Waste management in large corporations: reality vs. rhetoric

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Abstract:

In the past years, environmental challenges have become too important to ignore. Businesses are affected by environmental issues and this has been reflected in the formulation of environmental policies. The aim of this paper is to examine the waste management strategies of large corporations as part of these environmental policies and to identify whether their implementation has had any financial implications.

The design, conduct and analysis of the results of the case studies in this research have enabled an in-depth investigation through extensive interviews and resulting in multi-perspective conclusions. For all the companies observed environmental issues have been part of their policy for a few years now. Companies were purposefully selected on the basis of the monitored data obtained from environmental management systems. Companies interviewed belong to different sectors, thus offering a wide overview of the issue.

The fact that all companies seem to have experienced financial benefits makes waste management a promising business feature as part of the environmental agenda in which businesses of any size can invest as a step closer to sustainability.

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1. Introduction

1.1 Sustainability in contemporary society

The economic growth of the past decades has been infinitely praised; until the extensive use, misuse and at last, abuse of the natural resources that accompany this progress have started to have noticeable results. The – unintended- negative impacts of human actions on the environment have led to their official inclusion in the international legal framework. The term 'sustainability' has been officially introduced after the publishing of the Brundtland report (The World Commission on Environment and Development, 1987, p.43) and sustainable development has become a common objective and perhaps a form of ideology of the modern-day society.

According to the definition given by the World Commission, it is the 'development that meets the needs of the present without compromising the ability of the future generations to meet their own needs'. The significance of sustainable development has been later strengthened in the 1992 Earth Summit in Rio de Janeiro with the formulation of Agenda 21: sociological, political and economic factors have led to the need for a sustainable world. Even though there have been considerable disagreements considering the interpretation of the term sustainability (Bebbington and Gray, 2001, p.559, see also Pasqual and Souto, 2003, p.47), it has certainly become a common policy goal for governments and businesses which is where this project will focus. The concept that the economic growth and the environmental protection can never co-exist that prevailed in the past has been gradually changing. The consequences that the sustainable business policies have had and will continue to have for both the environment and the economy have received much attention.

There have been several positive and encouraging results observed of businesses that have had financial benefits as a consequence of the introduction of a 'greener' policy.

Within them, businesses have created sustainability development policies and waste management is one of them. As others have argued (Bebbington and Gray, 2001, p.560), at the moment there is a debate as to whether the business community could fulfil the sustainability requirements. The process of making businesses more sustainable by introducing environmental management systems is still evolving and the progress made in waste management is examined in this paper.

1.2 Sustainability and waste management

It has been argued (Uggla, Y., 2004, p.550) that the debates about environmental issues and the efforts made to resolve them, reflect the social values of contemporary society. Western civilizations place great importance on the luxuries of comfort and security provided by the misuse of the surrounding environment. Nature has been the object of not only knowledge but also of exploitation (Haila, Y., 1999, p.49)

The massive industrial expansion has led to the generation of larger quantities of industrial waste. The increased demand for products has also created unwanted side products that end up as waste. The idea for a sustainable waste managing of businesses and municipalities has been accepted; its satisfactory implementation however is found to be more difficult than expected (Read, 1999a,b). In the past few years in the UK, waste management has been the subject of two major acts, three waste strategy consultation documents, two waste strategies and a vast number of implementation schemes as a response to European Directives (Editorial, 2001, p.173).

The businesses have been responding to two widespread environmental management systems such as the ISO 14001 (International Organisation of Standardization) and EMAS (the European Union's Eco-Management Scheme) with the implementation of policies proposed by governments and local authorities. The regulated supervision of waste originating not only from the industry and businesses but also from households can act as a limiting agent to the so far harmful consequences of irresponsible waste handling and as an encouraging agent for a more responsible behaviour towards the preservation of natural resources.

This paper will be focusing on the waste management of large sized companies and how it affects and is affected by the existing policies within those companies. The companies used differ in the size and type of business and this is reflected on the different ways that these companies deal with the waste they produce. However, the main point will be to observe whether waste management practices can be a means for increased business profits or for decreased unnecessary expenses. What will be examined is the effect that waste managing has had on the financial performance of these companies. Where financial benefits have been observed, the ways this result has been achieved is also observed.

What is also examined, are the factors (legislative, economic, social, environmental) that influence the development of waste management schemes of these companies. A more complete understanding of what the real issues that managers face and what their role is in waste management has also been gained.

2. MAIN PART

2.1 Why waste?

This chapter aims to introduce the reasons why waste has become an issue not only for governments but also for the business community.

According to the European Union's studies (www.europa.eu.int/), the amount of waste that is thrown away only within the Union is around 1.3 billion tones, about 40 million of which is hazardous. Waste prevention and waste management have become one of the top priorities of the European Union according to the Sixth Environment Action Programme (6th Environment Action Programme) in an effort to set apart the continuous economic growth from the accumulation of waste (Appendix 1, p.39). For details about the amounts of generated waste from different types of industrial sectors within the European Union see Appendix 2, p.40.

In the UK alone, the sum of waste production of the manufacturing, industry and municipal sectors exceeds the 400 million tones per year (Department of the Environment, 1995). According to the Audit Commission (Audit Commission, 1997), as waste quantities are likely to double in the following years, by 2020 the UK will need to double its waste facilities; these facts can be seen as nothing but a challenge for the waste managing community. An indicative diagram illustrating the annual waste rise by sector, in the UK follows.

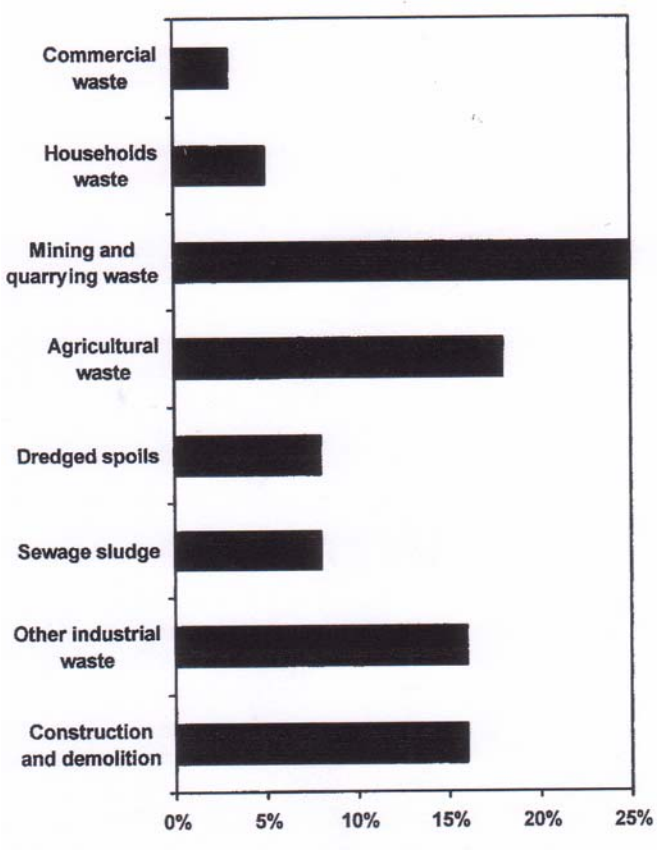

Fig.1 Estimated waste arisings per year in the UK, (DoE, 1995)

The increasing amounts of waste not only in the UK but also in all European countries have led to the formation of new legislation with which members of the EU have had to comply. However, as the capacity and ability of all counties are not the same, each of them has set their individual goals. In Sweden, the time target has been set as 2005 (SFS, 2001). In addition to that, a 25 Euro per ton tax has been introduced in 2000. Sweden is a nation that has been quite ambitious through the years about its environmental performance, claiming that the following generations will inherit a society with all the environmental problems solved (Skr 1999/2000).

Waste management is a quite big part within businesses' and governments' agendas not only for financial but for health and safety reasons too. In efforts to demonstrate their commitment to increased environmental performance, some companies have experienced financial profits. Nevertheless, this is not the only reason that waste management can play a decisive role in a company's future plans: risks associated with health are influential towards the decisions made for waste management. The unplanned disposal of mostly large waste quantities with uncertain qualities can have partly unknown ecological implications. The current waste management practices are therefore affected in a way that can lead to their re-evaluation. As this paper concludes, at the moment, companies seem to be formulating their waste management policies in a rather cautious manner, setting ambitious yet reachable targets.

2.2 Defining waste

In order to have a more in depth understanding of waste, one needs to define waste. The definition of the term needs to include all the characteristic elements of that term, which then will form the basis for the proposed solutions. Even though the definition of a term seems to be a straightforward process, in this case it appears to be a rather complicated area. The Waste Framework Directive that included in their definition that 'waste once always a waste' did not seem to give much room for a chance to encourage any further use of waste nor for recycling. 'Waste' is any substance or object that is disposed of while 'disposal' of waste includes its treatment, storage and any kind of transformation.

According to the Environment Agency (www.environment-agency.gov.uk), waste is anything that people at home and work discard because they no longer need it. Lox (Lox, 1994) defines waste as "either an output with ('a negative market') no economic value from

an industrial system or any subject or object that has 'been used for its intended purpose' (or 'served its intended function') by the consumer and will not be reused". The following table includes some more definitions given for waste.

Table 1

Some definitions of waste

EU	Waste shall mean any substance or object in the categories set out in Annex I which the holder discards or is required to discard (European Council, 1991)
OECD	Wastes are materials other than radioactive materials intended for disposal, for reasons specified in this table (OECD, 1994)
UNEP	Wastes are substances or objects, which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law (European Council, 1993)

The table was borrowed from Pongrácz and Pohjola, 2004, p.142

The choice of words used in the definition of waste by the EU Directive- using 'discard' rather than 'disposal'- suggest an attempt to include in the definition a broader group of actions involving abandoning objects (Cheyne and Purdue, 1995). However, at the same time, use of broad and therefore inaccurate terms leads to different interpretations of what waste is among member states of the European Union (Pongrácz and Pohjola, 2004, p.143). According to Bontoux and Leone (Bontoux and Leone, 1997) the European definition perceives waste more as a pollutant rather than a prospective raw material.

The purpose for the manufacturing of a product is directly linked with its classification as a waste. Based on this assumption, Pongrácz (Pongrácz, 2002, p.5) suggested a definition of waste, including its relation with its purpose: 'waste is a man made thing that has no purpose; or is not able to perform with respect to its purpose'. Pongrácz and Pohjola, (Pongrácz and Pohjola, 1999) extend this definition as follows: 'waste is a man-

made thing, which in a given time and place, in its actual Structure and State, is not useful to its owner, or an output that does not have any owner'.

Waste management licensing is based on the Environmental Protection Act 1990 (www.hmso.gov.uk). The original focus on the disposal of waste was changed after the introduction of the EC Waste Framework Directive (91/156/EEC) (www.europa.eu.int/), which expanded on the storage, treatment and recycling of wastes. The Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991 (www.legislation.hmso.gov.uk) introduced the waste registration scheme. It includes the differentiation between waste carriers (those who are registered to transport controlled waste by road, rail, air, sea or inland waterways) and waste brokers are people who make arrangements on behalf of others to dispose of waste.

2.3 Types of waste

The types of waste depend on the type of industry in question.

There are several criteria according to which wastes can be classified. Pongrácz and Pohjola (Pongrácz and Pohjola, 2004, p.144) who also relate the waste with ownership (Pongrácz and Pohjola, 1999) have gathered some of them. Classifications can be made according to:

- the physical state of the waste; so a waste can be solid, liquid or gaseous.

For example, in the solid waste category belong: the municipal solid waste (MSW), construction and demolition waste (C&D), waste from electrical and electronic equipment (WEEE), end-of-life vehicles (ELV), sewage sludge (SS), hazardous wastes (HW) and industrial waste (IW) (Bertram et al., 2002, p.44).

- the origin ; which can be processing, household, packaging or cleaning. Wastes can also originate from demolition or construction sites, or be classified as emissions treatment waste or energy conversion wastes

- other particular characteristics. In this case we have inert, combustible, bio-degradable, hazardous or nuclear waste.

- the reason why a product was disposed of and ended up as waste

The types of waste can also depend on the definition given for waste. These can be as many as those who define.

It appears that all the different arguments for defining the waste types suggest that this is still a complicated area. To finish this section, Pongrácz and Pohjola have continued their research on waste by identifying four categories of waste in a different paper than the one already mentioned (Pongrácz and Pohjola, 1997). They are summarized in the table below:

Table 2

Classes of waste

Class 1	Non-wanted things created not intended, or not avoided, with no Purpose. This class includes products with a negative market value, such as cleaning waste or emissions.
Class 2	Things that were given a finite Purpose, thus destined to become useless after fulfilling it. This class includes one use or disposable products.
Class 3	Things with well-defined Purpose, but their Performance ceased being acceptable. This class includes mostly non-functional products, such as demolition waste.
Class 4	Things with well-defined Purpose, and acceptable Performance, but their users failed to use them for the intended Purpose. This class includes products used in excess. As a rule it is due to the owner's irresponsibility that a product has ended up as waste.

The table was borrowed from Pongrácz and Pohjola, 1997 and 2004, p.144

2.4 Ways of treating waste

According to the Chartered Institution of Wastes Management and The Waste Framework Directive of 1991 (91/156/EEC), there can be a distinction between:

i) Qualitative waste prevention and reduction.

It includes the use of less toxic or hazardous resources and the production of less toxic or hazardous wastes. This is particularly interesting for the chemical industry as several of the reactant substances are hazardous and often toxic and their substitution might have an effect on the qualities of the product.

ii) Quantitative waste prevention and reduction

It includes the use of less resources and the production of less waste in terms of waste per unit of products. That is, it sets as a target the maximum possible minimization of waste per product used.

Some (Welstake K., 1997, pp. 453-461) have proposed the creation of sustainable landfills as a way to treat waste after it is disposed of. In this case, waste would have to go through a pre-treatment depending on its type. The creation of a stabilized degradation process might make the management of waste easier- it does not however occur without any downsides. The landfill gases produced might present a major health threat, a risk that might not be worth taking. Waste disposal has risks that cannot be totally eliminated and perhaps in order to avoid investing in a sustainable landfill that is not guaranteed to have the best results for the environment and humans, ameliorating the businesses' waste management systems would be the best available way to treat waste.

In general, there are two main ways in which any waste can be treated:

- the method of diluting and dispersing.

Waste can be deposited straight to the environment (whether it is a landfill or the sea). It then depends on the ability of the environment to absorb a polluter and then disperse it in smaller concentrations so that the effects on humans are negligible.

- the method of condensing and storing.

It is the opposite from the above; it is assumed that the polluter cannot be deposited straight in the environment because it will cause a non- acceptable hazard for humans or animals. In this case, the wastes are too contaminated to be directly and safely disposed of (Bertram et al., 2002, p.44).

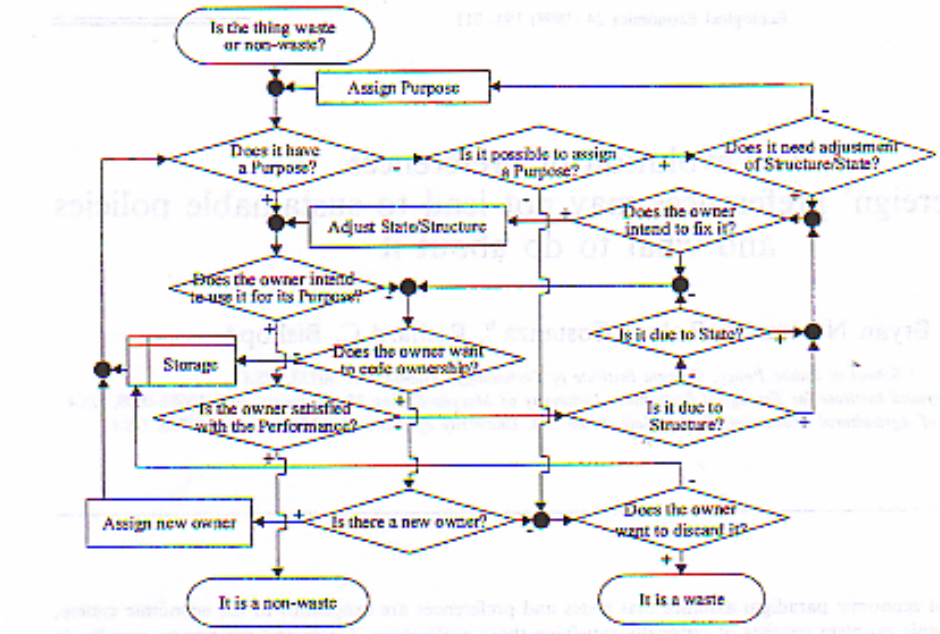

Fig. 2.Proposed procedure identifying whether an object is a waste or not (Pongrácz E. and . . Pohjola V.J., 2004, p.150)

The attempts made for the amelioration of waste management procedures have been becoming more intense during the past years. These include efforts to combine the minimisation of both the waste generated and the costs associated with the production of waste. In the petroleum industry mentioned earlier, the largest quantities of generated waste have the form of slurry and sludge form oil. It has been shown that there is a possibility of reuse of some sludge or slurry types. The most common method of disposing of these types of waste is by storing it in tanks and then disposing it into landfills randomly (Mendonça et al**.,** 2004, p.113) due to the lack of detailed legislation on such waste.

An account of the main elements of the EU's waste management strategies can be found in Appendix 3. Each strategy is accompanied with the respective existing or future legal action. Waste prevention and minimization appear to be crucial; where waste generation is unavoidable, then the recovery of materials is emphasized.

3. Literature Review

The background information that the review provides with, is useful in order to appreciate the existing circumstances under which waste management strategies are formulated. Environmental issues and as a consequence waste management have received increased attention during the past years. Waste management has been defined (European Council, 1991, Article 1) as: 'waste management shall mean collection, transport, recovery and disposal of waste, including the supervision of such operations and after-care of disposal sites'. As described by others (Bertram et al, 2002, p.43), the goals of modern waste management 'are to protect human health and the environment and to conserve resources such as materials, energy and space'.

Figure 3 shows a representation of a standard waste management procedure. The target is a waste product while the management is dealing with the monitoring of that target.

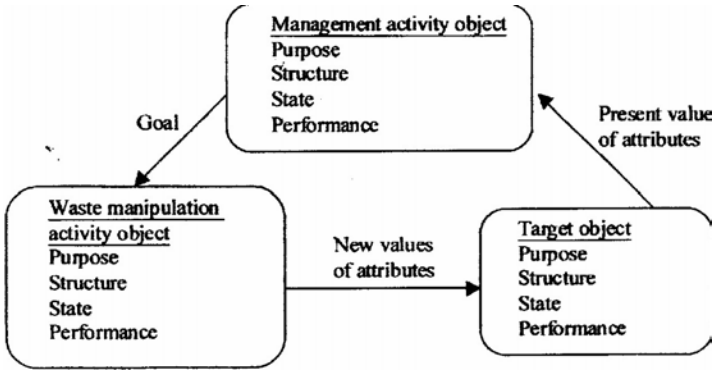

Fig. 3 – Representation of a waste management process (Pongrácz E. and Pohjola V.J., 2004, . . p.147)

Legislation plays a major role in the development of waste management strategies. The EU emphasizes in the Council Directive on Waste (European Council, 1991) two main targets for waste management: the first is the importance of prevention or reduction of the

amounts of waste generated. When this is not possible, due to the nature of waste or because of the lack of suitable equipment to treat waste, its recovery is encouraged by either recycling or re-use. These goals are set by the Directive on packaging and packaging waste (European Council, 1994). The possibility of using waste as an energy source is supported as well.

With the introduction of new environmental laws that require the controlled dumping of any waste and the fines that follow with incompliance with such laws, it is relatively uneconomical for any company not to obey them. Fines are a 'command and control' instrument introduced by governments and authorities as a means towards sustainability. The effectiveness of such an instrument is debatable; companies and firm representatives are not in favour if being monitored in a penalising way. The problem with command-and-control regulations is that typically they are in the form of punishment and the trouble with punishment is that it follows the crime. In this case, the regulation follows the environmental damage and it is therefore not the best solution environmentally as it arrives too late. On the other side, regulators oppose to that argument as they support the view that fines are a more effective way of modifying the activities of businesses in a more sustainable way.

Apart from the fines, market based instruments have also been introduced in a way to make businesses more sustainable. They include taxes, subsidies and tradable permits, all of which vary, depending on the type of the business and the nature of the waste they are producing. The best known example in this case is perhaps the Landfill Tax.

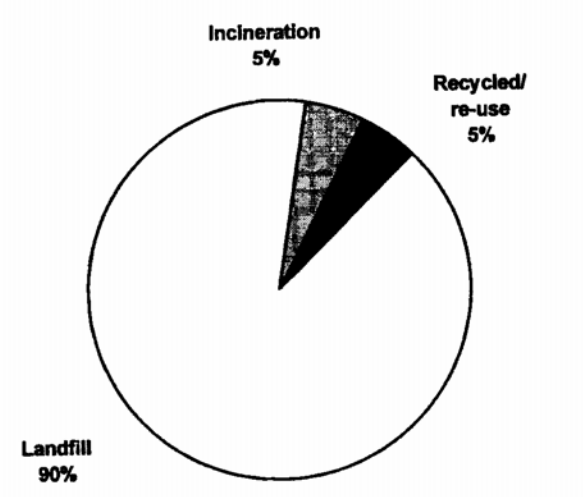

Fig. 4 : Proportion of management options for household waste in the UK (Davoudi, 2000, p.167)

The Landfill Tax, along with the Packaging Directive and the Waste Minimisation Act 1998 are a few of the drivers for businesses and local communities to lead them to rethink waste disposal.

Some studies (Gray and Shadbegian, 1993, p.2, also Binswagner, 1998, p.8) have shown that the compliance costs for companies often are higher then expected and this has been reflected in the magnitude of the total productivity. Nevertheless, in the same study (Gray and Shadbegian, 1993) there is one positive effect that policies can have: that of a better working environment for the employees. The health, safety and environment policies result in less accidents occurring in the workplace.

Another study (Smart, 1992, p.3) however, demonstrates a number of reasons how businesses can benefit from environmental regulations. One of them is by recycling and minimizing waste. According to the Business Council for Sustainable Development (BCSD) 'many of the waste reduction programmes in businesses are economically viable and are providing positive rates of return in relatively short time periods' (Schmidheiny, 1992, p.96). Some examples include the case of Northern Telecom, a company which when it stopped

using the ozone depleting substance CFC-113 saved $4 million on purchasing it, on taxes and waste disposal (Schmidheiny, 1992, p.230)

It has been apparent from the literature that society is imposing an indirect but strong pressure on businesses to take measures towards the risks associated with the increasing numbers of waste. The regulations have been criticized by some (Lambolez et al., 1994, p.317) as being insufficient in the required measures taken for controlling the properties of wastes. The necessary chemical analyses are not enough in order to determine the environmental impacts of waste products: the above study argues that they should be accompanied by toxicological analyses.

The idea that waste management could prove to be beneficiary has been regarded with disbelief. If waste reduction and recycling can bring financial benefits then why have not managers thought of it earlier? There can be multiple answers to this question; however it is worth examining the progress made in the last years in the area of profitable waste management.

There are two prevalent ways related with environmental improvement. Companies that seek to improve their environmental performance can do so by either using control or clean technologies (Murphy and Gouldson, 2000, p.36). The former are end-of-pipe technologies that are used to treat any waste after it has been produced. The use of end-of-pipe technologies that can too be costly (Binswanger, 1998, p.8) in order to treat waste can be replaced by the use of cleaner technologies in order to minimize waste from its source.

In an effort to reduce the amount of environmental damage caused by waste dumping, several governmental plans have been introduced. In 1991 the European Community issued a directive that promoted the use of cleaner technologies by emphasizing the advantages of recycling and ameliorating the ways waste is disposed to landfills (Poulsen O.M. et al, 1995,

p.34, Rådets directive 1991, Karlsson, 1992). In France, in 1992 the Minister of the Environment proposed the increased use waste recycling methods and the closure of all traditional landfill sites in the next 10 years (Karlsson, 1992). In the Netherlands, the National Environmental Policy Plan proposed as a target the reduction of waste to landfills from 55% in 1998 to 10% in 2000 and the increase of recycling from 35% to 55% (Brasser, 1990). In USA, the Environmental Protection Agency aimed to a 25% decrease of waste disposed to landfills by 1995 and to a 50% decrease by year 2000 (Petkov, 1993).

Many (for example, see Powell J., Turner K. R., Bateman I.J., p.*xii*) have argued that the reason why waste issues have not been suitably dealt with is because of the lack of information and education on the matter: there are not reliable data on the exact amounts of waste produced nor by whom and therefore the treatment of the issue becomes complicated.

The audits are part of the environmental management systems that businesses have set up in order to demonstrate their willingness to deal with environmental issues. It has been argued (Smart, 1992, p.3) that voluntary action can result in cost minimization.
Voluntary environmental agreements are considered to be a form of co-regulation that can complement the traditional command-and-control approach, instead of opposing to it (http://europa.eu.int/rapid/pressReleasesAction.do?reference=IP/02/1069&format=HTML&aged=0&language=EN&guiLanguage=en).

The preventive nature of such actions can result in avoidance of costs from non-compliance. It can also result in the obtainment of the relevant certification. Several companies have obtained such certification as it is often a requirement from future business partners. The certification mostly includes the ISO 14001-14040 series, concerning the environmental management systems of a company and ISO 14040-14060, concerning the services and production procedures. According to the EU, the main positive aspects of

voluntary agreements are the potential cost-effectiveness and flexibility. The proactive behaviour of the industry needs to be encouraged and supported.

4. Methodology

4.1 General research approach

The general research approach of this study has been a qualitative one. The data obtained from the literature review has been used as a guideline for a more comprehensive perspective on specific waste management cases. A quantitative methodology was not chosen in this project as the existing literature revealed that the available data would be insufficient as the only criteria for conducting this research.

However, in order to observe in more detail the findings of several previous studies and produce more inclusive outcomes on the way that waste management influences and is being influenced by economic drivers, the case study method has been chosen.

The case study method was chosen as the research questions focus on *how* the companies in question have dealt with waste issues and whether the way they have been dealing with them has had any financial implications. Since the focus of this research will be on large sized corporations, the conducted in depth interviews will help provide great understanding on how waste management is integrated in corporate responsibility.

The interviewees were also encouraged to make their own comments on the issues raised. At this point, the most important drawback of such a method needs to be pointed out. Due to the fact that the people interviewed are members of large corporations that need to maintain a sustainable public image, it is bared in mind that these people are not being entirely objective. Nevertheless, parts of the data obtained from them, are part of the company's records (such as the amounts spent yearly for waste managing) and are by nature neutral.

The sample used was not intended to provide statistically significant nor representative results. It was rather aimed to demonstrate in any possible detail existing

schemes and efforts made in the waste management area. The industries observed differ in nature and type of products they manufacture. For this reason, the results obtained and the observations made cannot be generalised for each type of industry (Eisenhardt, 1989). The results could be used as a basis for better understanding of the real issues waste management is facing.

4.2 Case study data collection and data analysis

The collection of data was performed in two phases.

The first phase was literature research performed over a wide period of time. The nature of this stage was mainly exploratory in order to obtain a wider understanding on waste management issues. The second phase consisted of in depth interviews with environmental advisors and waste management staff, arranged previously by e-mail. The case companies were selected according to some criteria:

- they should be large companies, with worldwide operations, as they are the ones mostly affected by legislation and policy instruments
- they should produce large amounts of waste of any kind
- they should have a waste management policy

The interviewees were informed on the purpose of the interviews by e-mail, over the phone or in person.

As recognised by the neoclassical economics (Ugelow, 1994, p.244) in waste management there have been two major distinctions made regarding the solution for waste issues. The short-term solutions involve treatment of waste and the adjustments in waste management are made according to the production costs. Contrary to the end-of-pipe solutions, the long-term solutions involve changes in the production processes and are considered to be 'cleaner' technologies.

During these interviews, information was collected on the environmental management of the companies and in more specific on the ways that the company in question is treating waste. Then the responsibility of the companies is gradually revealed by a series of questions.

All managers were also encouraged to add their own comments on the company's performance.

5. Results

5.1 Overview of companies

Company no.1

Company no.1 is a speciality chemicals company operating worldwide.

The company regulates its Environment, Health and Safety (EHS) performance by monthly reports, which include statistical data and internal audit results.

The company has formed a worldwide EHS policy in order to ensure the achievement of the best possible standards, in all the design, manufacture and supply procedures. The policy is formed irrespective of each country's legislation; it is stressed however that the legal requirements associated with EHS are met in each country. In order for the company to improve its performance, internal and external audits are performed. The results of the audits are then shared between different sites and the results are reviewed, in order to obtain a best practice.

Great importance is also placed in the certification obtained. When the annual report for 2004 was published, 16 sites of the company have been certified with ISO 14001. Two more sites were in the final stages of obtaining the certification. Plans for the future include a programme for all sites to obtain such certification.

Company no.2

Company no.2 is a carbohydrate processing company operating worldwide. The company produces and provides a variety of industries with sugar, sweeteners, wheat proteins and syrups and other products processed from carbohydrates.

The environmental management of the company is considered as important as the overall management. The company has three major environmental concerns: the energy use, the water use and the non-hazardous solid waste use. It is each division's duty to integrate the monitoring of the actions associated with a possible environmental impact into their policies.

Specific to the UK site, the efforts made the past years to reduce the amount of waste generated have been increased. The environmental management of the London site has aimed to reduce all types of waste, including the waste generated form the manufacturing areas as well as the waste generated from the rest of the site too.

Company no.3

Company no.3 is a pharmaceutical company operating worldwide.

As declared in the company's Corporate Responsibility Summary Report for 2003, it is crucial for the company's reputation to achieve the best possible performance in a sustainable way.

The company has placed intense interest in environmental issues especially after the observations made, in the past years, of increased concentrations of pharmaceutical residues in the surface waters of some countries. The company in question is acting pro-actively, assessing all its products before they appear in the market. Specific in the UK but also in the

rest of the EU, the Environmental Risk Assessment Guidelines have been reviewed and currently there are efforts being made in order to improve the existing knowledge.

Efforts are also being made in order to control other pharmaceutical wastes.

Company no.4

Company no. 4 is a technology company producing inkjets, printers, scanners, notebook PCs, Pocket PCs. The company's commitment to operate in a sustainable manner has been intensely stressed by the manager interviewed. Increased environmental performance and social responsibility have been one of the main concerns of the management since the foundation of the company. Each member of staff has personal responsibility to act in an environmentally sound manner. Programs are constantly being developed in order to increase employee awareness and the role that they can play in the overall environmental performance. The management has set worldwide goals to promote both environmentally sustainable production procedures and products. Regulation compliance is the first step towards these goals; pollution prevention, energy conservation and waste reduction are part of them.

The company has been one of the first in its group (operating globally) to implement an environmental management system. Internal and external audits have resulted in the certification of all manufacturing operations worldwide with ISO 14001.

The environmental concerns of the company are also expressed when a selection of a supplier or contractor is to be made. The company then uses the TQRDCE (Technology, Quality, Responsiveness, Delivery, Cost, and Environmental) criteria.

5.2 Analysis of key findings

All the people interviewed in this research have expressed a great interest.

Company no.1

Most of the waste that Company no.1 produces originates from its manufacturing sites. It is a mixture of general waste and special host waste. In 1997 the company introduced a new sophisticated manufacturing system at all its operation sites which resulted in the recycling of some of the produced waste. In this case, the company had a financial incentive to install this new system because it is using and producing large amounts of precious metals. These metals are rare and expensive in general and are the company's most expensive product. At the moment, the company has cut down some of its costs due to this recycling system.

As a result of some waste being re-used, the overall amount of waste has been reduced as well. The main driver for putting money into research and introducing an extended waste management policy has been legislation. The company is heavily regulated and because it is constantly expanding, its actions need to be monitored as often as possible. The expansion inevitably leads to not only an increase in the production rate but also in the environmental impacts. Even thought the main environmental impacts of the company are energy and water consumption and air emissions, there are several million pounds spent on waste managing.

The main target of the company is to re-use or recycle any type of waste if possible. Otherwise, if such an option is not feasible, efforts to reduce waste from its source are made. In the past year, the turnover of the company has been over £45 million worldwide and the costs for waste management have been around £3.5 million. There have been 37.7 tonnes of

waste per £Million sales or, in other words 46,100 tonnes of waste. The amount of waste has been increasing the past years; it is however due to the growth of the company.

The company is judging its overall performance in waste minimization to be successful; overall, the company apart from reducing its environmental impact has also observed noteworthy cost reductions.

Company no.2

Most of the waste Company no.2 produces originates from its manufacturing sites.

In order to reduce the extensive amounts of packaging waste throughout the site there has been a bailing machine installed. The results from using the machine have been almost immediate as the amounts of waste paper have been notably reduced. Company no.2 has experienced financial benefits from cautious waste managing. The installation of the bailing machine has resulted in the minimization of the packaging waste and in the costs related to its transfer and disposal. Plans for the future include the installation of at least another machine.

Company no.3

Company no.3 has also spent several amounts on improving its environmental performance. In the UK and Puerto Rico sites, the installation of two new power plants generating heat and power in a single process has lead to the to the reduction of CO_2 emissions by around 50,000 tonnes annually. Other operations are still being evaluated in the India site; an energy efficient heating, ventilation and air-conditioning system has been

installed; should it have the desired results there, it will probably be installed in other sites too.

The company has tried to reduce waste in ways not only concerned directly with its products. In the 2003 Senior Managers Conference, the employers did not have to travel; leaflets did not have to get printed, hotel bookings did not have to be made. The meeting took place in the most possible environmental friendly way: as a video-conference. The amounts of waste have been reducing; in 2003 the total waste was reduced by 3%. This has been achieved by improving to the maximum the production operations. The use of hazardous chemicals has been gradually minimized by substituting them with others. Less waste and more profits are expected at the end of this year.

Company no.4

At the moment Company no.4 is a special case as it has recently merged with another IT company. Both companies are collaborating as the post-merger environmental targets need to be the same as pre-merger. The main target for the company has been to eliminate waste from its source rather than treating it. The company's motto has been 'reduce-reuse-recycle' for all the above operations. As a result, there has been a decrease in the landfill diversion rates which have been higher for manufacturing and distribution operations than office sites. The volumes of non-hazardous waste in 2003 decreased by 12% compared to 2002.

The company is also dealing with hazardous waste too. According to the records for 2003, the amounts of hazardous waste have been increased; this is however due to the

overall increase of ink manufacturing. Still, the targets set for the coming years clearly set that the hazardous waste quantities need to be reduced.

Efforts to reduce waste have been made at all levels. The employees have unlimited access to beverages, all used in plastic cups. For this reason, bins for plastic have been placed around the building. The amount of plastic being recycled throughout the year is not negligible, nor is the amount the company can get from recycling them.

The company has also started several programmes for electronic equipment recycling as it will be affected by the introduction of the WEEE (Wastes from Electrical and Electronic Equipment) Directive.

5.3 Common observations for all four companies

What can be derived from the above observations is that waste management, being part of environmental management has been somehow problematic in a way that so far, the formulation of environmental policies has been based on productivity maximization. In practice and as it appears to be from the above companies, there is not a single solution to the integration of environmental policies. Each company has had a different approach on waste management, depending on its existing technology and on its capacity.

For the companies studied, there have been some common characteristics observed. All managers have expressed the corporate commitment in dealing with environmental issues. All have been doing so for years as part of the efforts to improve their corporate responsibility performance; economic, environmental and social issues all have been considered of equal importance. In order to achieve better performance, all companies have assigned responsibilities to well trained managers who can respond to the sustainable development challenges.

Also, when necessary, priority has been given to environmental issues, in cases when new directives are published or minimal accidents have occurred within the workplace. All companies have obtained external certification concerning their environmental management systems. This type of documentation (ISO certification) is an important driver for continuous improvement for two reasons: first, to achieve the less possible environmental impact and second, to reduce the costs associated with such impact. The reduction has also been achieved with the collaboration with waste consultancies, which provide with reassuring solutions for the businesses. The professional advice they are offering, help the managers dispose of their waste responsibly and therefore avoid any unnecessary costs. The increased need for professional advice has lead to the growth of about 3500 waste companies in the UK (Adams et al, 2000, p.226)

It has been recognized that both internal and external communications are equally important in order to obtain the desired environmental performance including waste minimization. For this reason, a number of tutorials are taking place throughout the year intending to inform the employees.

Investigation of environmentally related incidents is required to be done in depth. The promotion of energy and resource efficiency programs that all companies have is the result of how seriously they are taking environmental issues and waste minimization in particular.

Another general observation, also made by others (Murphy and Gouldson, 2000, p.36), is that all the companies that seek to improve their environmental performance are doing so in two main ways: the first one is to improve that performance by changing the existing technologies and the second one is to introduce a totally new technology. The second way is naturally seen with hesitation as the potential financial benefits are uncertain

since there is no recorded history. An example is the installation of the bailing machine of Company no.2: only one has been installed so far; the rest will follow after financial benefits have been recorded.

The reason why companies seem to be taking small and hesitant steps towards waste reduction or minimization (see also, Ugelow, 1994, p.243) and environmental issues in general, I believe is because nature has been only partly incorporated into the economy. As others (Binswanger, 1998, p.7) have explained, the use of renewable resources as energy providers needs to be extended, in order for the continuous economic growth to stop being identified with natural resource depletion.

So what can happen next? It is undisputable that the financial, environmental and health costs of waste are not insignificant. In order to address effectively those issues, the waste management programmes need to be developed more thoroughly in order to take more drastic steps towards successful sustainable development. Even though there appear to be financial benefits from waste minimization, the economic factors can no longer be considered as the main driver for extended improved environmental performance.

In cases where the presence of the company is important for the economy of the local community, as in the case of Company no.2 which has created many job opportunities for the surrounding areas, then the cooperation of the local authorities with the company's management is crucial.

The profits that the companies in this study have experienced can be used as evidence for the existence of this aspect.

It is up to the industrial community to use such profits as the ones from waste management to gain a future competitive advantage. This could be achieved by re-evaluating the actual costs involved in waste management, including not only the design, production

and disposal costs but also the costs from non-compliance with the relevant legislation. It could also be accomplished by sharing ideas and resources not only between different divisions of the same company but also between different companies. Partnerships with the local authorities could definitely result in the development and promotion of effective policies.

It is apparent from the companies of this research, even though they are not many, that the management of environmental issues can, indeed, be profitable for businesses. These results verify similar results shown by others (Phillips et al., 2001, p.392): that business can experience financial benefits by monitored waste management which results in waste reduction.

6. Conclusion

Waste management, being part of environmental management that businesses have been increasingly introducing the past years, is included in the efforts made towards sustainability. The change of the century has found the industrial world reorganized: the 'fall' of the nuclear power and the emergence of alternative energy resources, while at the same time, the economic and monetary union of Europe and the Kyoto Protocol have changed the market operations.

The emergence of EU's waste policies has generated a 'wave of change'. The cumulative environmental impacts of the industry have led to the industrial sector to be affected in two main ways: firstly, in the redesign of the production procedures and secondly in the nature of the products themselves. In the case of future developments of environmental policies, the issues addressed need to concern the relationship between the environmental impacts and the growing waste quantities and economic development. Economies need to become cleaner rather than dirtier.

The unified diversion from the landfill which is the main observed result is certainly a proof of the effects that policies have had on businesses; the choice of alternatives however, on how to deal with the waste have been diverse. This can be attributed to the influence that local factors have had on businesses, reflecting the economic, environmental and social aspects of waste management policies.

Whether waste is regarded as a signal of design failure or of bad management, it appears to be a lost profit opportunity which can result in reduced competitiveness. The companies of this research have had financial benefits from their waste management and several other common features. All consider the obtaining of certification as a basic step towards better waste management and therefore, sustainability. The regular monitoring of

the financial performance is used as an indicative means of judging the success of a waste scheme. The benefits that companies have experienced are due to either substantial reduction in costs or improvements in production processes. These observations are encouraging in a way that they justify the introduction of the European Union's environmental policies. The targets set which require the decoupling of the use of natural resources and the waste generation from the economic growth can be achieved not only by one single means but by developing a regulatory mix.

At the moment, there is no need for a new industrial revolution. The control of waste production, the clean up of contaminated areas and the re-evaluation of underused materials are undoubtedly the essential elements for sustainable investment. Environmentally sound solutions, including the advancement of waste management incorporate the decreased neglect on the role of nature and the environment. Businesses, being the main source of waste production in western countries, have the capacity of setting an example of environmental responsibility as a step closer to sustainability. As put by Huber (Huber, 1985, p.20): 'the dirty and ugly industrial caterpillar will transform into an ecological butterfly'.

7. Appendices

Appendix 1- 'Environment 2010: Our future, Our choice', Waste in the 6th Environment Action programme of the European Community

Objectives	• To de-couple the generation of waste from economic growth and achieve a significant overall reduction in the volumes of waste generated through improved waste prevention initiatives, better resource efficiency, and a shift to more sustainable consumption patterns; For wastes that are still generated, to achieve a situation where: • the wastes are non-hazardous or at least present only very low risks to the environment and our health; • the majority of the wastes are either reintroduced into the economic cycle, especially by recycling, or are returned to the environment in a useful (e.g. composting) or harmless form; • the quantities of waste that still need to go to final disposal are reduced to an absolute minimum and are safely destroyed or disposed of. • Waste is treated as closely as possible to where it is generated.
Targets	Within a general strategy of waste prevention and increased recycling, to achieve in the lifetime of the programme a significant reduction in the quantity of waste going to final disposal and in the volumes of hazardous waste generated. • Reduce the quantity of waste going to final disposal by around 20% by 2010 compared to 2000, and in the order of 50% by 2050; • Reduce the volumes of hazardous waste generated by around 20% by 2010 compared to 2000 and in the order of 50% by 2020
Policy approach	The Community's approach to waste management policy is based on the guiding principle of the waste hierarchy which gives preference first to waste prevention, then to waste recovery (which includes reuse, recycling and energy recovery, with preference being given to material recovery), and lastly to waste disposal (which includes incineration without energy recovery and landfilling). The current architecture of Community waste policy and legislation comprises three main elements: • framework legislation on waste definitions, site permitting, waste shipments controls, etc; • legislation governing the operating standards of waste facilities such as landfills and incinerators; • legislation targeted at specific priority waste streams such as end-of-life vehicles with the primary aim of increasing recovery, and in particular recycling levels and reducing the hazardousness of these wastes.
Actions	• Integrate waste prevention objectives and criteria into the Community's Integrated Product Policy and the Community strategy on Chemicals. • Revised Directive on sludges • Recommendation on construction and demolitions wastes • Legislative initiative on biodegradable wastes. • A Thematic Strategy on waste recycling to include the following types of actions: o Identify which wastes should be recycled as a priority, based on criteria which are linked to the resource management priorities, to the results of analyses that identify where recycling produces an obvious net environmental benefit, and to the ease and cost of recycling the wastes o Formulate policies and measures that ensure the collection and recycling of these priority waste streams occurs, including indicative recycling targets and monitoring systems to track and compare progress by Member States Identify policies and instruments to encourage the creation of markets for recycled materials.

Appendix 2:
Main elements of the EU waste management strategy

Strategy	Legal action in force	Considered legal and political action
Prevent waste generation and reduce its hazardous content Hierarchy of principles: prevention material recovery energy recovery safe disposal	Treaty, Art. 130R Member States are required to: • encourage firstly, the prevention or reduction of waste, secondly the recovery of waste by means of recycling, re-use or the use of waste as a source of energy (Framework Dir, Art 3) • ensure that waste is recovered or disposed of safely, and prohibit the dumping or uncontrolled disposal of waste (Framework Directive, Art. 4) • draw up waste management plans (Framework Directive, Art. 7)	Possible proposals to set quantitative targets for reducing and recovering waste (COM(96) 399)
Prevention of waste generation	Community Regulations on eco-audit and eco-labels (Regulation 1836/93 and 880/92) Member States required to take measures to prevent generation of packaging waste, limit the heavy metal content of packaging, and inform consumers (Directive 94/62, Art. 4, 11 and 13)	In particular cases EU-wide rules to limit or ban the presence of heavy metals or specific substances in products to prevent hazardous waste to generate (COM (96) 399) Integrate the principle of producer responsibility in all future measures on a case-by-case basis (COM (96) 399) Improve environmental dimensions of technical standards (Council Resolution 97/C76/o1)
Prevention of impact on environment Prevent the negative impact on the environment	Member States required to take measures: • to reduce the heavy-metal content of batteries and accumulators, ensure separate collection, inform consumers, and prohibit marketing of certain batteries (Directive 91/157) • to collect and dispose of waste oils safely and prohibit and discharge of waste oils into inland surface waters, groundwaters, etc. (Directive 75/439, Art 2. and 4) • for the use of sewage sludge in agriculture in order to prevent harmful effects on soil, vegetation, animals and man (Directive 86/278) • to implement common emission standards and operation criteria for incinerators for MSW and hazardous waste (Directive 89/369 and 94/67)	Proposed specific requirements for Member States to ensure that measures aiming at reducing the negative impact on the environment from end-of-life vehicles are implemented (Com(97) 358) Proposed directive on landfills setting minimum technical and administrative standards for landfills (Com (97) 105)
Recovery Where generation of waste cannot be avoided, waste shall be re-used or recovered for its material or energy. Where environmentally sound, re-use shall be further encouraged in order to avoid generation. Preference to be given to recovery of materials over energy recovery operations.	Specific requirements for Member States to: • encourage re-use systems of packaging, to take the necessary measures in order to attain certain targets of recovery and recycling of packaging, and to ensure that systems are set up to provide for the return and/or collection of packaging waste (Directive 94/62, Art. 5-7) • to give priority to the processing of waste oils by regeneration (Directive 75/439, Art. 3)	Consider EU quality requirements to define when a given incineration operation is a recovery or a disposal operation (COM (96) 399) Proposed specific targets of re-use, recycling and recovery for end-of-life vehicles, and demands for establishing systems for the collection of all ELVs (COM (97) 358) Development of a recycling industry based on modern technologies and methods and promote recyclability of materials and products (COM (98) 463)
Final disposal Avoidance of incineration without energy recovery and landfilling Incineration with energy recovery to be promoted for all incineration installations, leaving landfilling in principle as the last solution. In the mid-term, only non-recoverable and inert waste to be accepted in landfills	• Disposal costs must be borne by the producer of the waste (Framework Directive, Art. 15) • Member States required to make appropriate measures to: o establish an integrated and adequate network of disposal installations (Framework Directive, Art. 5) o dispose of batteries and accumulators containing dangerous substances separately (Directive 91/157, Art. 6) o ensure safe combustion of waste oils, and where neither regeneration nor combustion is feasible, to ensure safe destruction or controlled storage or tipping (Directive 75/439, Art.4) o prohibit the uncontrolled discharge, dumping and tipping of PCBs/PCTs, making environmentally safe disposal compulsor (Directive 96/59)	Proposed requirement for Member States to ensure that all costs are covered by the price to be charged by the operator for the disposal of any type of waste in that site and to set up a national strategy for reduction of biodegradable waste going to landfills ensuring certain targets to be met (COM (97) 107) Encourage Member States to make serious efforts to prevent and to minimise quantities of waste that go to landfills, and in the long run to ensure that the price of disposal is make more transparent (CPM (96 399)

Shipment of waste: the principle of self-sufficiency aims at avoiding shipments for disposal between Member States, while shipments for recovery are mainly submitted to the principles of the internal market	Requirements on notifications procedures (Regulation 259/93)	Increase approximations of standards in order to establish common environmental standards for recovery operations (COM (96) 399) Concern of large-scale movements within the Community of waste for incineration with or without energy recovery (Council Resolution 97/C76/01)

Source: Environment in the European Union at the turn of the century, European Environment Agency

Appendix 3:

Interview questions:

1. Does the company have a waste management policy? How does your company treat waste? (Are there any particular technologies being used? / Did you have to install new equipment?)
2. When was an environmental policy introduced?
3. Why was the current environmental policy of the company introduced? (Was it in order to avoid costs from fines, strictly for environmental reasons, to gain competitive advantage perhaps?)
4. Did your company ever have to pay any fines for not complying with environmental regulation? Was it after an audit?
5. Have you recorded any profits after introducing a waste management policy?
6. What kind of waste does the company have? (emissions, liquid etc)
7. How were you dealing with the waste before the introduction of a waste management policy?
8. Are all the employees aware of the company's environmental (and waste management) policy? / If yes, how do the employees learn about it? (Are there

any training courses?). If not, why not and what actions are taken to change that?

9. Are you collaborating with any other companies/ NGOs/ waste consultancies?
10. Have there been any accidents? What happens in that case? (Is there a danger of any accidents having environmental impacts?
11. What are the plans for the future?

Appendix 4:
List of companies

Company	Name	Title	Duration
No. 1	Johnson Matthey	Environment, Health & Safety Advisor	1 hr
No. 2	Tate&Lyle	Environment Advisor	2.5 hrs
No. 3	AstraZeneca	Communications Officer	1 hr
No.4	Hewlett Packard	Program Manager, Real Estate and Workplace Services	3 hrs

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Company No.4 www.hp.com

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