late 1960's their focus has extended considerably to include environmental protection; with some organisation being developed with this main purpose as their framework. This is similar to the UK, where nature
protection and conservation organisations originated at the turn of this century.

Environmental groups have emerged as a significant force, growing in membership, particularly over the last decade (refer to Tables 3.2 and 3.3). This is not surprising with regard to the economic situation and increasing population growth. As stated by Lowe & Goyder (1983) "Growth in new environment groups occurs towards the end of periods of sustained economic expansion". That is, in direct response to materialistic values more and more people recognise the external environmental consequences of economic growth and associated activities.

Table 3.2: Growth of Membership of Selected Leading Environmental Groups in the UK

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<tbody>
<tr>
<td>F.O.E</td>
<td></td>
<td></td>
<td>5,000</td>
<td>12,000</td>
<td>27,000</td>
<td>168,581</td>
<td>204,345</td>
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<tr>
<td>Ramblers</td>
<td>14,713</td>
<td>15,789</td>
<td>22,178</td>
<td>32,331</td>
<td>35,731</td>
<td>49,650</td>
<td>73,007</td>
<td>93,892</td>
</tr>
<tr>
<td>C.P.R.E</td>
<td>15,000</td>
<td>20,695</td>
<td>27,100</td>
<td>27,000</td>
<td>26,500</td>
<td>44,500</td>
<td>45,000</td>
<td></td>
</tr>
<tr>
<td>National Trust</td>
<td>164,527</td>
<td>170,986</td>
<td>226,200</td>
<td>463,556</td>
<td>949,323</td>
<td>1,323,996</td>
<td>1,864,951</td>
<td>2,189,383</td>
</tr>
<tr>
<td>R.S.P.B</td>
<td>31,738</td>
<td></td>
<td>65,577</td>
<td>165,716</td>
<td>321,000</td>
<td>390,000</td>
<td>433,000</td>
<td>506,000</td>
</tr>
</tbody>
</table>


Table 3.3: Growth of Membership of Selected Leading Environment Groups in the Netherlands

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<tbody>
<tr>
<td>F.O.E</td>
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<tr>
<td>IVN</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.B.N</td>
<td>51,000</td>
<td>100,000</td>
<td>200,000</td>
<td>259,000</td>
<td>235,000</td>
<td>276,500</td>
<td>292,000</td>
<td>722,000</td>
</tr>
</tbody>
</table>

Towards the end of the 1980's the politically active organisations had become more professional in their approach and often resorted to media-oriented tactics. Global issues had become more important, and the behaviour and attitude of the general public much more influential. Instead of working in hostile isolation, pressure groups had started to become more integrated with local authorities, government organisations and related industry, in an effort to reach goals and targets, in a more conventional and systematic manner. International links were developed, and organisations such as Greenpeace and Friends of the Earth started to coordinate their activities globally.

Membership of environmental groups could be regarded as one indication of the wider social movement occurring at that time. Their influence should not be underestimated in their role in the formation of policies. Often, the general public prefer to express their support in environment issues by joining the relevant pressure groups as opposed to supporting a political party.

3.6.2 Environmental Literature
Changes in lifestyle and consumer spending give an indication of a preference towards a more environmentally aware way of life. Also the publication of relevant environmental literature, and the space allocated to environmental issues in newspapers and magazines can be a good indicator of the demand for knowledge and interest in environmental issues. A study by Brookes et al. 1976 revealed that from 1953 up until 1965, The Times newspaper gave environmental issues minor coverage. However, from that date until 1973 when the study ended there had been a two hundred and eighty-one per cent increase in coverage. Although potentially representative of the views and ideals held by the readers, The Times was ultimately chosen as it was regarded as unbiased, and oriented towards the monitoring of serious and important issues. Brooks et al. (1976) assumed that any changes in the importance of such issues would be represented in the column inches that The Times devoted to their cause.
Figure 3.1 is another illustration of the growth of environmental issues in the media and represents the number of column centimetres devoted to environmental issues from late 1960's to 1990. It is taken from the index of Keesings Contemporary Archives which record month by month the topics being discussed around the world (Sadgrove 1992).

**Figure 3.1: Global Interest in Green Issues as Measured in Column Centimetres**

![Bar chart showing the growth of environmental issues in the media from 1970 to 1990.](chart.png)

Source: Sadgrove 1992

3.6.3 The Political Response in the 1970's

In the hierarchy of national goals, as described by O'Riordan in 1976, the environment does not feature very prominently. If any of the issues placed in a higher priority than the environment are threatened in anyway then they will take immediate precedence (refer to Figure 3.2).

This hierarchy is reflected in the early political response in legislative terms, in that the environment only featured as a component of public health, stated clearly as a number one priority. Waste management policies were also deeply embedded within the protection of public health but not the environment. In the UK the Public Health Act 1848 was the first piece of national legislation to deal with issues regarding waste and the environment. The Act attempted to deal with waste as a
statutory nuisance, focusing on the protection of public health against any accumulation of waste.

Figure 3.2: The Hierarchy of National Goals

However, as the industrial revolution changed the social, economic and political frameworks of the UK, there followed a series of amendments to this Act. In 1936, the Public Health Act was reformed, incorporating a number of new issues that had emerged; including the increasing quantity of household waste production. In the context of waste, its collection and disposal, local authorities were given greater responsibility, having the power to remove household and trade waste, and monitor for hazardous material. The Public Health Act 1936 played a prominent role in UK environment legislation for a number of decades and, in fact, parts of this Act were still in use until the early 1980's (British Medical Association 1991).

Source: O'Riordan 1976
With the emergence of environmentalism in the late 1960's and early 1970's, two important acts of Parliament were introduced, providing a main framework for management of household waste in the UK within planning law and pollution control. The first was a preventative policy in the form of the Town and Country Planning Act. This provided a planning framework to which developments on land are subject. Therefore, this Act made an attempt to control waste deposits by controlling the use of the land. This Act was subject to subsequent amendments and has now been superseded by the Town and Country Planning Act 1990. Its specific relevance to waste management is focused in the planning stage of site development.

The second main piece of legislation was the Control of Pollution Act 1974 (COPA). This was the UK's first attempt at comprehensive waste legislation, as a reaction to the pollution and resource issues that had gained prominence. Part 1 of COPA was concerned with waste on land and established a hierarchy of responsibility with the designation of waste disposal authorities. At the time it was renowned as the first piece of legislation that endeavoured to integrate pollution issues and deal with them in a holistic fashion. It was considered to be a major development in ascertaining a "basic standard of environmental protection" (Hughes 1986). However, some felt that the legislation was a little disappointing. Politicians had expressed enthusiastic rhetoric and on paper COPA appeared to offer a comprehensive system of control. However, in practice the result was a fragmented and piecemeal approach, that failed to deal with all the issues adequately. In the context of waste management a number of weaknesses were identified (refer to Figure 3.3) These weaknesses (or loopholes as they have sometimes been referred to) succeeded in undermining any confidence in the legislation to control or prevent pollution occurring, as a result of waste collection and disposal.

The legislation was slow to be implemented, and the government appeared reluctant to enforce the legislation during the late 1970's as this was a time of economic recession. With a lack of resources and incentives, a small number of policies proposed were never implemented. The total focus of the legislation was control of
pollution, and not restriction or prevention. However, COPA still represented an improvement on previous legislation, and was the first step towards integrating environment management and control.

Figure 3.3: Weaknesses in the waste policies featured in the COPA 1974

Poacher and Gamekeeper
Regulatory and organisational role shared by the Waste Disposal Authority undermined any confidence in them to enforce legislation

Regional Differences
Limited guidance existed, resulting in differing standards of waste management from region to region

Strategic Plans
A Laissez-faire attitude towards the development of strategic plans detailed in the COPA, occurred as a direct result of lack of guidance

Definitions
Essentially concerned with controlling the deposit of waste, problems arose when having to deal with issues of waste treatment or storage

Shifting Responsibility
Site operators could abandon all responsibility for their sites simply by surrendering their licence, thus avoiding any role to play in the 'clean-up' of the site

Source: Adapted from Ball & Bell 1991 p.275 - 277

The 1970's saw the introduction of a number of other relevant Acts, for example: the Deposit of Poisonous Waste Act 1972 (developed in direct response to an incident where toxic waste was discovered in an area used by children) superseded by the Control of Pollution (Special Waste) Regulations 1980; Health and Safety at Work Act (laying responsibility on employers for the safety of their workers handling waste); and Refuse Disposal Amenity Act 1978, supplementing the Civic Amenity Act 1967 (placing a duty on local authorities to provide sites for residents to bring bulky household waste, free of charge). The Civic Amenity Act 1967 was innovative in that it was proactive, targeting an environmental issue before it had become a problem.
In the Netherlands the political reaction represented a far greater commitment to manage the environment and waste more effectively. As environmental awareness increased and public pressure strengthened, the Dutch response was to produce a law for each environmental problem. A Ministry responsible for environmental policy was established, and immediate action was taken to provide a legislative base to minimise further damage to the environment.

First attempts at comprehensive waste legislation came in 1977 with the Waste Product Act (Afvalstoffenwet). In traditional Dutch style this followed many years of consultation and negotiation. The Waste Product Act 1977 created a framework, much like the COPA, for waste management to be carried out in an environmentally responsible way (Klaever 1991). The administration for the Act was decentralised in that the provinces accepted responsibility for the development of a waste disposal plan, and implementation was the responsibility of the municipalities. The waste disposal plans were to outline how, where and by whom the waste was to be deposited, treated or re-used, ensuring accountability at every stage.

The Waste Product Act 1977 provided a legislative framework within which waste disposal could be fully organised. The Act formed the basis of minimising and preventing waste, and promoted recycling, implemented on a local level symbolising a decentralisation of waste management practices.

However, this approach of singling out specific environment issues, such as waste, and dealing with them on an individual legal basis was proving to be unsatisfactory. It was felt that using straight forward laws, with no mechanism in place to implement them efficiently, and a lack of clear goals, was a distinct disadvantage in tackling the problem. Also, the use of single, focused issues as a basis for the legislation resulted in a piecemeal approach that often lead to the creation of other environmental problems. There was an over emphasis in the legislation of dealing with the effects on the environment as opposed to preventing degradation at source.
Therefore, initial attempts at environmental and waste policies, in both the UK and the Netherlands, were similar in their lack of scope and ability to deal with often complex environmental issues. In their defence this was simply a reflection of the lack of sophistication in the political response to deal effectively with complex environmental issues.

This was to remain the case until the 1980's and early 1990's (refer to Chapter 4 for information on the Environmental Protection Act 1990, Environment Act 1995, UK, and the National Environment Policy Plan 1989 (and subsequent Plans, Netherlands) when political attitudes started to reform at an increasing pace under pressure from the environment lobby. The often abstract and piecemeal approach towards environmental issues, with no concept of integration had proved unsatisfactory. In the UK Planning Policy Guidance 23 (PPG 23) (HM Government 1994) was introduced in 1994 to link the two distinct strands of planning and pollution control. This attempted to form a relationship between planning policy, for example the Town and Country Planning Act, with pollution control, COPA in the first instance. PPG 23 introduced the concept of the proximity principle, which has implications for the use of landfill sites which may be servicing large areas external to their regional or county location. Although primarily a planning document, it highlights the need for waste management strategies that have the least overall environmental impact.

Environmentalists increasingly targeted politicians and placed greater pressure for environmental issues to become components of the political agenda. Membership of leading environmental organisations increased, and as their tactics became more conventional this brought a greater understanding and acceptance of local, regional, national and even global issues. The environment and associated issues, including waste management, became more prominent and were given higher ranking in public concern.

Electoral success by the Green Parties in the European elections in 1989 supported the general trend towards the implementation of
environmental policies. There was a dramatic increase in the percentage of voters supporting the green party from 1979 to 1989 (Mackie 1990), although this significant change was not repeated to such an extent in the 1994 European Parliament elections. However, the increase in percentage votes for the green parties in 1989 cannot be specifically attributed to the growth of the environment movement and desire by the European public for a 'green government'. In the UK the percentage of eligible voters who actually took part in the elections was very low, and it may be considered that the vote was a show of dissatisfaction with the two major parties.

However, if it had not been for the UK's 'winner-take-all' electoral system, the Green Party may have won up to twelve seats in the elections (McCormick 1991). It cannot be disputed that this would have had a resounding impact on the UK's role in developing European environment legislation. Other countries in the EU operate a system of proportional representation for the European Parliamentary elections, as a result there are now a number of green party MEP's.

The Green Party's surprising success did alert other major parties that the environment was an area of concern, encouraging them to adopt some of the green issues that had been present on the Green Party's political agenda.

The environment as an item on the political agenda within the European Union has gained increasing significance throughout the 1980's. In 1988, as Figure 3.4 demonstrates, the environment was placed second only to unemployment, which successfully illustrates the strength of feeling with regard to green issues.

The environment movement of the 1980's can be considered as fundamentally different from that in the early 1970's. Although the initial recognition of environmental issues and the surge of interest shown in early, often doom-laden, publications was very significant, this interest was short-lived. The focus of economic and resource issues as a framework, without any other consideration, had proved to be rather limiting. Weaknesses in the arguments and philosophies of
neo-Malthusians could be clearly seen, as technical solutions in the energy crisis and the discovery of profitable alternatives led away from the idea of limits to growth. Increases in population did not result in global famines and widespread wars as predicted.

Figure 3.4: The Political Importance of the Environment in the European Union in 1988

Perhaps the most important and politically influential issue to emerge in the 1980's and 1990's, particularly with regard to waste management, was sustainability. It can be described as following on from the concept of neo-Malthusianism, with one fundamental difference, in that the debate has shifted from being an issue of growth versus the environment, to development working with the environment (Pearce et al. 1989). The environmental role in the political hierarchy was changing. It was now becoming more akin to the environmentalist framework proposed by O'Riordan in 1976 (Figure 3.5).

A new approach was emerging, with a focus on environmental and social equity, without preventing development. Questions were beginning to be raised about the consequences of unconstrained economic development and the impact on social issues in a global context. Initiation of lifestyle changes were emerging with an
increased focus on development integrating environmental and social needs. This integrated approach relates to O'Riordans reordering of national goals, in that a holistic approach has to be adopted to ensure protection and enhancement of the environment. This framework acknowledges an integration of actions in that environmental issues are not isolated and singular, but are the result or cause of an external factor.

Figure 3.5: Reordered National Goals in an Environmentalist Framework

![Diagram of reordered national goals]

Source: O'Riordan 1976

3.7 Changes to the Decision Making Process

The inadequacies in traditional routes, and the effects on changing composition and quantity of household waste have indicated the need for a management system, integrating practical, environmental and social issues. These issues have affected the historic decision making process to such an extent that the present day structure operates within a completely different framework (refer to Figure 3.6).

Influential factors such as environmentalism and the concept of sustainability, have resulted in controlling actors and players
involvement within the waste industry. At each stage, consequences of social or political change can be seen to have modified the contextual framework within the waste management structure.

Figure 3.6: Historic and Present Day Decision making Process
The present day process illustrates the changing attitudes towards waste within an environmental and resource framework. This is signified at the producer, consumer, management and regulation stage. The concept of regulation has been developed to represent environmental protection, and this will be addressed further in Chapter 4 with regard to current waste policy and legislation.

3.8 Conclusion
Chapters 2 and 3 have provided a synopsis of the development of waste management, focusing on the major evolutionary influences over the last century. The depth of detail in the analysis of the development of waste management, has removed the need in the following chapters for historical evaluation as an aid to visualise the concepts being proposed. The emergence and role of recycling as a waste management strategy has been given a philosophical base, to which the influencing factors and barriers to recycling activity can be related.

It was necessary to detail and evaluate, both the traditional routes of waste management and also the underlying concept of environmentalism to fully appreciate the current position and be able to predict future trends within waste management.
Chapter 4: Policies and Legislation in the UK and the Netherlands - Waste Management into the 21st Century

4.1 Introduction

Global issues addressed in previous Chapters, such as resource depletion and environmental pollution, have resulted in increasing pressure on environment and waste policy development, at a national and European level. The identification and evaluation, of current and future waste policies forms a crucial component of the research. It is necessary for consideration to be given to fundamental issues such as when, why, and how a policy was initiated and developed, the instruments used for implementation, and its success in achieving the goals or targets set out in the original policy.

The historical and evolutionary aspect of waste management as discussed in Chapters 2 and 3 reflects the initial reaction in both the UK and the Netherlands, in response to pollution and waste issues. Crisis management formed the conceptual framework within which reactive policy, which produced the least resistance from the main players, was developed. Piecemeal approaches to environmental pollution and degradation resulted in superficial legislation that was oblivious to any interaction or integration that existed between environmental issues. Waste issues were initially dealt with under Public Health Acts, and there was a distinct absence of legislation to deal with the broad problems associated with waste disposal.

However, as the scale of environmental incidents increased and greater awareness emerged, environmental protection became paramount. The 1990's have seen the introduction of more environmental legislation than any other decade, with waste management receiving a higher profile not only in national legislation but also on a European level (The Kindred Association 1994). The more proactive response is centred on future considerations
acknowledging the role of sustainability and focusing on optimal planning. The scope of actors and players involved as a direct consequence of the developing policies and strategies has increased to include industry, commerce, marketing, consumers, politicians, encompassing all levels of waste generators, handlers, and management.

This chapter focuses on a comparative evaluation of the current and proposed national waste policy, featured in the UK and the Netherlands. The importance of a comparative study in the case of policy evaluation is highlighted by Heidenheimer et al. (1990) who concludes that opportunities and constraints which may be hidden within national assumptions, may be identified when a comparison is made with another country.

The role and impact of the European Community and more recently the European Union, with respect to the formulation of current and proposed national polices is evaluated, as are the inter-relationships between the UK and the Netherlands with European policy makers. Strengths, weaknesses and innovative features of the legislation are highlighted, plus major influences and barriers.

4.2 Developments in UK Waste and Environment Legislation
Currently the most influential national waste management policies are featured in the Environmental Protection Act 1990 (EPA) and Environment Act 1995 (EA). The EPA 1990 has been perceived as "the most important piece of legislation in its field since the Control of Pollution Act 1974" (Tromans 1991 p.7). It attempts to eliminate the weaknesses of COPA (Ball & Bell 1991) and has been described by some as providing the UK's pollution control framework for the rest of this century and into the next. Others have not been so complimentary referring to a lack of cohesion due to the diversity of environmental issues covered by the Act. The Act attempts to provide an holistic system of management focusing on an integrated approach to protection of the environment.
The EPA 1990 introduces a stricter regime of control of waste on land, with the intention of replacing all of the COPA 1974 Part I, within Part II of the EPA 1990. However, the main additions and changes that have a fundamental effect on waste management practices can be found in both Part I and Part II (refer to Table 4.1). Part I deals with a more general source oriented approach, introducing the concept of integrated pollution control (IPC) within waste management. The Environmental Protection (Prescribed Processes and Substances) Regulations 1991 list those processes to be controlled under the EPA 1990 within the provisions of IPC. This includes waste disposal in the context of incineration, chemical recovery and waste derived fuel, but not landfill. IPC also establishes Best Practicable Environment Option (BPEO) and Best Available Techniques/Technology Not Exceeding Excessive Costs (BATNEEC). There have been a number of contentious issues linked with the definitive interpretation of BATNEEC, as the definitions laid down in the EPA 1990 are very broad and cover a range of possible meanings (Jackson 1991).

Part II is more focused towards an effect oriented approach, concerned with increasing the scope of responsibility beyond the disposer to include all those who produce, handle and treat the waste. Of particular importance to pollution and degradation associated with landfill sites, the legislation dictates a duty to monitor and, more importantly, remedy closed landfills with regard to methane and leachate generation, and contamination. There is increased orientation towards recycling and this was reflected initially in the governments White Paper: This Common Inheritance, produced prior to the Environmental Protection Act 1990, but given a statutory base within the Act. The White Paper states that a recycling target of 50% of the recyclable content of household waste, which equates to 25% of household waste, must be achieved by the year 2000. This general approach is dissimilar to the Netherlands and other European countries where intermediate or specific individual targets have been set. There is some concern that the 25% target will be difficult to achieve over the next five years as the current national recycling rate is approximately 5% (Audit Commission 1995). There has also been some contention over why a target of 25% was chosen at all. There
appears to be little evidence of the reasoning behind the selection of the target, and therefore little support in the viability of systems to achieve it. The national government did however produce a number of waste management papers to provide information on the types of schemes it would be possible to use to implement a recycling strategy, in particular Waste Management Number 28 (Department of the Environment 1991). Although theoretically the information is effective, its practical application is limited.

Table 4.1: Important Aspects of Part I and Part II of the EPA 1990 Concerning Waste

<table>
<thead>
<tr>
<th>Part I</th>
<th>• HMIP to consider simultaneously emissions to air, water and land to ensure that their total polluting impact on the environment will be minimised: Integrated Pollution Control</th>
</tr>
</thead>
</table>
| Part II | • Waste producers and hauliers to be bound by a duty of care for cradle-to-grave control of waste handling  
• post disposal aftercare responsibility placed on disposal operators  
• reorganisation of public sector waste disposal authorities into Local Authority Waste Disposal Companies and Waste Regulation Authorities  
• Local Authorities to be required to produce waste recycling plans  
• new site licensing system for 'waste management operations' rather than 'waste disposal' as at present  
• licences can be refused if applicant not considered to be 'fit and proper'. This implies a requirement to be technically competent.  
• grounds for refusal of a licence are re-defined and a licence fee and charging system will be established  
• new licensing arrangements for mobile waste treatment plants will be established |

Source: Environmental Protection Act 1990
In the UK, budgetary assistance to help Local Authorities to meet the Governments' recycling target is in the form of Supplementary Credit Approvals (SCA's) or Recycling Credits (RC's). SCA's were introduced in 1990/91 in England only, to aid the development of a recycling infrastructure. SCA's allow for a Local Authority to bid over their usual credit allowance for specific projects. However it has been stated that the money available under this scheme is to be drastically reduced in 1996/7 and 1997/8 (ENDS 1995a). It is anticipated that private sector spending will increase as a consequence of new policies and strategies.

In Wales, there is basic credit approval for projects, or the opportunity to gain financial investment from the Strategic Development Scheme, which basically supports economic, social or environmental projects in prescribed areas (Department of the Environment 1995).

Recycling Credits were introduced in 1992 and are a mechanism of passing the savings from collection and disposal costs to the recycling. This generally consists of a transaction between waste disposal authorities and waste collection authorities, although voluntary groups and businesses involved may benefit. Recycling credits are not readily applicable in Wales (or indeed Scotland) due to the collection and disposal being operated by one tier of local government.

4.2.1 Administration
Innovative features of the EPA 1990 include a separation of operational and regulatory functions within the Local Authority, thus removing the 'gamekeeper and poacher' scenario. There is now the power to create regional authorities for waste regulation, and to assign this power to the Environment Agency in April 1996 (Garbutt 1992). Specific administrative changes include separating the control of collection, disposal and regulation by the formation of Waste Collection Authorities (WCA's), Waste Disposal Authorities (WDA's), and Waste Regulation Authorities (WRA's) (refer to Table 4.2 and Table 4.3). With regard to waste collection and disposal, Local Authorities are required to form private companies and in the case of disposal must bid against the private sector to secure the contract.
Local government has increasingly experienced the effects of demunicipalisation on waste management. This has largely been in response to rising costs and technical complexity, required in response to increasingly stringent environmental standards and controls. As the political ideology has experienced a move towards the involvement of the private sector, and the increased role of market opportunities, waste has been no exception (Gandy 1993). Aspects of the waste management industry are currently placed out to tender, and it is anticipated that private sector involvement will play an increasing role towards the end of the decade, as waste management and in particular disposal, become good business opportunities.

Table 4.2: Institutional Arrangements: Control of Pollution Act 1974

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Waste Collection</th>
<th>Waste Disposal</th>
<th>Waste Regulation/ Licensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>WCA (district)</td>
<td>WDA/private</td>
<td>WDA</td>
</tr>
</tbody>
</table>

Table 4.3: Institutional Arrangements: Environmental Protection Act 1990

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Waste Collection</th>
<th>Waste Disposal Arrangements</th>
<th>Waste Disposal Operations</th>
<th>Waste Regulation</th>
<th>Central Government Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>WCA/ LAWDC</td>
<td>WDA</td>
<td>LAWDC/private</td>
<td>WRA</td>
<td>Intervention by the Sec. of State if the WRA unsatisfactory</td>
</tr>
</tbody>
</table>

Source: Croners Environmental Management

The policy of increasing private sector involvement in waste disposal has been met with some reservation. Although specific roles and responsibilities are now directly allocated through policy, some concern has been placed on the effect of private sector involvement
fragmenting waste management organisations (Blowers 1993). Fragmentation is not an ideal scenario as integrated relationships are the ultimate aim. However, with the installation of the Environment Agency in April 1996 environment regulation will be incorporated on one platform, which may negate the implications of possible fragmentation to a certain extent. Also indicators from Europe and the USA point to the decline of small to medium sized enterprises, as international corporations increase their market share. This may rationalise the industry and decrease the threat of fragmentation (Gandy 1993).

Developments in the administrative structure have provided a clear indication of the allocation of responsibilities and application of duties within waste management. WRA's, represented by County Councils (except in Wales, Greater London, and Metropolitan areas), have the power to grant and supervise licences and licensed sites. As this is no longer arbitrary, stricter controls now surround the granting and surrender of licenses. WRA's also have a duty to prepare a waste management plan, maintain public registers, and are responsible for the supervision of the Duty of Care (refer to Section 4.2.2).

WCA's have a statutory duty to collect household waste in their area and any commercial waste where requested by the occupier, for a charge. They are also responsible for the preparation of waste recycling plans. However, the provision for recycling plans is not as effective as anticipated, as a legislative base for ensuring the implementation of the plans is absent.

WDA's have the responsibility of organising the disposal of controlled waste that has been collected. One major function is the formation of waste disposal companies. They are also responsible for the provision of civic amenity sites, transfer stations and recycling facilities. In non-metropolitan areas it is the county council that forms a WDA but special arrangements apply to metropolitan counties where the district councils are the WDA. As already stated, operational disposal functions are not carried out by the WDA's; companies, either private sector businesses or those formed by waste disposal authorities
(LAWDC's), are responsible for the practical treatment and disposal of controlled waste.

4.2.2 Duty of Care
With a number of important new concepts introduced in EPA 1990, one of particular significance to waste management is Duty of Care. This creates a statutory duty on anyone who has control of, or responsibility for, controlled waste at any point from its production through to its disposal.

It places a duty to take all responsible measures to:
- prevent the illegal deposit or handling of waste by any other person
- prevent the escape of waste from control
- prevent the transference of waste to an unauthorised person, and
- ensure that the waste is adequately described, and labelled clearly to facilitate proper handling, treatment and disposal.

Croner's Environmental Management (1994)

Duty of Care responsibilities came into force on 1 April 1992 and any failure to comply is punishable by a fine. However, there is some contention over the definitions and interpretation of the terminology, and if this concept is to be fully effective then the UK legislators will need to provide more guidance.

4.2.3 Environment Act 1995
The Environment Act 1995 came into force in July 1995 and introduces a wide range of provisions, the most relevant aspect being reorganisation of administration and enforcement of environmental law (Croner 1995). Specific areas that will have a direct impact on waste management include the formation of the Environment Agency as mentioned earlier which come into force in April 1996. In England and Wales the Agency will consist of the National Rivers Authority, Her Majesty's Inspectorate of Pollution and Waste Regulation Authority. The Environment Agency is expected to unify
environment protection, and increase the ease of monitoring and enforcement over all three media, introducing a regional and national operational aspect to environmental control. The formation of the Agency does reflect the holistic approach towards the integration of environmental issues, and aims to remove some of the confusion surrounding environment policies and regulations.

Another area of importance is producer responsibility for packaging waste. Under the Environment Act 1995 the Secretary of State now has the power to impose regulations on producers of packaging waste, which will effectively implement the EC Packaging directive of 1994. This is discussed in greater detail in Section 4.8.

With regard to waste management strategies specifically, the Act requires the Secretary of State for the Environment to draw up a national waste strategy for England and Wales, of which a draft document was circulated in January 1995, and a definitive document was introduced in December 1995. The strategy 'Making Waste Work' (Department of the Environment 1995) focuses on sustainable waste management, and proposes targets to achieving this aim. The main objectives are:

- to reduce the amount of waste that society produces
- to make best use of the waste that society produces
- to minimise the risks of immediate and future environmental pollution and harm to human health and
- to increase the proportions of waste managed by the options towards the top of the waste hierarchy.

Source: Department of the Environment 1995, p.1

Specific targets concerned with household waste include two primary targets focused on landfill and recovery. It is proposed that controlled waste being disposed of by landfill, should be reduced to 60%, by the year 2005. This target is an effort to reduce the reliance on landfill and decrease the proportion of waste being managed by an option at the bottom of the hierarchy. The instrument that is anticipated to achieve
this target is the landfill tax. However, in reference to the discussion in Section 4.6, there are a number of unresolved issues with regard to the implementation of this instrument, which questions its viability. A target which complements the landfill diversion strategy is to recover 40% of municipal waste by 2005. This includes energy recovery, recycling and composting, therefore placing incineration in a favourable position as a component of the national strategy. The inclusion of energy recovery with recycling as a strategy to achieve 40% recovery, has prompted criticism from Waste Watch in a letter of response to the national waste strategy, for the inconsistency of this strategy with sustainable development. It can be anticipated that there will be further comments from environmental groups regarding this issue, who do not regard incineration in any context as a favourable option. However, promoting energy recovery in contrast to decreasing the reliance on landfill, does reflect movement up the waste hierarchy.

The concept of waste reduction has been addressed in the strategy although, unlike in the draft document, no specific target has been set. It is expected that, with the assistance of the Environment Agency, information and data gathering will enable the setting of a target by 1998, at a realistic and attainable level. In contrast to the Netherlands there still remains a degree of reluctance on behalf of the policy makers to introduce reduction and prevention measures. In the Netherlands, policy on recycling has integrated reduction and prevention targets, as it is the belief that success can be achieved treating the issues as complex and interrelated concepts. Further support is given to reduction of waste within the Department of the Environment itself as it has been stated that internal policies to minimise their solid waste production will be set by March 1996, and subsequently two thirds of all government departments will follow suit by the end of the year.

The strategy has categorised a number of secondary targets which it maintains will assist in the achievement of the primary target mentioned above. The commitment to recycle 25% of household waste by the year 2000 is reaffirmed, with specific focus on the inclusion of composting. Glass recycling facilities are to be increased by 12% of the 1994 level, and paper facilities to be increased by 51% of the
1994 level. Support to increase composting is given by the target for 40% of households with a garden to compost by the year 2000, with the ultimate aim to produce compost from one million tonnes per annum of household waste by the year 2001. Local government support is to be given in the evaluation of the potential to introduce central composting schemes by 1997, although the strategy does not directly support the implementation or utilisation of such facilities. Local authorities are also expected to introduce either kerbside collection schemes, or bring facilities within half a mile of the household, or two miles if there are other frequently used facilities in the area, for 80% of households by the year 2000. This target is ambiguous as there is no distinction made as to the distance that the frequently used facilities, in areas such as car parks and shopping centres, should be from the household.

Anticipated 'actors and players' involvement in the national waste strategy is clearly stated with regard to their specific roles. Central Government has the responsibility of promoting waste management in industry, Local Authorities, and households. It also states the philosophy that for the government to promote these issues on a national level, they must also have a strong internal environmental policy. This includes positive action towards the incorporation of reduction, reuse and recycling schemes. Local Authorities are responsible for ensuring implementation of national policies and should also ensure that internal systems are implemented. The Environment Agency is predicted to be a major force, and will be a key player in the delivery and future development of the waste strategy. Householders are named as the ultimate key group as it is their enacting of the policy that will dictate whether targets will be met. Greater participation is expected in recycling and composting activities, and a general change in consumer behaviour towards a more sustainable philosophy.

The overall aim is to direct waste management higher up the hierarchy, whilst specifying a number of more focused policies, for example there is a proposal for waste reduction targets for particular waste streams or particular industrial sectors. This is similar to the
Dutch approach as implementation of individual targets has been in place since 1989. However, a certain degree of scepticism still remains, that although credence is given to prevention and minimisation, the ultimate preferred options on the hierarchy, the UK still remains at the bottom, supporting landfill as the main disposal route. Current production of UK policies and strategies does not give a clear indication of how enthusiastic rhetoric can be developed into reality.

The production of a national waste strategy at this stage, after the EPA 1990 and the EA 1995, is in direct contrast to the Dutch approach. In this case a waste strategy in the form of a memorandum on waste and recycling was produced prior to the main legislation and, in fact, formed a basis for the policy development. The national waste strategy for England and Wales extends existing waste policies and develops targets and strategies further. The Dutch waste strategy formed the framework for the formulation of legislation in the first instance (refer to Section 4.3).

4.2.4 Impact of Legislative Changes
It is undeniable that the EPA 1990 and EA 1995 have and will continue to have considerable impact, particularly on local authorities with respect to changes in administration and also increased responsibility with a focus on waste management structure. In the private sector, the implementation of Duty of Care has resulted in companies that were not previously bound by statutes now required to adhere to legislative guidelines, namely waste holders and producers. With the onus now firmly placed on the principle of the polluter pays, companies may have extensive costs to fulfil Duty of Care. This increasing burden that has been placed on industry could be considered as a result of external pressure from NGO's, voluntary groups and the European Union (Jackson 1991), to force industry to accept responsibility.

It is also anticipated that policies within the Environment Act 1995, and also the National Waste Strategy for England and Wales have the potential to be extremely influential and introduce significant changes. However, at this stage it is too early to state whether the theory will be successfully translated into practice.
4.3 Developments in Netherlands Waste & Environment Legislation

The recent policy approach in the late 1980's and early 1990's has been based within a new conceptual framework of sustainability, which was influenced by a number of major reports. The Brundtland Commission in 1987 introduced the concept of sustainable development which was followed in 1988 by the publication of a report 'Zorgen Voor Morgen: Nationale Milieuverkenning 1985-2000' (in English - Care for Tomorrow: National Environment Reconnaissance 1985 - 2000) by the National Institute for Nature Management. This was to provide the scientific and theoretical basis for recent influential national environment legislation, such as the National Environment Policy Plan 1989 and subsequent additions.

4.3.1 Memorandum on the Prevention and Recycling of Waste

However, it is necessary to first discuss the role and influence of the Memorandum on the Prevention and Recycling of Waste, developed in 1988. This represented a guideline document from which national waste policy could be developed, incorporating a framework for discussion and exchanging of views. The Memorandum was developed within the philosophical framework that future waste policy would form part of an integral policy on the environment in general.

As the policy was designed within the conceptual framework of sustainable development, the Memorandum adopted a specific approach to achieve this, and this was in the form of a two-pronged strategy. This is illustrated in Figure 4.1. The source oriented strategy is focused on prevention and ease of recycling. The target groups are industries, households and the products themselves. This is in contrast to the effect oriented strategy which is concerned with management and protection, and with collection, transport, treatment and disposal of the objective target groups. Both the strategic approaches adhere strongly to the hierarchy of preferred management options. This strategic approach is similar to the distinction made in the EPA 1990 (UK) between Part I, which is concerned with IPC and source oriented issues, and Part II concerned with effect oriented issues.
Figure 4.1: The Dutch Two Pronged Strategy Approach to Sustainability

**Source Orientated Strategy**
- avoid/reduce production and escape of waste
- improve quality to effect easier recycling &/or reuse
- limit the negative effects of disposal

**Effect Orientated Strategy**
- management of waste from when its released & separated by production until final processing or disposal
- protect environment from waste in its application or disposal
- recycling & application methods carried out at other sites
- subsequent pollution caused by waste in its disposal

Source: Ministry of Housing, Physical Planning and Environment 1989

As well as proposing the strategic approach the Memorandum also included guidelines for specific targets in certain areas of the waste stream. These targets illustrated clearly the percentages for recycling and final disposal by the year 2000. The target for household waste is illustrated in Figure 4.2. The National Environment Policy Plan features general waste targets, which include prevention target of 10%, and a recycling target of 65%

Although the Memorandum was only offered as a guideline the targets are comparable to those featured in the National Environment Policy Plan, and the National Environment Policy Plan 2. It should be noted that the memorandum was developed with full consideration of the pending Policy Plan, which was introduced some six months later.
Figure 4.2: The Target for Household Waste as Featured in the Memorandum on Recycling and Prevention of Waste

Source: Ministry of Housing, Physical Planning and Environment 1988, p.16

4.3.2 National Environment Policy Plan

Current developments within the waste strategy have a firm statutory foundation within The National Environment Policy Plan 1989, National Environment Policy Plan Plus, and the recent amendment, the National Environment Policy Plan 2. These will be referred to in the text as NEPP, NEPP Plus and NEPP2 respectively.

NEPP was developed within the framework of sustainability, and was the result of extensive consultation and collaboration with environmental and consumer organisations. To support the ideals of the documentation the national government invested in advertising campaigns incorporating slogans and captions in the hope that public attitude and behaviour could be changed to become more conducive with the environment. To support implementation of NEPP a large number of actions were identified as being preferable to incorporate at Provincial level, whilst retaining national co-ordination and support.

NEPP was revolutionary in providing a basis for changes to the waste management infrastructure, and adopting new and innovative concepts. The legislation is focused on changing patterns of production and consumption, with important areas for control specified and targeted. The national government ensured that a budget would be
available to local authorities in support of recycling schemes and waste management initiatives.

NEPP Plus was introduced in 1991, and included a number of additions and amendments to the original policy document. With regard to waste, the policies featured within the NEPP Plus are designed to cut waste flows and consequently limit the load on the environment. The use of traditional disposal methods are to be reduced, and an overall prevention and reuse policy is to be promoted by the following strategies:

- accelerated screening of waste flows for possibilities of preventing and re-using waste
- a targeted product policy
- promotion of re-use through quality control of secondary raw materials and by raw material policy
- use of instruments e.g. environmental care and permits, and
- possible introduction of deposit return systems and regulatory levies after research.

Source: Ministry of Housing, Physical Planning and Environment 1991a

NEPP Plus also contains an overall target aimed at the total waste produced and is shown in Figure 4.3.

This strategy differs from earlier policy as the reliance on incineration is reduced, whilst the recycling requirement is increased. Also earlier targets were specific for particular priority waste streams, whereas this policy aims at the total amount of waste produced. The 65% target is very high, however it is achievable as the combined waste streams does include the industrial and commercial sector which are already achieving considerable success with regards to recycling. This may compensate for other generators included in the target.

Although elements of these two plans are still fully utilised, certain aspects have been superseded by NEPP 2. This was introduced in 1994 and emphasises the incorporation of sustainability, and makes a
number of target amendments based on previous achievements of the last five years. This emphasises the point that Dutch legislation is constantly being reviewed, amended and updated, allowing achievements or failures to be accommodated. The objectives of the first NEPP remain the same, with greater focus being placed on implementation. The underlying theme is emphasising the need for the government to support the target groups (including households) in strengthening their responsibilities, promoting the view that the government's role does not exceed establishment of frameworks and facilitating implementation. NEPP 2 also evaluated whether specific objectives were attainable with present policy. For waste this is perceived to be the case.

Figure 4.3: Target for All Waste

10% Prevention

65% Recycling

15% Incineration

10% Landfill

Source: Ministry of Housing, Physical Planning and Environment 1991a

4.3.3 Environmental Management Act
This was implemented in 1993 and provides a simplification of regulatory environment legislation by complete integration, treating environmental concerns in an holistic manner. This framework has laid the foundation for policies discussed in the NEPP's and Environmental Programmes to be dealt with by all levels of governments and all key ministries (Ministry of Housing, Physical Planning and the Environment 1994a). This does not replace any previous legislation, but provides a regulatory framework for all environmental law.
As a result of this Act, increased responsibility has been placed on Provinces and their role within environment management, with the requirement that they produce long term plans which can form the basis of action within the municipalities. Also, some of the larger or more proactive municipalities have the flexibility to develop their own plans, and although this is not stated in the Act as mandatory, monies can be made available by central government if they develop this option (Ministry of Housing, Physical Planning and the Environment 1994a).

4.3.4 Administration Structure
A unique aspect of Dutch legislation is the attitude towards implementation of policy at national and local levels. The policy makers have established that initial targets from the NEPP were being implemented at a slow rate. One solution to facilitate implementation was to incorporate a number of national statutory funded, independent bodies to offer advice, management skills, and research. The Afval Overleg Orgaan, or Waste Management Council (AOO) is one such body and was developed by the government in 1990 to promote waste management. Its prime function is to counter the previous lack of coordination at national level. The AOO is most active in areas where the government is experiencing most difficulties, in respect to waste management policies and strategies. Representatives from provincial and municipal authorities are all members of the AOO, with advisers ranging from environmental organisations, trade and industry, and representatives from the field of science. The framework within which AOO has developed its work ethic, is based on the ideal of resolving all national waste issues through discussion and agreement of all those involved, as opposed to law enforcement (Peeters 1993).

AOO had the initial task of producing a Ten Year Programme on Waste Management, which is reviewed every three years. This provides a common basis for all levels of government to work from. It incorporates the strategies and policies dictated in the NEPP, NEPP Plus and NEPP 2. However, the focus of the approach is guiding and aiding, implementation and success of these policies at a local level.
AOO is very involved with pilot schemes and action programmes, and produces advice to local and provincial areas on meeting the targets. The most recent and large scale action undertaken by AOO has been the development of the Programme on Separate Collection of Household Waste. Acknowledging the success of current policies in achieving the targets, the national and local government proceeded to introduce a systematic approach to increase the success of the collection of the dry component of household waste. This programme is operational within the framework of the Action Programme on Dry Components Waste Separation (launched by Ministry of Housing, Physical Planning and Environment) to promote achievement of the recycling targets by the year 2000 (refer to section 4.3.4 for further details).

AOO represents just one of the administrative organisations involved with waste management, although it is the most prolific. However, much of the work involves collaboration or utilisation of the National Institute of Public Health and Environmental Protection (RIVM). The RIVM is primarily responsible for research into 'man and environment' (RIVM 1992). It is a large and complex organisation whose work into waste management and, in particular, its effect on the environment, is just one of a wide range of areas of involvement. The RIVM is responsible for data gathering in respect to analysing the success of policies and targets by monitoring the waste composition. However, the information provision for AOO has been prolific in areas of data collection identifying trends enabling planning of strategies.

The Raad voor het Milieubeheer, or Council for the Environment (RNB) has been referred to as an 'environmental conscience' (Van Dijk 1994), providing advice and guidance to the government on their environmental policies. They are a public advisory board, which has been instituted by law, although they claim to occupy an independent position. RNB consists of integrated membership from numerous different groups including local authority, industry and voluntary organisations. Their recent work into waste management has included
identification of inadequacies between recycling goals, and the policies formulated to achieve them.

Warren Spring Laboratory (recently disbanded in 1994), and AEA Technology in the UK offer a similar service, in providing information to the government with regard to baseline data and feasibility studies. However they have not achieved the same status by any means as the AOO or RNB, and the implications of this are discussed in Chapters 7 and 8.

Non-government organisations (NGO's) have greater participation in the Netherlands than they do in the UK. The approach is unique and could possibly be attributed to cultural differences. The Dutch Government has a tradition of subsidising NGO's enabling them to become professional. Local, regional and national groups represent a number of different issues, including nature and the environment, and can participate in the development and implementation of policies. Stichting Natuur en Milieu (Netherlands Society for Nature and Environment) is a prominent NGO and due to its formal links with other related organisations it represents approximately 750,000 individuals (Stichting Natuur en Milieu 1991). It is concerned with a wide range of issues, including waste management.

The aim of the independent government funded organisation and NGO's is to give a 'voice' to all members of society in issues that are of national, European or global consequence. The role of these organisations, and the governments approach to implementation of waste policies is evaluated further in subsequent chapters.

4.3.5 Separate Collection of Household Waste
AOO in partnership with National, Provincial and local government have developed a programme on the separate collection of household waste. It operates within the framework of the Action Programme on Dry Components Waste Separation, which is non specific waste. Although policies to date are resulting in successful recycling rates, the Dutch government and supporting organisation have acknowledged the necessity to continue improving systems if the targets are to be
completed by the year 2000. The programme has resulted in all levels of government reaching an agreement on levels of responsibility between themselves and producers, targeted components, and methods proposed to achieve the targets (Afval Overleg Orgaan 1995). The shared responsibility dictates that the producers will become responsible for reuse and recycling whilst the government are responsible for collection and processing of the residual waste.

The selection of the components to feature within the programme reflect a great reluctance by the Dutch government to enter into the field of plastic recycling, preferring to recover the energy through incineration of the material. Whilst they perceive that markets are weak and not yet established, and technology immature they are determined to exclude plastic waste from the programme. Instead, the focus will be paper, glass and textiles. It is stated in the report that intensive collection programmes of these components, coupled with the organic collection scheme, will represent a 60% reuse/recycling of household waste (Afval Overleg Orgaan 1995 p.7). It is anticipated that this will culminate in a decrease in disposal costs, with the eventuality that additional collection costs will be negated by the savings from incineration of the reduced residual fraction. The final incentive to promote increased separation by the local authorities is centred around the ban on landfilling household waste on 1 January 1996, which will result in higher processing costs as all residual household waste must now be incinerated to provide energy. Of course, this does not have any implications for cities predominantly incinerating at present, namely Amsterdam.

With regard to plastics and metals, it is proposed that further developments may include separation from the residual waste at the point of disposal. However it must be stressed that although the programme does not support traditional separation techniques at source for plastics and cans, individual municipalities are at liberty to promote these schemes. This freedom does mean that there will be evidence of other systems in operation as well as the national basic collection system, and the Dutch will therefore be in a position to regard the degree of success of other schemes.
Of course, the programme is centred upon promoting the approach that is capable of reaching the targets, whilst entailing the lowest costs. Which could be contrasted with the approach currently in the UK, of promoting low cost strategies regardless of their effect on target completion due to a lack of financial availability and investment.

It is interesting to note that the programme supports kerbside collection of paper and intensive bottle banks for glass at a density of one bank per 650 inhabitants. This is in contrast to schemes promoted in Amsterdam, whereby the glass and paper banks are almost always located together encouraging the public to habitually recycle both materials. However, the programme does exhibit flexibility with the choice of schemes for specific areas. To support the programme and present a more formal stance, the components to be collected must feature in each Provincial Environmental Ordinance throughout the country, reflecting a united approach. This is similar to the requirement for all Local Authorities in the UK to produce recycling plans featuring all identified components.

4.4 The Influence of Sustainability
Sustainable development represents the key theme in recent Dutch legislation and policy documents, and to a certain extent in the UK legislation. Following the Earth Summit 1992 in Rio, sustainable development is now a fully established objective, at both national and global level. With specific reference to waste, sustainability requires integrated management with pollution to be fully controlled. Promotion of the '3Rs' (reduce, reuse, recycle) is encouraged and a focus is placed on prevention.

Agenda 21, as the blueprint for action, is the tool at both national and local level to assist the implementation of sustainable development. A specific component of the action tool is focused on waste management, specifically minimisation, re-use and recycling. Within the Agenda 21 documentation national programmes for re-use and recycling are required.
Both the UK and the Netherlands have shown a commitment to sustainability in waste management, whether this has been pilot schemes focusing in industrial or commercial sectors, or embedded in national and local policy.

Promoting Agenda 21 at both national and local level incorporates the philosophy of both a 'top down' and 'bottom up' approach to implementation. Local action within the framework of Local Agenda 21 forms a crucial component to the success of national sustainable strategies. The relevance and importance of the sustainable development movement incorporating both strategies, and the role it plays with regard to waste management, will be critically evaluated in greater detail in subsequent chapters.

4.5 European Community and European Union Influence

Prior to evaluating impacts and influences of Europe, it is necessary to explain the distinction between the European Community (EC) and the European Union (EU). The EC became known as the EU in 1994 as a direct consequence of the Maastricht Treaty. It signifies a move towards greater unity between the member states. Any policies or directives introduced post 1994 are referred to as EU, and anything prior is referred to as EC.

Comparative research of this nature necessitates the need for an investigation of the existence of common external influences, and not simply an evaluation of two national policy variations in distinct isolation. As both countries are members of the European Union, then it is a reasonable assumption that, with regard to policy development and future trends, the EU has and will play a prominent role. It is also reasonable to state that both countries respond differently to European Directives and proposals, and the prominence each country plays with regard to the development of European initiatives is contrasting.

Waste Directives introduced prior to the Single European Act, which gave the environment a true legislative base, provided the foundations for the initial waste and environmental legislation in the 1970's. The Framework Waste Directive of 1975 reflected the aims and
objectives stated in the first environmental action programme. The main emphasis was placed on the reduction of pollution and the installation of a reactive response to degradation. Therefore, it is needless to state that the Control of pollution Act 1974 and Waste Product Act 1977 (refer to Chapter 3) which were synonymous with the Directives implementation, reflected these aims. Any inadequacies in meeting the aims and objectives could be attributed to incorrect implementation or lack of guidance and support from a European level.

4.5.1 European Action Programmes
The Action Programmes that followed provide an insight into the developing sophistication and maturity of approaches, in respect to environmental protection and enhancement in the EC. These programmes are introduced at European level and illustrate the themes that succeeding Environmental Directives will focus upon. They have given a clear indication in policy terms of the changing awareness and attitude towards environmental issues over the last two decades. The Third Action Programme in 1983 illustrated this with a greater orientation towards preventative action from a long term perspective, focusing on an integration with global environmental issues. The Fourth Action Programme launched in 1987, made a more definitive move towards a general preventative approach to the environment, including a new emphasis on the conservation of natural resources, and increased action on disposal and recycling of waste. At the same time that this was introduced, the European Year of the Environment 1987 (EYE) was launched, placing an emphasis on changing attitudes to ensure that environmental protection is achieved. Concepts of sustainability were introduced, in particular environmental equity. This was not regarded simply as a year long project, but it was hoped that it would have long term effects.

In the late 1980's, in response to the Third and Fourth Action Programmes, significant new Directives that have had a direct impact on waste practices throughout the European Union, were introduced. Disposal options such as incineration are now covered by stringent controls in existing legislation such as Municipal Waste Incineration
1989, and the future for landfill is set to change with the implementation of the proposed Landfill Directive. As the Dutch Government had already reduced their reliance on landfill as a disposal option and proceeded to incorporate practices higher up the hierarchy, this Directive will have a greater impact on UK waste management options. It is set to alter the cost of disposal so it reflects the true cost of site construction, operation, closure and environmental protection. This will bring the price for landfiling waste more in line with the Netherlands and other member states, and is proposed to encourage more recycling and prevention. The other aspect of significance to the current UK procedures is the proposed ban on co-disposal practices. This is a very popular, although controversial practice that has a long history in the UK, and any ban imposed by the European Union will have very significant effect on waste disposal systems and management practices in operation.

The impact of the 1987 Fourth Action Programme was enhanced in 1989 by the production of a community policy document outlining a strategy for waste management within the European Community (SEC89/934 (final)), and it was within this that a 5 stage priority strategy (refer to Chapter 2) was identified. Working alongside the objectives stated in Article 130 about taking preventative action and utilising the polluter pays principle, the following strategy has become familiar in national policy throughout the European Community.

In 1992 the Fifth Action Programme was unveiled. It was based within the conceptual framework of sustainable development. Performance targets were set to be met by the year 2000 (refer to Figure 4.4), although in reality they did not have a legal basis as yet.

It is anticipated, as with previous action programmes, that this will pave the way for the development of more stringent environmental and waste directives by the year 2000. As previous trends have illustrated, waste management remains a firm area of focus, and in the action programme there is a re-emphasis of the hierarchy of waste management. Tools to achieve waste prevention, minimisation and recycling, such as life cycle assessment, are introduced in the
programme. However, life cycle assessment is not addressed in the research as it has only recently been applied to waste management, and can be regarded as being in its preliminary stages of application. This is discussed further in Chapter 8.

It is interesting to note that most of the aims and objectives stated in the Fifth Action Programme have already been clearly implemented in Dutch legislation. This is in direct contrast with the UK which gives the appearance of preferring to adopt a reactive stance, choosing not to act until targets have a statutory base.

Figure 4.4: Specific Targets and Strategies for Waste as featured in the Fifth Environmental Action Programme

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stabilise municipal waste production to 1985 level: 300kg per head</td>
</tr>
<tr>
<td>2</td>
<td>Recycle 50% paper, glass &amp; plastics</td>
</tr>
<tr>
<td>3</td>
<td>End export of waste for disposal outside the EU</td>
</tr>
<tr>
<td>4</td>
<td>90% reduction in dioxin emissions from incineration</td>
</tr>
<tr>
<td>5</td>
<td>Increase recycling consumer products &amp; develop markets for recycled products</td>
</tr>
<tr>
<td>6</td>
<td>EU infrastructure for safe collection, separation &amp; disposal of hazardous waste</td>
</tr>
<tr>
<td>7</td>
<td>Banning certain waste from landfill</td>
</tr>
</tbody>
</table>

Source: Croners Waste Management 1994

Each of the targets featured in the Fifth Action Programme are evaluated below in terms of comparable national targets featured in the UK and the Netherlands:

**Target 1:** The Dutch government introduced the concept of stabilising municipal waste production at the 1985 level in the Memorandum on the Prevention and Recycling of Waste. It forms an integral component of their prevention and reduction strategy. The UK proposed a much less stringent strategy of stabilising municipal waste
production at the current 1995 level in the draft Waste Strategy for England and Wales, although it was not included in the final version in December 1995.

**Target 2:** Dutch recycling targets that have been set also reflect the aims of the Fifth Action Programme in that they hope to achieve 65% recycling of controlled waste by year 2000. Currently they are achieving 73% recycling of domestic glass and 55% recycling of used paper (Laurijssens 1994). In the UK the national recycling target has been set at 25% for household waste, however the achievement at present is estimated to be on average 5%. Current achievements for separate components include 29% for glass, 6% for plastic and 35% for paper and board, from household and commercial waste. It is clear that the implementation of the Packaging Directive will have implications on recycling targets in both countries, but more so in the UK where the deficit between target aims and objectives, and current realisations, is more significant.

**Target 3:** With regard to the export of waste external to the EU, the Dutch government have stated in the NEPP that disposal should take place internally. This has been developed to the extent that it is proposed each province should be responsible for their own waste (Peeters 1993), and therefore they do not anticipate any movement of waste across provincial boundaries within the country. This is much more stringent than the EU response to restrict the movement of waste across national boundaries. However the UK has traditionally been an importer of certain types of waste, but national rhetoric has recently been approaching the Dutch philosophy of instilling responsibility of waste disposal on municipalities, with the implementation of the proximity principle.

**Target 4:** The Dutch are a leading force in the implementation of incineration technology as a consequence of significant internal pressure from well documented incidents of dioxins entering the food chain. In the UK the government is still in the process of implementing the EU Incineration Directive and although new developments meet the stringent targets, the existing older sites
remain below emission standards, but are scheduled for closure or retrofitting by the end of 1996.

**Target 5:** Activity in the promotion of recycling consumer products has been focused on the development and successful implementation of packaging policy. In the Netherlands this has been in the form of a packaging covenant, an agreement between industry and the government, to recycle and reduce high levels of packaging waste. The UK government is similarly developing such an agreement with the packaging industry, although specific targets remain unresolved. There is also continuing conflict between the industry and national government on allocation of responsibilities. This is discussed in greater detail in Section 4.8. Various campaigns such as the Buy Recycled Campaign in the UK, and numerous similar schemes in the Netherlands have had varied success, but there remains a need for specific policies to co-ordinate and formalise the action.

**Target 6:** Separate collection of household hazardous waste has been ongoing for some years in the Netherlands, and greater attention will be focused on this specific component during the rest of this decade. This is evident from promotions underway in Amsterdam, and this aspect is discussed within the local study in Chapter 5. It is clear that the Dutch will become a leading proponent of source separation of household hazardous waste, and will be influential in the development of European wide policy in the near future. At present, however, there has been no indication of the implementation of a similar national scheme in the UK, although a number of specific areas, including Leeds and Oxfordshire, have attempted collection schemes. There has been a tendency for specific components of hazardous household waste to be targeted by the specific industry involved, for example paint collection. However, these schemes have been inconsistent and not universal.

**Target 7:** The Dutch government has targeted a complete ban on landfilling household waste, to be implemented in 1996, and they also propose a decree banning landfill for thirty priority waste streams (refer to NEPP 2). The UK government are aiming towards a less stringent
target of reducing the amount of controlled waste being landfilled by 10% by 2005 (Department of the Environment 1995).

4.5.2 Conflicts with EC and EU Directives
There is the potential problem that the Netherlands may disagree with the EU over a number of proposed Waste Directives. Within the Netherlands waste legislation and strategies are at an advanced stage. The Dutch Government has produced and successfully implemented a number of stringent waste management policies. National targets are already being achieved and are under constant review and extension. This is dissimilar to the UK as it is only the recent development of the Environment Act 1995 and the provision for the development of a national waste strategy, that has resulted in a number of more innovative and advanced waste strategies being proposed. Most have yet to be implemented and therefore it is impossible to gauge their potential for success. National achievement of targets, and in particular the household recycling target, appears to be unlikely. The less developed stage of waste management strategies in the UK is comparable to a number of other member states within the EU and thus proposed waste directives must be formulated at a level achievable by the majority. The potential conflict between the EU and the Netherlands is that the Dutch national legislation may be more stringent than that proposed by the EU. This is occurring at present with the EU provisions for packaging targets, which are lower than those currently featured in the packaging covenant in place in the Netherlands (refer to Sections 4.7 and 4.8). Disputes are focused on the possibility of more stringent national policies creating a barrier to trade within the EU, which is in conflict with the Treaty. This highlights the continual debate of the Maastricht Treaty and the right to claim subsidiarity.

It is important at this stage to understand the role of innovative instruments that the Dutch government have adopted to ease implementation. There have been many proposed including financial incentives and penalties (refer to Section 4.6) setting examples of good practice; each of which enable the behaviour of business and the general public to be influenced to varying degrees. However, it is the
system of covenants that has gained the most interest and success with regard to promotion of aspects of waste management, and therefore commands detailed consideration (refer to Section 4.7).

4.6 Market Instruments

Typically, it has been said that governments often distinguish themselves from one another by the method of implementation rather than the content of the policy (Heidenheimer et al. 1990), therefore an evaluation of the implementation methods favoured by the UK and the Netherlands for their waste management policies is essential. Traditionally, waste management policy has been secured where the regulatory authority sets a goal or target and the polluter must adhere to it or face a penalty (Pearce et al. 1993). However, there is an increasing tendency in the Netherlands and the UK - as mentioned in NEPP and This Common Inheritance: The Second Year Report 1992 respectively - to favour market instruments. In both countries the types of market based instruments to deal with externalities and promote more favourable waste management strategies, is constantly under consideration (Table 4.4).

Table 4.4: Types of Waste Policy Instruments Currently in Use in the UK and the Netherlands

<table>
<thead>
<tr>
<th>Instrument</th>
<th>UK</th>
<th>Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit-refund</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Product tax</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Ban</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Recycling target</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mandatory collection</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Covenant</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Waste tax</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Subsidies</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Price support</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Recycling credit</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Source: Adapted from Environmental Resources Limited 1992
The Dutch have utilised a range of instruments, recently incorporating innovative actions such as packaging covenants, and a ban on the landfill of household waste. The impact of covenants on waste management has been significant and is evaluated in Section 4.7. To meet these stringent policies, the Dutch government acknowledged that the main difficulties would lie with implementation at local level. Therefore, greater emphasis has been placed, within the Dutch waste strategy, on the use of different instruments to successfully achieve targets. There have also been evaluations into the use of a tariff system. This has been applied in Oostzaan and is called 'diftar' (Hanemaayer 1993). Householders are charged per kilogram of waste to be disposed using a differentiated tariff. It is anticipated that direct charging may encourage the householder to reduce the amount of waste they produce, by either prevention, minimisation, or recycling. However, there is also the possibility that this type of system may lead to illegal disposal, and this issue is discussed further in subsequent chapters.

In the UK, previous application of economic instruments within the field of waste management has been limited. The relationship between the use of market instruments (for example the imposition in the UK landfill tax (Coopers & Lybrand 1993, Pearce et al. 1993, Royal Commission on Environmental Pollution 1993), with the use of conventional regulatory policy instruments, and the impact they have on the waste management options still remains to be seen. The landfill tax is an important new concept in the UK as it aims to ensure that disposal of waste reflects the 'true environmental cost' and incorporates the polluter pays principle. Currently in the UK the cost of disposal in a landfill is a cheap alternative to the other options such as recycling and incineration with energy recovery. The landfill tax is proposed to increase the disposal cost of inactive wastes by £2.00 per tonne and £7.00 per tonne for other waste. However what is still unclear is the implementation structure for the landfill tax, which is to be in place by October 1996. Critiques of the landfill tax have focused the problems associated with the proposed application of the tax. However, the use of a landfill tax has been welcomed by some sectors in the waste management industry as it is anticipated that the cost of
landfill will be increased to a more comparable level with other options. It is hoped that such a tax will stimulate recycling and incineration. The acceptance or failure of the landfill tax will give an important indication of the potential role of economics in the policy process, and the "willingness to pay" (Barde & Pearce 1991, p.4).

As previously mentioned, other economic instruments in use in the UK include recycling credits, which were given a statutory base in EPA 1990. They aim to encourage recycling within local authorities by authorising the use of a monetary incentive to reduce the quantity of the waste stream requiring final disposal. However, such a system of rebates is proving difficult to monitor and administer comprehensively.

The application of economic instruments to manipulate the market and encourage the use of alternative waste management options will continue to increase as the recycling target dates become closer. These include the utilisation of product taxes for PET soft drinks bottles, and a price support scheme for waste paper in the Netherlands (Wilson 1995). Currently there are a number of proposals under discussion in both the UK (ERL 1992; Coopers & Lybrand 1993) and the Netherlands, although due to the minimum number of instruments in use at present, greatest development will occur in the UK. Also, as it becomes apparent that preferred waste management options higher up the hierarchy are not being achieved, government intervention will occur. It is the combination of different instruments that will provide the main focus of development, targeted towards specific actors and players, a philosophy supported by Fenton & Hayley (1994) in their evaluation of economic instruments and waste minimisation. This is clearly an approach already adopted by the Dutch with a combination of incentive led, mandatory based, price support mechanisms, and voluntary agreements.

4.7 Dutch Covenants
A highly distinguishing approach to environmental policy systems in the Netherlands has been the application of environmental covenants. These have emerged due to ineffective complex regulations that have
not protected the environment, but contributed to its continual decay. Lack of compliance resulted from licensing regimes which were difficult to administer and unaccountable to specific situations. An alternative instrument was sought by the government that had to be based on a 'quid pro quo' situation (Koster 1993 p.2). This resulted in the introduction of a system whereby the government or quasi-government bodies develop a contractual arrangement with members of the business community (Koster 1993). The covenants are committed to meet pollution, energy and waste reduction targets in combination with the NEPP, NEPP Plus and NEPP2. The covenants can be very influential in the development of environmental policy, particularly if they are preparational covenants. They provide the opportunity to companies to prioritise action within their own time scale, and attempt to standardise aims and objectives on a national level. Many of the practical problems experienced by the traditional methods of licensing, with many different bodies in control, are avoided.

The UK has not developed environmental or waste covenants as part of their implementation strategy. The progress is slow with regard to innovative approaches to ease regulation and enforcement.

Generally, environmental covenants do not have a direct impact on household waste, however they do influence those involved in the waste management chain, whether they are producers or disposers. There is one particular covenant that is of significance to the household waste stream, and that is the packaging covenant (refer to section 4.8 for details). Packaging plays a very important role in waste management and has received a significant amount of attention with regard to policies, strategies, and methods of implementation. The covenant is based within a framework of multi-point commitment by all companies within the packaging chain. Again, as in the style of environment covenants, it is based upon voluntary agreement.

4.8 Packaging
The issue of 'producer responsibility', incorporating the cradle to grave principle, particularly with reference to packaging waste, has played a
role in the Netherlands since October 1990 when a Packaging Covenant was introduced (Anon. 1991). The Covenant was signed by producers and the government in July 1991, and sets concrete targets for waste prevention and recycling. The Packaging Covenant represents a proactive response to a well documented contentious area in terms of waste production. Again, the covenant is fully integrated with the aims and objectives of the waste hierarchy with a focus on prevention, reduction, reuse and recycling. The Packaging Covenant actively promotes the use of environmental management tools, such as Life Cycle Analysis. The application of this tool has far reaching implications as the covenant clearly supports its role in ascertaining environmentally preferable packaging.

This covenant is expected to have a direct impact on the household waste stream enabling targets towards prevention, reduction and recycling to be met from both a source oriented and effect oriented perspective. A covenant such as this may enable household waste targets to be met due to the industries commitment to 'take back' such a high percentage. However, the potential success of such a scheme should be met with caution as the comparable German Duales System Deutschland (DSD) resulted in a number of market failures. Their inability in the first instance to accommodate all the material collected for recycling resulted in the 'flooding' of overseas markets causing the price to plummet. Due to German investment in domestic recycling plants this large scale availability of packaging material has ceased to a certain extent (Edwards 1995).

Deposit refund schemes remain a dominant part of the Dutch lifestyle, and to secure this system with regard to managing one aspect of the packaging chain there is a policy for mandatory deposits to be placed on imported drinks.

In the UK, the prospect of a packaging agreement was only announced in July 1993 by the government, and in February 1994 the newly formed Producer Responsibility Industry Group (PRG) recognised the need for a packaging levy to meet the proposed recycling targets (ENDS 1994, PRG 1994). There is some confusion over the measures to take to
achieve the policy goals as "the policy includes two options which have very different implications" (ENDS 1994b). There is an aim to reclaim packaging material from industry and commerce, and also to extend the provisions for reclaiming packaging material from the household waste stream. The current kerbside and drop-off schemes will require expansion and there aims to be a greater incentive towards energy from waste.

The debate is ongoing as to where the ultimate responsibility will lie, and there appears to be little indication that the government and the packaging industry are close to a final agreement. Current options under discussion are illustrated in Table 4.5.

The government appears to particularly favour the packer/filler option, however, the manufacturers and retailers seem to prefer the shared producer responsibility option. This option is distinct from the others in that it proposes to deal with household and industrial/commercial packaging waste separately. This differs from the Dutch preference towards multi-point option for both the household and industrial/commercial packaging waste, although this is based on voluntary agreement and is without a legal framework.

It is interesting to note that both the Dutch and the UK targets towards packaging are more stringent than those proposed in the EU Packaging Directive. This is illustrated in Table 4.6 where the recovery and recycling targets are higher than those in the Directive.

There has been some conflict with the EU, especially from the Dutch and the Germans that the EU target is too lenient. Greater emphasis has been placed on the role of the packaging industry and incorporating the polluter pays principle.

The action between the packaging industry and the government in the UK, to reach an agreement on how the targets are to be met is similar to the Dutch Covenant system. This technique is new to the UK and this may be reflected in the length of time it is taking for the government and the industry to reach an agreement they are both
satisfied with. There is obviously more development needed in the UK before the use of agreements and covenants can be fully incorporated as in the Netherlands.

Table 4.5: Options for Responsibility of the Packaging Levy under Debate in the UK

<table>
<thead>
<tr>
<th>Option</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convertor</td>
<td>• ease of administration &amp; enforcement</td>
</tr>
<tr>
<td>Responsibility</td>
<td>• low overall cost</td>
</tr>
<tr>
<td></td>
<td>• unfair share of burden of recovery</td>
</tr>
<tr>
<td>Packer/filler</td>
<td>• recovery cost spread more evenly</td>
</tr>
<tr>
<td>Responsibility</td>
<td>• easier to pass on cost to consumer</td>
</tr>
<tr>
<td></td>
<td>• influence choice of packaging materials</td>
</tr>
<tr>
<td>Wholesaler/retailer</td>
<td>• ensure cost passed onto consumer</td>
</tr>
<tr>
<td>Responsibility</td>
<td>• difficult to administer</td>
</tr>
<tr>
<td></td>
<td>• exemptions needed for small firms</td>
</tr>
<tr>
<td>Omni-point option</td>
<td>• responsibility on 'brand owner'</td>
</tr>
<tr>
<td></td>
<td>• no identifying mark - fall on retailer</td>
</tr>
<tr>
<td></td>
<td>• targets those responsible for specifying &amp; using packaging</td>
</tr>
<tr>
<td></td>
<td>• could promote waste minimisation</td>
</tr>
<tr>
<td>Multi-point Option</td>
<td>• ensure fairest distribution of costs</td>
</tr>
<tr>
<td></td>
<td>• require complex regulatory system</td>
</tr>
<tr>
<td></td>
<td>• targets divided equally along the chain</td>
</tr>
<tr>
<td>Equi-point Option</td>
<td>• takes advantage of differing expertise</td>
</tr>
<tr>
<td></td>
<td>• post-consumer: packers/fillers &amp; retailers responsible, converters responsible for recycled content, raw material manufacturers reprocess the waste</td>
</tr>
<tr>
<td></td>
<td>• difficult to enforce and administer</td>
</tr>
<tr>
<td>Shared Producer Responsibility</td>
<td>• deals with industrial/commercial separately from household packaging waste</td>
</tr>
<tr>
<td>Option</td>
<td>• industrial/commercial: responsibility on those whose premises the waste arises</td>
</tr>
<tr>
<td></td>
<td>• household: shared across packaging chain</td>
</tr>
</tbody>
</table>

Source: Croners Environmental Management 1995
Table 4.6: Comparison of the Targets Featured in the EU Packaging Directive, Dutch Packaging Covenant, and the PRG Plan, UK.

<table>
<thead>
<tr>
<th>Policy</th>
<th>Recovery Target</th>
<th>Recycling Target</th>
<th>Landfill, Incineration (with energy recovery)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU Packaging Directive</td>
<td>50-65% within 5 years of implementation</td>
<td>25-45% within 5 years of implementation</td>
<td></td>
</tr>
<tr>
<td>PRG Plan (UK)</td>
<td>58% by 2000</td>
<td>30% by 2000</td>
<td>30% reduction to landfill by 2000 650kt p.a. of paper, board and plastics incinerated</td>
</tr>
<tr>
<td>Packaging Covenant (Netherlands)</td>
<td>90% by 2000</td>
<td></td>
<td>40% reduction to landfill by 2000 40% material recovered can be incinerated</td>
</tr>
</tbody>
</table>


It is possible that although the covenants appear to be a revolutionary management system, they may have their limitations and could possibly be in direct contravention with the European Union. That is, covenants cannot completely replace the role of legislation as EU Directives are required to be implemented in formal national legislation, not in the form of agreements. Also, it is possible that contractual arrangements may restrict European competition and therefore be prohibited by Article 85 of the Treaty. However, as the Dutch are one of the leading countries in developing EU environmental policy and legislation, they may be dictating the future trend in the implementation of less formal systems to achieve more stringent targets and goals. Currently, differences in targets, responsibilities and definitions feature in the EU Packaging Directive,
compared to the Dutch Covenant system which is undeniably more stringent. However, the Dutch state that it is the EU's responsibility to legislate at a high level, and point to the fact that many countries including Belgium, France and the UK, are making advances towards implementing their own packaging strategies. The Dutch exerted great pressure and influence over the way the Packaging Directive evolved, but was outvoted by other member states who believed that the targets in the Packaging directive were attainable by all countries.

4.9 Success of Waste Policies to Date

As initial policies have been underway for a number of years now, it is important to ascertain the successes or failures of the targets to date. In the Netherlands the situation can be regarded as propitious, as a large amount of household waste is already being separated for recycling. Approximate national figures include 73% of all domestic glass waste currently being collected via the drop-off schemes and recycled. Used paper is also being successfully collected via the drop-off schemes at a level of approximately 55% (Laurijsens 1994). This level is certain to increase as innovative schemes are applied to areas where it was previously unsuitable for the traditional recycling banks. This includes the provision of underground storage systems more suited to spatially restricted areas.

Pilot schemes for the collection of recyclables at the kerbside are also underway in the Netherlands incorporating a number of innovative techniques. These include the split bin, blue box and green bag schemes as discussed in Chapter 2. The mandatory source separation scheme of vegetable, fruit and garden waste is the best example of a nation-wide campaign to incorporate kerbside collection. This scheme has been fully incorporated in a large number of municipalities and it is expected that by 1996 all municipalities will be actively involved.

Obtaining data to evaluate the periodic success of the waste policies in the Netherlands is a relatively easy process. Due to the governments' commitment to achieving stringent waste management targets, monitoring and assessment programmes are commonplace. However, this is not the case in the UK. As the target is a general one, data to evaluate the success of particular components of the household waste
stream is not readily available. The current national recycling rate is very low, despite the fact that drop-off and kerbside collection schemes are being promoted at different places throughout the country. These include pilot kerbside schemes incorporating split bin, blue box and green bag schemes, similar to the situation in the Netherlands. Drop-off schemes are not fully utilised on a national level although it is anticipated that the densities of recycling banks will increase.

Recent policies and influence from the European Union will effect more significant changes in the UK, although at present management, structural and implementation developments need to be realised.

4.10 Conclusion
The complexity of constantly evolving policies and legislation controlling waste management in the present day, makes it very difficult to believe that less than 25 years ago regulations governing the control and disposal of waste were barely in existence (Garbutt 1992).

Both the UK and the Netherlands have been active in developing more sophisticated and integrated legislation, with a greater focus on a statutory basis for waste management. The Dutch environmental planning system has been described by the OECD as setting an example from which other countries can learn (Anon. 1995a). A distinct difference between the two countries however is obvious, with regard to the administrative and implementation structure. That is, the Netherlands has exhibited a proactive stance, leading and influencing the development of EU environment and waste policy. This differs from the UK which has been reactionary, its own environment and waste policy greatly influenced by EU Directives. Although this issue is of great interest with regard to the attitude to national level policy development, its influence on the research issues needs to be considered carefully. That is to say, is the active development of legislation in terms of a proactive or reactive response an important element of the success of recycling, or is the internal implementation of the existing legislative more significant? The debate focuses on the fact that as the UK has incorporated environment and waste legislation, is it of any consequence that the national government was
simply following EU and its member states influences? The proactive response of the Netherlands may initiate waste legislation earlier than in the UK, however the interesting aspect is whether this may result in differing attitudes with regard to implementation structures.

This chapter presents an insight into the initial significant differences between the formation and application of waste policies in the UK and the Netherlands. The Dutch preference towards the application of independent government funded organisations is evident by the number and influence of bodies concerned with waste. Their role appears to be in an advisory and consultative capacity, bridging the gap between legislation and policy development, and its application on a local level. This bridging concept forms an important focus in the following chapters, where its integration between local and national level is fully evaluated.
Chapter 5: Local Level Analysis - A Comparison of Sheffield and Amsterdam

5.1 Introduction
As stated in the methodology, a detailed analysis of waste management strategies at local level is an integral part of this research. Selection of two cities for extraction of specialised and defined data provides the research with a focus, and a comparison of influential factors forms the framework for the local study.

As explained in the research design (Chapter 1), Sheffield and Amsterdam were selected for local evaluation (refer to Table 1.1). Sheffield has a large population of just over half a million, a land area of 367 Km$^2$, and is the fourth largest city in the UK. Once a thriving industrial city, dominated by the steel and coal mining industries, there has previously been a deterioration in the economic climate. Redevelopment of large areas of land for non-manufacturing use has been ongoing, focusing on the development of leisure, recreation and retail outlets.

Sheffield is regarded as an example of good practice within the UK in terms of recycling initiatives and implemented strategies. The interest in recycling was developed in 1986, when the Cleansing Services Department developed a Recycling Forum in partnership with other interested and relevant Departments, voluntary groups and local industry, to evaluate recycling in the city (Simmonite 1990). This paved the way to a certain extent to Sheffield being declared the UK's first Recycling City in May 1989, allowing the city to take an innovative and proactive stance with regard to recycling initiatives. It is worthwhile noting that in an effort to increase its status and attract business, income and employment to the area, Sheffield hosted the 1991 World Student Games, which unfortunately was not as lucrative as was hoped, leaving the Local Authority heavily in debt. This had
implications for budgetary and financial issues within the city, including funding for waste management strategies and recycling schemes.

Amsterdam is the capital city of the Netherlands, with a slightly larger population than Sheffield of just under three quarters of a million, and a land area of approximately 161 Km\(^2\). The population density is extremely high. However, this is not unique as many other cities throughout the Netherlands can claim comparably high densities. Problems associated with high population densities can be significant, and these are addressed, within an evaluation of implementation and success of waste management strategies.

A dense network of canals operates throughout the city, and these are utilised by tourists and commercial business trade alike. Amsterdam has a long industrial and business heritage, as a consequence of its location and status. The tourist trade today is responsible for a large proportion of income to the city, and this is reflected in the large range of facilities oriented to attract visitors.

Although Amsterdam is not regarded as an example of good practice in recycling terms throughout the Netherlands, it has invested a considerable amount of time and resources into the development of waste management strategies, and is achieving commendable rates of materials recovery and recycling.

Although activity towards promoting separation of waste at the source is prominent in Amsterdam, this is integrated with the promotion of behavioural changes towards waste production by the householder, as prevention and minimisation form principle elements of the overall environment policy. There is also the recognised assumption that local targets may differ from national targets and it has been made a priori by the Milieudienst that local level circumstance should be taken into consideration with regard to the achievement of recycling rates.
The Local Authority in Sheffield has focused all their attention on the promotion of recycling and recovery. There has been little if any orientation towards minimisation or prevention at the local level, which reflects the national situation at present, where investment in these issues appears to be focused towards the packaging industry, as opposed to the household. The Local Authority has not set any local deviation from the national level of recycling 25% of household waste, although it will be extremely difficult and unlikely for this achievement to be made by the year 2000 (refer to section 5.7 for data analysis). However the recovery target of 40% of municipal solid waste will be met by the year 2000, as this includes incineration with energy recovery (refer to Chapter 4 for further details of this policy).

The similarities between the cities is focused on population size, diversity of geographical features and incorporation of kerbside, drop-off and energy recovery as major components of their waste management strategies. Their suitability for comparison is further evaluated throughout this chapter in terms of their innovative stance and support for opportunities to recycle and recover energy from waste.

The local study incorporated behavioural analysis and evaluation, although as the concept of behaviour is complex, it is addressed separately in Chapter 6.

5.2 Rationale of Recycling in Sheffield and Amsterdam

It is essential within the framework of this research, to identify the philosophical or theoretical context from which recycling has evolved within the two cities. This is not simply for comparative evaluative purposes in the first instance, but to identify the mechanisms from which recycling operates in each city, and establish whether their purpose has been achieved. Although it is safe to state that in both cities national targets have been the initial instigator of any increased activity, it does not necessarily represent the underlying theme.

In Sheffield, current recycling activity is as a consequence of its role as the UK's first Recycling City. There is a great reluctance by the Local
Authority to reduce or stop its expansion of recycling schemes and strategies, regardless of the end of the Recycling City Project in 1992. It could be hypothesised that the desire to succeed in this project could be a consequence of the city's well publicised earlier failure in financial terms of the European Games, although this statement is unsubstantiated. However a more feasible explanation is based within a number of integrated issues, with a focus on a concern to achieve high success rates in recycling due to the extensive internal interest generated as Recycling City. Differing objectives such as provision of money for charity, employment, integration of the handicapped and general positive feelings within the city, have all played a role in the development of Sheffield's recycling strategies, and are now important in forming the basis of their ongoing rationale. Also as Recycling City 'changed' to Recycling 2000, it became more locally oriented with less of a national approach. This is evident at the quarterly meetings of the Sheffield Recycling 2000 forum. Emphasis is placed on the success of the charity and not-for-profit organisations which operate and manage a number of the schemes. Community involvement is uppermost, and innovative although occasionally ad hoc schemes to encourage positive environmental attitudes and behaviour are integrated throughout the city. Environmental determinism and social engineering is incorporated to a certain context in that although some of the actions appear to have minimal impact in environmental terms, the implications to induce more positive behaviour in the local population could be extensive. Attention is focused on the determination to develop and increase the recycling activity, although there are a number of issues of concern, including the fact that the recycling rate for the city is very low, and below the national average of 5% (Audit Commission 1995). This chapter will address some of the issues, and evaluate the influential factors that preclude Sheffield from achieving high rates, irrespective of its positive social rationale.

Within Amsterdam, impressions indicate that their rationale is based within a context of sustainability and resource issues. However, although these issues are extremely influential, the situation is more complex. Amsterdam has to continually invest in innovative schemes to develop and enhance their recycling rates. They are achieving
figures significantly less than the stringent national targets, therefore this in itself is extremely influential. The ideal of recycling throughout the Netherlands is generated towards environmentalism and acts as a contributory factor towards becoming a more 'green' society. This is also the case for Amsterdam, although economic issues such as decreased costs for disposal play a very important role. Therefore the basis of the rational is generated within a formal environmental, social and also market based philosophy, which is reflected throughout the country.

5.3 UK Recycling City Project
This was part of a nation-wide project promoted by Friends of the Earth and UK 2000, with an aim to give recycling a national profile, enabling other cities to learn and possibly replicate successful experiences within Sheffield, and the other subsequent cities involved in the project.

A National Working Party was formed with representatives from national government, the waste management sector, industry, and voluntary groups (Wastes Management 1990). Funding for the three year period was generated from the organisers, reclamation industries, the Local Authority, and Friends of the Earth. A detailed breakdown of the funding is illustrated in Table 5.1 The entire scheme was also sponsored by British Telecom, who invested a considerable sum in the project.

Table 5.1: Funding for the First UK Recycling City Project in Sheffield

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Funding Given</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Telecom</td>
<td>£ 75,000</td>
</tr>
<tr>
<td>Reclamation Industries</td>
<td>£ 90,000</td>
</tr>
<tr>
<td>UK 2000</td>
<td>£ 20,000</td>
</tr>
<tr>
<td>Local Authority</td>
<td>£ 10,000</td>
</tr>
<tr>
<td>Friends of the Earth</td>
<td>£ 5,000</td>
</tr>
</tbody>
</table>

Source: Gwynn-Jones 1989
From a local perspective, objectives of the project included the creation of employment and stimulation of the local economy. The degree to which this was met in the three year duration of the project was minimal. Job creation in the collection operation remains in single figures, although at the processing stage, creation of jobs for people with learning disabilities can be considered an achievement regardless of the number involved. Stimulation of the local economy was limited in real terms, as the tonnage of material collected was relatively low, although as market values have recently increased, the income from recyclables has improved, but this market is highly fluctuating.

In terms of generating a high public profile at local level, this is evaluated in Chapter 6 with regard to behaviour and participation, although it would seem from the tonnages collected in 1994/5, the attainment of this aim is contentious (refer to section 5.8).

As is clear from Table 5.1 private industry have met the bulk of the payment necessary for the project. This reflects the anticipated role industry is expected to play in waste management with their role increasing with the development of packaging legislation and targets. However with the main actors being the private sector, it is individuals and society as a whole who are the main players. Therefore achievement of the objective to gain a high profile and increase awareness, is a necessary component to successful recycling. This is evaluated in detail in Chapter 6.

The Recycling City initiative cannot be regarded as a public service in its true context. The structure and framework of the project removed the requirement for high national or local government investment, and placed the cost with private industry. Therefore replicating the project in its entirety would require a similar investment structure.

The duration of the scheme was three years. However as a consequence of the national profile and expectations of the public who had become involved in the scheme, there was a determination once the trial was completed to continue the programmes developed under
the scheme. To date Sheffield has supported the development of recycling and the programmes in place are constantly under review and development. The negative aspect is in terms of monetary support from the Local Authority, which is not readily available as a consequence of their ongoing financial difficulties. This is discussed in greater detail within the evaluation of the waste management strategies.

For the duration of the Recycling City Project in Sheffield, it was determined that through funding from central government (DoE, DTI), and the Industry Committee for Packaging and the Environment (INCPEN), there should be continual monitoring and assessment of the implications and development of the recycling initiatives. The Centre for Waste Management (University of Luton) formed a partnership with Warren Spring Laboratory and Midland Environment Ltd to undertake this study. This partnership enabled easy access to data and contacts, an important pre-requisite for this research study (refer to Preface for details of the consortium research).

5.4 Local Administrative Structure
Within both Sheffield and Amsterdam it is the responsibility of local government to ensure national strategies are adhered to and implemented. Sheffield City Council is responsible for both collection and disposal of waste since April 1986, when the Local Government reorganisation came into force. This is due to its status as a Metropolitan Authority. Prior to this time, South Yorkshire Metropolitan County Council was responsible for waste management within the city. The Local Authority employs a recycling officer to coordinate recycling from within the Cleansing Services Department. Therefore, a focal point is provided from which all the household waste recycling activities can be coordinated. Budgetary controls are decided upon by the elected council operating with the Local Authority. Other relevant Departments are utilised for specific aspects of the recycling initiatives, for example marketing and information provision.
Sheffield Community Recycling Action Programme (SCRAP), a local registered charity, was designated the responsibility of allocating income generated as a result of the recycling activity, to local charity organisations. Recycling Credits of £5.00 per tonne for material collected in the recycling banks located outside the incinerator catchment area were paid to SCRAP, (credits for the kerbside scheme were paid to Wastestream Systems Ltd) (Recycling Evaluation Consortium 1993). Therefore from the outset, any monies raised were not regarded as income for the Local Authority, but an opportunity to provide financial support for charity organisations. SCRAP funding is subject to the effects of market price fluctuations, and in the early 1990's suffered financial setbacks as a result of decreased payments from industry for glass and paper (SCRAP 1993).

Recycling 2000 was launched at the end of the Recycling City Project to continue to support the development of recycling in Sheffield. Recycling 2000 still represents a partnership between the Local Authority, local industry, voluntary groups and the public, following the same framework as Recycling City, without the external financial commitment. The Local Authority felt any publicity or logo's should clearly represent the partnership nature of Recycling 2000, to limit any negative perceptions from the public that may be generated if it was regarded as purely a Local Authority initiative.

Within Amsterdam, the Department of the Environment, City Maintenance Department, Environmental Conservation Department, Sewage and Water Management Department, are all involved in work related to the environment. The District and Central City councils remain in contact with these organisations, to ensure coordination and integration.

Amsterdam is divided into 18 distinct areas of control, including 17 districts and a central area (Binnenstad) (refer to and for an outline map of Sheffield). Within these districts there is a district office which has control over a number of issues. In addition to these sub-city councils there is central city government comprising the city council and the municipal executive.
The western harbour area of Amsterdam was originally not a district in its own right, it simply fell under the jurisdiction of the central city administration. Therefore issues relating to the living environment i.e. waste, were under the central city control. However reorganisation has led to the western harbour being granted district status. It covers a large land area, although the population is extremely small. The districts have different socio-demographic characteristics, and different population sizes. This, coupled with an inconsistency in data generation and experience, make it difficult to internally compare waste management and recycling on a district level. There cannot be any specific conclusions drawn or hypotheses formulated that are distinct for specific districts. Therefore, when a distinction is made between recycling activity and participation in the separate districts it is for informative purposes only. Amsterdam, in its entirety, is used for comparative purposes.

In contrast, although Sheffield consists of 29 wards (local government district electoral wards), these do not have separate budgetary control for waste management, or separate management of recycling schemes, which is different to Amsterdam.

5.5 Household Waste Composition
Household waste production in the two cities in terms of composition is illustrated in Table 5.2. Differences between the two data sets can be attributed to a number of different factors. Firstly caution must be taken with regard to the methodological process that was used to obtain the compositional figures. Any distinct difference between the methods used can result in deviations in the figures obtained for the two cities. Also if the compositional analysis was carried out using waste collected and awaiting disposal, then certain elements of the waste stream may have been separated already. For example there is a distinct difference in the percentage of glass in each city. As Amsterdam operates a return deposit scheme for glass, then a much lower percentage will be present in the waste stream. Therefore the figures in the table do not necessarily represent the total compositional breakdown of all household waste generated.
Table 5.2: Typical Composition of Household Waste in Sheffield and Amsterdam (1993)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>% BY WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sheffield</td>
</tr>
<tr>
<td>Paper, cardboard</td>
<td>31</td>
</tr>
<tr>
<td>Plastic</td>
<td>8</td>
</tr>
<tr>
<td>Glass</td>
<td>10</td>
</tr>
<tr>
<td>Ferrous Metal</td>
<td>7</td>
</tr>
<tr>
<td>Non-ferrous metal</td>
<td>1</td>
</tr>
<tr>
<td>Textiles</td>
<td>2</td>
</tr>
<tr>
<td>Putrescibles</td>
<td>28</td>
</tr>
<tr>
<td>Leather, rubber</td>
<td>-</td>
</tr>
<tr>
<td>Other kitchen waste</td>
<td>-</td>
</tr>
<tr>
<td>Other waste</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: Sheffield Recycling Plan 1993; Heuting 1993

Also as stated in Chapter 2, the system for evaluating the waste, including the sequence and position of an automated system such as the location of the trommel at the start or end of the analysis, will have implications for the percentage of material allocated to the 'other waste' category. This does explain the great difference between the putrescible component of the household waste stream to a certain extent. Material that was classified as 'other waste' within Sheffield may have been classified as putrescible waste in Amsterdam.

5.6 Waste Management Strategies
Residual waste is collected from households in Sheffield once a week. The receptacle in use throughout the city since November 1993 is the wheeled bin, prior to this sacks were utilised. Since the introduction of the 240 litre bins there has been an increase in the amount of waste disposed from 9 kg per household to 13 kg per household per week (ERRA 1995). This increase is expected and reflects data collected from other cities incorporating wheeled bins (refer to Chapter 2).
Residual waste from Amsterdam is collected once or twice a week, depending on the location of the district, and whether separate collection of garden, fruit and vegetable waste (GFT) has been implemented. In the inner city of Amsterdam collection is twice a week, with the waste put on the pavement in allocated spaces or by the edge of the road (refer to Appendix 2). Waste must not be placed outside on any other day, with reprimands for households, or whole streets by the Sanitation Police if this is not adhered to, which may result in a fine (Stedelijk Beheer Amsterdam (date unknown); Mol 1993). Thus is purely for reasons of space limitations, hygiene, and street cleanliness.

As briefly stated in the introduction, Amsterdam and Sheffield incorporate recycling and energy/heat recovery schemes within the waste management strategies. These are illustrated in Table 5.3, and differences and similarities in the local waste management strategies can clearly be identified.

Table 5.3: Methods of Waste Management in Sheffield and Amsterdam

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Sheffield</th>
<th>Amsterdam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incineration</td>
<td>Heat Recovery</td>
<td>Energy Recovery</td>
</tr>
<tr>
<td>Kerbside</td>
<td>Glass; Plastics; Paper; Cans; Textiles; Aluminium Foil</td>
<td>GFT (garden, fruit, and vegetable), Paper (limited to specific districts)</td>
</tr>
<tr>
<td>Drop-off</td>
<td>Glass; Plastics; Paper; Cans; Textiles; Oil; Batteries</td>
<td>Glass; Paper; Textiles; GFT; Small chemical waste; Residual Waste</td>
</tr>
<tr>
<td>Density of paper banks</td>
<td>1 site per 10,000</td>
<td>1 site per 1,500</td>
</tr>
<tr>
<td>Density of glass banks</td>
<td>1 site per 7,700</td>
<td>1 site per 1,500</td>
</tr>
<tr>
<td>Mobile drop-off schemes</td>
<td>Aluminium cans</td>
<td>Small chemical waste</td>
</tr>
</tbody>
</table>

5.6.1 Traditional Routes: Landfill and Incineration

Until the 1970's, waste management in Sheffield followed the traditional route with preference being placed on landfill. However as
the sites experienced increasing pressure, it was felt necessary to invest in an alternative option. Therefore in 1975 an incinerator was built at a cost of three and a half million pounds (Gwynn-Jones 1989). The facility was based on mass burn of domestic and commercial waste, and now uses the steam generated to provide heat which is exported to adjacent Local Authority flats. With an outstanding operational record, plans were backed to expand the incineration plant and heating scheme. As has been the experience of a number of incineration projects, major UK contracting organisations were not prepared to invest the large sums of money required, forcing Sheffield to obtain an overseas partner. A Finnish energy specialist Ekono, backed by the Post Panniki Bank was Sheffield's final choice. A joint stock company was formed called Sheffield Heat and Power, with Sheffield being a minority shareholder in an effort to distance the Local Authority from the financial aspects of what was viewed as a commercial venture (Porter 1987).

In 1991 two clinical waste incinerators were installed to accept Sheffield Health Authority clinical waste (Sheffield City council 1991). The operational concept is based on the principle that steam generated by burning the waste is then purchased by Sheffield Heat and Power.

The superheated steam is distributed to a network of properties (currently standing at 4,500 dwellings), to provide hot water and heating. These include the Town Hall, City Hall, amenity and leisure facilities, Cathedral, Sheffield Hallam University, Barclays Bank, and a number of public houses and shops (Sheffield Cleansing Services 1993). Therefore heating produced by the incinerator forms an integral component of inner city life.

As the incinerator was built in 1975 controls regarding emissions are not very stringent, however the incinerator requires upgrading to meet the standards set in the EU Incineration Directive, due to be implemented by the end 1996 (ENDS 1992). There remains concern over where the investment needed to implement the emission control technology will be obtained. Due to the financial status of the Local Authority, and the recent heavy investment in the Super tram system,
it is not anticipated that the Local Authority will be in a position to provide the main investment.

The incinerator enjoys a central location in the city, increasing the convenience of waste transfer to the site. Transport costs are lower than those for areas having to use out of town landfill sites. The current cost of disposal at the incinerator varies from £16.70 - £33.50 per tonne, with an anticipated price increase on 1st April 1996. Although in comparable terms with Amsterdam the price of incineration is not high, compared to the local landfill price in Sheffield of only £7.00 per tonne, the incinerator does not compare favourably. Presently, landfill only accounts for approximately 30% of household waste disposal in Sheffield, and it is anticipated that the landfill tax will result in incineration with energy recovery becoming even more favourable. Ideally however, recovery and recycling will ultimately be the initial route for all household waste.

Amsterdam, like many cities in the Netherlands does not utilise landfill as a major option for waste disposal. Due to its location, population density and geological aspects, landfill does not represent a feasible option. It is regarded as a poor solution to the management of waste, an impression further supported by the evidence of a heavily polluted land area in Amsterdam-Noord called the Volgermeerpolder, a legacy of a badly managed disposal site (Stadsdeel Amsterdam-Noord 1990). Therefore, both historically and in the present day, incineration has represented the 'better' option. The incinerator in operation is AVI-Amsterdam, and is the third facility to be built in Amsterdam this century. It is a high status incinerator, regarded as Europe's largest for household waste. Plans for the development of AVI-Amsterdam were proposed as early as 1973 however due to the energy crisis at that time (refer to Chapter 3), they were suspended. It began operating in 1993 after the closure of AVI Nord II which was no longer deemed as suitable in the current environmental climate, due to its inadequate emission controls, small capacity, and inner urban location. AVI-Amsterdam complies with national and European emission regulations with control facilities regarded as amongst the most stringent in the world. The investment required from the Local
Authority in Amsterdam to develop the incinerator and install such sophisticated abatement systems ultimately reached £376 million (Jonkhoff 1993).

The site is on reclaimed land from the sea on the outskirts of the city in the Aziëhaven Harbour, dissimilar to Sheffield's inner city location. The waste arrives by road and rail, serving all of Amsterdam's districts and inner city area, plus 27 external communities. Incorporating traditional transport mechanisms to the incinerator such as use of the canal system throughout Amsterdam, is not possible due to the new location of the incinerator. However it is anticipated in the future there will be full utilisation of canals to transport residue.

The cost of incinerating a tonne of waste is approximately 200 Dutch guilders (AVI-Amsterdam 1993). This equates to approximately £70.00 per tonne, which although high, signifies the investment costs undertaken to develop and operate the incinerator.

Public investment utilised in the development of this incinerator ensures its role in an integrated waste management system for the city. The incinerator also provides approximately 12% of Amsterdams' electricity.

5.6.2 Recycling Schemes
Both Sheffield and Amsterdam incorporate kerbside collection and drop-off schemes in their recycling strategies, with differences in terms of operational aspects and specific components of the waste stream which are collected separately. However the fundamental characteristics of kerbside collection and drop-off are the same in both cities (Figure 5.1).

In Sheffield, the installation of facilities for drop-off schemes was regarded as the initial phase of the Recycling City Project. The incorporation of kerbside collection schemes represented the second phase, to enhance the initial public awareness and participation generated by the drop-off schemes (Simmonite 1990).
In Amsterdam, drop-off schemes have proved to be a natural solution to the collection of recyclable material from a city with a high population density. Kerbside schemes for dry components of the household waste stream have been previously incorporated with differing intensities throughout the city, as different districts have adopted innovative strategies for trial periods, to varying degrees of success. The integration of kerbside for the collection of garden, fruit and vegetable waste (GFT) has been implemented throughout the city.

Drop-off schemes form the principal collection method for recyclable material from the household waste stream within both Sheffield and Amsterdam. In Sheffield drop-off sites collecting glass have been in place since 1977, paper since 1988, cans since 1989 and textiles more recently in 1990 (Recycling Evaluation Consortium 1993).
In Sheffield mini-recycling centres are favoured, with preferred locations being major shopping areas or car parks, where space is a premium. The facilities usually cover a range of material to be collected including glass, paper, textiles, cans and plastics. Five Recycling Centres, formally Civic Amenity Sites, managed under a franchise, extend their collection range to include waste oil, batteries, and bulky household waste. The collection of plastics from the waste stream in Sheffield is both innovative and relatively unique, particularly in comparison with Amsterdam. Sheffield has experienced a number of problems due to market failure, and on a limited number of occasions collected material has been incinerated. Reclaim, the not-for-profit company responsible for managing the operations at the Sheffield Reclamation Centre, was previously operated and funded by the British Plastics Federation. However they now rely on financial support from Sheffield's Cleansing Services Department, government grants, sponsorship and donations. Regardless of the problems experienced in the plastic markets, Reclaim is determined to continue operating. They provide a much wider remit than simply processing the plastic component, as they represent an opportunity of employment and social support for people with learning disabilities. This underlies the basic rationale that forms the theoretical framework for recycling within Sheffield. The social implications of Reclaim encompass a wider environmental context of recycling than purely resource and energy issues. This is reflected in Reclaims achievement of winning the national 'Learning in the Workplace' award in 1995, promoted by the National Association for Adult Learning (Sheffield Recycling 2000 Forum 1995a)

Locating drop-off sites has caused a number of problems in Sheffield, as there has been a degree of NIMBY, and also in some cases an unwillingness to provide the necessary space at shopping centres (Pellet 1995). Vandalism has resulted in a number of sites being removed, particularly in the case of firing paper banks (Bacon 1995). Generally however, this doesn't occur at sites located in car parks or at shopping centres.
The density of drop-off sites is low in comparative terms with Amsterdam, however, nationally Sheffield is achieving a high number of sites per person. Presently the number of glass banks remains at 1 per 7,700 people, and the number of paper banks remains at 1 per 10,000 people. It is paper and glass that forms the predominate material collected in both Sheffield and Amsterdam. Textile, cans and plastic banks are not as densely distributed.

Collection utilising drop-off schemes in Amsterdam, focuses on glass, paper, small chemical waste, and to a lesser extent textiles. The Dutch have abstained from implementing the collection of the plastic component as a national initiative, as the market availability is considered to be undeveloped and unstable throughout the Netherlands at present. With regard to the implementation of specific schemes to collect specific components of the waste stream for recycling, there has been consideration given to the costs and benefits of separating the waste. Although the data source could not be accessed to support the validity of the perspective given in the report, it is interesting that consideration has been given to this aspect. The results clearly identified glass and textiles to have very low costs in contrast to positive environment effect, which indicated a high environmental benefit. KCA has high costs, however the high environmental effect of separating this component, resulted in a sufficient environmental benefit.

Within Amsterdam, although the density of paper and glass banks is much greater than Sheffield despite a slightly larger population, there are still plans to intensify the provision of drop-off facilities. This will not only extend the collection range, but also increase the number of sites. Drop-off facilities are generally located on streets, which is dissimilar to Sheffield, as large car parks and shopping centres are not commonplace throughout the confined land area of Amsterdam. Due to space constrictions and preferred options, the fixed drop-off facilities in Amsterdam are currently oriented towards paper and glass collection only. In Amsterdam, and in fact throughout the Netherlands, it is only recently that there has been a move to collect glass according to the colour. Prior to this decision, it was simply
collected together as a mixed cullet. However the price offered for mixed material such as this is very low, and the Dutch decided that they would overcome the locational issues, such as space limitation, and attempt to incorporate colour separation as part of the collection scheme.

With regard to glass and paper there is an average of 20 collection sites each in the districts and central area. This equates to a density of 1 bank per 1500 people. Even with this high density, there are still problems in collecting the high amounts of material necessary to reach the recycling targets.

Permanent collection facilities for textiles are few and far between, with most charities relying on organising door to door collections at specific times of the year. With regard to metal cans, both aluminium and ferrous, there are limited facilities around the city as it is accepted that the residual waste will be disposed off at the incinerator, and the cans are being extracted prior to the incineration process. This is more efficient than in Sheffield where the cans are extracted after incineration. Facilities for the collection of plastics are not provided due to the Local Authorities disregard for the economic feasibility of recycling this component. More importantly the local government expressed a preference that the ideal management of plastics is recovering their energy via incineration.

A movement to collect small chemical waste (KCA) from the household reflects the national strategy. This is an attempt to remove some of the more harmful material from the incinerator process that has historically been the cause of the release of toxic substances. The Milieudienst commissioned a study in 1992 to identify the main sources of heavy metals in the residual waste going to the incinerator (TNO 1992). Household waste was responsible for 62% (TNO 1992), which resulted in an intensification of the strategy to remove KCA from the residual waste stream. Although chemical waste is collected based on the drop-off concept, collection banks located on the street are not utilised. KCA is collected at district depots, specified shops, or on a monthly basis using a 'chemo car' from allocated areas around the city.
The separate collection of this component is considered an essential aspect of waste management within the city, and one which requires considerable development to increase the quantity and participation. Districts are not responsible for funding this aspect of separate collection, as due to the high costs the Milieudienst budgets for KCA collection at a city level.

Problems have been experienced with the collection of this component as the public have in the past left their KCA at the pick up spot in the street when the Chemo cars have been late arriving or not turned up. This could potentially be dangerous to both the environment and also human health. Therefore education and information campaigns have been launched focusing on this specific aspect.

Although traditional recycling containers located on street corners are common place in Amsterdam, trials have recently been carried out on drop-off systems that could potentially revolutionise the system of separate collection. Densely populated areas such as Amsterdam, have realised the logistic problems of separate collection schemes. It is not only the locating and servicing of drop-off sites that causes potential logistic problems, but implementing kerbside schemes in areas of dense housing is not always viable. Successful trials have resulted in the development of two decentralised drop-off systems that could prevent the need for kerbside collection of any of the waste including the residual fraction. The MSTS system utilises above ground containers, in contrast to the METRO system which utilises below ground containers. Both systems have been trialed initially in the two Southern districts of Amsterdam, where the density of population is the highest, and the METRO system is currently being developed in other districts and also other municipalities in the Netherlands. MSTS and METRO systems require the equivalent of two car park spaces (usually in street locations) and consist of four containers, each collecting paper, glass, organic waste and the remaining fraction. They are designed to service 50-70 households, with the MSTS requiring daily servicing, compared to the METRO system requiring fortnightly servicing (Segall 1995). Anticipated problems with regard to odour from the organic fraction in the METRO system as a result of storage
time have not occurred. Due to the depth of the tubes of between 12-20 metres, material in the tubes compacts as other material is dropped upon it, increasing the capacity. Coupled with the requirement of only one operator to collect the waste, this is a cost effective and attractive option. Despite installation problems with the METRO systems, as a direct consequence to the complicated underground systems of pipes, supply lines, and support network in Amsterdam, the trial has been highly successful and it is anticipated that the use of the METRO system will increase throughout areas of high density. The MSTS system is anticipated to be favoured in areas of lower density, reducing the servicing period required.

In Binnenstad, which represents the inner city area of Amsterdam, a great number of difficulties are experienced with regard to the operation of any type of collection approach. It is anticipated that future environment policy will be directed towards the reduction in the number of cars allowed in the area (Paupert 1994). This will increase the problem in locating banks in terms of access to service the sites. This may increase the tendency towards the possibility of utilising the canal network to service the drop-off sites.

A number of issues of concern in both cities is the implications of NIMBY on location of sites. In Amsterdam the local policy requires that the historical view of houses and buildings must be retained. This has implications for the shape and design of the container, which increases the appeal of an underground storage system such as the METRO system (Paupert 1994). In Sheffield fundamental issues such as perceived noise and nuisance caused by the use of drop-off sites has severe implications for limiting the possible number of locations to site the facilities.

With regard to kerbside collection schemes, both Amsterdam and Sheffield utilise this approach. However, there are fundamental differences in the underlying philosophies in the formation and application of the schemes. In Sheffield the kerbside programme was developed as an integral part of the Recycling City Project, promoting innovative schemes to intensify collection. The pilot scheme was
initiated in November 1989, and the launch was assisted from a financial aspect with the donation of collection vehicle by IVECO Ford (Simmonite 1990). Once the Recycling City Project was completed, Sheffield Recycling 2000 continued and developed the kerbside scheme. However in Amsterdam, the implementation of a kerbside scheme is part of a national strategy. It became mandatory on 1st January 1994 for garden, fruit and vegetable (GFT) waste from households to be collected separately. Therefore the local government did not adopt the scheme out of choice, or selection as the best collection option available, but merely to comply with national level policy. Separate collection is currently underway in most areas of the city for organic waste. GFT is collected in small containers provided free of charge by the Local Authority, approximately 35 litre in size (referred to as a biobak). The average amount collected on a national level is 4.8 kg per household per week (Hanemaayer 1993). The cost to each district for disposal of GFT to the composting plants is approximately £40.00 per tonne, which is considerably cheaper than the incineration charges (Mol 1993). This does increase the potential of GFT collection in terms of reducing the districts residual waste costs.

Although it is only organic waste that is collected from all districts utilising kerbside collection, the Northern District of Amsterdam is also considering incorporating kerbside collection of glass and paper, and Buitenveldert currently collects paper. However experience from other districts have proved it to be far too expense to be effective.

The introduction of the kerbside scheme collecting GFT has had implications on the collection of residual waste from households. It has been decided that residual waste collections can be reduced from twice a week to only once a week in a number of districts, which has lessened the impact of the costs of collecting the GFT component.

The kerbside collection scheme is covered by a rigid social policy to protect workers. This results in limitations being developed to the amount of physical work in direct correlation to the weight lifted and age of the worker (Segall 1995). Therefore when materials are considered for inclusion in the kerbside scheme, consideration must be
given to the operatives in the context of this social policy. Conversely if material is being separated from the waste stream, then this will reduce the impact of the social policy on the collection of residual waste.

The district of Westerpark has opted out of wide scale implementation of the kerbside scheme for the collection of GFT (Terlouw 1993). Instead the district will be focusing on the collection of this component utilising the drop-off scheme, with a view to incorporating the METRO system.

In Sheffield the kerbside collection scheme, referred to as the blue box scheme, collects a wide range of materials which includes newspapers and magazines; glass bottles and jars; plastic bottles and containers; food cans and drink cans; aluminium foil; textiles; and aerosols. Participating households are provided with a blue box, within which they are asked to place specified components of the household waste stream. These are collected once a week by one of two specifically designed vehicles which can accommodate kerbside sorting of the material.

Initially the pilot scheme started in 1989 collecting from 2500 households in the north west region of Sheffield, but by 1994 approximately 10,000 households in the north west and south east areas of Sheffield were being served by the blue box kerbside scheme. The scheme currently covers approximately 5% of all households in Sheffield. The original location of the kerbside scheme was not ideal in geographical terms, due to the undulating landscape, causing numerous operational difficulties which have implications for participation. Ambitious plans to extend the collection of material to include aerosol cans were initiated, and Sheffield became the first pilot scheme in the UK to collect this component of the waste stream. The scheme has the backing of both the Local Authority, and also the British Aerosol Manufacturers Association (BAMA), representing a partnership of local government and industry. The BAMA funded the publication and circulation of information and promotional leaflets, encouraging householders to include aerosols in the blue box scheme.
The kerbside scheme was originally operated by Recycling City Ltd for the duration of the Recycling City project, however current operators are Wastestream Systems Ltd. Consideration is being given towards the idea of merging the activities of Wastestream Systems Ltd with Reclaim to unify operations. However there was no definitive information available on this as of March 1996.

Approaches to extend participation and increase collection of material includes developing the kerbside scheme to include integration of high rise flats, previously a more difficult household type to incorporate. Although high rise flats constitute a small proportion of housing stock, they form a significant component in some areas of Sheffield. A number of schemes have been tried in the UK and throughout Europe with regard to this type of accommodation, with difficulties experienced in accessibility, storage space within the flats, and inconvenience to the householder. These issues are particularly important in influencing behaviour towards recycling (refer to Chapter 6), and therefore Wastestream Systems Ltd needed to ensure that the critical factors were either overcome or limited (Birley 1994). One important factor that has increasingly warranted consideration is involvement of the target group in the initial stages of developing recycling initiatives. The incorporation of the high rise scheme has proved successful to date (Birley 1994) and there are plans to develop this area further with the collaboration of Wastewatch and Sheffield City Council, researching into the feasibility of high rise recycling at the Callow Estate (Sheffield Recycling 2000 Forum 1995c).

Expansion of the kerbside scheme to 15,000 households has been proposed, which will entail operational costs of approximately £73,000. The Local Authority has offered £22,000 to the scheme, leaving Wastestream Systems Ltd to finance the balance from sponsorship or grants. One idea under consideration was an advanced disposal fee whereby the householder pays a nominal amount to be involved on the scheme. However this type of system would be unsuccessful as the householder will simply favour disposal which they are already charged for in the council tax, or drop-off sites will become the preferred option.
As a provider of jobs, although the scheme has extended to approximately 10,000 households since it was initiated, the number involved in the actual collection operation has remained the same.

In the initial stages of the scheme there were an expected number of operating problems, such as staffing issues resulting in boxes not being collected, vehicle design issues, and delay in planned expansions. These were duly featured in local newspapers such as Sheffield Star and Sheffield Weekly Gazette and the adverse publicity had immediate, although short term effects.

Kerbside schemes have been criticised for their high cost. In Sheffield, the total running costs for the initial year of the scheme amounted to nearly £26,000, with a further £50,000 required for equipment. The earnings amounted to just £5,180, which resulted in a collection cost per household involved in the scheme of £9.34. This is a very high figure which reflects the need for extensive financial support prior to a trial of this nature commencing.

For the period December 1990 to November 1991 the expenditure amounted to £112,719, however with monies obtained from recycling credit, income, grants and sponsorship amounting to a total income of £114,275 which adequately covered the costs (Wastestream Systems Ltd 1992). Therefore it can be stated that the development of such an operation requires an initial large investment in the early stages. It should be appreciated however, that the costs will decline once the scheme has been in operation for some time, and as expansion occurs the income generated from the sale of recyclables will increase, depending of course on market fluctuations. The scheme is currently supported in the main by ERRA and Sheffield City Council, although private investors are sought. Extra income to replace one of the collection vehicles and purchase more blue boxes has been obtained through a successful Supplementary Credit Approval bid in collaboration with the Local Authority (Wastestream Systems Ltd 1995) (refer to Chapter 4 for details of this funding).
There are a number of different public awareness strategies either implemented or proposed that are distinct from kerbside or drop-off. Within Amsterdam there are preventative instruments householders can adopt with regard to waste minimisation and prevention. Stickers with waste prevention slogans to deter the delivery of free newspapers, flyers, and other advertising material by placing in the window or on the letterbox are easily accessible. Approximately 30% of households in Amsterdam utilise this waste prevention measure.

Sheffield is also proposing a sticker programme, with trial scheme utilising 200 households. The stickers will be placed on the households wheeled bin, and act as a reminder or deterrent to the householder to remove recyclables from the waste stream and not place them in the wheeled bin with the residual waste (Sheffield Recycling 2000 Forum 1995d).

New initiatives in Sheffield include the provision of collection facilities for the 'ring leader' recycling scheme, which aims to reclaim from the household waste stream all plastic rings that secure cans together for recycling.

Composting is currently carried out on a small scale at Heely City Farm in Sheffield, although the Local Authority intends to develop a home composting initiative in 1996 (Sheffield Recycling 2000 Forum 1995b). It is not perceived that home composting will effect a significant reduction in the residual waste stream. However it is regarded that those participating may become more positive in terms of participating in recycling activities. The interest from the public to date does suggest that home composting schemes may generate positive attitudes and behaviour with regard to other aspects of waste management (Pellet 1996).

5.7 Data Analysis
Data was obtained for the tonnage of material collected separately from Sheffield and Amsterdam for 1992, 1993, and also 1994/5 for Sheffield. From this data it has been customary to calculate the recycling rate as referred to in Figure 5.2.
Therefore, although this figure would be regarded as the separation figure within the Netherlands, it is an accepted approach to regard this as the recycling rate. There should be an acknowledgement that the actual figure recycled will be slightly lower than the figure calculated, due to contamination, or potential loss of material markets. This issue introduces the need for consistent definitions that ensure comparability of data.

Figure 5.2: Definition for Calculating the Local Authority Recycling Rate

<table>
<thead>
<tr>
<th>Total weight of designated recyclables collected and available for recycling in a Local Authority</th>
<th>X</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total weight of household waste available in the Local Authority</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: adapted from Civic Amenity Waste Disposal Project 1993, p.31; Department of the Environment 1993

In Sheffield it has been the norm to calculate recovery rate, and this includes all the material separated for recycling, plus material processed at the incinerator. If this calculation were applied to all waste produced in Amsterdam, the figure would be virtually 100% as it is only a small percentage of the incinerator ash that is landfilled. Similarly if this were applied to all waste produced in Sheffield it would equate to approximately 70-80%.

Prior to Sheffield's designation as Recycling City, approximately 1.5% of household waste was being recycled (Recycling City Ltd 1991). Post Recycling City, the recycling rate increased to 4%, which reduced slightly in 1994/5 to 3%. Amsterdam has achieved much higher recycling rates of 12% (1993), although this remains lower than the national target. In 1992 the figure was as high as 15.5%, although the data and approach used to obtain figure this was not made available (Milieu dienst 1993).
From the data set in 1992 (refer to Table 5.4) the distinction between the two cities can be clearly seen. The amount collected per capita of paper, glass and textiles in Amsterdam is approximately four times greater than the amount collected per capita in Sheffield. In real terms the actual tonnage of material collected in Amsterdam ranges from five times greater for paper, to seventeen times greater for textiles than in Sheffield. Data for GFT, KCA and cans was not available for Amsterdam, and plastic is not collected separately. In Sheffield GFT and KCA are not collected separately.

The data in Table 5.4 does exclude kerbside for both Sheffield and Amsterdam. GFT collection in Amsterdam was in its early stages and therefore data was not available. In Sheffield data from the kerbside was available as a total amount, or specifically for plastic and paper.

Table 5.4: Material Collected from Drop-off Sites in Sheffield and Amsterdam in 1992

<table>
<thead>
<tr>
<th>Specific Component</th>
<th>Tonnage</th>
<th>Kg per capita</th>
<th>Tonnage</th>
<th>Kg per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>2865</td>
<td>5.39</td>
<td>14810</td>
<td>20.26</td>
</tr>
<tr>
<td>Glass</td>
<td>1413</td>
<td>2.66</td>
<td>9329</td>
<td>12.76</td>
</tr>
<tr>
<td>Textiles</td>
<td>27</td>
<td>0.05</td>
<td>459</td>
<td>0.63</td>
</tr>
<tr>
<td>Plastics</td>
<td>75</td>
<td>0.14</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cans</td>
<td>97</td>
<td>0.18</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>GFT</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>KCA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Adapted from Coggins (1993), and Heuting (1993)

The data for 1993 includes the material collected from the kerbside schemes as well as data from drop-off sites (Table 5.5). This provides a more concise comparison in terms of all the data available from Sheffield and Amsterdam. Once again a large distinction exists between the material collected from Sheffield compared to the material collected from Amsterdam.
Table 5.5: Separate Collection of Material from the Household Waste Stream in Amsterdam (1993) and Sheffield (1993/4)

<table>
<thead>
<tr>
<th>Specific Component</th>
<th>Sheffield Tonnage</th>
<th>Sheffield Kg/Per Capita</th>
<th>Amsterdam Tonnage</th>
<th>Amsterdam Kg/Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>3113.89</td>
<td>5.86</td>
<td>14,073.9</td>
<td>19.44</td>
</tr>
<tr>
<td>Glass</td>
<td>1702.56</td>
<td>3.21</td>
<td>10,116.4</td>
<td>13.97</td>
</tr>
<tr>
<td>Textiles</td>
<td>89.55</td>
<td>0.17</td>
<td>508.8</td>
<td>0.70</td>
</tr>
<tr>
<td>Cans</td>
<td>178.82</td>
<td>0.34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>GFT</td>
<td>-</td>
<td>-</td>
<td>12,479.8</td>
<td>17.25</td>
</tr>
<tr>
<td>KCA</td>
<td>-</td>
<td>-</td>
<td>392.3</td>
<td>0.54</td>
</tr>
</tbody>
</table>

Source: Pellet 1995; Milieuverkenning Amsterdam 1995

The kerbside scheme in Sheffield has suffered from a number of operational issues which has resulted in a drop in the participation rate. In July 1990 the participation rate in the north west area of Sheffield was 68%, and this had declined to just 37% by November 1993 (ERRA 1995). This is significant, and much lower than can have been anticipated. Under normal circumstances, kerbside collection attracts a relatively high participation rate, due to the ease of use and convenience of the scheme - factors which are attractive to householders and represent an incentive to participate (refer to Chapter 6). Problems include staffing issues, mechanical faults on the vehicles, and extreme weather conditions, which all contribute to unreliability and low quality of service from the scheme. The significance of these issues reached a high level in 1994/5 where 20% of collection days were lost in whole or part (ERRA 1995).

In 1994/5 Sheffield kerbside collections brought in 555 tonnes of recyclable household waste (Table 5.6). This included 234 tonnes from the north west area of Sheffield, and 320 tonnes from the south east area (Sheffield Recycling 2000 Forum 1995a). As an average figure, between 45 - 50 tonnes are collected by the kerbside scheme each month.
There was no data available for the tonnage of plastic material collected from the drop-off scheme in 1993/4. Also the data for 1994/5 is stated as being questionable, which limits its applicability. The figures for glass in 1993/4 (including glass collected by the kerbside scheme) also consists of average figures for as much as 6 months, which may explain the high tonnage. Metals retrieved from the residual waste stream post incineration are excluded, although it is estimated that in 1993/4 just under 2000 tonnes were collected. The Recycling Officer is currently trying to rationalise the data input system, to prevent anomalies which are present in the current data set, from occurring in the future (Pellet 1995).

Table 5.6: Separate Collection of Recyclables from Drop-off and Kerbside for 1993/4 and 1994/5 for Sheffield

<table>
<thead>
<tr>
<th>Specific Component</th>
<th>Tonnages 1993/4</th>
<th>Tonnages 1994/5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>2767.15</td>
<td>2883.247</td>
</tr>
<tr>
<td>Glass</td>
<td>1577.12</td>
<td>916.529</td>
</tr>
<tr>
<td>Textiles</td>
<td>49.82</td>
<td>87.409</td>
</tr>
<tr>
<td>Cans</td>
<td>103.5</td>
<td>134.232</td>
</tr>
<tr>
<td>Plastics</td>
<td>-</td>
<td>457.264</td>
</tr>
<tr>
<td>Kerbside</td>
<td>591.49</td>
<td>555.335</td>
</tr>
</tbody>
</table>

Source: Pellet 1995; Milieuverkenning Amsterdam

The total tonnage of recyclable material collected separately for 1994/5 was 5,034, which gives a recycling rate of approximately 3%. This is lower than the recycling rate of 4% achieved during 1991/92 which was the final year of the Recycling City project.

Within Amsterdam it has been calculated from information from the city districts and from AVI-Amsterdam, that 436kg of household waste is produced per person per year. This figure is higher than the national average of 410 kg per person, however it is accepted that some districts, are including commercial waste and litter in their household waste
data as a consequence of their collection methods. Approximately 12% of this is being recycled. The districts vary considerably in their recycling rates with Buitenveldert achieving over 30% separation and Watergraafsmeer, Slotervaart, and Rivierenbuurt achieving over 20% separation. Table 5.7 represents the tonnages of material separated from the residual waste stream for the different districts of Amsterdam.

Table 5.7: Separate Collection of Material from the Districts of Amsterdam (in tonnages) for 1993

<table>
<thead>
<tr>
<th>Stadsdeel</th>
<th>Glass</th>
<th>Paper</th>
<th>KCA</th>
<th>GFT</th>
<th>Textile</th>
<th>AVI residual</th>
</tr>
</thead>
<tbody>
<tr>
<td>De Baarsjes</td>
<td>365.0</td>
<td>684.5</td>
<td>4.6</td>
<td>0</td>
<td>32.0</td>
<td>13,830</td>
</tr>
<tr>
<td>Bos en Lommer</td>
<td>339.6</td>
<td>548.2</td>
<td>27.2</td>
<td>254.8</td>
<td>55.2</td>
<td>10,930</td>
</tr>
<tr>
<td>Binnenstad</td>
<td>1741.8</td>
<td>1992.9</td>
<td>49.2</td>
<td>246.6</td>
<td>0</td>
<td>40,710</td>
</tr>
<tr>
<td>Buitenveldert</td>
<td>603.5</td>
<td>947.0</td>
<td>9.6</td>
<td>1264.9</td>
<td>0</td>
<td>5,530</td>
</tr>
<tr>
<td>Geuzenveld/Slotermeer</td>
<td>320.0</td>
<td>709.0</td>
<td>19.6</td>
<td>1616.0</td>
<td>66.0</td>
<td>10,910</td>
</tr>
<tr>
<td>Amsterdam-Noord</td>
<td>2049.0</td>
<td>1748.0</td>
<td>78.3</td>
<td>3788.0</td>
<td>0</td>
<td>32,420</td>
</tr>
<tr>
<td>Oost</td>
<td>350.0</td>
<td>639.3</td>
<td>22.5</td>
<td>54.0</td>
<td>23.0</td>
<td>13,080</td>
</tr>
<tr>
<td>Osdorp</td>
<td>444.0</td>
<td>444.2</td>
<td>13.7</td>
<td>123.0</td>
<td>0</td>
<td>13,820</td>
</tr>
<tr>
<td>Oud-West</td>
<td>421.9</td>
<td>634.2</td>
<td>22.1</td>
<td>0</td>
<td>20.0</td>
<td>14,840</td>
</tr>
<tr>
<td>Rivierenbuurt</td>
<td>230.0</td>
<td>943.1</td>
<td>10.0</td>
<td>972.0</td>
<td>0</td>
<td>8,480</td>
</tr>
<tr>
<td>Slotervaart/Overtoomse Veld</td>
<td>576.5</td>
<td>777.9</td>
<td>21.9</td>
<td>1582.4</td>
<td>73.5</td>
<td>10,240</td>
</tr>
<tr>
<td>Watergraafsmeer</td>
<td>587.1</td>
<td>767.9</td>
<td>5.9</td>
<td>1247.4</td>
<td>67.9</td>
<td>8,470</td>
</tr>
<tr>
<td>Westerpark</td>
<td>497.0</td>
<td>589.9</td>
<td>20.3</td>
<td>0</td>
<td>19.0</td>
<td>11,500</td>
</tr>
<tr>
<td>Zeeburg</td>
<td>280.0</td>
<td>401.6</td>
<td>29.6</td>
<td>19.0</td>
<td>33.0</td>
<td>10,750</td>
</tr>
<tr>
<td>Zuid</td>
<td>686.5</td>
<td>1436.5</td>
<td>28.5</td>
<td>573.3</td>
<td>99.2</td>
<td>22,630</td>
</tr>
<tr>
<td>Zuid Oost</td>
<td>75.0</td>
<td>175.0</td>
<td>16.8</td>
<td>690.0</td>
<td>80.0</td>
<td>32,020</td>
</tr>
<tr>
<td>De Pijp</td>
<td>549.0</td>
<td>634.8</td>
<td>12.6</td>
<td>48.5</td>
<td>0</td>
<td>15,930</td>
</tr>
<tr>
<td><strong>Total for Amsterdam</strong></td>
<td><strong>10,116.4</strong></td>
<td><strong>14,073.9</strong></td>
<td><strong>392.3</strong></td>
<td><strong>12,479.8</strong></td>
<td><strong>508.8</strong></td>
<td><strong>276,090</strong></td>
</tr>
</tbody>
</table>
It is evident from the table that there are distinct differences between the districts, with values ranging from as low as 0 to figures as high as 3788 tonnes of a specific material collected for 1993. However, caution should be applied to direct comparisons between the districts. It is not possible to draw any specific conclusions with respect to patterns of quantity and composition, as the data sources may differ.

The 1993 recycling rate is approximately 12% for Amsterdam city. This is excluding KCA which once separated is not necessarily recycled, but managed utilising the best environmental option specific to the composition of the material.

It is considered that the national targets will not be realised within Amsterdam by the year 2000. However the attainable targets proposed by the city remain higher than the UK target of 25% (refer to section 5.0 for local targets). It is stated that the Milieudienst in Amsterdam base their predicted achievements on the development and growth of separate collection systems and market prospects. There is also a greater onus placed on the role of the consumer, and information provision to the general public. This follows the traditional environment philosophy proposed by the Dutch in that a greater emphasis is placed on 'target groups' and in the potential roles in achievement of targets.

A great deal of attention has been placed on improving, developing and implementing waste management strategies in Amsterdam that will assist in the achievement of the national targets. Amsterdam has a number of factors which are problematic in terms of implementing recycling strategy and it is for this reason that the Milieudienst has invested a considerable amount of resources in developing its programmes. The main activities have been documented until the year 2000, and are featured in a policy plan entitled Uitvoeringsnota Afvalstoffen Huishoudens 1993 (Implementation Policy for Household Waste 1993).

It is clear from the results shown in this section that a great difference exists between the amount of recyclable material collected separately
from Sheffield and Amsterdam. Sheffield's recycling figure remains low and comparatively the figure for Amsterdam is much higher, illustrating the potential for possible improvement in Sheffield.

5.8 Data Discrepancies

Although data has been made freely available from both Sheffield and Amsterdam, this has not automatically ensured its worth in terms of accuracy. Difficulties with this research have arisen with regard to the quantitative information provided. With regard to Sheffield the basis for their calculations has been misleading to a certain extent, and in Amsterdam there has been a tendency for percentages to be provided as opposed to tonnage figures.

As stated in Chapter 4, all Local Authorities in the UK were requested to provide recycling plans. Sheffield produced such a document however the data it includes is extremely misleading. The Local Authority proposes that a recycling rate of 11.42% was achieved in 1991/2, excluding incineration. If incineration with energy recovery was to be included, then the figure would be 42.2%, which compares extremely favourably with the government's target of 25%. However closer examination of the data has provided a completely different recycling scenario. The methodology used to determine the 11.42% recycling rate differs from the standard approach in the UK. The total household waste production is given as 183,638 tonnes per year, but in calculating the recycling rate a figure of only 66,000 tonnes total household waste is used. The justification behind this is the subtraction of some 117,638 tonnes of domestic refuse which is incinerated. It is clear from other parts of the Plan and previous reports and papers that the Local Authority regards incineration of energy recovery as a recycling option, and therefore justifies recycling 25% of the remaining waste destined for landfill. This is not the interpretation the recycling rate at a national level (refer to the definition in Figure 5.3). The total amount of recycled material was 7,542 tonnes, which as a proportion of the 183,638 tonnes of household waste produced gives a recycling rate of 4%.
Obtaining accurate data has also been a problem within Sheffield. There is no formal consistency of the approach utilised by Reclaim and other contractors involved in sorting, baling and storing the material. Often tonnages have been based on estimates or average figures, which is not very satisfactory in terms of evaluating the data. This is a problem that is by no means unique to Sheffield, and they are in fact much more advanced than most cities in the UK in that they are making an effort to collect tonnage data.

The Milieudienst in Amsterdam have proved to be very helpful in providing real data required for comparative analysis thus overcoming the initial problems experienced with the data set. There is a preference towards the use of percentages illustrated on bar charts, which is not satisfactory when comparing and contrasting data from other sources.

Another problem in Amsterdam is the lack of consistency throughout the city. Each district does not necessarily utilise the same approach when assessing the tonnage of material collected. Definitive issues such as an analysis of the tonnage of household waste produced, may also include commercial and business waste, depending upon the collection operation. Therefore this can cause anomalies when evaluating tonnage's and separation rates. Until the Milieudienst provides a central framework and dictates the approach needed for consistency, accepting and indicating the possible anomalies that may be present in the data set is a reasonable solution.

The issue of data discrepancies is widely acknowledged within the field of waste management and this is reflected in current research carried out in this area (refer to Brown 1994).

5.9 Local Policy and Targets
Sheffield does have specific local policies, with the exception of ensuring that the incinerator plays a continual prominent role within the waste management strategies promoted. There is no alternative or supplementary local target, simply the national requirement to recycle 25% of household waste by the year 2000. To obtain this and
implement the national policy at local level, Sheffield relies on local partnership operations between industry, voluntary groups and the Local Authority. In doing so the Local Authority attempts to ensure preparation for the integration of related national policy, such as packaging targets. However the implementation of these national policies has not resulted in the formulation of specific local targets.

In Amsterdam there are a number of specific local short term policy goals. The main local policy was developed in 1993 by the Milieudienst and is featured in the Uitvoeringsnota Afvalstoffen Huishoudens 1993. This was developed initially to represent a formalised approach to the intention of meeting the targets stipulated by the Ministry of Housing Physical Planning and Environment at national level. Even at this time the Milieudienst expressed concern over the possibility of Amsterdam achieving the national levels, stating that mandatory separation of all the different components of the waste stream would be the only route. This of course is not a feasible option at present, and the Local Authority did acknowledge this, in terms of uncertainty about market provision.

The Milieudienst does appear to present realism in stating that the possibilities of Amsterdam achieving the national targets by the year 2000 are highly dubious. They have translated this concern to reality in the provision of local targets, which although lower than at national level, remain suitably high in terms of their impact upon the need for coherent waste management strategies.

Amsterdam must separate 33% of household waste from the residual waste by the year 2000, compared to the national target of 65%. To achieve this there are separate targets for specific components of the waste stream, illustrated in Table 5.8.

There are no specific targets for ferrous and non-ferrous metals as these will continue to be extracted from the residual waste stream at the incinerator, and therefore it is anticipated that this will achieve maximum separation for recycling.
Table 5.8: Local Targets for Household Waste Separation in Amsterdam

<table>
<thead>
<tr>
<th>Waste Fraction</th>
<th>Percentage to be Separated</th>
</tr>
</thead>
<tbody>
<tr>
<td>GFT</td>
<td>35</td>
</tr>
<tr>
<td>Paper</td>
<td>40</td>
</tr>
<tr>
<td>Glass</td>
<td>80</td>
</tr>
<tr>
<td>Textiles</td>
<td>80</td>
</tr>
<tr>
<td>KCA</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Milieudienst 1994a p. 4

It is important to note that the conceptualisation of these targets evolved within a logical framework, where the Milieudienst had access not only to quantitative data from the districts and AVI-Amsterdam, but the results of a lengthy questionnaire survey carried out in October and November 1993. The results were made publicly available in Voorlichtingsstrategie: Preventie en Afvalscheiding Amsterdam, O-meting in 1994, and complement the local strategy published simultaneously. The general conclusive comments reflect the situation in Amsterdam in terms of the success of positive attitudes to waste separation, particularly paper and glass, but with limited success in changing behaviour patterns to integrate prevention and reduction of the residual waste stream. The results support the philosophy of the Milieudienst for an improved and more coordinated approach to information provision, whilst ensuring accessibility to facilities. Specific aspects of the survey are discussed in Chapter 6 in conjunction with the results from the survey conducted for the purposes of providing data for this research project.

It is accepted that these are targets for the city as a whole, and the individual districts within the city will achieve varying success (Milieudienst Amsterdam 1993, 1994a). There is the expectation that the more densely populated areas of Amsterdam will experience more difficulty in reaching the targets due to operational and physical
problems, and therefore the less disadvantaged districts will compensate for this with higher levels of separation achieved.

In terms of local policy, Amsterdam reflects the national level approach to playing more of an interventionist role. That is, the action of banning household waste from landfill sites, and introducing mandatory separate collection for GFT enforces the need for innovative waste management strategies, and development of markets to accommodate these strategies. The Local Authority support of the new incinerator, has resulted in a secure and definite market for residual household waste.

5.10 Incineration Versus Recycling
As discussed in Chapter 2, a great deal of attention has been given to the relationship between incineration and recycling. At a local level, incineration plays an important role that should not be underestimated, both in terms of provision of energy, but also as a preferred 'disposal' route. There is concern, particularly from environmentalists that incineration with energy recovery will be perceived as a recycling option, as demonstrated in the recycling plan from Sheffield. It is the implications of such a perspective that could result in preference towards recovery at considerable cost to reduction and recycling. However the role of incineration with energy recovery does appear higher on the waste hierarchy than landfill, and within the national waste strategy, any form of recovery (which includes this process) is placed on par with recycling. Therefore the local approach in Sheffield is simply reflecting the national policy approach.

When Sheffield accepted the role of the UK's first Recycling City there was concern of the impact the recycling activities may have on the quantity and quality of waste going to the incinerator. It was stressed prior to the scheme proceeding that energy recovery must remain an important aspect of waste management within Sheffield. Integration of the requirements and facilities offered by the incineration process were incorporated within the development and operation of recycling schemes wherever possible. This was emphasised by the reluctance to place facilities for the collection of steel and aluminium cans within
the scope of the incineration catchment. Post-incineration steel and aluminium is extracted from the residue and sold onto merchants.

The perceived choice between incineration and recycling does not appear to exist within Amsterdam. AVI-Amsterdam has been integrated as a necessary component of waste management strategies within the city. Representatives from the incinerator are involved in all stages of discussion and development concerning issues related to recycling, reduction and prevention. AVI-Amsterdam is a member of the platform working towards information provision, and is actively participating in the provision of data for the Milieudienst, to calculate separation rates.

The local office of Vereniging Milieudefensie (Friends of the Earth) have expressed concern over the promotion of incineration within Amsterdam, and the Netherlands as a whole (Cravitz 1993). This is for similar reasons to those discussed by environmentalist in the UK. An anti-incineration lobby was also set up in light of the publicised dioxin issue of the late 1980's, and although the lobby is present in Amsterdam it has had no impact on the incorporation of incineration as a preferred option for the residual waste stream.

Concern has been expressed over the impact of successful recycling on the utilisation of energy, particularly as the national and local targets are high. The impact of mandatory schemes such as the separate collection of GFT requires specific evaluation, as removal of this component from the waste stream will increase the calorific value of the waste. Also as other material, in particular glass, is removed and the presence of plastics becomes more significant, this will contribute to increasing the calorific value of the residual waste. Incineration has been advocated as the preferred option for managing plastics from the household waste stream in a study conducted by the national government and the plastics industry. Although it is acknowledged that environmentally this may not be an attractive option, economically it is the most cost effective, particularly as the energy recovery potential is very high (Anon. 1994). This is supported in Amsterdam, where there have been no plans to introduce targets or
collection schemes throughout the city for this specific component (refer to the local policy documents; Heuting 1993; De Jong 1994)

Although the Milieudienst supports the role of AVI-Amsterdam this is not at the expense of recycling initiatives within the city. There remains a concerted effort to achieve local targets, and ultimately national level targets. Therefore it can be stated that the relationship in Amsterdam between incineration and recycling is a positive one, illustrating good integration between the requirements of each strategy.

5.11 Public Information Provision

It has been readily accepted in Amsterdam that effective information systems play a crucial role in achieving recycling targets. Information provision is one of the key policy instruments promoted by the Milieudienst, to influence behaviour towards recycling within the city.

One area of concern regarding the information strategy within Amsterdam, is the need for a co-ordinated approach throughout the city. That is, due to the nature of administration and control, the districts differed in terms of their method and design with an absence of consultation between the districts, resulting in an ad hoc and fragmented approach (Milieudienst 1994a). The focus of attention currently is on introducing a productive and coherent strategy plan to coordinate all of the districts.

Two distinct strands of information requirements have been identified within Amsterdam. Firstly, there is action information. This is readily available, and is the type of information utilised in Sheffield. The focus is to direct the householder towards a specific behaviour in terms of collection system available to them. Kerbside collection schemes utilise action information specifically during the initial period of the scheme, and periodically throughout. Thematic information is the other strand which aims to provide increased knowledge and awareness, inducing lifestyle changes in the long term. The Milieudienst has stated that action information is more effective if there has been a degree of thematic information initially. If there is a knowledge or awareness base in the first instance, then the
householder may be more receptive in receiving further information regarding active involvement in the behaviour. Thematic information is also useful in increasing positive behaviour in householders who are involved to a certain degree, but are not demonstrating maximum participation. These issues are discussed further in Chapter 6 with regard to recycling behaviour evaluation, and also in Chapter 7 in the context of the significance of information provision within the framework of evaluation.

It has been proposed that from 1995 thematic campaigns will be carried out collectively, co-ordinated centrally, whereas action campaigns for recycling will be on a district level with collective co-ordination. The initial results of these campaigns are not available to date (March 1996).

It is clear that an integrated approach has many benefits, including uniformity of information; access to media which would be resource inefficient at district level; and awareness and familiarity throughout the city.

This is illustrated in the Milieudienst decision in 1993 to commission the BBK Informatie-overdracht (data transmission) to develop a strategy for the distribution of information on recycling and prevention. This resulted in December 1994 in the development of a platform on the Provision of Advice on Waste Matters. The program and structure that such a platform would take was voted upon by all the districts in Amsterdam, and is subject to yearly reviews. The framework that the platform was developed within, was based on a conscious awareness that a change in behaviour from all residents of Amsterdam would be required to achieve the ambitious recycling targets (Milieudienst Amsterdam 1994a).

The strategy of BBK Informatie-overdracht is to develop a cost effective way of enabling districts within the city to utilise information that supports prevention and recycling (Milieudienst Amsterdam 1994a).

The most significant aspect of the achievements by the platform have been their innovative approaches to information access. Most notably
this has included the introduction of monthly television bulletins on Amsterdam's most popular channel AT5. These bulletins last five minutes and are broadcast three times on a monthly basis, covering a range of aspects of recycling and prevention within the city of Amsterdam. They provide information on practical tips, city district initiatives, new developments, and up-dates on amounts of separated waste collected within the city. Utilising this type of media is novel not only in the Netherlands, but throughout Europe. Bulletins have also been placed on Migrantentelevisie MTV (migrant television) promoting campaigns for the collection of KCA, aimed specifically at the Turkish, Moroccan and Surinamese population. Providing information with regard to the success of a scheme has been found to be a vital component in promoting continual recycling behaviour. This theory is supported by Pieters (1991) who stated that consumers would be more likely to participate in waste separation for recycling, if they perceived that their behaviour was effective in terms of recycling rates achieved.

The philosophy behind the high cost of the information campaigns is centred on the possible savings made from reduced processing costs. It has been estimated that using a variety of different media (newspapers, advertising, television and radio) the costs for the information campaign are approximately £350,000. It is anticipated that if the information strategy is a success then 4% reduction in waste being incinerated can be achieved through increased recycling and prevention. This will provide approximately £35.00 per tonne in savings, over £350,000 in total, which can be offset against the costs of information strategy (Milieudienst 1994a, appendix 3).

Favoured media sources utilised in Amsterdam, include weekly local and free newspapers, mupi's (pole with a poser attached), advertisements on trams and billboards, and television and radio stations (Milieudienst 1994a, 1994b).

The Dutch approach towards the need for continual information regardless of the intensive provision of schemes available, supports the theory that continual information proves more of an incentive to
continue recycling than the provision of additional opportunities (Jacobs & Bailey 1983). That is, those already participating in recycling, are more likely to continue with their behaviour if it is regarded as effective, and if awareness of the schemes is enhanced. Motivational issues are discussed in further detail in Chapter 6.

Sheffield does not have a sophisticated, structured network for the transfer of information. Most of the promotion and advertising schemes occur randomly throughout the year, in line with specific campaigns. Local press and local radio have been utilised, and the Local Authority has supported the use of display material to promote specific projects. Leaflet campaigns are particularly favoured in response to reduction in participation rates, especially with regard to the kerbside collection schemes. Updates of the recycling facilities present within the city are continual, with the next date scheduled for 1996. SCRAP are involved in producing educational material, such as teaching aids and videos, as well as producing leaflets and reports to support the work of the Local Authority. They also produce Newsletters throughout the year, which contain useful information with regard to recycling and other environmental issues in progress throughout the city. ERRA have supported the requirement for information and promotional material with regard to the kerbside scheme, as this particular strategy is less effective if information is not kept to a premium. Unfortunately Sheffield has not had access to similar levels of budget as Amsterdam, resulting in a more ad hoc and fragmented approach of producing local information as and when specifically required, for example the launch or relaunch of particular schemes.

A formalised approach to information is becoming an increasing requirement with the increasing number of actors involved in the dissemination process. At a local level there are policy makers, recycling officers, promotion officers, waste services department, plus the numerous players involved in reacting to this information. Coordination and clarity between the actors and information provision and utilisation is a necessity if efficient and successful waste management strategies are to be widely implemented.
5.12 Conclusion

Initial impressions show Sheffield to be a city that is committed to recycling, with examples of innovative schemes, and good practice occurring throughout. There is no question that the partnership, Sheffield Recycling 2000, encourages the continued development and operation of recycling schemes. However the data gives a different perspective, which may hold negative connotations for other cities eager to achieve the national target. Even after three years commitment to developing recycling, with large amounts of financial investment in a pilot kerbside scheme traditionally regarded as high cost with high material returns, cannot raise the recycling figure higher than 4%. Compared to the national target of 25% there is a deficit that is impossible to breach under current circumstances, by the deadline of the year 2000. This brings into question the feasibility of such a target without significant lifestyle changes, market or statutory intervention to enforce a change. Sheffield is an example of where the highest level of commitment and support from the Local Authority, local industry, and voluntary groups is not enough to produce a recycling figure that is in reach of the national target. However it must also be stated that Sheffield has surpassed other cities in the UK in terms of its recycling rate. Sheffield still retains its status as an example of good practice in light of the data, but brings into question the potential need for legislative intervention on a national level. In real terms Sheffield has responded positively to both the recycling target and also the waste hierarchy. Incineration with energy recovery remains a dominant method of processing, in line with the preferred disposal option stated in European and national policy. Also, as recently stated in the national waste strategy (refer to Chapter 4), recovery has been placed on par with recycling. This may concern environmentalists but fully underpins the current waste management strategies in Sheffield.

A number of issues can be identified that differ from Amsterdam and may be regarded as contributing factors to the low level of recycling in Sheffield. The actual density of drop-off schemes located around the city remains low for the population they are servicing. This indicates a less than adequate provision of facilities to collect waste, which may deter households from becoming involved. The provision and
availability of local facilities is an important incentive to participation levels, and this is supported in Chapter 6 as a result of data collected from the questionnaire surveys. The predominance of facilities in Amsterdam is much greater, and this is evident from simple observation throughout the city. With regard to kerbside collection there remains a need to expand the scheme in Sheffield before income generated can achieve the levels required to support the operating costs of the scheme. Also as the kerbside scheme is regarded as an approach where high levels of material separation can be achieved, expanding the scheme may increase the possibility of raising the recycling rate. Participation rates for both drop-off and kerbside are not reaching their expected or target levels. Therefore there needs to be further work in attaining higher levels of participation in existing schemes as well as the development of innovative approaches.

Comparatively, Amsterdam is achieving high levels of recycling, averaging at 12%, although this falls short of the national target. There is a conscious effort to increase and develop the provisions currently available to raise the separation rate to meet the local targets.

Information provision within Sheffield with regards to the waste strategies is often unstructured and inadequate. Also information detailing issues concerned with recycling schemes in operation for external sources, has been limited since the completion of the Recycling City project. However during the period of Recycling City data was accessible both locally and nationally, ensuring that other cities could and have learnt from Sheffield, regardless of whether the information was 'positive or negative'. The national attitude is currently moving towards the need for better information systems that have structure and coordination, throughout the UK. Presently there is development of a national scheme with regard to information generation, and the feasibility and implementation of the specific proposals are discussed in Chapter 7.

Financial investment for the operation and development of schemes is low both in terms of public and private investment. This is in contrast to Amsterdam where the Local Authority has pledged to
support and develop schemes, especially in terms of information provision and utilisation. The Milieudienst has handed over budgetary control to the districts with regard to most aspects of waste management, but retains full funding for KCA collection as this is very costly.

The prominence of recovery above recycling is evident in Sheffield, and although this may be regarded as a critical factor in the implementation and success of recycling schemes, the local reaction is focused on the concept of cradle to grave planning. This includes economic and market led planning strategies. Incineration with energy recovery is placed within the context that recovery is a more stable option that reduces the reliance on fossil fuels and produces energy for the local community.

In Amsterdam, although the incinerator does play a dominant role it was originally introduced due to the lack of alternative disposal routes. The Milieudienst regard incineration, recycling, reduction and re-use as integrated strategies towards managing the household waste stream.
Chapter 6: Recycling Behaviour in Sheffield and Amsterdam

6.1 Introduction
The phenomena of recycling behaviour is an important aspect in any research investigating the process of household waste recycling. In order to facilitate the ultimate development of a model predicting barriers and incentives to recycling, the factors that influence behaviour need to be identified and evaluated. As this is a comparative study it is important to identify whether any significant differences exist between such influencing factors in Sheffield and Amsterdam.

Chapter 5 has identified differences in the quantities of separated material for recycling in the two cities, with Amsterdam achieving considerably higher tonnage's of separation and consequently achieving higher recycling rates. Although this can be attributed in part to the advanced approach with regard to the provision of facilities and investment in the promotion of recycling schemes in Amsterdam, this does not explain the low rates achieved in Sheffield. As the first Recycling City in the UK, Sheffield received attention and support in the promotion and installation of recycling schemes. It represented a pilot project serving as a national case study. Therefore it is fundamental to the research to establish the reasons why the recycling rate in Amsterdam is considerably higher than that in Sheffield, despite its previous status as Recycling City.

Evaluations of data in previous chapters have indicated that the overall planning philosophy and attitude towards recycling is fundamentally the same in both cities. There appears to be a positive approach towards the notion of recycling, as well as an awareness of the problems in achieving recycling activity in practice. However regardless of the fact that there is evident support of recycling in theory, engaging the public to participate and continue participating in
separation of material for recycling is possibly the essence of the problem. Therefore it appears that the reason for the lower participation rates in Sheffield could be attributed simply to the fact that they do not want to behave in this way, or rather, there are a number of factors present that may be inhibiting or preventing them from achieving continual positive behaviour.

Based on the initial comparative evaluation in Chapter 5 and the questionnaire data collected, supplemented by previous research into recycling behaviour, this study proposes the theory that the influential factors and barriers to material separation are the same in Sheffield and Amsterdam. However greater success in achieving positive recycling behaviour in Amsterdam could be as a direct consequence of differences in approaches to overcome the barriers or promote the influential factors. Therefore a single model of recycling behaviour can be developed for both cities (refer to section 6.4). This theory is in contrast to a certain extent with previous case study research into recycling behaviour, and in particular that of Lansana in 1993. Whilst Lansana concluded that models of recycling behaviour were different in each of the case studies, this research attempts to indicate that models of recycling behaviour are fundamentally the same in Sheffield and Amsterdam.

The consequence of supporting the theory that the models of recycling behaviour are in essence the same in Sheffield and Amsterdam, will mean that within the overall recycling framework the actual concept of behaviour should not be regarded as the barrier to successful recycling. Limited participation could be resolved by management practices and systems which are effective towards the influencing factors.

The technique selected for evaluating recycling behaviour has been discussed in detail in Chapter 1, where it was concluded that questionnaire surveys were an appropriate method to identify, compare and contrast the factors which influence the attainment of positive recycling behaviour in Sheffield and Amsterdam. Data collected from the questionnaire surveys allows for statistical analysis which eases comparability. Questionnaire surveys previously carried
out in both Amsterdam and Sheffield are utilised to support the findings of this research.

The data analysis of the questionnaire results was carried out using SPSS, which is a well established statistics computer package, recognised for its extensive use within the social sciences. The data set obtained consists predominantly of nominal and ordinal scale. With nominal data there is no order or actual numerical measure, individuals are purely categorised. The numbers allocated to the variables are not representative of an actual measure in quantitative terms, they are simply a label. Ordinal variables can be ordered in terms of more or less than, with regard to the concept i.e. recycling all, most, some or none of their waste. There are a number of dichotomous variables which can fall within the nominal or ordinal level (Bryman & Cramer 1990).

Questionnaire survey analysis follows a predictable sequence of evaluatory mechanisms. Initially, to identify patterns and trends in the data, univariate analysis is a necessity. This results in the development of frequency tables for all the variables involved and cross-tabulations for selected variables so initial groupings can be identified. Exploratory analyses are useful in indicating and leading to further supplementary findings, whilst ensuring that the analyses retain a strong link to the original theory or hypothesis (Openheim 1992).

With regard to the evaluation of the data, the term significance is used to express statistical significant difference at the 99% level, unless otherwise stated.

6.2 Questionnaire Survey

6.2.1 Question Composition
As the questionnaire survey was the tool for data collection, it was imperative that the content and structure of the questions sufficiently accommodated all significant issues of concern (refer to Appendix 3 for full details of the questionnaire used in the survey). Omissions in the questions would invariably lead to insufficient data, and consequently
the theory will not be able to be supported or disproved. Therefore prior to the questionnaire design it was necessary to identify and define the components incorporated within the concept recycling behaviour. This was a crucial stage to the methodological approach, as identification of fundamental conceptual components formed the essence of the questionnaire.

Extensive reviews of previous behavioural studies within waste management were necessary, supported by the initial evaluations within the research. Common themes were identified, and certain components were excluded for irrelevance prior to any decisions being taken. Previous research such as Coggins (1993), identified a number of background factors that influence recycling behaviour, and whilst a number of these were excluded from the questionnaire for various reasons, they remain an important aspect in the construction of the survey (Table 6.1).

Table 6.1: Background Factors Influencing Recycling Behaviour

<table>
<thead>
<tr>
<th>Place Variable</th>
<th>Socio-demographic variables</th>
<th>Human Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Household Size</td>
<td>Knowledge &amp; Awareness</td>
</tr>
<tr>
<td>Urban v. Rural</td>
<td>Household Composition</td>
<td>Awareness</td>
</tr>
<tr>
<td>Street Layout</td>
<td>Affluence/Disposable Income</td>
<td>Attitudes</td>
</tr>
<tr>
<td>Plot Variables</td>
<td>Social Class</td>
<td>Behaviour</td>
</tr>
<tr>
<td>Property Tenure</td>
<td>Car Ownership</td>
<td>Preferences</td>
</tr>
<tr>
<td>Domestic Heating</td>
<td>Life Cycle/Dynamic Change</td>
<td>Incentives &amp; Penalties</td>
</tr>
</tbody>
</table>

Source: Coggins 1993

The questionnaire was basically structured to obtain information regarding purchasing behaviour, environmental attitude, recycling activity and personal profile data of each respondent in the sample. General questions at the beginning of the survey identified a number
of socio-demographic issues such as household type and size. These types of questions can be perceived as non-threatening and easy to recall and therefore are ideal to be placed at the beginning of the questionnaire. Most sensitive issues such as educational achievement and ethnicity were placed at the end of the survey, whereby it was hoped that the respondent would have become more relaxed and more likely to respond. Age and gender of the respondent were simply observed and noted, and not referred to directly.

Questions regarding purchasing behaviour and environmental attitude are essential in generating an overall perspective with regard to the respondents general perception of environmental issues. It is interesting to establish whether a positive relationship exists between an environmental attitude and the likelihood of participating in positive recycling behaviour.

The essence of the questionnaire is structured around recycling attitude and participation questions. These questions represent the dependent variables that are being evaluated to develop the model of recycling behaviour. The questions are focused on different aspects and incorporate issues that influence recycling behaviour. For example there are questions to establish the motivation of the respondents with regard to their participation in recycling, and also questions to identify barriers to this participation. Attitude, ability, knowledge and awareness are also established within the context of recycling participation. The inclusion of these issues as dependent variables which require evaluation, can be justified by previous research into recycling behaviour and also initial conclusions drawn from both qualitative and quantitative data for Sheffield and Amsterdam. A model defining recycling behaviour in terms of conceptual components and operationalisation, depicting the flow from theory level to research level has been developed, based on a framework for social research by Frankfort-Nachmias and Nachmias (1992) (Figure 6.1).
This clearly identifies significant issues that require evaluation and reflects preliminary assumptions within the research which are supported by a number of proponents (refer to Table 6.2). It must be clear however that the proponents do not support specific conceptual components in isolation. There is a degree of dependence and interaction and to some extent causal flow relationships between components. This is evaluated in greater detail in the concluding discussion to this chapter. Although it is important to recognise the findings in previous behavioural research, it is also important to retain a degree of uniqueness in the study, based on initial theories supported...
by previous chapters. That is, although previous research has developed models for achieving positive environmental behaviour, these are acknowledged to a certain extent with the inclusion of proponents of key influencing factors, but they may not necessarily be applicable in this specific case.

Table 6.2: Proponents of Specific Conceptual Components of Environmental Behaviour

<table>
<thead>
<tr>
<th>Conceptual Component</th>
<th>Proponents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness</td>
<td>Lansana (1993), Sia et al. (1986), Schoenfeld (1974)</td>
</tr>
<tr>
<td>Ability</td>
<td>Pieters (1989), Heiskanen (1992)</td>
</tr>
</tbody>
</table>

It is interesting to note that the conceptual components of behaviour in any context is subjective. However data collected from applying the questionnaires can support and justify the role and significance of specific components, allowing for a framework of recycling behaviour to be developed.

6.2.2 Data Generation and Analysis

The total sample size obtained from the street surveys was 350, which consisted of 165 from Sheffield and 175 from Amsterdam. Although it may be argued that the sub samples are not very large compared to the populations of Sheffield and Amsterdam, they were adequate for the statistical tests. A figure of 50-100 is stated by Hoinville et al. 1977 (p161) for the minimum size for subgroups. A compromise had to be reached between sample size, cost, accuracy and time. As the questionnaire surveys formed only a single component of the entire methodology,
investigating one issue within the holistic approach, it was not possible to allocate a greater amount of human and economic resources. Of greater importance than the size is establishing whether the samples from Sheffield and Amsterdam are representative of the populations (refer to Table 6.3 and Table 6.4).

Table 6.3 Comparison with Population Data to Establish whether the Sample from Sheffield is Representative

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender: Male</td>
<td>50.9%</td>
<td>48.3%</td>
</tr>
<tr>
<td>Female</td>
<td>49.1%</td>
<td>51.7%</td>
</tr>
<tr>
<td>Age Groups: 0-44 years</td>
<td>69.7%</td>
<td>59.8%</td>
</tr>
<tr>
<td>45-64 years</td>
<td>17.6%</td>
<td>19.3%</td>
</tr>
<tr>
<td>65 and over</td>
<td>12.7%</td>
<td>20.9%</td>
</tr>
<tr>
<td>Ethnic groups: Black African</td>
<td>0.6%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Indian</td>
<td>1.8%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Pakistani</td>
<td>1.2%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Bangladeshi</td>
<td>1.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td>White</td>
<td>95.2%</td>
<td>95.0%</td>
</tr>
<tr>
<td>Black Caribbean</td>
<td>0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Black (other)</td>
<td>0%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Chinese</td>
<td>0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Asian</td>
<td>0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Other</td>
<td>0%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

Source: 1994 Survey (Price), 1991 Census Data for Sheffield

Census material provides vital comparative data to establish whether the sample is truly reflective of the population. Gender, age groups, ethnic groups, and household composition represent the variables selected from the sample and compared with their respective population percentages. Unfortunately it was not possible to compare the same variable in Sheffield and Amsterdam with their respective
population data. The categorisation of age groups from Amsterdam census material were very detailed and specific and did not reflect the categories used in the questionnaire survey. Therefore it was not possible to compare this variable with the population, except for the age group 65 and over. Likewise it was not possible to compare the ethnic groups in the Amsterdam sample with the population, as the census material contained more generalised groupings. In Amsterdam gender, 65 and over age group, and household composition were compared from the sample with local population data. In Sheffield, a comparison was made between gender, age groups and ethnicity from the sample data, with the local census material.

With regard to gender, the sample from Sheffield is very similar in terms of the proportion of men and women to the census data for Sheffield, which reflects a lack of response bias from men or women. In Amsterdam, although there has been a slight over sampling of men compared to the population proportions, this has had limited bearing on the overall data acquired. Analysis of contrasting behaviour between men and women with regard to dependent variables did not highlight any major differences. Therefore it is possible to state that the higher sampling of men had minimal implications with regards to the validity of the questionnaire data.

Table 6.4: Comparison With Population Data to Establish whether the Sample from Amsterdam is Representative

<table>
<thead>
<tr>
<th>Variable</th>
<th>Amsterdam Sample</th>
<th>Amsterdam Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender: Male</td>
<td>54.9%</td>
<td>49.1%</td>
</tr>
<tr>
<td>Female</td>
<td>45.1%</td>
<td>50.9%</td>
</tr>
<tr>
<td>Age Groups: 65 and over</td>
<td>3.4%</td>
<td>13.6%</td>
</tr>
<tr>
<td>Single Person Household</td>
<td>42.8%</td>
<td>53.2%</td>
</tr>
<tr>
<td>Households without children</td>
<td>25.7%</td>
<td>24.0%</td>
</tr>
</tbody>
</table>

Source: 1994 Survey (Price), 1995 Amsterdam in Cijfers
Also, within the age groups for Sheffield there appears to be differences between the percentages of the different groups within the survey, compared to the population data. The actual population of Sheffield predominately consists of people within the 0-44 years age range, followed by a more even distribution between 45-64 and 65 and over age groups. This is not reflected in the sample characteristics. To justify confidence in the sample, the 65 and over age group was evaluated against a number of variables to establish whether distinctly different response patterns were obtained, which could have implications for the data set. The variables concerned with purchasing behaviour, awareness of neighbours recycling participation, cost implications of the introduction of schemes, and recycling activity were cross tabulated with age groups. In most cases the selection of a positive response was slightly lower in contrast to the other age groups. However the pattern of response was the same, therefore any bias in age group response did not adversely affect the data set.

It is difficult to ascertain whether the over sampling in the 0-44 age group has implications for the data set, as in the questionnaire this group was split into two distinct categories: less than 24 age group, and 24-44 age group. The two categories were regarded as one group simply for ease of comparability with census data.

As the 44-64 age group was very close to the population percentage for Sheffield there can be little doubt that this was representative.

Within Amsterdam, sample survey data for the 65 and over age group indicates an under sampling compared to the population data. However, this age group was evaluated against a number of different variables, and did not exhibit any extreme responses. Therefore, once again, a bias in the age group response did not adversely effect the data set.

The number of single person households in the Amsterdam sample was 42.8%, compared to 53.2% in the population, representing an under sampling in the survey data. Once again, the single person household group was evaluated against a number of different variables
thought to be influenced by occupancy level. The pattern of response was consistently the same. This lessened the likelihood of under sampling in this group adversely affecting the data set. The number of households without children in the Amsterdam sample was very close to the census data, therefore it is highly probable that this is representative.

Once the initial analysis has established whether the survey data is representative of the population, the second stage of analysis involves establishing the presence of specific relationships between variables. A number of bivariate techniques such as chi-square and correlation coefficients, can be applied. Dependent and independent variables are identified and comparisons between sub groups within the data set are carried out. It is at this stage that interactions between the conceptual components (dependent variables) and independent variables are identified.

6.3 Evaluation of the Data
6.3.1 Socio-demographics
The identification of socio demographic factors did not produce any significant unexpected results. The majority of the sample in Amsterdam occupied apartments, with only a minority having access to gardens. This had been anticipated through observation of the city as the architectural structure is based on street lined tall narrow housing. Most of this housing has been converted into apartments, allowing the size of the population to live in a relatively small surface area of 161.87 km². In Sheffield the majority of the sample occupied houses with gardens, which again through observation was an expected result. Although the responses to the question of type of accommodation were anticipated, their inclusion in the questionnaire was important. One aspect of motivation has been the convenience or ease of involvement in separating waste for recycling, including storage facilities for recyclables. Therefore this issue requires evaluation within the context that the majority of people living in Amsterdam have limited storage space available, due to the structure and size of their accommodation. The consequence of this is discussed in further detail with regard to opportunities and barriers to recycling.
Over 50% of the respondents interviewed in both Sheffield and Amsterdam lived with another person. The percentage that lived in a household with children was smaller, with 38.2% in Sheffield and 25.7% in Amsterdam. The lower percentage in the Amsterdam sample reflects the population percentage (refer to Table 6.4) and represents the type of inhabitants of Amsterdam, which due to its cosmopolitan appeal and focus on social provisions, attracts a great deal of independent young people. This is supported to a certain extent in the high percentage of single person households, both in the sample and also the population of Amsterdam. The implications of the sample characteristics in terms of differences exhibited in the dependent variables is subsequently assessed.

The results of the questionnaire highlight a distinct difference between achievement of higher levels of education in Sheffield and Amsterdam. This is a reflection of national trends in the two countries. The percentage of the student-aged population at college is 21% in the UK, compared to 60% in the Netherlands according to figures recently published in the Guardian (Swain 1996). Educational expectations differ in the UK and the Netherlands, which is reflected to a certain extent by the data. 12.7% of the sample in Sheffield achieved only a basic level of education, compared to just 6.3% of the sample in Amsterdam. At the other extreme 2.4% of the sample in Sheffield achieved post graduate qualifications compared to 6.3% in the sample from Amsterdam. Opportunities differ in that a number of different routes are available, offering training in Amsterdam and throughout the Netherlands, in contrast to the rather confined educational system available in Sheffield and the UK.

As evaluated in Section 6.2 age groups compared favourably with the population, and there were no significant differences between the samples. However the questionnaire data illustrated that in the overall sample the consistent recyclers of the more established material, namely paper and glass, were in the 24-44 age group. This was significant at the 95% level, and compares well with previous
research which has indicated age groups most likely to behave positively with regard to recycling (Coggins 1993)

It was important to identify ethnic groups and possible relationships with recycling activity variables, to establish whether issues such as awareness and knowledge have a more significant role when there is the possibility of a language barrier. However within Amsterdam the sample was not representative in terms of ethnic groups. In Sheffield the sample was representative of ethnic groups in the population, but due to the small sample size there was not a viable number to evaluate possible relationships with other variables. It can be stated that in both Sheffield and Amsterdam there are strategies implemented within recycling schemes to minimise the implications of language difficulties, particularly in respect to information provision (as discussed in Chapter 5). It is important to ensure involvement of the entire population of the cities if recycling is to be a success in terms of recycling rates.

Gender is considered in terms of establishing differences in attitude and behaviour between men and women, in particular in consideration of the barriers and incentives to positive recycling behaviour (refer to Section 6.4.).

6.3.2 General Indicators of Environmental Behaviour

There were a number of question that were specifically aimed at evaluating whether there was evidence of general environmental awareness. The question based on purchasing choice required the respondent to select a single reason for purchasing a household product. Most respondents found this very difficult to answer, as they were inclined to select more than one response. However, the main response in both samples was quality, followed by cheapness (refer to Table 6.5). The environment was selected by only 13.7% in Amsterdam, however this was more than double the percentage for Sheffield.

It is unsurprising that quality and cheapness represented the main reasons for purchasing household products, and does not necessarily
imply a negative environmental attitude. Differences in the respondents socio demographic status did not influence the response given for purchasing choice, nor did differences in recycling participation. It must be considered that the householder may look for a combination of factors when purchasing a product.

Table 6.5: Influential Reason for Purchasing Household Products

<table>
<thead>
<tr>
<th>Purchasing Choice</th>
<th>Sheffield</th>
<th>Amsterdam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>61.8</td>
<td>56.0</td>
</tr>
<tr>
<td>Price</td>
<td>26.1</td>
<td>24.0</td>
</tr>
<tr>
<td>Environment</td>
<td>6.1</td>
<td>13.7</td>
</tr>
<tr>
<td>Recycling</td>
<td>0</td>
<td>2.9</td>
</tr>
<tr>
<td>Packaging</td>
<td>0.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Other</td>
<td>5.5</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Source: 1994 Survey (Price)

Within the UK research has identified that where the government does not regulate green products they fail to gain a market share. This is illustrated by unregulated green detergents which claim only 2% of the market. There appears to be a reluctance to pay more for a product that may be believed as being less effective as traditional brands (Motluck, 1995). It can be stated that positive environmental responses given to this question can illustrate nothing other than extreme proactive behaviour whereby a householder is prepared to place environmental reasons ahead of quality and price. Therefore the response to this question does not reflect the general environmental attitude in Sheffield and Amsterdam, but indicates a general reluctance to sacrifice price and performance in household products.

The low figure achieved by recycling as a purchasing choice can be explained in part for the sample from Amsterdam, by respondents comments. The philosophy that most material would be recycled, and new products would contain a certain amount of recycled material,
negated the selection of recycling as a purchasing choice. This view was expressed by a number of respondents. These assumptions, which appear to underlie behaviour, represents a new aspect to recycling behaviour research and introduces a different perspective worthy of further investigation. Within Sheffield there was no similar explanation as very few of the respondents expressed any opinion with regard to this variable, other than a desire for 'value for money'. This is very similar to the results of 1992 survey carried out by the Recycling Evaluation Consortium, where 40% favoured cheapness, 40% favoured quality, and only 4% selected recycling as a purchasing choice (Recycling Evaluation Consortium 1993 p. 32).

A second question focusing on the extent of positive environmental behaviour evaluated action towards the receipt of 'junkmail'. This can range from mail not addressed specifically to the named household, to free newspapers, which can understandably form a significant component of household waste paper.

It is possible in both cities to obtain a sticker to place near the letter box, indicating that the household does not want to receive flyers, adverts, and 'junkmail'. To evaluate the strength of proactive environment behaviour, and awareness of such a preventative tool, respondents were asked whether they participated in this action. The response indicated a significant difference between the two samples, with only 24.8% giving a positive answer in Sheffield, compared to 41.7% in Amsterdam. This is slightly higher than the figure of 30% given by the Miliedienst, as stated in Chapter 5. It was anticipated that there would be a reasonable level of participation in Amsterdam as the stickers are evident in the windows and on letterboxes of apartments. It is significant that of those who used the stickers in Amsterdam, 42.5% were participating in the kerbside collection scheme, whilst only 19.4% using the stickers were not. The statistical analysis indicates that there is a high degree of confidence this did not occur by chance or sampling error. There is evidence that the respondents who used the 'junkmail' sticker were also 20% more likely to select concern over the use of resources as a reason to recycle, which reflects the waste reduction philosophy to a certain extent. These relationships could
indicate a greater awareness with regard to recycling. This may be a direct consequence of being involved in the kerbside scheme, and therefore in receipt of more information regarding recycling activities. Or conversely the mere action of being involved in the kerbside scheme renders the householder more aware of their actions with regard to waste management in general. It is not possible to hypothesise the specific reason for the relationship, merely state that the fact the relationship exists is significant. It can be assumed to a certain degree that participating in the kerbside collection scheme will result in more information and promotional materials being made available to the householder, which will be influential in itself. As previously discussed in Chapter 5 and evaluated further in Chapter 7, information provision is an important aspect of recycling participation and promotion of positive behaviour.

With regard to Sheffield only 15% of those involved in the kerbside collection scheme took part in the sticker scheme, which nonetheless does indicate positive behaviour. It appears that in Sheffield there has been little promotion of this preventative measure, which could be reflected in the fact that only a quarter of respondents stated positive involvement.

6.3.3 Peer Pressure
Peer pressure can be acknowledged as providing extrinsic motivation, whereby people feel compelled to take part in an environmental activity such as recycling, because their neighbours or friends are seen to participate. This issue was addressed with a question focusing on the respondents knowledge about their neighbours recycling activity. There was a significant difference between Sheffield and Amsterdam in the respondents knowledge or opinion of their neighbours recycling activity. In the sample from Sheffield 46% were aware of their neighbours recycling activity, compared to 76% in Amsterdam (refer to Table 6.6).

The fact three quarters of the respondents in Amsterdam had an opinion of how many of their neighbours recycled compared to just under half in Sheffield, could be due to the style of housing. The
population density is much greater in Amsterdam, and apartment accommodation lacks the privacy of conventional housing. The awareness of neighbours presence, and their activities, is heightened thus making it possible for their recycling activity to be acknowledged. Also as recycling certain components of the waste stream (as will be discussed later) is regarded as the norm, respondents from Amsterdam may simply be assuming that their neighbours are recycling, simply because they themselves are participating. To evaluate this further, responses to recycling activity were cross tabulated with the responses for neighbours recycling activity and tests of significance carried out. These indicate a relationship between non recyclers and lack of awareness of neighbours recycling activity, which was statistically highly significant.

Table 6.6: Respondents Opinion of their Neighbours Recycling Activity

<table>
<thead>
<tr>
<th>Recycling Activity</th>
<th>Sheffield</th>
<th>Amsterdam</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of the neighbours recycle</td>
<td>4.2%</td>
<td>18.3%</td>
</tr>
<tr>
<td>Most of the neighbours recycle</td>
<td>8.5%</td>
<td>25.7%</td>
</tr>
<tr>
<td>Some of the neighbours recycle</td>
<td>13.3%</td>
<td>18.9%</td>
</tr>
<tr>
<td>None of the neighbours recycle</td>
<td>20.0%</td>
<td>13.1%</td>
</tr>
<tr>
<td>Don't know</td>
<td>53.9%</td>
<td>24.0%</td>
</tr>
</tbody>
</table>

Source: 1994 Survey (Price)

The influence of participating in kerbside collection schemes was evaluated against the knowledge of neighbours recycling activity to see if there was any correlation between the two. Of those involved in the kerbside scheme in Sheffield, 19.1% were unaware of whether their neighbours recycled, compared to 76.4% of those not participating. A similar trend was identified from the Amsterdam sample, with 16.7% of those involved in the kerbside scheme being unaware of their neighbours recycling behaviour, compared to 71.4% of those not participating. This relationship is expected to a certain extent, as the
action of placing the kerbside container outside the house (blue box or biobak, as discussed in Chapter 5) gives a positive indication of recycling behaviour, and therefore it is easier to establish the behaviour of neighbours in the area.

6.3.4 Cost of Recycling
The perception of whether recycling would affect the cost of waste disposal was significantly different in the two sub samples. The majority of the respondents in Sheffield believed that the cost would in fact stay the same. Only a small minority believed that the cost would increase. This was significantly different to Amsterdam, where the majority believed the cost would increase as a result of recycling activity. The statistical analysis indicates that the difference between the opinion of the two samples is significant. In Amsterdam the public is made much more aware of the true costs of waste disposal as each month their electricity bill includes the cost of their waste disposal. As of 1994 each Stadsdeel (district) was able to set their own tax for waste, however, the taxes are set at a similar rate to avoid unfairness, and it is forbidden for the Stadsdeel to make a profit from the taxation. The public is also aware of the development and construction cost of the new incinerator that currently manages their waste. The opinion of many of the respondents is that although they were not necessarily content with a presumed increase in cost, it was accepted as a necessity to achieve successful recycling. There was a perception that recycling would increase the cost as resources would need to be available to supplement or promote markets for the material. There appeared to be definite opinions with regard to financial issues and recycling, although this did not have any implications on participation, and did not appear to be an influential factor. Willingness to pay was therefore evident within the sample from Amsterdam.

In Sheffield, comments from some respondents indicated that they are unaware of the cost of disposal and some imagine it to be 'free'. Therefore the implications of recycling on disposal costs has little or no meaning to the householder. In reality the cost of disposal is immersed within the payments required for council tax, although there is a growing consensus of opinion that the true costs should be made
available to the public to increase their awareness of waste management.

There was no distinction in either Sheffield or Amsterdam between the recyclers and non recyclers perspective of the implications of recycling on the cost of waste disposal. Therefore, in this case economics does not appear to play an extrinsically motivating role with regard to engaging the sample in positive recycling behaviour.

6.3.5 Recycling Activity
Kerbside collection as a component of the household waste management strategy is evident in both cities. Within Sheffield the blue box scheme collects a variety of material, whilst in Amsterdam the biobak scheme collects only GFT (as discussed in Chapter 5).

Within the two samples, 24.2% in Sheffield stated that they are participating in the kerbside collection scheme, and of those not participating only 4.2% are unaware of the kerbside schemes existence. In Amsterdam 28.6% of the respondents are participating in the kerbside collection scheme, with 8% unaware of the activity. Therefore general awareness of kerbside collection is high, although in the sample from Amsterdam there remains a slightly higher degree of ignorance which is currently being addressed by the BBK Informatie-overdracht (refer to Chapter 5 for further details).

Currently there is a proposed expansion of both schemes. In Amsterdam it is in response to the mandatory nature of the GFT collection scheme, whilst in Sheffield it is a purely voluntary expansion in a continual effort to increase the productivity of the scheme in both monetary and material terms.

Although it became mandatory for GFT to be collected separately from household waste on 1 January 1994, the Milieudienst in Amsterdam accepted that it would be impossible to implement this successfully throughout the entire city. Increasing attention has been focused on achieving participation in areas of the city previously excluded from the scheme. This is reflected to a certain extent in the range of
responses given with regard to the length of time respondents had been recycling their GFT. Only 33% claimed they had been participating for over 3 years, which is in contrast to participation periods of glass and paper.

Recycling of specific components of the waste stream differs between the samples from Sheffield and Amsterdam (Figure 6.2 and Figure 6.3).

Figure 6.2: Percentage of Respondents Recycling Specific Components of the Waste Stream in Sheffield

In both Sheffield and Amsterdam paper and glass is the material predominately separated for recycling. However almost twice as much of all paper and glass is claimed to be separated by the respondents in the Dutch sample. This corresponds to the quantitative data collected from Sheffield and Amsterdam with regard to annual tonnage figures. Comparable responses from both Sheffield and Amsterdam are given with regard to the separation of all textile waste.
Separation of all cans from the household waste in Sheffield is only carried out by 24.8% of the respondents. Within Amsterdam, as the cans are extracted from the residual waste stream pre-incineration, separate collection of cans is not pursued by the householder, and therefore responses were not required within this sample. Plastic separation is carried out by 21.2% of the respondents from Sheffield. This is an area of separation that is relatively unique to Sheffield, as many towns and cities throughout the UK are not promoting the recycling of this component. As already stated, with regard to the Netherlands and more specifically Amsterdam, plastic is not regarded as a viable material to recycle.

Figure 6.3: Percentage of Respondents Recycling Specific Components of the Waste Stream in Amsterdam

Small chemical waste (referred to as KCA in Figure 6.3) is separated from the household waste stream by over 30% of the sample in Amsterdam. This figure is relatively high in terms of the inconvenience and effort necessitated for the householder to separate this component, although the local government is dissatisfied with the
achievements. As discussed in Chapter 5 this is an area where there is currently a lot of focused activity with regard to the promotion and implementation of collection schemes.

In Sheffield there is no widely available permanent scheme in place to allow for this component to be collected separately. A number of drop-off sites do accommodate for the collection of household batteries, and oil, specifically at Civic Amenity sites, although the availability of sites is minimal. Therefore no positive answers were given for recycling household chemical waste.

Overall it is evident from the data that separation by the householder of specifically paper and glass is much more prolific in the sample from Amsterdam than in Sheffield. This supports the comparison between tonnage data acquired for the two cities. As Amsterdam recycles a greater amount than Sheffield it is unsurprising that a greater percentage of respondents participated in separating these components waste.

The high numbers of respondents stating their involvement in waste separation for recycling in Amsterdam, is supported by the results of a local questionnaire carried out in 1993 by the Milieudienst, in which a large number of households involved in the survey (435 in total) were actively separating their waste for recycling (Milieudienst Amsterdam 1994b).

It is evident from the data that paper and glass are most frequently separated for recycling in both Sheffield and Amsterdam. This is illustrated further in Figure 6.4 and Figure 6.5, and although there is a distinct difference between the participation in samples from Sheffield and Amsterdam the overall involvement in the separation of these components from the household waste stream is high. The percentages of those involved in textile, small chemical waste, can, and plastic separation is much lower, although these do represent only a small percentage of the household waste stream. Also as markets are more established for paper and glass, and the recycling of these components is relatively easy, the promotion of these components has
been more intense previously. Therefore it is interesting to establish whether an internal relationship exists between the separation of paper and glass. That is, to evaluate the consistency of paper and glass recyclers. Statistically the internal reliability analysis gave an alpha coefficient of 0.7 and 0.8 for Sheffield and Amsterdam respectively, inferring a strong relationship between recycling of paper and glass.

Figure 6.4: Participation in Paper Separation in Sheffield and Amsterdam

<table>
<thead>
<tr>
<th></th>
<th>Sheffield</th>
<th>Amsterdam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recyclers</td>
<td>53.3%</td>
<td>21.1%</td>
</tr>
<tr>
<td>Non-recyclers</td>
<td>46.7%</td>
<td>78.9%</td>
</tr>
</tbody>
</table>

Source: 1994 Survey (Price)

Figure 6.5: Participation in Glass Separation in Sheffield and Amsterdam

<table>
<thead>
<tr>
<th></th>
<th>Sheffield</th>
<th>Amsterdam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recyclers</td>
<td>49.7%</td>
<td>15.4%</td>
</tr>
<tr>
<td>Non-recyclers</td>
<td>50.3%</td>
<td>84.6%</td>
</tr>
</tbody>
</table>

Source: 1994 Survey (Price)

This indicates that within the sample the respondents separating paper were also likely to separate glass. This is an interesting concept that has
been fully utilised in Amsterdam with the dual locating of paper and glass banks. However, this needs to be taken into consideration in Sheffield when the location makes it difficult to site a full mini recycling centre. It may be beneficial to locate both a paper and glass facility as the minimum option, when space availability restricts the possibility of locating recycling banks for all components.

6.3.6 Recycling Facilities
As previously discussed in Chapter 5 Amsterdam has a much denser network of paper and glass banks than Sheffield with an average of one site per 1,500 people. The ease of recycling is evident in Amsterdam with 94.6% and 94.2% of the respondents visiting a site to recycle paper and glass respectively within 1 km of their household. This is in contrast to Sheffield where only 53.6% and 54.4% of the respondents visit a site within 1 km of their house to recycle their paper and glass respectively. Statistically the difference between the samples is highly significant, ensuring confidence can be placed in the existence of difference occurring in the population, and not as a consequence of sampling error.

Due to the high density of sites in Amsterdam, all of the Dutch sample used their local facility, which was significantly different to Sheffield as 14% claimed never to use their local facility. The location of sites at supermarkets and major shopping areas in Sheffield has made it possible for people to combine their shopping activity with recycling. Also, as just under half of the sample estimated that their local facility was between 1-5 km away, it would often be easier to visit a facility that was convenient for other reasons. This may include a facility at or near to the workplace, or at the regular shopping facility.

Textile recycling showed comparable differences, with over 60% of respondents in Amsterdam travelling less than 1 km to the collection site, compared to only 40% of respondents in Sheffield. None of the respondents in Amsterdam travelled more than 10 Km, which was in contrast to 6.4% of the sample from Sheffield travelling over 10 Km. Statistically this was significantly different at the 99% level, thus
indicating a confidence in the difference occurring between the populations, and not as a consequence of sampling error.

The collection of cans within the Sheffield sample was separated into those using a facility less than 1 km away, and those using a facility between 1 to 5 km away. This indicates that generally facilities which can be considered as local are only available for half of the sample, which reflects the situation for the other material collected in Sheffield. Plastic collection gave similar figures, as generally facilities in place for cans also accept plastic, as they are processed within the same facility.

With regard to KCA, the abundance and location of the chemo stops in Amsterdam reflects the fact that most respondents, over 80%, travelled less than 1 Km.

6.3.7 Established Behaviour
This research is primarily concerned with established behaviour as there is a distinction between continued participation and initial enthusiasm. This is illustrated in Sheffield when the kerbside collection program was launched. Initially, response rates peaked at 70-80% in the first few months, however by December 1992 recycling fatigue had developed in the north west area of Sheffield and participation dropped to 50% (Recycling 2000 Forum 1992).

It is evident from Figure 6.6 and 6.7 that the recycling of paper and glass is an established behaviour in both samples. Within the sample from Amsterdam, the majority have clearly been carrying out the activity for over three years, compared to Sheffield where the majority is 1-3 years.

Although only a small percentage participated in textile recycling in both samples, in Sheffield over 50% had been participating for more than 3 years. The figure was higher in Amsterdam at 68%. The problem appears to be encouraging the non-recyclers to participate.
Figure 6.6: Length of Time Respondents Participating in Paper and Glass Recycling in Amsterdam

![Bar chart showing the percentage of respondents participating in paper and glass recycling for different time periods in Amsterdam.](image)

Source: 1994 Survey (Price)

Figure 6.7: Length of Time Respondents Participating in Paper and Glass Recycling in Sheffield

![Bar chart showing the percentage of respondents participating in paper and glass recycling for different time periods in Sheffield.](image)

Source: 1994 Survey (Price)
With the collection of KCA in Amsterdam although 57.3% had been recycling for more than 3 years, there was an indication of new participants as 16% had been recycling for less than 6 months. This reflects the increase in publicity and information programmes as greater attention has recently been placed on the need to increase the collection of KCA. Irrespective of the cost, the local and national government are promoting the removal of this component from the waste stream so that it can be recycled or management in the Best Practicable Environment Option (refer to Chapter 4 and Chapter 5).

In the Sheffield sample although the recycling figure for cans is low, of those that participate 50% have been doing so for 1-3 years, reflecting established behaviour. Plastic recycling is more varied with 15% recycling for a year or less. However, the majority of respondents did state that they had recycled for 1-3 years.

6.3.8 Motives for Recycling
A number of different reasons for encouraging positive recycling behaviour were offered to the respondents. A limit was not placed on the number of responses each respondent could select.

Figure 6.8 represents the responses obtained from both samples, indicating the reasons given for motivating positive recycling behaviour from both Sheffield and Amsterdam.

The respondents from both Sheffield and Amsterdam clearly show a preference towards altruistic reasons, with the environment and resources selected as the main motivators for participating in recycling schemes. This is similar to a survey carried out in 1990 by the Recycling Evaluation Consortium who found that 52% stated environmental reasons for their positive recycling behaviour (Recycling Evaluation Consortium 1993 p.32). Therefore motivation is linked with providing benefits which can be shared by society as a whole. This is comparable to a study carried out by Thorgersen who found that 60-70% chose conservation as the main reason for recycling.
This was followed by approximately 30% of the Sheffield sample selecting charity as a motivating factor. This again is an altruistic reason and contributes to the 'feel good factor'. This reflects to a certain extent their perspectives and beliefs towards the identity of the main beneficiaries of recycling. It also exhibits a distinct difference between the basic theoretical framework of the promotional material in Sheffield and Amsterdam.

In Sheffield a number of charities or 'non-profit' organisations are involved in administering, organising and managing the recycling schemes. The Local Authority simply acts as a facilitator and coordinator, overseeing the operations, and donating a minimal amount of economic support. Therefore the perspective of the schemes is different. In Amsterdam the only process associated with charity provision is textile recycling.
The issues of energy conservation and perception of recycling being a relatively easy and small act in the scale of environmental issues are the other main reasons for recycling in Amsterdam.

In Sheffield, although these reasons were also stated, approximately 20% of respondents chose the reason that they were producing too much waste for disposal. This reflects an awareness towards over consumption, which was not exhibited in the Amsterdam sample. This does not necessarily illustrate disregard for their waste production, but rather implies that there is not the belief that they are producing too much waste. This would be consistent with the level of awareness and knowledge towards minimisation and prevention of waste, which appears to be much greater than in Sheffield. Campaigns and promotion have focused on waste production, emphasising the need for the householder to reduce their waste. It could be stated that these campaigns have had an effect and therefore the respondents from Amsterdam may have reduced their waste and believe their recycling activity limits the implications of the residual waste they produce for disposal. However it is very difficult at this early stage to obtain statistical data to support this theory.

Only a very small percentage of both samples regarded the provision of jobs as a reason to recycle, which illustrates that either recycling is not being promoted from this perspective, or there is a lack of belief in any claims of job provision.

Continual behaviour can occur without there necessarily being a continual incentive as a consequence of the behaviour ceasing to be reasoned action and becoming the norm. This is consistent with comments made by respondents in Amsterdam who initially found it difficult to express why they recycled, as they had been participating in the behaviour for some length of time. They regarded separating paper and glass from their waste stream as normal acceptable behaviour. It was only when questioned about the less established separation of other material such as the kitchen waste or small chemical waste that they had an immediate response.
Habit also plays a very important role in whether an individual will engage in an activity consistently. That is, if an individual is familiar with a particular behaviour pattern, then it is more likely that they will engage in that behaviour again. It will form part of a routine or habitual activity (Macey & Brown 1983). In Amsterdam, recycling of glass, in particular through the use of a drop-off scheme has been in place for over 20 years and so is now part of a habitual exercise. Also as paper banks are placed in the same location of glass banks recycling of this material has also become a repetitive activity. It is only material such as textiles, GFT and KCA that have been promoted for separation in recent years, that are not yet components of habitual activity for the majority of respondents.

Encouragement to recycling, such as reward processes, have been identified with 'boring and adverse tasks' in an effort to make them more appealing, and to stimulate intrinsic interest (Deci & Ryan 1980). Both Sheffield and Amsterdam have incorporated this positive influence in their recycling strategy to a limited extent. Amsterdam utilises deposit return systems for specific glass bottles, a scheme that extends throughout the Netherlands. On a more comprehensive level, there have been a number of discussions relating to the possible incorporation of a payment scheme or reduced disposal fee for those householders that recycle in Amsterdam, although this has not been implemented. Deposit return schemes have been discussed at length for incorporation in the UK, however it has been estimated that the total costs of introducing such a scheme for beverage containers is as high as £300-500 million (Environmental Resources Ltd 1992). In Sheffield ALCAN do offer monetary rewards for the collection of aluminium cans, but this is only a small sum.

However intrinsic non-economic incentives such as instilling a sense of achievement, responsibility and satisfaction have a greater effect on promoting continued positive recycling behaviour (Young 1986). These have been referred to as the 'feel good factor' by Pardini & Katzev (1984). These intrinsic motivators have been incorporated in the promotional material used in both cities, although to a greater extent in Amsterdam than Sheffield. The results of a questionnaire
survey carried out by the Milieudienst and BBK Informatie-overdracht, concluded that a positive attitude towards waste separation comes mainly from one's own sense of responsibility (Milieudienst Amsterdam 1994b, p. 3). This is supported by non-recycling respondents from the Sheffield sample who could not understand why the issues related to waste management was their responsibility (refer to section 6.3.9).

6.3.9 Reasons Stated for Not Recycling
The main reason given for not recycling by respondents from both Amsterdam and Sheffield was the lack of facilities (refer to Figure 6.9). Therefore the lack of ability and opportunity to carry out the action of recycling was limiting participation. Comments stated by some respondents in Sheffield were with regard to the low number of collection facilities available. This was in contrast to the main areas of concern in Amsterdam which centred on the provision of specific material collection facilities, for example textiles and small chemical waste, which are not as densely located or readily available for paper and glass facilities. These findings are supported by the results of a previous questionnaire carried out by the Milieudienst and BBK Informatie-overdracht which concluded that there remained a need for better visions to enable the collection of separated waste (Milieudienst 1994b). Also, previous questionnaires in Sheffield indicated that inadequate facilities were barriers to positive recycling behaviour (refer to Table 6.7).

Therefore, the lack of opportunity, whether actual or perceived forms the main barrier to recycling in both Sheffield and Amsterdam.

Approximately 20-25% in both the samples from Sheffield and Amsterdam felt that they did not produce enough material to constitute separating it for recycling. This figure was surprising, but may reflect the relatively high number of single occupancy households, particularly in the Dutch sample. A number of respondents selecting this category in Sheffield were also elderly and did not consider that both the composition and quantity of waste they produced was sufficient to require separation for recycling. This
reflects the need for increased promotion and information provision highlighting the significance of recycling in terms of its national and even global importance. Comments were made concerning the lack of impact that recycling the small amount of waste produced by the household would have on national waste issues.

Figure 6.9: Reasons Given for Not Recycling

Inconvenience of recycling was the third main reason given for not participating. Convenience of a particular activity is regarded as a crucial factor in encouraging recycling behaviour (Reid et al. 1976). There was a significant difference in the sample between gender of the respondent and perception of whether recycling was inconvenient. Approximately 70% of those who agreed that recycling was inconvenient were men. Statistically this result was highly significant. This is an interesting issue, as although recycling is traditionally perceived as an activity shared within the household, other research has indicated this not to be the case. Harrison et al. (1994) found that the responsibility of organising and implementing recycling to become part of everyday activity in the household fell largely upon the
women. Therefore the fact that such a high proportion of men stated that recycling was inconvenient, does not correlate with other research that states the activity is carried out by women in the main. Perhaps the involvement of men in an area generally falling under the traditional 'housewife' role has resulted in their perception of the activity being inconvenient. However it is not possible to draw any specific conclusions with regard to the issue of gender perception.

The inconvenience factor relates to different areas of concern in the two cities. In Amsterdam the lack of storage space within peoples homes could become a significant issues, whereby inconvenience overcomes the desire to participate. Lack of space may increase the frequency of visits required to recycling facilities, which in turn may contribute to the inconvenience of recycling. However, the high availability of sites near to households in Amsterdam may negate the inconvenience of lack of storage space and high frequency of visits.

With regard to the kerbside collection scheme separated GFT is stored for a maximum of 2 weeks by 75% of the Dutch sample. This includes 55% who store the material for less than a week. This storage period reflects the frequency of kerbside collection which is both necessitated and required by householders who lack the availability of space. Results from the Milieudienst questionnaire in 1993 indicates that although there is a willingness to separate the waste into different components there is not always the ability to do so because of space limitations (Table 6.7).

In Sheffield, limited availability of recycling sites contributes to the inconvenience of recycling. As a high percentage of respondents live in houses with gardens, storage space is not considered a problem. Therefore although inconvenience is considered an important barrier to recycling, it is related to housing structure in Amsterdam, and availability and opportunity in Sheffield.

Lack of knowledge of recycling schemes available was a reason given by only 5.3% in Amsterdam compared to 16.7% in Sheffield. The low percentage from Amsterdam is explained by the intense advertising
undertaken by the Milieudienst to promote recycling schemes in the city. The importance placed on information supply and awareness is supported by the development of the BBK Informatie-overdracht in 1993 (refer to chapter 5). However considering the ad hoc process of information provision in Sheffield, it is reassuring to note that 83.3% does not regard lack of knowledge as a limiting factor to recycling.

Table 6.7: Judgement by the Householder on the Adequacy of Space to Store Recyclables in Amsterdam

<table>
<thead>
<tr>
<th>Component</th>
<th>Very Satisfactory</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>GFT</td>
<td>25%</td>
<td>36%</td>
<td>39%</td>
</tr>
<tr>
<td>KCA</td>
<td>19%</td>
<td>53%</td>
<td>28%</td>
</tr>
<tr>
<td>Paper</td>
<td>24%</td>
<td>60%</td>
<td>16%</td>
</tr>
<tr>
<td>Glass</td>
<td>19%</td>
<td>57%</td>
<td>24%</td>
</tr>
<tr>
<td>Textile</td>
<td>16%</td>
<td>50%</td>
<td>34%</td>
</tr>
</tbody>
</table>

Source: Milieudienst 1994b

In Sheffield a small percentage stated that they were unclear why recycling was their responsibility. Once again this factor is linked with awareness, knowledge and understanding. There appears to be a distinction between promoting a recycling scheme, and generating full understanding and awareness of the underlying issues. This theory has been investigated by Fishbein and Ajzen in 1977 who stated that once an acceptance of responsibility had occurred, then a positive attitude was more likely. This is also supported by Schwartz (1977) who refers to the level of responsibility for an issue being a mediating factor between attitude and behaviour. Comprehension of the purpose of participation in recycling schemes can lead to a positive behaviour (Kok and Siero, 1985). However, it is also possible for positive behaviour to occur with regard to recycling, without a full comprehension occurring, if there are other factors present. This includes peer pressure, habit, convenience of facilities, intrinsic and extrinsic motivation.
Reasons for not participating in Sheffield are similar to those found in surveys carried out in 1990, 1991 and 1992, where the main reasons were inconvenience and lack of facilities (Table 6.8). This is also supported by a survey carried out in Sheffield by Midland Environment Ltd in 1991, in which 74% of respondents stated that there were not enough facilities convenient to their household. This is a concept which appears to occur at a national level in the UK as there is a target in the national waste strategy to improve the availability recycling facilities close to the householder.


<table>
<thead>
<tr>
<th>Factor</th>
<th>1990</th>
<th>1991</th>
<th>1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconvenient</td>
<td>32%</td>
<td>39%</td>
<td>48%</td>
</tr>
<tr>
<td>No Facilities</td>
<td>22%</td>
<td>13%</td>
<td>25%</td>
</tr>
<tr>
<td>Nothing to Recycle</td>
<td>7%</td>
<td>8%</td>
<td>6%</td>
</tr>
<tr>
<td>Not interested</td>
<td>16%</td>
<td>22%</td>
<td>not asked</td>
</tr>
<tr>
<td>Don’t know how</td>
<td>not asked</td>
<td>not asked</td>
<td>16%</td>
</tr>
</tbody>
</table>

Source: Coggins 1993

It is not clear why the inconvenience factor has increased in the 1990, 1991 and 1992 surveys, however it could be stated that as awareness increases and the percentage of people willing to recycle also increases, there may be a growing awareness of problems encountered with carrying out the activity. This also could explain the increase in perceived lack of lack of facilities from 1991 to 1992.

Specifically with reference to the kerbside scheme in Sheffield, a number of comments with regard to the development of recycling fatigue, were linked with unreliability of the service offered. This is complemented by research carried out in the north west area of Sheffield, which identified that reasons for reduced participation rate were linked with poor service, boring information provision in the
form of newsletters, and confusion over the fate of materials collected (Recycling 2000 Forum 1993a). Other specific issues raised included the servicing of the drop-off sites, which was referred to as inadequate, resulting in full and overflowing collection facilities making it impossible for the householder to deposit the material.

6.4 Recycling Behaviour Framework for Sheffield and Amsterdam

It is clear from the results of the questionnaire survey, that there are distinct factors which are influential to recycling behaviour in Sheffield and Amsterdam. Issues such as opportunity and availability of facilities, understanding and attitude towards recycling, have been raised either directly by the respondent, or indirectly through their selection of response. It is also evident from the data that the theory that the population of both cities are subject to the same incentives and barriers is correct.

The results achieved had been anticipated to a certain extent as a consequence of the data evaluation in Chapter 5. The high density of facilities in Amsterdam indicates a greater ease of recycling in terms of access to local sites to the household, which was reflected in the data collected for the availability of sites within 1 km of the house. This of course has direct consequences for convenience of recycling. Specific socio-demographic characteristics which were anticipated to be problematic, for example, the predominance of apartment style housing, resulting in space limitation, were overcome to a certain extent by the promotion of other influential factors, such as availability of facilities. This is in contrast to Sheffield where more spacious housing style, accommodating extra storage space, should have increased the convenience of storage for recycling, but in fact was not enough to overcome the inconvenience of reduced access to local facilities.

Using data generated from the questionnaire survey, supported by previous research in Sheffield, Amsterdam, and also within the field of behavioural studies, a recycling behaviour framework has been developed (Figure 6.10).
Much of the research into behavioural issues, has indicated that there is a sequence of events which leads to an action or particular behaviour being adopted. This sequence is primarily concerned with an initial knowledge of the subject or issues, followed by a general concern, opinion, or attitude towards that subject or issue, which then leads to a particular behaviour or action (Sia et al. 1986, Schoenfeld 1974, Ostman & Parker 1988). This is supported by the framework that operates within Sheffield and Amsterdam.
This framework is hierarchical, that is, to reach a certain stage it is assumed that the preceding stages have been passed.

The success of any recycling policy is only evident in the behaviour it induces. If the targets and goals (both national and local) are not achieved, then it can be assumed that there are factors which are inhibiting the positive behaviour from occurring. It is clear from the framework that the initial issue is the policy. An awareness of policy, either in terms of what the policy is trying to achieve, or how the policy is going to be achieved, is crucial. This has been addressed in a number of ways in Amsterdam, incorporating national level promotion of the waste policy and legislation, with local level strategies to achieve this. In Sheffield, awareness of strategies and their role formed a crucial component in the first instance with regard to the launch of the schemes in the Recycling City project. The level of awareness in Sheffield and Amsterdam appears to be high in terms of facilities available. This is illustrated by the low number of respondents who were unaware of the existence of the kerbside scheme. It is crucial that awareness is generated as successful participation cannot occur if there is a lack of knowledge in what the policy represents and what the implementation strategies are (in operational terms) to achieve it.

Once an awareness has been generated there needs to be adequate ability by the householder in terms of opportunity to participate in recycling. It is evident from the survey that with regard to paper and glass specifically, there is the opportunity to participate in recycling these components in Amsterdam. There is a high density of recycling facilities, located within close proximity to the household. However a number of problems are being experienced with regard to textile and KCA recycling. The ability to carry out this activity is reduced to a certain extent, regardless of an awareness of the possible facilities available, and the need to meet the local level targets.

Within Sheffield the ability of the householder to recycle forms the initial major barrier to positive behaviour. The inconvenience of lack of available sites near to the household, and low density of sites
throughout the city, inhibit participation. Lack of facilities for the collection of materials causes difficulties in applying the knowledge gained and awareness of recycling strategies. It is at this point that a number of potential recyclers may be 'lost' regardless of their awareness of the strategies in place to implement the schemes.

Incentives to carry out the strategies available are mainly intrinsic in both Sheffield and Amsterdam. This is illustrated by the fact the economic incentives to recycle are unavailable except to a limited degree for aluminium in Sheffield, and return systems for beverage bottles in Amsterdam. Although these represent two quite different systems, their similarities lie in the fact that they are confined to specific components and offer minimal monetary return. In fact the perception by a large number or respondents, specifically in Amsterdam, is that recycling will ultimately cost money. This should serve as a extrinsic disincentive, however this does not appear to be the case considering the large number of Dutch respondents participating. The main reasons given to motivate positive recycling behaviour are altruistic.

Within Amsterdam lack of extrinsic motivation does not serve as a barrier to recycling, in fact the altruistic incentives act as influencing factors. Publicity and promotional material involved in the awareness campaigns have focused on the role of the individual and their responsibility to the environment.

In Sheffield, a trend towards intrinsic altruistic reasons has emerged as influential in the development of positive recycling behaviour. Comments made and the responses given by the sample in Sheffield indicate that although there is a degree of motivation present, it is not fully utilised due to the limiting effect of the opportunities available to recycle. Therefore due to the sequential nature of the framework, the failure of earlier concepts such as awareness and ability will negate any influence that motivation has on the individual.

The remaining important concept to be addressed is attitude. Regardless of whether there is a knowledge of the schemes and
opportunity and motivation to participate, if there is a negative attitude towards the role and concept of recycling itself, then participation will not occur. The importance of recycling, and other waste management strategies such as re-use and reduction, appear to be better understood in Amsterdam. This is evident initially in the basic fact that there is a greater percentage of respondents participating in material separation for recycling. This in itself reflects a positive attitude. Environmentalism is more integrated within society and the relevance of individual actions is accepted. One key concept that has been addressed in chapter 5 and will be discussed further in Chapter 7, is information provision. Householders are made aware of how successful schemes are being in terms of tonnage collected, and participation rates, which contributes to an understanding of the importance the individuals activity within the management of household waste.

Within Sheffield a negative attitude has arisen from a lack of understanding of the importance of recycling. The worth of an individuals action is not appreciated in terms of the perception that the individual is not producing enough waste to recycle. There is a degree of mistrust with regard to the management of the material that has been collected separately for recycling. Also the idea that the local authority is not carrying out sufficient action to enable recycling has resulted in a negative perception of the schemes available.

Lansana proposes that each policy introduced with regard to recycling should consider the demographics and attitude of the particular local for implementation. This supports a 'bottom up' approach that is certainly encased within Dutch policy development, but is not clearly as evident in Sheffield. Once again the important role of intermediary organisations and non-government bodies is brought into question, and their role is established further in Chapter 7.

It is clear that once recycling behaviour has been achieved there needs to be continual intrinsic motivation to ensure continuity of behaviour, until the time is reaches that the activity becomes the norm and is habitual. In Amsterdam whilst paper and glass separation for recycling
is habitual, textile, KCA and GFT separation are not yet part of the normal pattern of activity. This is evident from both the length of time of participation, and also the reduced participation for these components. However it is hoped that as a consequence of the current promotion strategies with regard to the separation of these specific components, this will become the case. In Sheffield, whilst for the percentage of those exhibiting positive recycling behaviour, paper and glass are also habitual, it is not to the same extent as Amsterdam. Once behaviour is established, it will for the majority of cases continue (Macey & Brown 1983)

6.5 Conclusion
The results of the survey and the development of the framework for recycling behaviour have identified key factors that are recognised as influencing positive recycling behaviour. In Sheffield, whilst there appears to be an awareness of recycling in terms of policy and strategy, ability and opportunity to participate in recycling appears to be the limiting factor. This is comparable to Amsterdam to a certain extent in that the opportunity to recycle specific components of the waste stream is not as intensive as for paper and glass. This has limited the impact of recycling textiles, KCA and GFT. More complex issues such as attitude appears to have a negative impact on recycling in the sample from Sheffield, whereby a lack of sufficient information to appreciate the significance of recycling could be a contributing factor.

Improved information provision is already being addressed in Amsterdam, whilst in Sheffield it is being addressed in part with regard to specific schemes. Amsterdam has benefited from national awareness campaigns and it is hoped that as the UK develops initiatives nationally these will provide supplementary assistance at a local level in Sheffield.

Due to an established level of understanding and awareness in Amsterdam, it is anticipated that any schemes to encourage and develop household waste separation will receive widespread support. This is supported by the motivations for recycling which centred on altruistic responses and a sense of individual responsibility.
There is some concern that without intervention in terms of financial assistance and a more coordinated approach towards recycling schemes in operation, the barriers to recycling in Sheffield will not be overcome. However, it is evident from comparison with Amsterdam that there are alternative approaches to improve participation, and therefore it is possible to generate higher levels of positive recycling behaviour.
Chapter 7: Integration of Local and National Level Issues

7.1 Introduction
As clearly stated in Chapter 1, there are three distinct stages to this research. Stages one and two have been satisfied to the extent that significant issues with regard to household waste recycling have been addressed at both local and national levels. The final stage of the research is concerned with bringing the key issues together, and ultimately presenting a framework model of recycling. This Chapter will therefore focus on identifying the integrated nature of local and national level issues, addressing the concept of recycling from all perspectives holistically. This will ensure that within the final Chapter, recommendations can be made with regard to overcoming the barriers identified and represented in the model, thereby satisfying the criteria stated in the aims and objectives (Chapter 1).

It is evident in the local case study that the Dutch are achieving higher levels of household waste recycling than in the UK. Tonnages of material collected are higher, and a 12% recycling rate has been achieved in Amsterdam in contrast to 3% in Sheffield. Chapter 6 has addressed some of the reasons for this from the perspective of the participants within the context of behaviour.

The support structure for implementing recycling policies in each city differs, not in terms of attitude or ultimate aim to achieve recycling targets, but in operational and managerial terms. That is, the local authority in Amsterdam plays more of an interventionist role, promoting and supporting coordinated activities throughout the city, with a common goal of achieving firstly local and then national level recycling targets. Specific responsibility is disseminated to the districts within the city, provoking internal competition and focusing the scale of operation. Far from fragmenting waste management in the city, the coordinating and managerial role of the Local Authority ensures that
the districts are not isolated and are all operating within the same framework. Due to the differing and wide ranging nature of geographic and demographic aspects within the city, operation at a district level reduces the scale of the problems and improves the manageability of barriers encountered. Not all activities are reduced to district level, specific campaigns such as information and education are retained within Local Authority control, where it is better suited to give a uniform and city-wide approach.

The financial support within Amsterdam differed from Sheffield. There is a freedom to charge householders a waste tax that reflects the needs of the city, with one stipulation in that there should not be any profit gained from the tax. Also, as the costs of disposal are so high (over £70 per tonne), any diversion from residual waste stream is regarded as an economic benefit. Therefore the Local Authority has a tendency to support the implementation of schemes and strategies with the long term philosophy that this will generate economic gain. Participation rates differ also, and the underlying rational and public perception of recycling is encompassed within a framework of positive environmental behaviour. Recycling is perceived as just one component of action required by the Dutch to improve the environmental nature of their lifestyles.

In Sheffield the local Authority represents more of a facilitating and coordinating role, although the operation and management of the strategies is undertaken in the main by non-profit and charity organisations. The financial support is limited, without access to specific funds for recycling (refer to discussion about recycling credits and supplementary credit approval in Chapters 4 and 5). This ad hoc approach in Sheffield is dissimilar to the more sophisticated strategy incorporated within Amsterdam.

Nationally these differences are also self evident. The Dutch government has played a proactive role throughout, whilst encouraging activity at local level. An extensive amount of policy and legislation has been produced, and most if not all has been successfully implemented at local level. The national government is extensively
involved in the development of waste management practices that incorporate resource, energy and environmental consequences. As a leading country in the EU in terms of developing environmental directives, the Dutch are in a superior position with regard to their current recycling status. They are however subject to the same issues and areas of conflict that will be discussed later. It is their management of these conflicts and issues which has enabled them to retain their progressive status in terms of environmental and waste management.

There remains some dissatisfaction with regard to the uncoordinated approach nationally within the UK. This is supported by the results of this research, whereby a number of comments arose throughout the local survey, criticising the 'lack of economic support and assistance with schemes in the UK'. Comments such as this have been echoed in numerous reports and articles by both the public and private sectors. This has highlighted the distinct difference between the UK and the Netherlands with regard to the role of non government organisations (NGO's), industry and Local Authority involvement. This concept has been mentioned briefly in chapter 4 and will form the focus of greater evaluation in this penultimate Chapter, and also the final discussions in Chapter 8.

A number of issues raised in previous chapters such as market provision, decentralisation and demunicipalisation, are significant in the role they play with regard to the further development of waste management. Therefore this Chapter addresses both issues of concern and those that may give rise to conflict, and attempts to evaluate whether the solutions introduced within the UK and the Netherlands are adequate to overcome the negative connotations.

7.2 Public Information Provision

Information can still be regarded as one of the most powerful tools, in combination with other motivation mechanisms, to achieve successful recycling. It is essential that information provision and dissemination forms an integral component of any waste management strategy or recycling scheme. Reliance on the public as providers of material for recycling, and the main players in achieving household waste recycling
targets, necessitates clear and informative data that will leave them capable and willing to participate. Involving the public from the first instance and providing continual unambiguous information is regarded as an integral approach in realising policies and opportunities. At a local level in Amsterdam, the role of information is seen as an important aspect of their waste management strategy, and the Local Authority is prepared to make the initial high investment, confident that they will be recompensed by decreases in disposal costs. The local approach reflects the national government's attitude towards dissemination of information, and national waste management campaigns have provided the baseline for Local Authorities to work from. One of the principal information strategies on a national level has been an advertising campaign featuring the slogan "Minder afval heb je zelf in de hand" (refer to Appendix 4). This is a play on words which can be translated as meaning less waste is something that is in our hands, that is, the public has the power to do something about the household waste stream. At the same time it also refers to that fact that the waste that is in our hands can be reduced. The national campaign was widespread and the process of generating such an interest or awareness throughout the country at national level has provided the Local and Provincial Authorities with a framework to base their activities within. The Amsterdam information campaign, integrated throughout the city, aims to utilise sources of material from the national government, ensuring a degree of familiarity within the local population. This also coordinates national and local approaches, which works towards the implementation and achievement of national targets at a local level.

It is possible that in the UK this approach will be adopted, as the national government has launched a Going for Green campaign (Going for Green Campaign 1995). This is a strategy to promote environmental behaviour, incorporating the slogan 'Making a world of difference - together'. Waste management is a significant component of this campaign and features as the first issue in the 'green code'. This national strategy emphasises the concerted effort applied by the government in aiming to encourage positive environmental behaviour. Again this reflects the Dutch approach, and obviously it is
hoped that it will be as successful as their national environmental campaigns.

Also, promoting a national approach towards waste management, Wastewatch (an independent organisation funded in part by the Department of the Environment), recently launched a television advert in February 1996. The advert focused on a young girl surrounded by waste on a landfill site, and then in a house next to a full kitchen bin. It featured in the final frame, a telephone number to contact for further information about recycling. The message was clear and simple and aimed to stir the public conscious and increase awareness to the 'waste problem'. The advert was not frequently aired which may indicate that this is a trial strategy. The success of this approach will be interesting to evaluate and presents a further research opportunity.

It must be stated that caution should be applied when providing information or promoting recycling strategies. Terminology utilised to promote awareness provides the underlying concept of whether the information will be readily received and accepted. The paradox is that the education needed to increase awareness and understanding may be the inhibiting factor in terms of social constructs, or language symbolism, as defined by O'Riordan (1995). The promotion of an environmental activity such as recycling, generally focuses on the possibilities of either self interest or self sacrifice. Initial perceptions may provide negative connotations in that self interest may imply behaviour that will specifically promote ones self, with scant regard for the benefits to the population as a whole. This is in contrast to the interpretation of self sacrifice which implies benefits to others as a consequence of an ir 'individual's loss. Different perceptions may appeal to different sectors of the general public. Therefore campaigns have generally tried to state how an individuals action will benefit themselves, the population, and more importantly, the environment. This is certainly true of the Dutch waste reduction campaigns, and is true with regard to previous environment advertising campaign in the UK, specifically energy saving adverts. The present interest in advertising waste issues in the UK has also incorporated elements of
self interest, including a promotion of the feel good factor, with the imagery that is presented. However as stated above, it is too early to establish the effect or significance of the television campaign.

The public should be provided not only with information regarding the schemes being implemented and incorporated within the waste management strategy, but also actual data in terms of success of the schemes. This is evident in Amsterdam where regular bulletins are provided, indicating the amount of material recycled, the recycling rate being achieved, and comparison made with other districts and also other municipalities. This feedback reinforces the initial messages and encourages continual participation. Therefore the public are in a position to not only gauge their current success but also be confident the schemes are operating as stated. This appears to be an important aspect of participation, as from the sample in Sheffield a number of respondents stated their lack of confidence in whether the material was actually being recycled. Comments within this context may have been raised on numerous occasions throughout the UK as a consequence of periods when prices fell and material collected for recycling may have been disposed of via the traditional routes, as components of residual waste.

From a more general perspective the government in the UK has launched an initiative to ensure local environmental information is freely available in the form of the citizens charter. A model charter highlighting environmental services in the local area, including information on standards attained and targets achieved at local level, is promoted by the national government (H M Government 1994a). Performance indicators in this case will be different from previous information sources. As stated, a large proportion of waste data has been utilised from CIPFA where the main focus has been on the cost element of waste management strategies. Any waste information generated from the citizens charter initiative will be in relation to policies and legislation implemented, and targets set.

In the UK there is a fundamental problem in providing the public with accurate waste data in terms of tonnages to reflect performance rates, as
there are inadequacies with existing baseline data. Good information management is becoming a crucial component, not only with regard to public provision but also in establishing achievement and relative success of targets. This is an issue that has been previously addressed nationally in the Netherlands, and is under current development in the UK.

7.3 Data Collection and Dissemination
In the UK the government has accepted the importance of well established data provision and information schemes, although in practical terms there has been little or no action previously with regard to enhancing information provision. Lack of data was specified as being responsible for the difficulties in devising feasible targets and goals in the national waste strategy for England and Wales (ENDS 1994c). Information resource management has been started to a certain extent with the Audit Commission report of Local Authority services, however this is not specifically for waste as it encompasses all operations within the Local Authority remit. However, the Commission did provide a comprehensive document in 1995 (followed by a subsequent document in 1996) indicating waste generation and recycling rates for all Local Authorities throughout England and Wales.

All waste management policies and targets necessitate data collection to establish their success or failure. It is also in the public interest to ensure information is readily available (as stated in Section 7.2), and to place accountability upon those responsible for implementing the strategies. The most comprehensive data currently available on household waste in the UK is supplied by CIPFA, although this is incomplete and limited in its application. Ideally waste data should be capable of replication, and standardised to ensure its usefulness (Coggins & Brown 1995)

These issues were acknowledged in 1995 when it was determined that the Environmental Protection Group, within the Department of the Environment, should include in its remit a review of the provision of information systems, including specifically waste management. This is
with a view to establishing requirements and proposing recommendations to aid implementation and success of environment policies. One of the key aims is to develop an information inventory to be used by the Department of the Environment and the general public, in line with ensuring data is freely available. Specifically with regard to waste, this is similar to the work of the Waste Management Council (AOO) in ensuring that a database is generated and managed as a resource to be accessed by the national government to review the success of policies and attainment of targets, and also be accessible to the general public as and when required.

The Department of the Environment is aiming to coordinate and implement a review of the data requirements for waste management to correspond with the implementation of the national waste strategy for England and Wales. Numerous studies have been undertaken by Wastewatch, CIPFA, WRA’s and consultancy groups generating data with regard to specific aspects of waste management. However this ad hoc fragmented approach have led to inadequate information, and differing methodological approaches has resulted in discrepancies within the data sets. If the attainment of targets set in the national waste strategy are to be monitored, then a formal centralised approach is required to ensure validity and accuracy of the data generated.

The ultimate aim of the strategy is to introduce an action plan that will raise waste management information provision to an adequate level. However with a lack of standardisation it is unclear what is meant by the term adequate and from whose perspective. The action plan drawn up focuses on 70% of information items not available or inadequate, which brings into question the significance of the remaining 30% of information items which are not being accounted for in the plan. The estimates of the cost of implementing the action plan is stated to be £990,000 (Department of the Environment 1995c, p3). Comparatively, in Amsterdam alone the figure estimated for data generation and dissemination in 1994 was £350,000. However although the UK figure appears to be low, a large amount of the data will be acquired at no or little cost to the Department of the Environment as the source of a
large component of the information already exists or will be generated by government bodies.

When waste information items were reviewed it was discovered that an overall figure of 4% was stated with regard to information items being fully and adequately available (p.8). This figure reflects the scale of action required. Therefore prioritisation has occurred with items being categorised as high, medium or low value. Unfortunately due to the large proportion deemed of high value this category was further divided into high one and high two. In the short and medium term focus has been placed on attaining those items categorised as high one and two. Table 7.1 illustrates the information items related to household waste that were prioritised for action.

It is evident from this that there is very little baseline information available at present, and therefore it would be very difficult to establish whether targets were being achieved. This may prove to be a disincentive to the actors and players involved in household waste recycling. Policies and targets are ineffectual if there is no method to measure or standardise their success.

The Department of the Environment is the prime customer of the information, within the context of its many divisions. The concept of prime customer is a novel approach in the UK but it does ensure specific responsibility on a single authority group. This in turn ensures that the information meets the specific requirements stated by the Environmental Protection Group (Department of the Environment 1995c) and potentially feeds into European reference Directives.

Current providers of information such as CIPFA, Wastewatch, WRA's plus external contractors, will be expected to be the main actors and players in generating the information resource. Other specific sources of information are to include Duty of Care and waste transfer notes as these are regarded as a cheap approach to obtaining accurate data (Department of the Environment 1995c). However there may be a number of issues with utilising these sources, specifically with regard to waste transfer notes. There appears to be a feeling within the waste
industry that the information provided is not always accurate by any means and therefore basing a database upon this source could undermine the overall aims and objectives of the strategy.

Table 7.1: Prioritised Information Required in the UK in Specific Relation to Household Waste

<table>
<thead>
<tr>
<th>Information Item</th>
<th>Sub Item</th>
<th>Priority</th>
<th>Frequency (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household Waste</td>
<td>Total weight</td>
<td>One</td>
<td>Three</td>
</tr>
<tr>
<td></td>
<td>Material composition</td>
<td>Two</td>
<td>Three</td>
</tr>
<tr>
<td></td>
<td>Chemical composition</td>
<td>Two</td>
<td>Three</td>
</tr>
<tr>
<td></td>
<td>Treatment of disposal route</td>
<td>One</td>
<td>Three</td>
</tr>
<tr>
<td>Packaging Waste</td>
<td>Total weight</td>
<td>One</td>
<td>One/three</td>
</tr>
<tr>
<td></td>
<td>Consumption by material type</td>
<td>One</td>
<td>One/three</td>
</tr>
<tr>
<td></td>
<td>Household/non household split</td>
<td>One</td>
<td>One/three</td>
</tr>
<tr>
<td></td>
<td>Treatment of disposal route</td>
<td>One</td>
<td>One/three</td>
</tr>
<tr>
<td>Waste Recycled</td>
<td>Total weight</td>
<td>One</td>
<td>Three</td>
</tr>
<tr>
<td></td>
<td>Household waste</td>
<td>One</td>
<td>Three</td>
</tr>
<tr>
<td></td>
<td>Waste paper used in newsprint production</td>
<td>One</td>
<td>Three</td>
</tr>
<tr>
<td></td>
<td>Number of households with easy access to recycling</td>
<td>One</td>
<td>Three</td>
</tr>
<tr>
<td></td>
<td>Number of drop-off sites</td>
<td>Two</td>
<td>Three</td>
</tr>
<tr>
<td></td>
<td>Number of kerbside schemes by type of Schemes and materials content</td>
<td>Two</td>
<td>Three</td>
</tr>
<tr>
<td>Waste Composted</td>
<td>Local Authorities actively promoting composting</td>
<td>One</td>
<td>Three</td>
</tr>
<tr>
<td>Financial &amp; Market Based Analysis of Waste Management Option</td>
<td>Household waste</td>
<td>Two</td>
<td>One</td>
</tr>
</tbody>
</table>

Source: Department of Environment (1995c), p. 12-14, 95-97
It is interesting to note that as the UK government has stated its reliance on the support offered by NGO's with regard to information retrieval, this reflects a move towards the Dutch approach. That is, incorporating third party organisations to 'bridge the gap'.

The integration of different sectors operating within the waste and environmental arena is a positive indication that all actors and players are significant and of value both at national and local level. The facilitating approach by the national government in acquiring the data through external contracts may assist the impartiality of data collection and aid its accuracy and validity. The negative connotation is that the national government may simply engage the cheapest route in information retrieval due to the small amount of finance budgeted.

The Department of Environment have proposed that it is necessary to employ a specific person for the role of information coordinator (refer to Figure 7.1 for a review of the management structure). This is in an effort to ensure that the strategy does not become piecemeal and fragmented. However, due to the scale of information needs, and the aim to collate comprehensive waste management information, the action of delegating a specific actor to coordinate may not be enough.

It is anticipated that there will be a period of a couple of years between full implementation of the strategy and material becoming readily available for full use. This delay is both expected and unavoidable, however it does increase the sense of urgency that the information strategy needs to be implemented as soon as is possible, if it is going to be of any use to measure the success of targets by the year 2000.

In general terms the recommendations proposed require an extensive programme of work. There is little or no strategy in place at present sufficient to meet the information requirement. Therefore this reflects the present situation with regard to the limited availability and access to information and data in the waste management sector in the UK.

In the Netherlands the situation is very different. There has been continual research in compositional waste analysis since 1971
(Hanameeyer 1994), providing good baseline data from which to develop both policy and targets. This has placed the Dutch in a much better position in terms of measuring the success of their policies. It has also enabled comprehensive research to underlie the development of specific targets, an issue which is questionable in the UK with regard to the development of the 25% recycling target. This is also an important issue with regard to the number of polices introduced in the draft national waste strategy for England and Wales which were excluded from the final document due in part to the lack of data to support their feasibility. The Dutch approach to the generation of data has been to extrapolate sample findings to be nationally representative. This may cause some difficulties in not giving a true picture of the Netherlands. However this is overcome to a certain extent with flexibility in the implementation of some waste policies.

Figure 7.1: Information Management Structure

![Information Management Structure Diagram]

Unlike the UK where the Environment Agency will play a prime role in coordinating and managing the data, the Dutch have opted to utilise
the services of their main intermediary organisation, the AOO. An example of this in Amsterdam, whereby the BKK Informatie-overdracht work with the AOO and the national government to compile local data to contribute to a national database (refer to Figure 7.2). Although different Local Authorities throughout the Netherlands have in the main collated waste management data under guidance of the national government, it is only recently that extensive work towards compiling a national database is underway. They are more advanced than the UK as a good baseline of information does exist and it is simply a matter of adopting a formal approach to managing the data at a national level.

Figure 7.2: Integration of Dutch Data Provision at Local and National Level

It must be stated that the acknowledgement of information and material deficiency in the UK, evident by the development of the waste information strategy, is very encouraging. The provision of national policies and strategies is insufficient without the means to assess their progress and take any necessary further action. It represents a more integrated system, within which the national government is taking
greater responsibility towards the attainment of targets. An aspect which is already very evident in the Netherlands.

7.4 The Role of the Public and Private Sectors
There are two main issues that need to be considered, firstly there is the possibility of conflict between Local Authority implementation and national government control. Secondly there is the issue of the provision of a public service and integration of private industry applicable to market forces.

The relationship between national purpose and local autonomy remains a difficult area. This is reflected specifically in the development of national targets with implementation based on local budgets. Although the national government has been responsible for the development of recycling policy, it is not responsible for the actual execution or direct financing of the projects at a local level. A number of Local Authorities in the UK are experiencing difficulties in terms of their budgetary control and the recycling schemes they should be implementing in order to meet the national recycling target. There are now other issues they will have to consider in terms of the policies introduced in the national waste strategy for England and Wales. The provision of kerbside schemes, or location of drop off sites within half a mile of the household, plus the promotion of home composting will add to the cost implications of waste management strategies incorporated at local level. Although some green issues can be readily absorbed into mainstream politics and implemented at local level without too much effort, a number, including waste management strategies, require specific action, which in turn requires specific budgetary control. This is more relevant in the UK where Local Authorities are expected to reduce their reliance on the relatively cheap option of landfill (despite the implications of the landfill tax in October 1996), and focus on implementing collection systems that are both costly, and unstable in terms of market availability for the material. This cost will ultimately be passed onto the consumer, initially within the council tax, which may not be beneficial to the Local Authority in terms of short term popularity and re-election.
In Sheffield there is increasing activity by the Local Authority in respect of work currently underway by the Recycling Officer, to increase the economics of recycling within the city, and incorporate new strategies to meet the policies and targets in the national waste strategy (Pellet 1995). The Local Authority in Sheffield is in a slightly different position than some others in the UK from an operational perspective in that incineration with energy recovery forms the major route for waste. Which removes the possibility of conflict that may arise when moving from the relatively cheap option of landfill to incorporate the more costly option of recycling.

In the Netherlands a similar situation is present in that there may be conflict between the Local Authorities and national government. However attempts at ensuring local activity is integral to national aims has been resolved to a certain extent by decentralising waste management within a framework of national facilitation. An agreement has been reached between national government, Interprovincial Consultation Forum, Association of Netherlands Municipalities, and the Association of Water Boards, that environmental policy should implemented jointly where possible (Ministry of Housing, Physical Planning and Environment 1989, 1991a and 1994). This ensures that although decentralisation of environmental and waste management strategies is favoured, there remains a coordinated national approach to integrate the activity on a national level.

However, in general the public appears to be more willing to pay for environmentally associated activities, including waste management. This is in contrast to the UK where the actual costs of waste management are not known by the public, and as a consequence it is regarded by many as a public service. This may be related to the issue discussed in Chapter 6 with specific reference to Amsterdam, in that the disposal fee is known to the householder and features on their energy bill. There is also the issue in the Netherlands, that as most areas are utilising incinerators for the disposal of household waste, many of the other separation options are cheaper. For example, many Local Authorities have found that the cost of separating GFT and
sending it to composting plants is cheaper than the incineration charges. This ensures that alternative options may in fact be economically preferable to the disposal route. This is in contrast to the UK, where landfill remains the cheapest option. The implications of the landfill tax in October 1996 have yet to be realised.

Another issue of importance with regard to possible conflict between national and local government is the idea that the national government is prepared to allow deviation from national policy and targets if the case requires. For example it is accepted that the mandatory policy of separating GFT from all household waste by the year 2000 may not necessarily occur 100% in all towns and cities.

With specific reference to Amsterdam, the Local Authority is in conflict with the national government in so far as it does not anticipate that it can possibly meet the national level targets for household waste recycling by the year 2000. However, it has set its own, lower targets, and the national government has accepted this.

With regard to private sector involvement in waste management, notions such as public services operating less efficiently and less successfully than private sector operations have assisted in the support for demunicipalisation of the waste management industry. Possible conflicts may be present with the provision of a public service and its compatibility with private industry working within market forces.

In the UK organisation and reorganisation of local government, coupled with increasing costs and demands on local budgets has ensured private industries increasing involvement in waste management. The role of the private sector has also been encouraged by the introduction of compulsory competitive tendering for collection and disposal of waste, as laid out in the Local Government Act 1988, and Environmental Protection Act 1990 (Gandy 1993). Conversely, future long term evolution of waste management, with increasing environmental demands, and pressure placed on resource and energy usage, could ensure that waste may become a profitable prospect. This is certainly the philosophy of a number of multinational organisations
such as Onyx UK (parent company is Compagne Generale des Eaux), Waste Management Inc, and Attwoods, who have recently moved into the UK waste market. In some cases mergers have been formed with companies primarily concerned with management of different media, including the water industry. This is an interesting concept as it could represent an increasing move towards integration of environmental issues.

In the Netherlands, the major development within the waste industry have been investment in incineration. However, the national government has maintained their stake in these investments, as they are cautious against the development of cartels (De Jong 1994).

Conflict has arisen in the UK between private sector involvement, and public sector planning controls. It is proving to be increasingly difficult to secure planning permission for waste management facilities. However this may not necessarily be a negative issue in environmental terms. Planning permission for new landfill sites is difficult to obtain, and private investors in incineration are facing fierce public opposition which has resulted in cases being refused planning permission. This may result in increased emphasis being placed on more favourable options of recycling and prevention, as alternative routes become limited. However recycling operations can also experience opposition, particularly transfer stations and material reclamation facilities. Even more crucial to recycling activity is the opposition to drop off sites by the public. The NIMBY response can undermine the strategy proposed by the Local Authority, regardless of the role of the private sector. Kerbside schemes are more readily accepted, and this may result in waste management strategies being reconsidered in terms of integrating the main components of recycling schemes. One example of this is the 'blue bag' option, whereby householders are provided with bags in which to store and transfer their recyclables to local drop-off sites. Thus incorporating the context of kerbside schemes in the provision of a specific container, and the essence of drop-off schemes in the requirement of the householder to take the material to a separate facility.
Within the Netherlands, although there was public opposition to the development of new incinerators as an initial reaction to the dioxin incident, planning permission was not a considerable hindrance to the developments. The national government involvement in the developments plays a crucial role, as does the realisation that there was very limited choice due to the lack of suitable landfill space. The incorporation of high technology emission control standards also aids the acceptance of the incinerators amongst the public.

In the UK the South East London Combined Heat and Power incinerator (SELCHP) was readily accepted by the local population mainly due to the involvement of the public from the initial planning stages. This approach is successful in reassuring the public of the safety procedures and emission control standards incorporated within the incinerator. This issues of public awareness and provision of information is addressed continually and it is apparent that it forms a significant component towards the acceptance of government policy.

Partnerships are now becoming a crucial and necessary component of the waste management industry. If there is to be successful household waste recycling then the main actors and players involved are not only the households, but also the secondary materials market. Increasingly, Local Authorities may be implementing schemes and promoting them, whilst it is private investors who are managing the operational aspects. Local level activities are also becoming coordinated at national level. Partnerships are being formed by the materials reclamation industry to secure better prices and there is an integrated approach that extends to regional and even national levels. These partnerships explain to a certain why a number of smaller enterprises remain in operation despite the past fluctuations of the markets. In both Sheffield and Amsterdam this is certainly the case.

Currently the philosophical framework of private industry is undergoing a metamorphosis. Whilst economics will of course remain the underlying theme of any business or industry, there have been changes in attitude and perspective towards environmental issues.
As this shift continues there will be an increasing tendency for traditional public based activities to be incorporated within the private industry. This will certainly be a necessity for household waste recycling, which is reliant on a demand for the material in the first instance, to ensure that it can all be recycled. This will become much more important as increased activity leads inevitably to increased material available for recycling.

The private sector involvement in a traditionally public sector activity introduces important concepts of economic and market availability in terms of the recycling policy and legislation set at a national level.

7.5 Economics of Recycling and Availability of Markets

Costs for kerbside and drop-off schemes differ, as illustrated at a local level in Chapter 5. Average calculations for utilising the blue box approach to kerbside collection is £10 per household and £60-150 per tonne (Coopers & Lybrand 1993, p. D6). Net of revenue costs per tonne have been estimated to be £85-127 (CSERGE et al. 1993). Drop off costs are much lower, estimated to be £16-36 per tonne (CSERGE 1993).

The higher cost of the blue box scheme, as utilised in Sheffield, reflects the lack of integration between residual waste collection and recyclable material collection. That is, the provision of an extra collection service results in the cost of this type of scheme to be high. The costs of residual waste collection remain the same, as the collection of material from the kerbside scheme generally is not enough to reduce the residual waste collection service. Even in areas where the blue box has been most successful i.e. Milton Keynes, the Local Authority suggestion to alternate collection, thus effectively reducing residual waste collection to once every two weeks, was not accepted by the local community. Therefore once again the role of education and information is an important concept to bring about necessary lifestyle changes.

In Amsterdam the implementation of GFT collection has meant that in some areas where there was previously as twice weekly residual collection in operation, this has been reduced to once a week. The cost
of implementing this scheme has therefore been offset to a certain extent by the savings in residual waste collection costs. As the biobak scheme is a national initiative, other towns and cities have also experienced such savings.

It remains uncontested that recycling schemes are costly in comparison to some traditional disposal routes, consequently recycling often appears as economically unfavourable. Different systems of charging for residual collection have been discussed in terms of their significance in encouraging reduction, re-use and recycling. Direct charging or pay-as-you-throw schemes per unit of waste collected, rather than a fixed fee has been evaluated in detail in the USA (EPA 1994). This received a mixed reception and encountered predictable problems such as fly tipping. Incorporating such a system would require extensive restructuring not only in terms of the administration involved in waste management, but also the public's perception and attitude towards what has traditionally been regarded as a public service.

In the Netherlands there is a reluctance towards the widespread application of pay-as-you-throw schemes, as trial programmes have also given varied results. In Amsterdam, it is anticipated that this type of scheme will not be regarded as a viable option.

One main influencing factor in the economics of recycling is market availability for the material collected. Problems have and do occur when the consequences of a recycling scheme are not fully realised (Bone 1993). If markets are not fully established prior to the development of a particular scheme or strategy then there is the possibility that supply will outgrow the demand.

Throughout the early 1990's this market has fluctuated immensely, with prices dropping considerably for some material, specifically paper. The reaction in the Netherlands to the drop in the price for paper, was for Local Authorities to work together to secure a price. Through increasing the total tonnage of material they had to offer, they were able to generate a positive income from the paper (Hanameeyer 1994).
Reaction such as this is commonplace throughout Europe and is an effective mechanism to overcome the market deficiencies at that time. However there is no evidence that this has occurred extensively throughout the UK.

Although still fluctuating, market prices in 1995 appeared to be more stable. It is anticipated that prices will change, however it is not expected that prices will drop as low as in previous years (Lynch 1995).

There is a wide range of economic based instruments available to manipulate the recycling market, as previously discussed in Chapter 4. A number of which are already implemented in the UK and the Netherlands, and others which are currently under discussion. These include green taxation and direct charging, and deposit-refund systems which are already fully utilised throughout the Netherlands, and although historically accepted in the UK, this system is currently not implemented. Recycling Credits and Supplementary Credit Approval schemes are in use in the UK, and they attempt to internalise the cost of waste management and correct market failures. Market instruments are expected to be increasingly extended in their application as their use is fully supported by the national government in both the UK and the Netherlands. With the implementation of the Environmental Management Act in the Netherlands, priority waste streams such as bulky household waste products and also potentially hazardous material such as batteries, may be applicable to both regulatory and market based forces, such as mandatory take-back requirements and return-deposit systems (Laurijssens 1994).

Increasing attention will be placed on the integration of both purchase-relevant and discard-relevant instruments to focus on all actors and players involved, preventing a shift in responsibility to a certain extent (Fenton and Hanley 1995). However a considerable amount of work is required at the national government level, specifically in the UK where economic instruments have been limited in their diversity and consequently in their application, before an integrated system can be applied.
There are a number of more basic reactions to the cost implications of recycling and direct response to the fluctuating market, that have been implemented in both the UK and the Netherlands. Drop-off sites have been sponsored by industry, leased from private contractors, or rented out from the Local Authority itself. Practices such as management by charity groups has been commonplace. Income can also be generated from renting the space on the side of collection containers for advertisement. This is very lucrative, compared to the more traditional strategy of leasing the actual container plus contents. In Amsterdam this strategy is fully utilised.

Concern has been expressed with regard to the availability of markets when recycling schemes are fully integrated and succeed in reaching high levels of reclamation. For some material such as plastics this may cause problems, which is one of the underlying reasons for the absence of collection facilities for this material in the Netherlands. In the UK although plastic collection is undertaken, it is not yet implemented nation-wide. Mandatory collection of GFT in the Netherlands, may cause some concern as it is anticipated that by 1996 78% of the total number of households in the Netherlands will be participating in the scheme (Bio-waste Action Programme 1992). Market availability for the compost generated may become limited unless there is sufficient intervention to ensure product usage. Throughout Europe large scale composting has been traditionally inhibited by lack of suitable markets. However, as increasing pressure is placed on industries such as peat extraction, and constraints implemented with regard to chemical fertiliser usage, markets may develop (Coggins & Bone 1993).

In general, markets for recyclables can be assisted by the development of the products themselves. It is easier to provide markets when the material produced is suited to recycling and re-use. That is, increasingly the main players involved in new policy development and strategies can be traced back down the supply chain, increasing the role of producers. This is the case in the UK, and especially in the Netherlands where concepts such as Life Cycle Analysis, eco-labelling and waste auditing are recently becoming more prominent due to government intervention and support. Utilisation of these concepts is
in an effort to represent true costs, that is incorporating environmental burdens.

The context of utilising producers in innovative approaches to manage waste is based within concepts of product durability, ease of reuse or recycling, and creation of minimum waste. This will then ease the burden on other actors and players, particularly in terms of the focus placed on the householder. However there are problems, as demand for specific types of products needs to exist in the first instance. Various approaches to evaluate different perspectives of the householder towards their consumer behaviour and lifestyle in terms of incorporating environmental aspects, have been proposed. One such example is the five point ROAST scale (Resistance, Observe and comply, Accommodate, Seize & preempt, Transcend) to consumer philosophy, devised by Welford (1995). This distinguishes five stages of consumer philosophy ranging from "purchases made without any regard for the environmental consequences or attributes of the product", through to the other extreme of "reduced level of human consumption to ensure a balanced ecosystem is maintained" (p.195). It is anticipated that as increasing emphasis is placed on the householder to control the waste they produce, lifestyle changes will be seen to occur in terms of consumer selection and choice that will incorporate environmental consequences to varying degrees. Consumer philosophy scales such as the one proposed by Welford will become useful in illustrating changes that occur.

To ensure that lifestyle changes from a consumer perspective are possible, waste management has increasingly evolved from being purely a government concern, whether local or national level, to placing a greater onus on the producer. Producer responsibility is featured in both the Environmental Protection Act 1990, and also the national waste strategy. Increasingly, attention is also being placed on consumer responsibly. These are key elements in recycling, particularly in response to the historic failure of the markets, whereby intervention at the production and manufacture level will be an essential component as recycling becomes more successful. As products and materials become more adapted to ease of recycling, and
the consumer adopts positive recycling behaviour, this incorporates the full extent of polluter pays principle.

In reality, the combination of moving waste management away from the public service sector industry and placing it within the arena of market forces has yet to be realised. It will not be possible to judge the relative success of the role of economics in policy development, and willingness to pay to waste management, until the strategies are fully implemented and utilised over a period of time. Needless to say this will become an active area for waste management research in the immediate future.

7.6 Incineration with Energy Recovery

This is an issue that has been addressed in previous chapters, but forms an important concept within the identification of barriers to successful recycling. Incineration has become a very important aspect of waste management, and although this is more evident in the Netherlands, it will play an increasing role in the UK not simply as a consequence of its position within the waste hierarchy and in subsequent legislation, but out of necessity as availability of landfill decreases.

In the Netherlands incineration is being developed rapidly. In 1989 there was an initiative from the state, signed by national, provincial and municipal government, towards a commitment to incineration. The Netherlands was divided in five parts and each part was required to invest in incineration. The implications of prevention, reduction and recycling are taken into consideration when developing incineration, utilising baseline data to establish future needs (De Jong 1994).

Incineration does cost more per tonne than alternative options, more so in the Netherlands where high levels of investment have been placed in stringent abatement systems. There is concern that as recycling activity increases in the Netherlands, the price per tonne for incineration will increase. This hypothesis is reflected by Paulien De Jong from IVAM (1994), who stated that as more waste is recycled there will be less to incinerate, which will result in the incinerator costs
having to increase as a consequence of loss of material. Also, if private companies chose alternative waste management methods this will have implications for the cost to the district or Local Authorities in respect to their residual household waste disposal. This concept is applicable on a national level. However, whilst it is accepted that the price per tonne may increase, overall savings may result from less material being managed in this way.

The argument for incineration in the Netherlands is further supported by the implications of implementing mandatory separation of GFT. It is believed that incineration of the residual waste stream will be a cleaner less polluting process. As the calorific value of the waste is increased by the removal of the component with the highest moisture content, higher temperatures will be achieved in the incinerators, thus reducing the chance of creating noxious or toxic emissions. However this may create problems with incinerator design, which as a consequence of the dynamic nature of waste composition, is an important area of research.

As stated in the national waste strategy the UK is also keen to encourage composting. However, traditionally there has been a tendency to support home composting as opposed to large scale central composting schemes adopted in the Netherlands. This does make it more difficult to measure the effectiveness of policy focused on the separation of the organic component. Regardless of the approach, it is anticipated that removal of this component from the residual waste stream in the UK, will have the same implications for incineration as it does on the Netherlands.

There is concern, as stated previously that incineration with energy recovery will detract from more environmental options of prevention, re-use and recycling. However, national policy and strategy in the Netherlands have clearly stated that recycling and reuse always take precedence over incineration, regardless of the presence of energy recovery. This is dissimilar from UK where there appears to be a degree of ambiguity over the relationship between incineration and recycling, an issue which is causing concern to environmentalists.
However, in the Institute of Wastes Management response to the Waste Management Paper No. 23 (then in its draft form), it was clearly stated that recycling should be placed in higher profile than energy recovery (Institute of Wastes Management 1991).

The Royal Commission on Environmental Pollution in the UK acknowledges the role of waste avoidance and recycling, however it supports the increased role incineration is set to play, reflecting the situation in the Netherlands (refer to ENDS 1993, Local Authority Waste & Environment 1993, for a review of the report).

The role of incineration in the hierarchy above landfill has also been questioned. However, incineration is a complex area, as development and support for this strategy is embedded within a number of issues that are external to the waste management debate. The UN Framework Convention on Climate Change forces the UK to reduce its methane and carbon dioxide to 1990 levels by the year 2000. As landfill sites are major contributors to greenhouse gas production, and waste incineration is promoted as an alternative to reduce fossil fuel usage, this generates support for the incineration option. However, concern is generated that a trade off has occurred based on technology available, which will undermine prevention, reduction and recycling strategies.

It can be stated that recycling may be more efficient if there is a specific structure in place that incorporates environmental concerns, to manage both the residual waste and also specific components of the waste stream. These specific components may be impractical to recycle, and therefore energy recovery may represent the best option.

The question to be answered is how to achieve a balance between a profitable market based approach to waste management in favour of energy recovery, as opposed to public preparedness to pay for recycling programmes that have obvious environmental and resource benefits. It is the belief of this research that the Netherlands are currently achieving this balance, which gives optimism to the national support of incineration in the UK.
7.7 Actors and Players
In the Netherlands there is a well established system whereby a framework for discussion and exchanging of view exists within environmental policy.

This is not just at national level specifically. This was evident from Amsterdam, whereby the districts within the city were integrated within the whole process under the management and guidance of the Local Authority. The Provincial level also plays an important role, as a number of waste management issues have been passed down from national level. It is evident that this system allows for an integration of the traditional 'top-down' approach with the 'bottom-up' implementation.

The Dutch approach operates from within an integrated theoretical framework. Discussion and compromise forms the basis of the development of environment policy. This approach has been adopted by the realisation that there is greater chance of success if the actors and players are targeted in the initial stages and play a part in the formation of the policy. This is preferable to imposing ideals and strategies without prior consultation and expecting immediate compliance.

In the case of this research, the target groups were in fact the householders. This posed an initial problem to the Dutch approach as there was not an obvious representative group with whom the government could enter into negotiations. The issue of concern was identifying a group that was representative of the views and concerns of all householders. Changes in lifestyle dictated by the waste and environment policy targets, must be formulated from the 'bottom-up'. Therefore one approach linked with increased education and information provision has been the inclusion of intermediaries.

In the UK any discussion or debate generally focuses on specific parties involved within local or national government. There has been criticism of minimal integration of interested parties. The exception to this was the Recycling City Project which was a good example of the formation of a partnership between the public and private sector, at
local and national level. Local Authorities have been criticised for failing to regard the expertise of community recycling groups when developing their waste plans, an issue that the national government subsequently worked to alleviate (Gartside 1990). Increasingly, the national government aims to integrate all actors and players involved, as they accept that this is a fundamental concept in realising recycling strategies and targets. Present failures to adopt this system however, is proving to be a weakness in the success of recycling.

7.7.1 Intermediary Groups between the Local and National Levels
The concept of intermediary groups in the Netherlands has been discussed in previous chapters (refer to Chapter 4), however it is important to acknowledge their significance in terms of opinions and perceptions of the service they provide.

Although there is no doubt that AOO plays a necessary and important role in implementing, advising and assessing waste management strategies, there has been some concern over the focus of its attention. Environment groups have criticised AOO for its lack of activity in recycling, as during the early stages of its inception AOO was involved mainly with the planning, locating and coordination of incineration (De Jong 1994). However this was necessary at that time due to the intense activity required to implement the development of new incinerators throughout the country. More recently AOO has been involved with recycling focusing on local level inception of schemes. Other weaknesses cited include AOO lack of expertise in the field of pollution prevention, and in particular waste prevention.

Intermediary group involvement in separate collection, whether it be consultancy groups, advisory boards of councils, has been ongoing for the last ten years or so, which does reflect the advanced stage of recycling in the Netherlands. Consultancy groups such as DHV have only become involved in prevention assignments since the early 1990's (Kamp 1994). The rationale behind promoting prevention of household waste is focused within reducing the costs of waste management, and more importantly disposal costs. This ideology may appear to be in conflict with the national incineration strategy
particularly as the government are major investors. However, they accept that regardless of the success of their prevention and recycling strategies, there will remain components of the waste stream for which incineration will be the Best Practicable Environmental Option. This features fundamentally in the waste management rationale of the Netherlands.

In the Netherlands, the role of intermediaries, specifically councils, is constantly being questioned at a national level. There is concern that there are too many different bodies, as such the future for the Council for the Environment is uncertain (Van Dijk 1994). The emergence of specialisation, such as AOO have removed the need for a number of councils to work in specific areas. Waste is one such area where specialisation has occurred. However, the overall role of advisory boards is placed into question as Dutch policy and legislation becomes more improved and advanced. It may be considered that they have played their role and may not necessarily be required any longer.

It is anticipated that in the UK the Environment Agency will form the main intermediary group between national policy and local implementation. They will be in a position to monitor and evaluate waste management strategies, and coordinate on a national level, the Local Authority initiatives. Whether the formation of the Agency will be enough to integrate the two levels, is questionable. This issue is addressed further in the final Chapter.

In the UK V-Wrag which represents the packaging industry in coordinating the details of the packaging agreement between industry and the government (refer to Chapter 4), can be regarded as a specific intermediary group. As V-Wrag are not established in terms of operational activity within the industry, it is not possible to establish the significance of their role and the impact that they will have on recycling. They are however currently experiencing problems with regard to coordinating all the actors, and reaching an agreement over the specific details of the packaging agreement.

Although they are not aimed at household waste recycling, but specifically at the packaging industry themselves, they do represent an
initial step towards the use of intermediary groups as utilised in the Netherlands. The impact on the public will be in the form of publicity and promotion for recycling and related strategies, with the money generated from material subsidies, and utilised by V-Wrag (Mayhew 1995).

7.8 Conclusion
It is evident from this chapter that specific conflicts and issues of concern exist at both national and local level. However it is also clear that there are different strategies or approaches possible to alleviate the problems and therefore remove or diminish barriers to the attainment of successful recycling.

The issues of information provision and data generation have been raised at local and national level. Lack of information at a local level can be inhibiting to the implementation of specific recycling schemes, but more fundamental to this, if there is an absence of a formal structure nationally, this will prevent the complete integration of recycling policy into waste management strategies. The UK does not have the formal structure necessary and as such cannot develop new policy efficiently without the existence of baseline data. From a positive perspective, this inadequacy has been acknowledged and the national government is implementing a waste information strategy to overcome the problem. The effectiveness of translating the theory of the strategy into practice will dictate how recycling policy develops into the next century in the UK.

Decentralisation and demunicipalisation have both had an impact on Local Authority and private industry involvement in the waste sector. This is an area where further development will occur as waste management continues to evolve, and the deadline for self imposed targets comes closer. It is not considered that these issues are specific barriers to recycling, however they may contribute to the fragmentation of control of the management and operation of recycling.
The variety and number of actors and players involved in waste management are extensive, even those specifically involved in household waste recycling. Their relationships with each other are complex, but not necessarily inhibiting to recycling. Appreciation of their roles is necessary, and full utilisation of their services will contribute to successful recycling.

The administrative structure of waste management at both a local and national level is in conflict with the economic pressures placed on waste. Traditionally regarded as a public service, there is also demand that waste management should be accountable for the true costs, incorporating the environmental consequences. It is anticipated that direct charging and stable markets would enable waste management to be in such a position as to reflect agreed national and local goals and targets. The full costs of environmental impact of waste could be met, and recycling would become a more attractive option, as a 'level playing field' evolves.

These issues would ensure the incorporation is sustainability in terms of resource and energy use, reduction, re-use and recycling. It is this aspect that will increasingly influence waste management strategies, and add impetus to the incorporation of waste minimisation, recycling, and energy recovery schemes.

This chapter has succeeded in reiterating a number of important concepts and also introducing different perspectives to issues addressed in previous chapters. However, the main emphasis emerging from the areas of conflict and issues of concern is the need for integration within the waste management infrastructure. Tools such as statutory legislation and economic instruments have an equally important role to play in achieving recycling targets. However the true significance of each role is not yet clearly understood, due in part to the recent nature of implementation of economic instruments. This is an area that justifies further research and evaluation as evidence of their influence becomes known.
Chapter 8: General and Specific Models of Household Waste Recycling

8.1 Introduction
This research has focused on household waste recycling in the UK and the Netherlands, identifying critical and significant factors and issues that influence the attainment of recycling targets. The evaluations throughout the thesis culminate in this final chapter in the form of models of household waste recycling for the UK and the Netherlands. These models allow the information assimilated during this research to be represented in a systematic, structured manner, clearly illustrating the main factors that influence household waste recycling in the UK and the Netherlands. Following the specific models developed from the embedded case study, a general model is included which can be applied to similar case studies (refer to Chorley & Hagget 1967 for further information on the use and application of models). The models support the originality of the research, which is both novel and unique in terms of structure and content. As stated clearly in the preface, this research extends the work of previous studies and adopts a new perspective of the evaluation of household waste recycling. Work within the Centre for Waste Management, University of Luton, in the years prior to the development of this study in 1992, provided the baseline data from which an apparent 'opening for new research' could clearly be identified. It is acknowledged that due to the nature of waste management and the significant changes it has undergone, particularly throughout the previous thirty years, it has been subject to research interest from both academic and industrial sectors. However there has been a tendency for research to focus on a specific aspect of waste management, for example policy formation, economics of a specific strategy, or technological innovation. This research is original in its holistic approach incorporating a European perspective to identify underlying national factors in the UK. The development of the models of household waste recycling provide the research with
substantive instruments that can then be applied to subsequent household waste recycling evaluations in other developed countries. Throughout this research it has become evident that waste management, with particular reference to recycling, is both complex and dynamic. The research has highlighted the difficulties in integrating the range of disciplines incorporated within the subject of waste management. That is, waste management can be regarded as both a natural science and a social science, involving engineering and design disciplines, along with socio-economic parameters and policy discussions. The necessity of a defined methodology in the initial stages of the research is therefore crucial to structure and order data collection within a specific framework. This ensures that information, which is required within a broad remit, remains relevant and is confined to the aims and objectives of this research.

The preface to the thesis, and the research design outlined in Chapter 1, 'set the scene' in terms of identifying and stating specific issues to be critically evaluated both at local and national level. Parameters are identified and conceptual frameworks for the evaluation are addressed throughout the thesis. The methodological approach to the research is novel within waste management, in that the embedded case study allows for a holistic approach to be taken.

8.2 Household Waste Recycling
Waste management is subject to a wide range of internal and external pressures, most of which have been addressed through this research. There have been a significant number of changes in terms of policy options, operational management, and responsibility with regard to the environment. As stated in Chapter 3, the evolution of environmentalism has been particularly significant in defining the current and future role of waste management, adding impetus to the increasing importance of materials recycling as a component of a waste management strategy.

Physical changes in the waste stream throughout this century in terms of quantity and composition, have also highlighted the necessity of alternative management strategies to incorporate environmental
needs (refer to Chapter 2). At European level, policy responses have been positive, particularly since the late 1980's in both the UK and the Netherlands (refer to Chapter 4). There have been limitations in early statutory approaches to incorporate environmental perspectives within the waste management hierarchy, with piecemeal and fragmented policies presenting difficulties in terms of implementation and administration. Original policy, which was based within a framework of crisis management, was reactive in its approach and consequently received little opposition from actors and players involved in waste management. However as increasing awareness of the need for environmental responsibility occurred, resulting policies began to incorporate and integrate actors and players involved. Within waste management this is certainly the case, as reflected in policy and legislation from the late 1980's in the Netherlands, and mid 1990's in the UK. The responses have been increasingly proactive.

Recycling of household waste is presently the main focus of attention in terms of waste policies and strategies, emphasised by the designation of national targets. It is also proving to be a difficult area to achieve success. In the UK, it is clear from the current national recycling rate of 6% that it will not be possible to meet the self imposed target of 25% by the deadline of the year 2000. External pressures from European legislators and fellow member states will create international comparisons, with the UK being obliged to meet minimum targets and move away from landfill as the main waste management option. The Netherlands and Germany are already achieving considerable success in terms of recycling rates, and have in place more stringent targets than the UK. When the EU decides to implement directives for priority waste streams other than packaging, then the UK may experience difficulties in complying.

Internal pressures within the UK from the environment sector, and the waste industry itself, will also lead to policy reappraisal. Although at present there is minimal concern over the capacity of landfill as an option for waste disposal, it still represents the final option within the waste hierarchy. Therefore the necessity to reduce reliance on this method of waste disposal is increasing. This research, which attempts
to identify barriers to successful recycling in the UK, and policies to remove such barriers, is fundamental to the future development of waste management strategies.

This research addresses a number of issues determined from literature reviews and previous research which are regarded as influential for the success of recycling. The wider implications of sustainability, resource and energy use are acknowledged with regard to their role and their significance on recycling schemes and policies, and form the basis of evaluation in the preliminary chapters. National issues such as policy formulation and target setting, economics, political pressures and technological innovation have been addressed in terms of the recycling model. These issues have been evaluated within a holistic framework to incorporate specific local issues based on Sheffield and Amsterdam. These include local government administration, implementation structures, practical aspects, behavioural analysis, and evaluation of recycling schemes and policies through the use of performance indicators.

This research has identified and evaluated key issues and influencing factors, to enable a framework model for recycling to be developed and refined with specific reference to the UK and the Netherlands. This Chapter presents this model, based on evaluations developed within the research. Recommendations are then stated in terms of possible alternative incentives to household waste recycling. More general applicability of the model is discussed, and general conclusions drawn with regard to evaluating recycling in other developed countries.

8.3 Models of Household Waste Recycling: the Case Studies
The research can be judged to have achieved its ultimate aim by the development of models for household waste recycling for the UK and the Netherlands (Figures 8.1 & 8.2). These models clearly illustrate the relationship between global, European, national and local levels, indicating the holistic and integrated nature of waste management. The models represent the basic framework of issues that require analysis to identify the presence of barriers and possible incentives to successful household waste recycling.
The directional flow of information within the models is illustrated by the arrows across the interfaces and between issues and strategies. Information flow between significant and influential factors is crucial in both directions up and down the models. This represents a situation where top down policy and bottom up perceptions and ideals integrate at the interfaces, easing implementation. As clearly stated throughout the thesis the dissemination of information particularly between the local and national level is paramount to the successful implementation of recycling strategies (refer to Chapters 5, 6 and 7). It is important to be aware of the fundamental differences in directional flow in the UK model and the Netherlands model, as these represent variations in terms of the decision making structure and illustrate integration between the relevant issues.

It is evident from the models for both the UK and the Netherlands, that each country is subject to the same influences and pressures from a global perspective. Issues of concern such as resource depletion and environmental degradation have resulted in strategies such as United Nations Protocols being introduced, which operate within an informal framework. Any response to these issues is largely dictated at European level, in terms of the global influence on the development of European strategies. Therefore it is reasonable to presume that particularly for household waste recycling, the pressure from a global level is at present limited, and currently places negligible direct pressure on a national level in the UK and the Netherlands. The interface that exists between the global and European level is present, but only on an informal basis as the global strategies have no statutory influence over European strategies. It would be naive to presume though that there was a complete lack of interaction between these higher levels, and the influence of global strategies on a local level has been addressed throughout the thesis (refer to references made to sustainability and sustainable development).
Figure 8.1: UK Model for Household Waste Recycling
8.2: The Netherlands Model for Household Waste Recycling

WASTE MANAGEMENT

Global Perspective

GLOBAL ISSUES
Resource Depletion
Environmental Degradation

Global Strategies

UNITED NATIONS PROTOCOLS
Montreal Protocol for CFC's

Informal Interface

European Perspective

EUROPEAN ISSUES
European Union
Energy Rich/Resource Deficient
Environmentalism

European Strategies

EUROPEAN POLICIES & LEGISLATION
Community Strategy on Waste
Directives: Incineration, Landfill, Packaging
Environmental Action Programmes

FORMAL INTERFACE

National Perspective

NATIONAL ISSUES
Impact/Relevance of Global & European Issues
Scale & Proximity Principle
Historical Perspectives

National Strategies

ECONOMICS
Market Development

POLICIES
Proactive

FORMAL INTERFACE

ADMINISTRATION
Non-government Organisations
Private Sector

Local Ownership

WASTE MANAGEMENT OPTIONS
Prevention
Reduction
Recycling
Energy Recovery

WASTE MANAGEMENT INFRASTRUCTURE
Public & Private Sector Involvement
Covenants

PEOPLE AND BEHAVIOUR
Increased Awareness, Motivation & Opportunity

WHO PAYS?
Willingness to Contribute
Issues of concern at the European level have been discussed and analysed in terms of their relationship with household waste recycling. Reflecting the multi- and inter-disciplinary nature of waste management, these issues have encompassed environmental and resource concerns as well as socio-economic ideals of the European Union itself. The influence of Europe is similar for both the UK and the Netherlands in that a formal interface exists through which statutory policies flow as a consequence of membership of the EU. With regard to household waste there are no specific statutory requirements at present, although Directives such as Packaging does have an impact on household waste and the requirements of the householder. Europe also represents a pressure in the form of Environmental Action Programmes and voluntary agreements. It has to be considered that ultimately specific legislation may be introduced at the European level, with which the UK and the Netherlands will have to comply.

The community strategy on waste is useful in illustrating the current position of waste management within the UK and the Netherlands. These strategies form a waste management hierarchy, representing a continuum between the most and least preferred options (refer to a Community Strategy for Waste Management 1989, plus subsequent revised draft version 1996). This hierarchy is incorporated within national legislation for all member states in the European Union.

The UK and the Netherlands operate at different levels within the waste management hierarchy. There are preferred options which each country is striving to achieve, with varying degrees of success, as indicated by the research. The Netherlands have incorporated prevention and reduction strategies in their recent national policy, and have successfully implemented recycling and recovery schemes for a number of years (Ministry of Housing, Physical Planning and Environment 1989; 1991; 1993; DHV 1993). The Dutch present a more advanced position with regard to implementing preferred waste management strategies higher up the hierarchy, contrary to the UK
which still remains at the lower end favouring landfill as a major disposal route (refer to Chapter 2). However the UK does recognise the importance of waste prevention, reduction and recycling (Department of the Environment 1995).

As discussed in Chapter 4, the relationship between the UK and the Netherlands with the European Union differs with regard to national level involvement in European strategy development. The UK has traditionally adopted a reactive stance in terms of policy implementation, with minimal input in the development stage of European strategies. This is symbolised by the single direction of the arrow across the formal interface between European and national levels. In contrast, the Netherlands is a leading member of the European Union, strongly influencing decision making and strategy development. Typically, in terms of their environmental policies and strategies, legislation is adopted at national level prior to it becoming statutory at European level. Therefore the dissemination of information flow and influence at the European level and national level, operates in both directions on the Netherlands model.

National issues are similar in the UK and the Netherlands, encompassing general areas of concern such as the need to manage waste within national and even local boundaries, adhering to the proximity principle. Also, as clearly identified in earlier chapters the influence of each countries' historic perspective in terms of traditional waste management and disposal routes should not be underestimated with regard to their present preference towards specific strategies.

The main factors evaluated throughout the research which were perceived to be significant in the national approach towards waste management (refer to Chapter 1), were economics, legislation and policies, participation, economic and political pressures. With reference to the development of the models, it was established that the main influencing factors appear to be economics, policy and legislation, and the administrative structure. Political pressures were not generally perceived as playing a significant role in household waste recycling directly, as the pressure to develop and implement recycling
strategies is present as a consequence of the strengthening role of environmentalism (refer to Chapters 2 and 3). Therefore although it would be naive not to acknowledge that different political parties would approach the issue from slightly different perspectives, there remains an external pressure on the political system regardless of the party in power (refer to Chapter 4). The influence of political pressures is encompassed within policy development, economic perspective and legislative stance of the particular country, and therefore is discussed within these contexts. More importantly is policy development, which is directly influential to waste management and recycling strategies.

As discussed in Chapter 4 there are distinct differences which exist between the UK and the Netherlands in terms of policy development. Waste management policy formation in the UK has until recently been based within a reactive framework, in direct response to European and global pressures. There is very little opportunity for the public to become involved within policy formation stage at a national level in the UK. Public acceptability of schemes and strategies is paramount to successful implementation of recycling policy. However the lack of transparency to public scrutiny of national government in terms of its cabinets or committees working towards environmental policy and targets, provides little evidence of success of previous policies, and subsequently a lack of stimulus.

Involvement of all interested parties in policy development is commonplace in the Netherlands. However, although extensively utilised, internal dissatisfaction does occur within the Netherlands with regard to its round table approach to policy development, due to the slow process. This approach is now being incorporated globally in terms of the implementation of Local Agenda 21, the blueprint for sustainable development, and therefore it is anticipated that round table discussions will become more prominent in other countries.

An issue of concern is suitability of the policy and implementation strategies in terms of meeting specified targets or goals. Inadequacies or weaknesses at either the policy development stage or implementation at local level, results in limited success of the strategy. The research
has identified that whilst innovative schemes are very influential with regard to achieving recycling rates, they have an indirect role to play and are incorporated within the framework of both policy development and administration. They are important in achieving the ultimate aims of the policies as they can aid the success or otherwise of recycling. The Netherlands has been prolific in incorporating innovative approaches to minimise practical and operational barriers to recycling schemes and therefore increase the possibility of attaining national targets. The implementation of the METRO system represents a specific example, where space limitations and NIMBY opposition have been overcome by an innovative approach (refer to Chapter 5 for its application at a local level in Amsterdam).

Legislation produced as a consequence of proposed policies reflects the national level philosophy, in that the UK remains reactive and the Netherlands very proactive. However it must be stated that the situation in the UK is changing and it is anticipated that as the year 2000 approaches and targets remain to be achieved there will be significant activity in terms of incorporating a more proactive response, similar to the Dutch, by decision makers in the UK.

Economics must be considered as an important issue, as they dictate the limitations to waste management policies developed at national level. Waste management has recently evolved from a public sector operation to being applicable to market forces and this has increased the role played by economics (refer to Chapters 4, 5 and 7). There is no question that the recycling market is a relatively unstable entity due in part to fluctuating material markets, comparative cost of alternative options, and cheap virgin resources. Demunicipalisation has encouraged this transition and integration between policy instruments and economic tools will become more evident as a strategy to manage the externalities.

The main focus of concern in the UK with regard to economics, are short term issues of market adjustment and manipulation, with scant regard to future provision. This is influenced by policies and
legislation at a national level, which in themselves have disregarded economic requirements. Development of policy in isolation of the availability and provision of markets has resulted in very little change occurring with regard to the UK's position within the waste hierarchy. The implementation of recycling has been impeded by the attraction of landfill as a cheap and easy disposal route. Market fluctuations and instability in the past have been a cause for concern. This situation is currently undergoing a certain amount of change with the introduction of a landfill tax, and also implementation of the Packaging Directive. Also, new (1995 onwards) and proposed legislation does appear to be incorporating proactive measures. The success of these measures has yet to be realised. However it does represent a more positive stance towards further development of waste management strategies in the UK.

Administration of policy and promulgation of legislation and recycling strategies, has been found to be a crucial element in achieving targets. The role of non governmental organisations (NGO's), and private sector involvement either in a support role in monitoring, data acquisition and information retrieval, or implementation procedures, appear to be significant as both actors and players (refer to Chapters 4, 5 and 7). The attitude of the national government towards such involvement varies between the UK and the Netherlands, and it is these variations that are considered as causal factors in the recycling success in each country.

In the UK the administration sector is currently inadequate to manage the policies proposed, identify and collect relevant data, and ensure implementation of recycling strategies on a local level. There are two distinct strands present within the administrative framework that contribute to the fragmentation and lack of coordination. Firstly the decentralisation of waste management issues to Local Authority control, without substantive budgetary additions, plus a further fragmentation caused by demunicipalisation, introducing a high percentage of private sector involvement. This has caused a complex situation in terms of a lack of coordination between the numerous actors and players now involved. Discrepancies and deviations within
Local Authority areas has resulted in a wide ranging achievement of recycling rates (Audit Commission 1995; 1996). Lack of standardisation or a nation-wide approach does not aid successful implementation of national targets.

The administration of policies and legislation in the Netherlands is much more sophisticated and developed than the UK. Involvement of independent councils and NGO's including voluntary and environmental group representation, allows for a comprehensive programme of discussion, debate, monitoring and evaluation.

As illustrated by the model for the UK there is limited integration between the national level and local level decision makers. Information dissemination and interaction occurs in one direction, therefore there is an absence of opportunity for feedback and incorporation of ideas and perspectives. Activity on a local level remains distinct and isolated from the national strategies, which causes significant problems for implementation. The flow of information and implementation of policies filters down through the interface from national to local level, without the opportunity for local level interaction. This effectively 'blocks' the bottom up approach, which results in weaknesses and problems with nationally determined strategies and targets being fully implemented at local level.

The Dutch model clearly illustrates some fundamental differences at national and local level with the UK. There is a complete integration of economics in terms of market development, policy and legislation evolution from a proactive stance, and also an administrative structure located within the interface between the national and local level. The Waste Management Council (AOO) plays a specific administrative role that has helped to integrate and coordinate the different levels of activity (refer to Chapter 4, 5 and 7). This involvement is very successful in 'bridging the gap' between national requirements and local needs. This is an element distinctly lacking in UK activity. The success of these groups involved in implementation issues has been so great that the national government is considering withdrawal of funding for a number of these groups, specifically
councils, as they are now regarded as superfluous as a consequence of specialisation.

There is the possibility that the Environment Agency will provide the intermediary role that is currently lacking in the UK. However this is an aspect that will require further research as the Agency has only been established since April 1996. It is difficult to ascertain the success of the Agency in providing the necessary service to be effective, as there are many demands placed on the Agency from other media. Its internal organisation is driven by the former National Rivers Authority, which represents a much larger body than the existing Waste Regulation Authorities, and therefore the profile and status given to waste issues is of concern. From a more positive perspective there is the possibility that protection of water supply quality and water resources will encompass landfill control, and may ultimately stimulate the development of alternative options.

Local level involvement centres around the context of local ownership. Specific issues were raised initially (refer to Chapter 1) for evaluation within the context of Sheffield and Amsterdam. These include local infrastructure, innovative schemes, available technology, behaviour and economics.

The local infrastructure is a distinguishing factor between the two cities. The administration and organisation provides an insight into different management structures available which can have a distinct influence on the successful implementation of local recycling strategies. The responsibility acknowledged by, and integrated nature of the local infrastructure provides a basis for the national policy to be incorporated. Weaknesses at this stage will result in inadequacies of the local implementation of the recycling policy, thereby representing a barrier to the attainment of recycling targets.

Issues of innovative schemes and available technology at a local level are evident within the range of waste management options, and application of specific schemes. In both Sheffield and Amsterdam similar options were available, however what differed was the extent
to which they were incorporated. Quantitative data from Sheffield supplemented with the behavioural analysis indicated that recycling schemes were not sufficiently accessible within the city. This is in contrast to Amsterdam, where density of drop off sites for specific materials is very high.

Conflict between options, specifically recycling and energy recovery, was addressed in the research (refer to Chapter 2, 5 and 7). From the data obtained it is evident that incineration in the two cities is a dominant waste disposal method. However cause for concern that the significance of incineration with energy recovery as a major waste management option, would act as a barrier to attaining the recycling targets, was acknowledged, but negated to a certain extent by the high levels of recycling achieved in Amsterdam. There has been a certain amount of research in the UK into this area of conflict (Porteous 1990, 1992; ENDS 1994e), however, as incineration increases its share in the UK this is an area that will specifically require further investigation. The policy in the UK at present appears to be ambiguous, with support by the national government and the Local Authority in Sheffield that both energy recovery and materials recycling are perceived as preferred options. This theory is not supported in the Netherlands who have made a clear distinction between the two options, in favour of recycling. Presently in the UK, as incineration capacity is minimal there is no direct evidence of competition between the two options. Therefore it should not be regarded as a barrier.

Sheffield differs from the general UK position, in that utilisation of landfill does not play a significant role. Incineration with energy recovery is the dominant waste disposal method, although there is a range of recycling facilities incorporating both kerbside and drop-off. The provision of recycling sites is low and consequently recycling rates achieved are also low. Information is ad hoc and fragmented, and the city is very much in isolation from national activity, now its period as Recycling City has ended. The Local Authority, although utilising extensive amounts of private sector involvement, is currently undergoing further privatisation. The impact that this will have cannot be anticipated, however unless there exists an intermediary,
integrating local waste management administration, there is the concern that local ownership will become more isolated and detached from national strategies.

The rationale of recycling schemes within Sheffield appears to be based on charity provision, employment creation (specifically for those with learning disabilities), and the development of a waste management strategy that generates the finance necessary for its operations. This does not really consider the global inferences that recycling should become a necessity for deeper environmental reasons.

One aspect that was surprising is cultural differences on a local level from the samples surveyed did not account for participation differences in Sheffield and Amsterdam. Lack of accessibility and opportunity was inhibiting behaviour and therefore this could be resolved with increased provision of available facilities.

Financial aspects of waste management options with regard to willingness to contribute towards the cost of schemes is a contentious area. The Local Authority of Sheffield is clearly not in a position for large scale financial investment. The schemes implemented presently are operated by private sector or non-profit organisations. The ultimate aim is for schemes to generate their own income to such a level that they will meet the expenditure. However at the current levels the sales of material are not significant enough to make a difference. Direct charging to the householder for residual waste disposal would not be an option at present as there are clearly inadequacies in the provision of facilities for alternative options. Payment schemes incorporating for example charges for the blue box utilised by householders involved in the kerbside scheme is also not a feasible option (Birley 1994). This reluctance to incorporate specific economic instruments focused on the householder introduces the conflict once again between the provision of a public service, and the application of market based forces.

Behaviour is an important factor that could form a barrier to household waste recycling, however the research has indicated that on
a local level, there is no distinction between the declared recycling behaviour framework for Sheffield and Amsterdam (refer to Figure 6.10). The hierarchical framework indicates that when problems are experienced at any stage of the framework, then this will result in a barrier to participation. If participation is not maximised then achievement of recycling targets will not be possible. In Sheffield issues such as inconvenience and inability to participate as a consequence of lack of adequate facility provision were the main problems stated by respondents within the sample. Ability to participate is an important aspect of the framework, and if barriers are experienced at this stage then it is unlikely that positive participation will occur. In Amsterdam, although there is a degree of concern with regard to the provision of facilities, this is only with regard to specific components of the waste stream. There are a limited number of motivation issues that inhibit participation such as awareness, lack of intrinsic incentives and public perception regarding waste, but it can be stated that accessibility and opportunity is the significant barrier. Therefore if the opportunity to recycle is present, and the other conditions featured within the behaviour framework are satisfied, then there is little indication that positive behaviour would be inhibited. This reflects the current approach in Amsterdam, that although significant levels of recycling are being achieved, there is a determination to increase the accessibility of facilities in order to increase recycling rates (refer to Chapter 5).

Local economic issues such as financial support for recycling strategies are complex. Local market forces are applicable to national issues such as unstable markets for material reclaimed for recycling, although policy and legislation based at a national level will be influential in manipulating the situation. Local Authority support is not available in Sheffield as it is in Amsterdam, where supplementary support is given for more costlier but environmentally significant collection of household hazardous waste. General budgetary control for waste management has been completely decentralised in Amsterdam, enabling districts to set their own waste taxation level to cover the costs of waste management. The concept of waste management being a
'hidden' cost in the UK contributes to an unwillingness to pay that appears to be present among the households.

The local recycling market in Sheffield is more exposed to market forces than in Amsterdam where, there is a degree of intervention with regard to implementation of specific collection schemes and utilisation of a specific disposal option.

8.4 General Model of Household Waste Recycling

It is possible to develop a model that incorporates the main issues identified within the UK and the Netherlands, but retains a degree of generality, enabling its applicability to other case studies. This model is represented in Figure 8.3. This model could be regarded as a template which can be applied to other countries in an effort to identify barriers, or incentives to overcome these barriers and achieve successful recycling.

It is clear from the model that at a global level the context in terms of issues and strategies, remain the same as those identified in the models for the UK and the Netherlands. Also, at a European level, the strategies and issues remain the same with the proviso that the country the model is applied to is a member of the European Union. This does not mean that the model cannot be applied to non-member states, as there are a number of international groupings and organisations that can provide a suitable regional focus. Such groupings are numerous and include the North American Free Trade Association, and Caribbean Free Trade Association. Although these international organisations are not as formalised or as structured as the European Union, they do allow for a regional perspective to be taken and so could be applicable to the general model. Particular perspectives and strategies can be inserted in the second tier box. There is also the possibility the interface will be informal in this case in contrast to the interface between the European Union and national level of member states.
Figure 8.3: General Model for Household Waste Recycling

**WASTE MANAGEMENT**

**Global Perspective**

**GLOBAL ISSUES**
- Resource Depletion
- Environmental Degradation

**Global Strategies**

**UNITED NATIONS PROTOCOLS**
- Montreal Protocol for CFC's

**Informal Interface**

**European Perspective**

**EUROPEAN ISSUES**
- European Union
- Energy Rich/Resource Deficient
- Environmentalism

**European Strategies**

**EUROPEAN POLICIES & LEGISLATION**
- Community Strategy on Waste
- Directives: Incineration, Landfill, Packaging
- Environmental Action Programmes

**FORMAL INTERFACE**

**National Perspective**

**NATIONAL ISSUES**
- Impact/Relevance of Global & European Issues
- Scale & Proximity Principle
- Historical Perspectives

**National Strategies**

**POLICIES**
- Proactive or Reactive

**ECONOMICS**
- Costs & Benefits

**LEGISLATION**

**ADMINISTRATION**
- Non-government Organisations
- Demunicipalisation
- Private Sector

**FORMAL INTERFACE**

**Local Ownership**

**WASTE MANAGEMENT OPTIONS**
- 3R's
- Energy Budget
- Technical, Economic & Environmental Feasibility

**WASTE MANAGEMENT INFRASTRUCTURE**
- Local Infrastructure
- Markets
- Partnerships

**PEOPLE AND BEHAVIOUR**
- Socio-demographics
- Awareness & Attitude
- Pressure Groups
- Lifestyle Changes

**WHO PAYS?**
- Market Instruments
- Valuing the Environment
- Producer/Consumer Responsibility
At national level, the examples clearly stated under 'national issues' are general enough to allow for national variations, and encompass a variety of differences that may arise when applying the model to different countries. The national level strategies draw from the UK and Netherlands examples, focusing on policies as a key issue, underpinned and supported by economics, administration and legislation. There is flexibility within the general model to move strategies into the interface, and change directional flows where applicable, depending upon the national situation of the specific country under investigation.

Locally, once again, examples from the case studies of Sheffield and Amsterdam have been drawn upon, identifying main areas of significance within the main issues. The examples selected allow for significant deviation at local level, whilst emphasising the main areas that should be identified in order to ascertain barriers or incentives to overcome these barriers to achieve successful recycling. These include the changing role of the local waste management infrastructure as the need for partnerships increases, plus the increasing significance of changes in behaviour resulting in differences in lifestyle, purchasing behaviour and recycling activity.

Therefore it is evident that the general model, although drawn from the models for the UK and the Netherlands, is a useful instrument that can be applied to other countries.

There are a number of general conclusions that can be discussed with regard to all models of household waste recycling. It is important to acknowledge that the structure of the models in this chapter have emphasised issues of importance which may not be comparable to the findings of similar research within the field of waste management. Gandy (1993a) states that issues such as weaknesses in secondary material markets, quantity and composition of household waste, local government organisation and financing, and competition against more profitable alternatives, are all barriers to household waste recycling. Whilst this present research accepts that the issues proposed by Gandy are all very important elements which underlie the success
of recycling, they merely represent components of the evaluation model that can contribute to limiting the achievement of targets.

However a more fundamental issue is of greater concern, and that is the approach towards implementation. This present research has indicated that whilst markets do fluctuate and weaknesses exist in options available for secondary materials, this has not prevented recycling from occurring, with higher levels being achieved in the Netherlands than UK, regardless of both being subject to similar market failures in the past. It is also clear from this research that there are market instruments which have been utilised and a great number which are under discussion, that can manipulate the market, coupled with the introduction of legislation and policy to ensure the producers are incorporated into recycling strategy.

It is recommended that in the UK the national government should increase their role in order to coordinate national approaches towards the attainment of targets and the development strategies. Recycling rate discrepancies between Local Authorities operating under similar geographical, demographic, economic conditions, indicates an inadequacy in local and national waste management strategies.

Particularly in the UK, long term environmental strategies remain unclear. There are specific targets set for the year 2000, 2005 and 2015, but as these dates are approaching there seems to be little coordinated activity towards longer term strategies and action plans, particularly in the light that attaining the recycling target is highly dubious. All policies call for integration; this is the essence of waste and environmental issues. There is an impression that the 25% recycling target is not widely known within members of the general public. As these are the main players involved in achieving this target, this is a significant issue of concern. This is dissimilar to the Netherlands where as a consequence of national information and education campaigns, there is a widespread awareness for the Local Authorities to build upon.
Inadequate legislation has been blamed for the poor performance in the UK, where scepticism over the role of Local Authority Recycling Plans reached a climax when it became well publicised that implementation of the plans was not statutory. New legislation which incorporates some of the approaches in the Netherlands towards the use of targets, may be enough to change the situation. However the fundamental issue is whether this change in policy will be enough to have a significant impact on the national recycling rate.

It is imperative that a balance is achieved between the top-down approach with regard to national government policy development, with an action orientated bottom-up perspective (Hogwood and Gunn 1984; Barret and Fudge 1981). Only when this is achieved can policies be fully implemented. Achievement of this balance ensures that barriers to recycling are limited or removed.

8.5 Possible Limitations of the Research and Future Research Potential
One general point which has been raised in previous chapters and specifically addressed in Chapter 7, is the lack of quality baseline data in the UK. Baseline data is essential for the evaluation of success of policies and for calculating performance indicators, which supports the earlier assumptions of the necessity for better waste information. Due to the current status in the UK this issue applies to all waste research currently undertaken. However, as Sheffield was monitored and evaluated during its period as Recycling City, this ensured the provision of specific baseline data for this research.

Within the field of waste management it is widely acknowledged that discrepancies exist in terms of standardisation of data. However if these differences are known, then they can be acknowledged, and once again accounted for in the research. Attempts are being made to standardise waste classifications, but there are still numerous methods available for calculating recycling rates.

Future research potential as a result of this study is numerous and varied. Firstly the most obvious area for further development would be to apply the model to a number of other case studies. The potential
applications of the model in terms of setting policies and evaluating household waste recycling strategies, enabling the identification of barriers, and subsequently the development of incentives or regulations.

There is the potential for research in numerous different aspects of waste management, such as the impact of economic instruments, the development of a more comprehensive and integrated administrative structure, and the implications of the new environmental and waste policy in the UK.

Other issues of interest over the next four years to the end of the 20th century and into the 21st century will be the reactions of national governments as targets are not achieved by the self-imposed deadlines. The European response may be greater focus on specific management tools to 'encourage' increased recycling rates and implement waste management options higher up the hierarchy.

An area of specific research potential is the significance of incineration as the capacity increases through new developments. One aspect relevant to the Netherlands will be the possible prospect of over capacity for residual waste, in light of the success of the incineration development programme.

8.6 Final Conclusion
What is evident from this research is both the scope and scale of the issues involved in household waste recycling, and also the significance of current actions. Although there is a degree of lethargy exhibited in the UK due to the relative lack of urgency to implement alternative systems out of necessity, the benefits of proactivity are slowly being realised. Introduction of strategies from the EU has definitely played a role in the implementation of specific actions, however current and proposed policies and legislation indicate that the philosophical framework that waste management was previously encompassed within is changing and developing. The experience of the Dutch is already becoming evident with a move towards discussion, information, awareness and education as opposed to enforcement and
penalty. Lessons from abroad will play an increasing role as the self imposed deadlines come closer, and research such as this will form an important component in modifying and developing recycling strategies currently imposed.

The wider implications of action or inaction at both local and national levels are being realised. Responsibility, both public and private, towards waste and integration issues such as resource and energy usage, pollution control, is becoming paramount to waste management systems in the developed world. Partnerships and cooperation are the buzz words of the 1990's. Waste management needs to be encompassed within the philosophy of the Agenda 21 initiatives, as a coordinated, integrated approach is the single response that will ensure successful attainment of the waste polices and targets.

The increasing importance of waste management on a global level in both an environmental and resource context, coupled with increasing awareness of pollution problems associated with traditional waste management strategies, have led to sustainability being a major force in waste strategy development. Therefore the future trend is the development of integrated waste recovery and recycling systems as an essential component towards achieving sustainability (Blowers 1993).

The concept of sustainability is increasing in its importance with regard to specific components such as equity. This incorporates environmental, resource, and lifestyle issues, within the framework of waste management. It is anticipated that as more significance is placed on sustainability, this will have a greater influence on the further development of regulations and market instruments. The specific implications for waste management within the framework of sustainability are laid down in an action plan within Agenda 21 (refer to chapter 4). This has taken waste issues from a local public concern, to a global level, incorporating the private sector, environmental concerns, and future developments in technology. This development of philosophy attempts to reach a level of compatibility between ecocentrism in support of materials recycling, and technocentrism in support of incineration and energy recovery.
Integrated waste management equates to: disposal without environmental side effects; recycling of material that considers economic consequences; changes in social attitude and behaviour towards the resource and energy use; and ultimate achievement of sustainability.

Environmental legislation (and waste is no exception), will ultimately require changes in political, economic and social philosophy, before it can be regarded as fully implemented and successful. It has been stated (Gray 1993) that to become part of the environment as opposed to being its exploiter will require a paradigm shift, a concept supported in part by the conclusion drawn in this research. However this is a concept which will evolve over a period of time and may be in response to a distinct crisis, or simply as a reaction to the development of changes in perception which are currently underway. It does represent a new and significant area of research, highlighting the diversity presented by this study, and also indicating the truly dynamic nature of environmental and waste management.

It is important to mention new developments within waste management that are excluded from the conceptual framework of this thesis. Life Cycle Assessment is an important tool that has only been introduced within the area of waste management since 1994. It provides an additional source of data which may prove invaluable to the further development of waste management strategies. Life Cycle Assessment and the evaluation of environmental burdens are all moving towards a common method for economic evaluation.

Within waste management in the UK there is still room for compromise and discussion, but unless integrated management strategies are implemented which account for environmental, social and economic needs, then this situation could become more urgent, increasing the possibility of conflict and postponing implementation of adequate action to meet all the needs.

This research has attempted to achieve its aims and objectives, culminating in the development of models of household waste
recycling for the UK and the Netherlands. The simplified nature of the models belies the complex nature of waste and its management, which underlies the essence of a great range of environmental issues. The general model of household waste recycling is applicable to any developed country or city in terms of identifying barriers or incentives to household waste recycling. This may appear to be a wide remit based purely on two case studies but it is possible to draw general conclusions based on the evidence evaluated throughout this research.
References


[Anon.], (1992), 'The Value of Waste,' *Environmental News from of the Netherlands*, 4, 7-10.


Cravitz, I., (1993), Friends of the Earth (Amsterdam), Personal Interview, April 19.


Croners Environmental Management (1992 onwards), Information utilised from Croners from this date, plus subsequent amendments.

Croners Waste Management (1994 onwards), Information utilised from Croners from this date, plus subsequent amendments.

CSERGE, Warren Spring Laboratory & EFTEL (1993), Externalities from Landfill and Incineration, Department of the Environment, London: HMSO.


ENDS (1992), 'Subsidising the Dash to Burn Trash', *ENDS Report*, 211, 12-14, August.


ENDS (1994c), 'Advancing the Sustainable Development Agenda', ENDS Report 228, 18-21, January.


Environmental Protection Agency (USA), (1994), Pay as You Throw: Lessons Learned about Unit Pricing, Washington: Environmental Protection Agency.

Environmental Resources Limited (1992), Economic Instruments and Recovery of Resources from Waste, London: HMSO.


Exportradet London (1994), Information supplied directly by Exportradet, Swedish Council, to Centre for Waste Management


Friends of the Earth (Netherlands), (1995), Personal Communication.


Going for Green Campaign (1995), Campaign Information and Leaflets obtained directly.

Goldsmith, E; Allen, R; Allaby, M; Davoll, J; and Lawrence, S., (1972), A Blueprint for Survival. London: Penguin Specials.


H M Government (UK) (1990), This Common Inheritance: Britains Environmental Strategy. London: HMSO.

H M Government (UK) (1990a), The Environmental Protection Act, London: HMSO.


Hardin, G., (1968), 'The Tragedy of the Commons' Science, 162, 1243-8.


Heiskanen, E., (1992), Consumer Attitudes and Participation in Packaging Waste Recovery: English Summary,


Local Authority Waste & Environment (1993), 'Incineration of Municipal Waste Favoured by Royal Commission', Local Authority Waste & Environment, 1, Issue 1, June, 5.


Milieuverkenning Amsterdam (1995), Data sheets sent in response to personal communication.

Ministry of Housing, Physical Planning and Environment (1977), Afvalstoffenwet (Waste Product Act), The Hague: VROM.
Ministry of Housing, Physical Planning and Environment, (1986),

Ministry of Housing, Physical Planning and Environment, (1988),

Ministry of Housing, Physical Planning and Environment (1989),
*National Environmental Policy Plan: To Choose or to Lose*, The Hague: Department for Information and International Relations.

Ministry of Housing, Physical Planning and Environment, (1991),

Ministry of Housing, Physical Planning and Environment (1991a)
*National Environmental Policy Plan Plus*, The Hague: Department for Information and International Relations.

Ministry of Housing, Physical Planning and Environment (1994),

Ministry of Housing, Physical Planning and the Environment (1994a),
*Towards a Sustainable Netherlands: Environmental Policy Development and implementation*, The Hague: VROM.

Mol, G., (1993), Representative from the Stadsdeel Zeeburg, personal interview carried out in September.

National Institute of Public Health and Environmental Protection


Pellet, L., (1995), Personal Communication in December - sheets of data provided on request.


Porritt, J., (1993), 'It May No Longer be a Bad Thing to go for the Burn' *The Daily Telegraph*, 2 October.


RIVM (Netherlands) (1992), Personal Communication.


SCRAP (1993), *Scrap is Moving*. Information sheet provided by SCRAP and distributed to members of SHEffield Recycling 2000 Forum, 31 March.


Schoor, T., (1993), 'How the Netherlands is Keeping Agenda 21 on the Political Agenda,' *Environmental News from the Netherlands*, 2, 11.


Stedelijk Beheer Amsterdam (Municipal Management Amsterdam), (Date unknown), *Refuse Removal in the Inner City of Amsterdam*, Information Sheet.


Terlouw, H., (1993), Representative from the Stadsdeel Westerpark, Personal interview carried out in September.


The Ramblers Association (1994), Personal Communication - data provided on request.


Vereniging Voor Natuur-En Milieueducatie (1995), Personal Correspondence.

Vereniging Natuurmonumenten (1995), Personal Correspondence.


Warren Spring Laboratory (1994), Unpublished material sent specifically to the Centre for Waste Management.


Williams, R., (1990) Keywords: A Vocabulary of Culture and Society. London; Fontana Press.


## Appendix 1

### Contacts in the Netherlands

*Indicates a personal interview

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<td>Mr J A Timmington</td>
<td>Assistant Director (Waste Disposal), Sheffield.</td>
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<tr>
<td>Ms J Warrender</td>
<td>SCRAP, Sheffield.</td>
</tr>
</tbody>
</table>
Appendix 2

Photograph Illustrating the Pavement Marking for Household Waste Collection in Amsterdam
Appendix 3

Profile Questions
A. Which type of household do you live in?
   1. Apartment
   2. Apartment with garden
   3. House
   4. House with garden
   5. Boat house
   6. Other (please specify)

B. How many people are there in your household?
   7. Number of Adults
   8. Number of Children

C. When shopping for domestic items what is the single MOST important factor affecting your choice of product?
   9. Cheapness of product
   10. Quality of product
   11. Environment friendly
   12. Uses recycled materials
   13. Less packaging material
   14. Other

D. How many of your neighbours separate their waste for recycling?
   15. All of them
   16. Most of them
   17. Some of them
   18. None of them
   19. Don't know

E. Do you think separating some of your waste for recycling will affect how much you pay for household waste disposal?
   20. Yes - it reduces the cost
   21. Yes - it increases the cost
   22. No - it stays the same
   23. Don't know
F. Have you taken action to prevent junk mail being delivered to your home?
   24. Yes
   25. No
   26. Never thought about it
   27. Don't know

*Behaviour Questions*

G. Do you have separate collection of GFT in your district/Do you have kerbside collection in your area?
   28. Yes  29. No  30. Don't know

H. Do you separate the following items form your household waste for recycling?
<table>
<thead>
<tr>
<th>All</th>
<th>Most</th>
<th>Some</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
31. Glass
32. Paper
33. GFT/plastics
34. Textiles
35. KCA/Cans
36. Other (specify)

I. What are the main reasons you separate your waste for recycling? (1 or more answers applicable)
   37. Too much waste for disposal
   38. Money for charity
   39. Energy saving
   40. Saving resources
   41. Environmental reasons
   42. To create jobs
   43. It is only a small thing to do
   44. Other (specify)
J. What are the main reasons you do NOT separate your waste for recycling? (1 or more answers applicable)
   45. Not enough to recycle
   46. Don't know how to
   47. Inconvenient
   48. No local facilities
   49. Not interested
   50. Too much effort
   51. Other (specify)

K. How long do you generally store the following, before taking them to be recycled?
   <1 week  1-2 weeks  2-4 weeks  >1 month  Don't know
   1  2  3  4  5

   52. Paper
   53. Glass
   54. GFT/plastic
   55. Textiles
   56. KCA/cans
   57. Other

L. Do you use your nearest facility for paper and glass collection?
   58. All of the time
   59. Most of the time
   60. Some of the time
   61. None of the time
   62. Other (specify)

M. How far do you usually travel to recycle the following?
   <1 km  1-5 km  6-10 km  >10 km  Other

   63. Paper
   64. Glass
   65. Textiles
   66. KCA/Cans
   67. Plastic
N. How long have you been separating your waste for recycling?

<table>
<thead>
<tr>
<th>&lt;6 months</th>
<th>1 year</th>
<th>1-3 years</th>
<th>&gt;3 years</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

68. Paper  
69. Glass  
70. GFT/plastic  
71. Textiles  
72. KCA/cans  
73. Other (specify)

Q. What is the highest level of education that you have chosen to reach?

74. Full time basic education  
75. Lower vocational education  
76. Lower general secondary education  
77. Intermediate vocational education  
78. Higher general/pre-university  
79. Higher education  
80. Postgraduate education  
81. Other (specify)

P. Please indicate your ethnic group

Q. Age (observed)

<table>
<thead>
<tr>
<th>&lt;24</th>
<th>24-44</th>
<th>45-65</th>
<th>&gt;65</th>
</tr>
</thead>
</table>

R. Gender (observed)

Male   Female
Appendix 4

Photograph Illustrating the National Waste Minimisation Campaign in the Netherlands