S. A. Abou Baker / ICEHM2000, Cairo University, Egypt, September, 2000, page 384- 419

RECYCLING INDUSTRY AND ITS INSURANCE

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Abstract

The volume of waste and emissions has increased very rapidly as a consequence of advancing industrialization and civilization. In manufacture of industrial and agricultural products raw materials such as coal, minerals, oil, and gas are consumed polluting air, water and soil. Pollution, with its negative effects on man and nature has become a global problem. Major raw materials are, at today's rate of consumption, will only last for a few more years. These considerations lead to the idea of recycling.

There are many worldwide environmental research centers, institutes; educational materials; and projects that do studies on recycling and environment, example are Harvard University. In HU research conducted at the Environment and Natural Resources Program (ENRP) has influenced USA and international environmental policy for nearly 20 years. ENRP provides a hub where faculty, students, and visiting scholars engage in disciplinary and interdisciplinary research on environmental policy issues. The Program supports work on critical issues including: market-based approaches to reducing pollution; the use of technical assessments in environmental policy; global environmental change; sustainable development; and natural resources management in USA and abroad.

This paper has three objectives, first one is to overview the recycling industry, second one is to outline law and legislation affecting recycling, and third one is to illustrate how to manage recycling by Property-Liability insurance and Waste Management Programs. The paper consists of the following sections:

Section (1) Introduction
Section (2) Recycling industry
Section (3) Law and Legislation affecting recycling
Section (4) Insurance coverage and waste management programs
Section (5) Recommendations

SECTION (1): INTRODUCTION

Making uses up energy can cause pollution and create waste, every time we thaw something, we add to this waste. Most of the waste is put into large holes in the ground and buried (*Landfill*), some is burnt (*incineration*), and some is reused and recovered (*recycling*). The following are the percentage of the three processes of getting rid of waste in U.K[1] as shown in chart (1).

Chart (1)

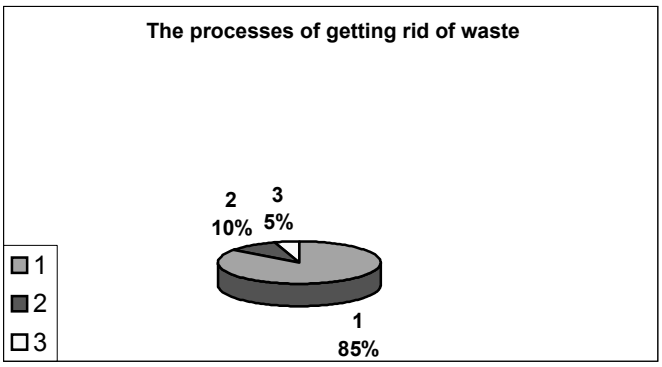


Chart (1) illustates that 85% of waste ends up to in landfill sites, 10% is incinerated, and 5% is recycled. The organic materials within a *landfill* are the main source of methane, which is responsible for global warming phenomenon, and liquid, which may enter and contaminate water supplies. However the amount of methane and liquid seepage can be controlled by appropriate landfill management. Also the organic materials within a landfill are the main source of methane and liquid, which may enter and contaminate *Incineration* leaves a residue of from 10% to 30% of the original mass, which may contain toxic chemicals and heavy metals, and which still has to be landfilled.

What is recycling?

Recycling is "*the processing of waste manufactured products to provide the raw material to make new ones"* . It is the modern term for "*the practice of reusing products and recovering materials*". Recycling usues less energy and causes less pollution than using raw materials. It also reduces the demand for imported raw material and the amount of waste being sent to incineration and landfill. Athough it was not uncommon in the past to use spent products again for reasons of economy or owing to a lack of raw materials, recycling is gaining in importance all the time now. In toay's affluent consumer society we must recognize the need to change our lifestyle if we are to secure the basis of existence for ourselves and future generations.

The need for recycling:

Recycling reduces the demand for raw materials, lessening the impact of extraction and transportation. It is estimated that for every tonne of waste thrown away, an extra 20 tonnes of waste is created at the point where the raw material is exstracted. Activities such as mining, quarrying and logging can be environmentally destructive, destroyig the natural environment and precious local wildlife habitats. Athough some materials tor recycling need to be transported, the impact of this is significantly less than of transporting raw materials from often remote locations in other parts of the world.

Recycling lessens the amount of waste going to landfill. Disposal to landfill also involves high transportation costs as landfill sites are an increasingly long way away from large urban areas where most of the waste is produced. Modern landfill sites are constructed to high standards but remaining environmental concerns include the production of methane, a greenhouse gas which can cause explosions in landfills, and the leaking of synthetic chemicals, heavy metals and bacteria into the soil and the water table.

Recycling is a positive act which individuals can take help the environment. It encourages us to think about the waste we create and take responsibility for what happens to it. Ultimately this is the greatest advantage of recycling as raising awareness is is the first step towards changing the way we deal with any problem. As more people recycl, more recycling plants will be built, and the impact of transporting will decrease.

Acording to the above, the needs for recycling are as follows:

a- Conservation of resources:

In the manufacture of industrial and agricultural products, it is always nessesary to exploit the resources that are available. Raw materials such as coal, minerals, oil, and gas are consumed and this has an impact on the air, the water, and the soil. Reserves are dwindling ever faster and our natural habitat is becoming more and more confined. The recycling of rare materials has long been common practice, as gold and silver. In the future, we must treat other materials more economically and responsibly too and step our efforts to recycle them.

b- Waste disposal, waste reduction:

The rise in standard of living has gone hand in hand with an increase in consumption and the volume of waste genetated. It is becoming more and more difficult for twons and cites to handle this flood of waste with the methods they have relied on in the past i.e. incineration and landfilling. The number of suitable locations for landfills is declining, while the average distance from metropolitan areas and the transportation costs involed are increasing. At the same time, the danger of groundwater pollution is growing. It is therefore necessary to reduce the volume of waste significantly. A more responsible use of cosumer goods can help to avoid unnecessary waste from the very start. In concert with this, recycling is one of the most important means available to reduce waste.

c- Environment protection:

For many people, protection of the environment and the battle against its destruction are among the central issues of our time. The negative effects of human activity on nature have now become unmistakable. Evidence of this is provided by globl problems like the ozon hole, man-made climate change, and presence of toxic materials in such remote parts of the earth as the Antractic. In the major cities and industrial areas of the world, the air, the water, and the soil are heavily polluted. An important contribution to limiting this kind of environmental damage can be made by property disposing of used goods and not simply throwing them away.

There are many world-wide research at environment and natural resources, conferences and exositions, and exhibitions that do projects and studies on recycling and environment such as the following:

(1) Research at Environment and Natural Resources Programs:

Research conducted at Enviroment and Natural Resources Program (ENRP) has influenced U.S.A. and international policy for nearly 20 years. ENRP supports work on the following critical issues[2]:

Market-Based Systems for Achieving Environmental Goals
Extensive *ENRP* economic research in this area examines innovative marker-based instruments for implementing cost-effective means to meet environmental standard.

Global Environmental Assessment (GEA) Project
This five-year international collborative program of interdisciplinary research and training explores how assessment activities can better link scientific understanding with the progressive design, implementation, and evaluation of effective policy responses to global environmental change.

Climate Change Policy
The global threat of climate change is a primary research focus for *ENRP*. Through multiple initiatives sponsored predominantly by the *U.S. EPA* analyzes means to reduce greenhouse gas emissions, nationally and globally, through market incentives and international research and development implementation.

Managing Public Infrastructure
ENRP has initiated an *international executive training effort* to develop case materials and teach Latain American government officials and business leaders how to privitize and manage infrastructure effectively.

Natural Resources
ENRP's research dedicated to natural resource management has recently focused on environmental regionalism, urban water supplies, management of our National Parks, and the effects of information technology on the environmet.

Energy Technology Innovation
ENRP collaborates with BCSIA's *Science, Technology, and Public Policy Program* on the Energy Research and Development Policy for a Greenhouse Constrained World effort, focusing on strategies for research, development, demonstration, and deployment of new energy supply and end-use technologies in the U.S.A. and in a number of other major greenhouse-gas-producting countries, including India, China, Barzil, and Russia. The project's aim is to characterize the gaps between what is being done and what is likely to be required, and identifing approaches to close those gaps.

Managing thd Atom Project
ENRP explores the environmetal implications of the nuclear industry in conjunction with BCSIA's *Managing the Atom (MTA) Project*. In April 1998, ENRP co-sponsored a conference with MTA and the Harvard Electricity Policy Group where the nation's nuclear power producers, government leaders and environmentalists discussed the implications of electricity restructuring on the management of U.S.A. nculear power.

Industrial Ecology
Research in the area of Industrial Ecology, jointly sponsored with BCSIA's Science, Techology, and Public Policy (STPP) Program, focuses on conserving material resources and reducing industrial waste by integrating industrial use of byproducts.

Harvard Electricity Policy Group
ENRP conducts research and sponsors conferences in conjunction with the Haravrd Electricity Policy Group to address the environmental implications of the deregulation of the electricity industry, most recently focusing on U.S.A. industrial responses to global climate change initiatives and the future of nuclear power in a deregulated marker.

Environment Rule-Making
Ongoing interdisciplinary research in law and policies concerns the effects of negotiated and delayed rule-making on environment policy outcomes.

(2) Conferences and Exositions[3]:

There are many technical papers have been presented and published at various industry trade conferences[3] and expositions as follows:

Egosi, April 1989, "Design Considerations for Material Rectcling Facilities", Jornal of Resource Management and Technology.
Darcy, February 1991, "RRT Proves that Recycling is Good Business", World Wastes.
Egosi and Romeo, June 1991, "Meeting High Expectations through MRF Design", Solid Waste and Power.
Egosi and Edelson, November/December 1991, "Primer on Plastic", AIPE Facilities.
Jones, 1992, "Time and Motion Analysis of Manual Sorting and Procedures at Materials Recovery Facility", ASCE Proceedings of National Waste Processing Conference.
Egosi, September 1992, "Mixed Waste Processing", ASCE National Convention, New York. *Egosi, November 1992,* "Mixed Waste Processing", 8th International Conference on Solid Waste Managemet and Secondary Materials.
Harris and Zeterbo, August 1993, "Design of Bulky Waste Processing Facility for Atlantic County Utilities", Abstrct of: Atlantic County Utilities Authority". *Powell, October 1993,* "Who are the Big Actors and What are They Up To?", Resource Recycling.
Romeo, 1994, "Material Recovery Design of Ocean County, New Jersey", ASME National Waste Processeing Conference at the Cape May Countt New Jersey Intermediate.
Jones, 1994, "Integrating County Recycling and Bottle Bill Redmption at the Moore County Material Recovery Center", Solid Waste Association of North America, New York State Chapter Annual Conference.
Harris and Zeterbo, 1994, "Operation at the Cape May County Processing Facility, National Waste Processing Conference Operations at the Cape May County, Jersey Intermediate.
Jones, February 1994, "The Outagamie County Material Recovery Facility", Associated Recyclers of Wisconsin, Eau Claire.

Gould and Meckert, *September 1994,* "Materials Separation Systems for Solid Waste Compostin", BioCycle. *Egosi, November 1995,* "Automatic Paper Sorting", 11th International Conference on Solid Waste Technology and management, Phliadelphia.

Ficks, October 1997, "Lean, Mean Processing Machine, the importance of paper equipment maintenance", World Waste.
Egosi, October 1997, "Worker Safety: An Important MRF issue", Resource Recycling. *Ficks, November 1997,* "From Zero to 100 Tons in Four Weeks, The importance of proper operations training", World Waste.
Egosi and Weinberg, May 1998, "Single Stream Processing", Resource Recycling.
Egosi, June 1998, "Material Recovery Facility Design Considerations", Waste Expo 98, Chicago.
Eosi and Moore, October 1998, "Overlooked by the Industry?, Paper recycling and paper sorting equipment", Recycling Today.
Barber*, November 1998,* "Phoenix's New MRF: A Singular Sensation", Waste Age.
Mekert December 1998, "An Overview of Municipal Solid Waste Processing", ANACON 98, Los Angeles.
Tom, April 1999, "The Baler 3 Step, insigt on baler selection", Waste Age.
Gery, August 1999, "MSW and Biosolids Feedstocks for Ethanol, MRF project in Middletown NY", BioCycle.
Collaborative Effort, August 1999, "RRT's Tenth Anniversary supplement, several feature articles provide a current overview of the solid waste and recycling industry, new technologies and what's on the horizon", Resource Recycling.

(3) The Recycling & Waste Management Exhibitions[4] :

The Recycling & Waste Management Exhibition provides a board showcase for the latest in recycling products and services, including processing and handling equipment, parts and components, and materials reclamation systems for deomestic and commercial waste. It attracts: Local authority recycling and waste officers, councillers, processors of recycled materials, metals, paper, plastics, textiles and wood recyclers, companies, refuse and collection companies, and others affected by waste legislation. The following is events calender of these exhibitions:

3-6 July Paris (France), ISWA World Congress 2000, International congress on waste management?.
23-25 July Montreal (Canada), SMART's 2000 executive mid-year management conference, Secondary Materials and Recycled Textiles Associaition.
23-28 July Rome (Italy), XXI IMPC, XXI International mineral processing congress.
12-14 September Birmingham (U.K.), Recycling & Waste Management Exhibition, International exhibition on recycling and waste management.
19-22 September Dublin (Ireland), 7th European Lead Battery Conference, International conference and exhibition on lead-acid batteries.
21-23 September Maastricht (Nertherland), IDREX 2000, International exhibition on demolition and recycling equipment.
17-20 October Lyon (France), Pollutee 2000, International environmental exhibition.
22-25 October Pittsburgh (USA), Lead-Zinc 2000 symposium and Recycling of metals and engineered materials symposium.
23-26 October Kowloon (Hong Kong), ISWA 2000, International symposium & exhibition on waste management in Asian Cities.
5-7 November Dusseldorf (Germany), BIR Autumn Convention.

8-11 November Rimini (Italy), Ricicla 2000, International show on material/energy recovery and recycling.
14-17 November Basel (Switzerland), M.U.T. 2000, European exhibition for environment Technology.
13-*16 March 2001 Leipzing (Germany,* International trade fair environment technologies and services.

SECTON (2): RECYCLING INDUSTRY

This section divided into two parts, part one discusses material to be recycle and part two discusses recycling of industrial products.

A- Material recycles:

The main things that can be recycled are:paper, glass, plastics, and metal. For this reason, the recovery of these four resources will be discussed in more detail.

(1) Paper:

The first pice of paper was produced in AD105 by Tsai Luin, the Chinese Minister of Agliculture and paper is still the standard method of communication today. Paper is made from cellulose fibre, the source of which can be pulped wood, or a variaty of other materials such as rags, cotton, grasses, sugar can, straw or waste paper.

Waste paper provides about 65% of the source materials for paper manufactured in U.K. Much of this 'waste' is paper which has never been used, either printer's offcuts or rolls damaged during production. This is called 'mill broke' and it is easy to recycle, as it can simply be mixed with water to free the fibres into pulp. The recycling of paper which has been printed on and used, or 'post-consumer waste', is more problematic, but it is still worthwhile. Paper cannot be recycled indefinitely as some virgin pulp must be introduced into the process to maintain the strength and quality of the fibre.

Recycling paper helps the environment[6]:

Although the raw material for making paper is predominantly tree, it is common misconception that recycling waste paper saves tree. Trees for paper making are grwon and harvested as a long term crop with new trees planted to replace those cut down. Nearly all paper is made from wood grown in these 'sustainable' forests. The more important environment issues are:

a- The nature of forests and where they are situated. As the demand for paper increased, more timber has been needed to meet the demand for wood-pulp. In some cases this has meant the loss of valuable wildlife habitats and ecosystems, when old forests have been replaced by managed planations, usually of conifers. The use of recycled paper helps to protect wildlife habitats.

b- By using waste paper to produce new disposal problems are reduced.

c- Producing recycled paper involves arounk 28% lower energy consumption than virgin paper and uses less water. This is because most of the energy used in paper making is the pulping needed to turn wood into paper. However, much of the energy used in virgin pulp production is from renewable sources whereas the energy used for recycling is from fossil fuels. Some mills also recycle the water used in the pupling process, reducing the quantity used even futher.

d- Recycled paper produces fewer polluting emissions to air and water. Recycled paper is not usually rebleached and where it is oxygen rather than chlorine is usually used. This reduces the amount of dioxins which are released into the environment as a by-product of chorine bleaching processes.

There has been some research undertaken on where it is better to recycle or incinerate waste paper. A report from the organisation CSERGE concluded that: recycling is a process which benefits the community- incineration currently imposes a net cost to the community, the UK's national income rises by around £ 154 every additional tonne of paper recycled, recycling creats three times the number of jobs that incineration would, recycling offers savings for local authorities, and recycling paper saves more energy than is generated through its incineration.

The main types of paper in everyday use which can be recycled are:

- Computer print out paper.
- Office white paper.
- Newspapers, magazines, telephone directories and pamphlets.
- Cardboard.
- Mixed or colored paper.
- There are also grases of paper and board colleced mainly from agricultural and industrial sources.

(2) Glass:

The manufactue of even simple type of glass is relatively expensive athough the required raw materials, primarily quartz sand, are cheap and available in practically inexhoustible quantities. The expensive part is the energy required to melt the glass and to produce the temperatures of over 1000 ^{o}C needed for further processing. Broken glass is added in order to replace the amount of raw materials used and to lower the melting point of the glass mixture.

However simple it may sound, the waste glass must be meticulously sorted by colour before recovery is possible. This is because although broken glass of different colours can be used without diffeculty in the production of green glass. It is of limited use for brown glass and completely unsuitable for clear glass. For this reason, glass collection containers in the appropriate colours have been sent up in many countries.

Reuses (returnable bottles):

The difference between glass and other materials is that glass bolltes are suitable for both reuse and recovery. Reuse makes the most sense in ecological terms. It represents a saving not only in raw materials, as in the case of waste-glass recycling, but aslo in the energy that would otherwise be needed to melt and process the glass. Reusable bottles can be used up to fifty times. For economic reasons, however, the benefits of this only materialize if the following condition are met:

- Short transportation distances: The delivery of the goods to be sold is linked with the return of the empty bottles, which is usually the case in markets saving specific geographical regions.
- Rapid consumption and high turnover, as particularly in the case of mineral water, lemonade, beer, and milk.

The glass industry has recognized the benefits of recycling and has adapted its production accordingly. It will continue to manufacture a large proportion of reusable bottles and use recycled glass in the process. The following table (1) shows the recycling volume and rates in a selection of European countries.

Table (1)
Glass recycling in Europe 1991

Country	Tonnes collected	Recycling rate
Austria	156000	60%
Belgium	223000	55%
Denmark	60000	35%
France	15000	31%
Germany	987000	41%
Greece	2295000	63%
Ireland	26000	22%
Italy	16000	23%
Netherlands	763000	53%
Norway	360000	70%
Portugal	10000	22%
Spain	50000	30%
Sweden	310000	27%
Switerland	57000	44%
Turkey	199000	71%
United Kingdom	54000	28%
	385000	21%
Total	**5966000**	**Average 46.3%**

Source: Munich Reinsurance Company, Recycling, A new challenge and its insurance, 1996

(3) Plastics[7]:

World-wide production of plastic materials has increased from less then 5 million tonnes in the 1950's to about 80 million tonnes in 1997. In 1997 consumption of plastics in Weastern Europe was about 28 million tonnes with the UK's consumption just over 3.5 million tonnes. The amount of plastic waste genetated in the UK is about 2.5 million tonnes which is considerably lower that the amount consumed, giving an indication of the quantities of plastics used in long lifetime applications. Approximately 60% of the total plastic waste is packaging, which typically has a 'life' or less than 12 months. Of the approximately 1.5 million tonnes of plastic packaging waste, 500000 tonnes is commercial (distribution and industry) and 1.0 million tonnes is domestic origin.

Plastic process scrap recycling

Currently most plastic recycling is of 'process scrap' from industry. This is easy to recycle as there is a regular and reiable source, uncontaminated by previous use. Process scrap does not enter the waste stream and is generally recycled in house or with a local reprocessor.

Post-use plastic recycling

Post-use plastic is defined as "plastic material arising from products which have undergone a first full service life prior to being reclaimed". This plastic waste requires collecting, sorting and in most cases cleaning and is therefore harder to recycle, however this type of recycling is on the increase.

The main disposal role of waste plastics is currently landfill, with some incineration and recycling. British plastics Federation figures indicate that the current recycling rate of post-use plastics waste generated in the Uk from all sectors (domestic, commercial and industrial) is approximately 5%.

According to RECOUP (RECyclig Of Used Plastics containers), 225 million plastic containers (mainly plastic bottles), equivalent to 11300 tonnes, were recovered from household waste in 1999.

Plastics recycling and recovery methods

There are generally three main routes for plastics recycling and recovery:

- Mechaniccal recycling by producing new finished plastic products. This is carried out for instance by melting and moulding or by manufacturing regranulate.
- Feedstock recycling by break polymers down into their constituent monomers which in turn can be used again in refineries or petrochemical production. A range of feedstock recycling technologyies are currently being explored and include, e.g. pyrolysis, hydrogenation, gasification and thermal cracking.
- Incineration with energy recovery, where plastics can be burnt to release electricity or heat.

Types of plastic

There are about of 50 different family groups of plastics, with hundreds of different varities. Because plastics are light in weight, transport costs for waste plastic to a recycling centre are relatively high, and the number of different plastics makes sorting complicatged. To make recycling easier, the American Society of Plastic Industry developed a marking code to help people identify and sort the six main types of plastic. These are shown below:

PET	Polyethylene terephthalate. Fazzy drink bottles and oven-ready meal trays.
HDPE	High density polyethylene. Bottles for milk and washing-up liquid.
PVC	Polyvinyl chloride. Fppd trays, bottles for squash, mineral water and shampoo.
LDPE	Low density polythylene. Carrier bags and bin liners.
PP	Polypropylene. Margarine tubs, microwaveable meal trays.
PS	Polystyrene. Yougart pots, foam meal trays, hamburger boxes and egg trays, vending cups, protective packaging for electronic goods and toys.

(4) Aluminium [8]:

Aluminium Cans:

Aluminium is the most commonly occuring metal, making up about 8% of the earth's crust. One of its concentrated forms is bauxite, ore. Production is costly, demanding large quantities of energy, and the process is environmentally damaging. Recycling aluminium can bring energy saving of 90-95%, reduces import costs and

produces 99% less emissions than when it is produced from raw materials. The metal can be recycled indefinitely as reprocessing does not damage its structure.

In 1998, an estimated 5 billion aluminum cans were used in UK. If recycled these would be worth around , £ 38 million, aluminum has the highest value of any recyclable packaging material. 36% of these were recycled, which is about 1.8 billion cans weighting 28186 tones. This still leaves 3.2 billion cans a year going to landfill. The 36% recycling rate in UK is lower than the European average of 37% but a vast improvement on the 2% recycled in 1989. In 1996, Sweden's aluminum can recycling rate was 91%.

Aluminum Foil:

When washed, foil milk bottle tops, tops of cartons, baking and freezing trays, cigarette and tobacco foil are all suitable for collection. The foil should be packed as compactly as possible into large bages or sacks. About 34000 tonnes of household aluminium foil is used each year or which an estimated 400 tonnes is recycled.

B- Recycling of Industrial Products:

In the following section we shall examine in some detail the recycling for huseholders, automative, battery and pakaging.

(1) Recyclig of Householders:

The volume of domestic waste produced per person in the industrialized countries of the world has increased rapidly in recent years. Household's waste consists of the following items as shown in table (2).

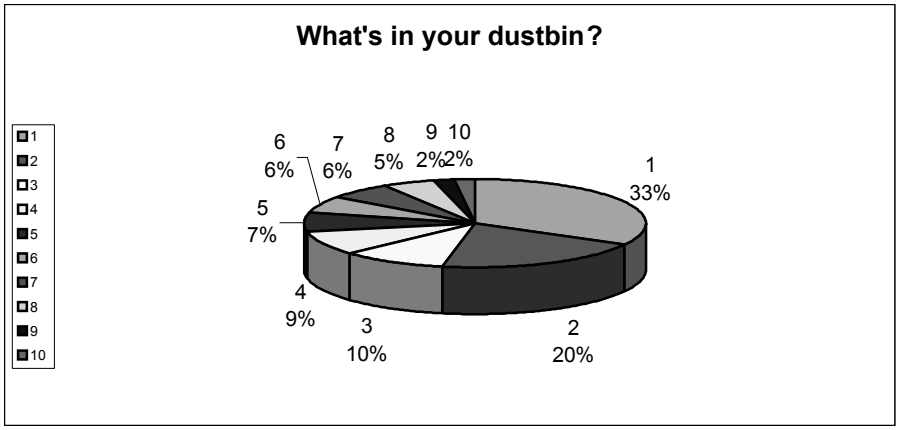
Table (2)
Household's waste in dustbin

No.	**Items**	**%**
1	Paper and Card	33
2	Organic/food	30
3	Other	10
4	Glass	9
5	Fines (dust)	7
6	Hard plastic	6
7	Steel food cans	6
8	Plastic film	5
9	Textiles	2
10	Aluminium drink cans	2
Total		**100**

Source: Waste Watch Information Sheet: Recycling for Householders, Http://www.wasrewatch.org.uk/information/householder2.hlm

Table (2) has been represented by Chart (2) as follows:

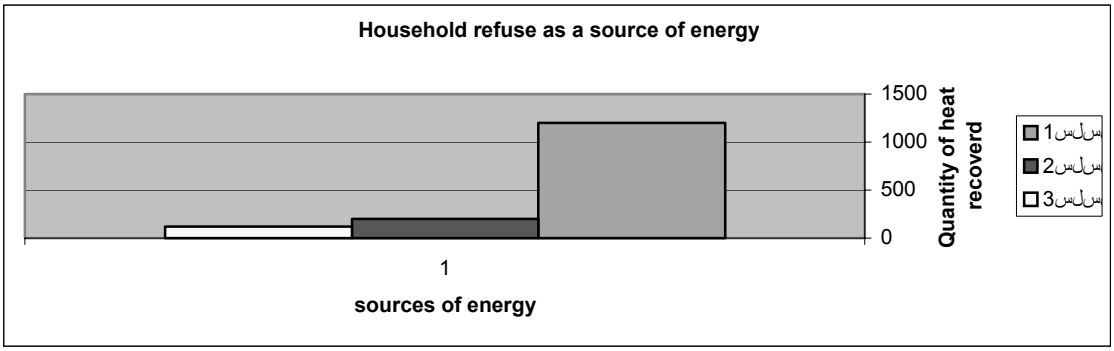
Chart (2)



Energy recovery:

The environmentally sound incineration of domestic household waste using state-of-the-art technology is a further integral part of recycling. It recovers the energy contained in the domestic waste, which burns almost as well as lignite. Thermal treatment is also another way of separating and recovering metals. Even the slag is suitable for certain applications such as road construction. Burning one tonne of household refuse generates the same quantity of heat as burning, 120 oil, 200-kg hard coal, and 1200-kg lignite. The above is represented by chart (3) as follows:

Chart (3)



Source: Munich Reinsurance Company, Recycling: A new challenge and its insurance, 1996.

(2) Automotive Recyclig[9]:

There are many car parts that can be recycled, from the oil plastic bumpers and wadding. The following table (3) shows car materials breakdown.

Table (3)

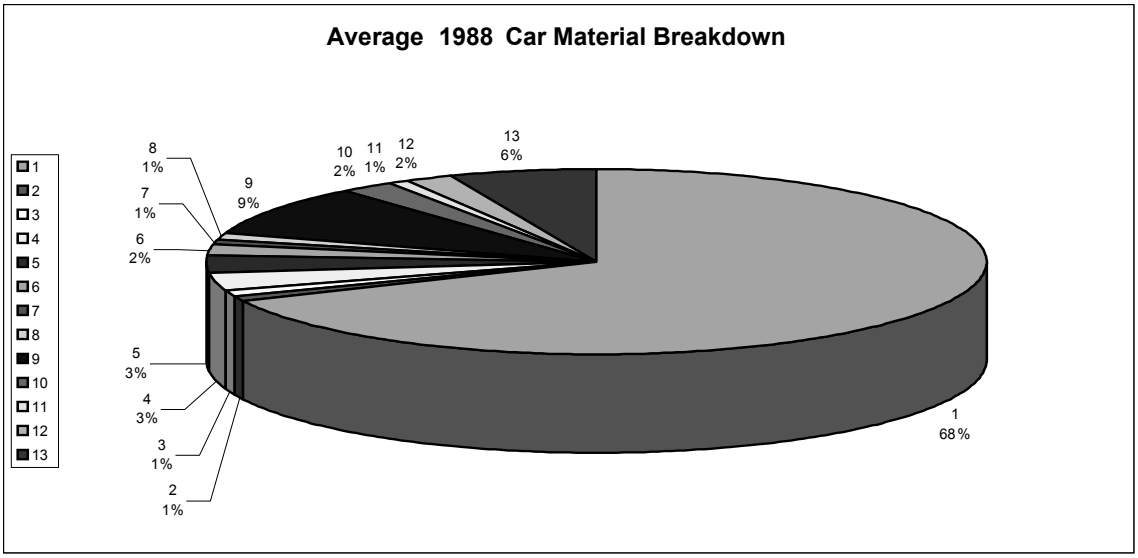
Car materials breakdown

No.	Items	Percentage	No.	Items	Percentage
1	Ferrius metal	68%	8	Carpets	1%
2	Other	1%	9	Plastics	9%
3	Battery	1%	10	Fluids	2%
4	Glass	3%	11	Electrical	1%
5	Tyer	3%	12	Equipment	2%
6	Rubber	2%	13	Heavy metal	6%
7	Process Ploy.	1%		Light metal	
Total					**100%**

Source: Waste Watch Information Sheet: Car Recycling ,
http://www.wastewatch.org.uk/information/carre..htm

Table (2) has been represented by Chart (4) as follows:

Chart (4)



Metals

77% of the average car is metal, sheet steel reprsenting 50% of the total. Up to 95% of the metals, which also include a cooper and zinc, can be recovered for resmelting, or the complete engine may be remanufactured for reuse.

Seat units

Seat units can be separated into their components of plastic, metal and polyurethane foam for recycling, or the wadding compressed to make sound-proofing material or seating for reuse in motor vehicles. Latex-bound coconut fiber, or rubber backrests, can be reconditioned and used again in new parts, as in the Volkswagen recycling program.

Plastics

Plastics used in the car industry have risen from 30 kg in 1977 to 100 kg in 1997. Between 10 and 14% by weight of a car plastic components, used for qualities such as impact and corrosion resistance, low weight and economy. According to the Plastic Federation “105 kg of plastics, used as a replacement for metals, in a car weighting 1000 kg could make possible up to 7.5%”.

Although 74% of ELV are currently recycled, of the plastic component, the rate is only 8%; one reason for this is the wide polymer types used. Identification, by marking at production or by sorting, will be vital if the practice of recovering plastic. The new high performance plastics will probably be the most valuable for recovery, and make the process and recovery financially worthwhile. This will also depend on the level of demand for these types of plastic when the car get end of its life in maybe 10 years time. Plastic parts currently being recovered from cars include battery cases, which are recreates and land drainage systems and bumper material which is recycled into bumpers, mountings, fascias and carriers.

PVC plastic is used extensively in the auto industry, in particular it holds 70-80% of the market for dashboard covering and Environmental concerns over PVC include

dioxin emission when incinerated and the use of phthalate plaster through to endocrine disrupter. Also PVC is relatively difficult to recycle which could cause a problem when the 'end-of-life' vehicle of requires manufactures to recycle plastic in significant quantities. Car manufactures are currently looking for alternatives the world's largest manufacturer, General motors, is phasing out of PVC in most applications by 2005.

Tyres

It is estimated that 25-30 million tyres are recovered from vehicles in the UK each year. About 26% of these are incinerated, 9% are granulated for secondary raw material, and 4% used in landfill engineering and 5% are reused in other ways. Granulated tyres can be used in a variety of ways, such as for athletics tracks, carper underlay, playground surfaces and asphalt for road surfaces. Tyres also yield quantities of steel, which can be extracted using magnets during granulation or from the residue on incineration, and cotton.

Oil

It is estimated that approximately 400000 tonnes of waste oil arise in the UK each year. 380000 tonnes of this were collected for recycling in 1993, mostly from commercial and industrial premises, 30000-40000 tonnes of oil are removed from vehicles by DIY motorists during oil changes, but only half of this is taken to an oil collection point- the rest is put down drains or even poured on the garden. It finds its way into sewers and water courses and causes contamination. One litter of waste oil can significantly contaminate one million litters of water, and oil poured onto the ground will affect the most of the oil recovered is cleaned and used to fuel cement kilns.

Oil Filters

Starting form February 1994, oil filters are collected. The filters are fed into a press which squeezes out the oil, the metal which are left are used as feedstock by a steel manufacturing.

Catalytic Converters

Catalytic converters have only been fitted compulsorily in new perro-engine cars since 1993, so business of recovery is just developing system. In USA, there is a well-established network or agents who collect the cats, and a similar system is developed in UK. The active component of cats, will become scrap each year by 2005. The stainless steel from the precious metals can be recovered when the exhaust is replaced. Platinum, rhodium and palladium can be reuse, either in new autocatalysts or for some purpose, and as 68% platinum and 90% of rhodium used, this business is extremely viable.

Air Bags

Air bags become standard components in UK produced vehicles in 1993, and they already arriving at car breakers with accident damaged vehicles. Air bags are only activated as a result of front collision.

From the earliest days of motorized travel, automotive recyclers have been leaders. These entrepreneurs developed a disassembly process for salvaged automobiles in order to reclaim reusable parts and components, and, thus, established an efficient automotive recycling system. For more than 75 years, automotive

recyclers have been providing local employment, consumer service, and environmental conservation, worldwide.

In a typical modern recycling business, operative motor vehicles are brought into a facility where the hazardous and recyclable fluids are properly drained. Undamaged parts are then dismantled from the vehicle, cleaned, tested, inventoried, and stored in a warehouse until sold. The remaining vehicle hulk is then prepared for scrapping.

(3) Battery Recyclig[10]:

Dey cell batteries are varied and have a complex make-up. There are five different categories as follows:

- **Zinc carbon:** disposable and the cheapest to buy, used in low drainge appliance like torches, clock, shaves and radios. They make up 50% of the market.
- **Zinc chaloride:** disposable batteries, more expensive than the zinc carbon type, and not necessarily better. Prone to leak so do not leave them in products after they have run down.
- **Alkaline manganese:** general pupose batteries, the most expensive of disposables. Supposed to be leak-proof and longer lasting. They are used in personnal stereos, radio-cassette players.
- **Nickel cadmium:** rechargeable batteries, one of the fastest growing sectors in the battery market. Used for corkless power tools, personal stereos, portable telephones, lap-top computers, shavers, motorised toys..etc, with life of 4-5 years.
- **Primary buttom cells:**
  - mercuricoxide: for hearing aids, pacemakers, photographic equipment.
  - Znic air: for hearing aids and radio pagers.
  - Sliver oxide: for electronic watches and calculators.
  - Lithium: for watches and photographic equipment.

Heavy metals

Batteries contain lead, mercury and cadmium, with smaller amounts of antimony, lithium, cobalt, silver, zinc and other chemicals. Some of these can cause serious pollution problems. Cadmium, for example, does not degrade and cannot be destroyed and unless it is deposited in secure waste disposal sites it can get into the food chain, where it affects all environmental sectors and can damage livers, kidneys and the brains of humans and fish. Mercury too cannot be destroyed, it contaminates by inhalation or skin contact and lodges in the kidnyes and liver, leads to brain damage, haemolysis, lowered resistence to infection and cancer of the lungs and kidneys.

- In some countries such as Japan, Germany, Switzerland and the Netherlands, batteries are collected seperately from other domestic refuse and are disposed of as hazaerdous waste.
  Some local authorities in UK have had, or presently testing, collection schemes for batteries. Once collected batteries are treated as hazardous waste.

(4) Packaging Recyclig[11]:

Packaging can be defined as "all products made of any materials to be used for tbe containment, protection, handling, delivery, and presentation of goods". Packaging can be divided into three board categories. Primary packaging is the packaging handled by the consumer. Secondary packaging is the term used to describe larger cases or boxes that are used to carry quantities of primary packaged goods for distribution and for display in shops. Transit packaging is the wooden pllets and plastic wrapping that is used to enable and ease loading and unloading of goods.

Packaging materials

The most common types of material used for packaging are paper, fibreboard, plastic, glass, steel, aluminium, and mixed materials. Mixed materials packaging can in some cases have the benefits of being more resource and energy efficient than single material packaging, but combining materials makes recycling difficult. An example of this type of packaging is 'tetra pak' which typically cosits of 75% paper, 20% polythylene and 5% aluminium foil. Recycling of mixed materials packaging is hindered by lack of facilities and technology necessary to separate materials to avoid contaimination.

SECTION (3): LAW AND LEGISLATION AFFECTIN RECYCLING

The following is a detailed discussion of law and legislation affecting recycling in both Europe and United States.

A- European Legislation Affecting Recycling & Waste:

European (EU) policy on both waste and environment consequently play a large part in shaping the nature of European waste legislation's.

EU environment policy

EU fifth Environment Action Programme, which was approved in February 1993, was produced as the Community's main response to the UN conference on Environment and Development (the Earth Summit) held in Rio de Jeneiro in 1992. The Earth Summit called on the international community to develop new policies as set out in Agenda 21, and thus take society towards a sustainable pattern of development.

Community Strategy for Waste Management

The European Commission initially set out its Community-wide waste policy in the Community Strategy for Waste Management of 1989 (SEC (98) 934 Final 1989). This document forms the cornerstone of European waste policy. As well as many detailed measures, the strategy contains the following points:

- The establishment of a hierarchy of waste management. These priorities of waste then its reuse and recycling and lastly the optimization of its final disposal through, for example, energy recovery.
- Confirmation of the 'Proximity Principle'. This requires that waste be dealt with as near as possible to its source.
- The goal of waste disposal self-sufficient at every level is emphasized.

Subsequent to the Treaty on European Union entering into force in 1993, a revised version of the strategy was addopted by the Commission in July 1996 (COM (96) 399 Final 1996). The 1996 strategy has added the following points:

- Every recovery may in some cases be environmentally superior to recycling within the hierarchy. This is short of the UK's position of *Best Practicable Environmental Option*.
- The EU will investigate possible actions on incineration and the implications of using waste as a fuel at installations not originally designed for this.
- The commission will introduce targets to substantially reduce the amount of waste generated and to generally achieve high waste recovery objectives.
- The principle of Producer Responsibility (where waste producers are actively involved in the waste management of their products) will be incorporated in all future measures.
- The commission will come forward with proposals to control landfill.
- Suggestions are given for guidelines on use of economic instruments for waste management including the harmonization of waste statistics and a common Methodology for Life Cycle Analysis, (a way of discovering the impact a product has during all stages of its production, use and disposal).
- The initiative on Policy Waste Streams has abandoned due to slow progress, although some follow up work on the original five waste streams will continue in the short term.

The following are the Directives that affecting recycling and waste:

(1) Directive 75/442/EEC on waste &91/689/EEC on hazardous waste

It provide the overall structure for and effective waste management regime within the EU as follows:

- Set requirements for the permitting and operations of waste disposal facilities,
- Deal with disposal options for specific types of water, or,
- Control the movement of waste within, into and out of the EU.

Although the Framework Directive on Waste was extensively revised with its 1991 amendment, the following four general duties on Member States sill apply:

- Encourage the prevention and reduction of waste and reduce its potential for harm cleaner technologies, new disposal techniques and new, more environmentally benign product.
- Encourage waste recovery such as recycling, reuse, reclamation and energy recovery.
- Ensure the above without endangering human health or harming any other part of the environment. Prohibit dumping and uncontrolled disposal of waste.
- Ensure and integrated and adequate network of waste installations using the 'Best Available Technology Not Entailing Excessive Cost' (BATNEEC).

(2) Directive 75/439/EEC on the Disposal of Waste Oils

It requires that the Member State ensure the safe collection, treatment, storage and disposal of waste oils, with the discharge of waste oils to waters and drainage systems being prohibited. The Directive gives highest priority to the regeneration of waste oils (where technical, economic and organisational constraints allow) followed by combustion, and lastly their destruction or controlled storage or tipping. Regenerated

oils must not contain more than 50 parts per million of polychlorinated biphenyls and terphenyls (PCB/PCT), which are both highly persistent pollutants.

Implications

Undertakings collecting and/or disposing of waste oils must carry out these operations in such a way that there will be no avoidable risk of water, air or soil pollution. These requirements are implemented in the UK by the licensing system or the treatment, keeping or disposal of controlled waste on land. Implementation of the Directive of also aided by the following Government and industry initiatives:

- The *Environment Agency's Oil Care Campaign* aim to improve the way in which waste oil is managed by providing information on good practice.
- The *Environment Agency's Oil Bank Line*, which provides details of the closest oil recycling bank, and,
- The *Natural Household Hazardous Waste Forum*, which aims to double the number of oil recycling, banks in the UK.

(3) Directive 91/157/EEC on Batteries and Accumulators

This Directive looks at ways of reducing the amounts of potentially toxic heavy metals used in the production of batteries and accumulators, while increasing controlled disposal and recycling through more effective product labeling. The Directive covers batteries and accumulators containing:

- More than 25 mg of mercury per cell, except alkaline manganese batteries (this applies to mercuric oxide batteries used for hearing aids, pacemakers and photographic equipment),
- More than 0.025% of cadmium by weight, such as rechargeable (nickel cadmium) batteries.
- More than 0.4% lead by weight (essentially lead-acid batteries used in motor vehicles), and,
- Alkaline manganese batteries containing more than 0.025% mercury by weight (i.e. general-purpose batteries such as long-life Duracell, BATA and Eveready Gold Seal).

Implications

Battery manufacturers have now eliminated mercury and cadmium from most ordinary household batteries. In addition, an industry led program (REBAT) is recovering increasing quantities of rechargeable nickel-cadmium batteries from industrial and commercial sources (these being shipped to a facility in France for recycling). Consultation is still continuing on ways of meeting the other EU environments, and discussions have been linked to the implementation of 'Producer Responsibility' policies. Further, it is expected that the European Commission will shortly propose to extend the Directive's scope to cover all batteries, as will as setting quantified collection and recycling targets for Member States. As such, the Government is currently assessing a range of collection infrastructures, which might have the potential to recover large quantities of spent consumer batteries from industrial, commercial domestic source.

(4) Regulation No 880/92 on a Community Eco-Label Award Scheme

The scheme is a voluntary market mechanism to promote products that have a lesser impact on the environment in certain consumer product groups. The Eco-label is awarded once the environmental impact of a product's whole life cycle (including disposal) has been assessed with respect to other similar products. These investigations use ecological criteria defined by product groups that are set at a European level, which may not always fully reflect UK concerns and practice. Eco-label criteria have now been agreed for certain textile, light bulbs, washing machines, soil improvers, tissue-paper products, detergents for laundry and dishwashers, paints and varnishes, personal and portable computers, footwear and copying paper. Several other Member States have national Eo-lables such as the German 'Green Dot' scheme.

(5) Directive 94/62/EC on Packaging and Packaging Waste

The main aims of this Directive are to reduce the overall impact of packaging on the environment, to harmonize the existing packaging legislation of Member States and to remove trade obstacles which may distort competition. It applies to all packaging, regardless of material, and wherever it is used, whether indurstrial, commercial or shop level.

The identified means of reducing environment impact are: reducing packaging at source, eliminating harmful materials in packaging waste, maximizing recovery of packaging for reuse, recycling composting or energy generation, and minimizing the quality going for final disposal.

The Directive requires Member States to establish systems for return, collection and recovery packaging wastes. With these systems in place, each state must meet an overall recovery target of 50-65% (by weight) of all packaging waste. An additional 25-45% of each material, averaged across the board, should be removed from the waste steam, with an absolute minimum of 15% of any material being recycled. Member of States generally have until 2001 to reach these targets, but may only exceed these levels provided they have sufficient capacity and that their measures will not distort the single market or hinder other Member States' ability to comply. The Directive also requires the production of a future directive on marking and identifying packaging.

(6) Directive 1999/31/EC on the Landfill of Waste

Under this Directive, a ban in the landfill of certain hazardous wastes, liquid wastes and tyres is imposed on Member States. Further, the Directive sets targets to reduce the amount of biodegradable municipal waste that is sent to landfill to 75% of baseline (1995) levels by 2006, to 50% by 2009 and to 35% by 2016. This represents an attempt to reduce the EU s total methane emissions (a powerful greenhouse gas), which derive partly from the breakdown of biodegradable elements in waste.

(7) National Waste Management Strategies

The objectives of the above strategies can be summarised as follows:

- To tackle the amount of waste produced, by breaking the link between economic growth and waste production, and;
- To put waste which is produced to good use through substantial increases in re-use, recycling, composting and recovery of energy.

The document sets a number of targets and goals for improvements in waste management within England and Wales, as follows:

Goals

- By 2005 to reduce the amount of industrial and commercial waste sent to landfill to 85% of that landfilled in 1998.
- To recover value from 40% of municipal waste by 2005, 45% by 2010 and 67% by 2015 (throng recycling, composting, other forms of materials recovery or energy via waste combustion);
- To recycle or compost at least 25% of household waste by 2005, 30% by 2015.

U.K. Legislation Affecting Recycling & Waste

A summary of principal British legislation affecting recycling and waste is given below:

(1) Environment Protection Act (EPA) 1990

Section 34 of the EPA 1990 imposes a new Duty of Care on person, who produces, Import, carry, keep, treat or dispose of controlled wastes. The term 'controlled wastes' covers household, commercial and industrial wastes (either solid or liquid). Those subject to the Duty of Care must seek to:

- Prevent the escape of waste;
- Ensure waste is transferred only to an 'authorized person' or to a person for 'authorized transport purposes' as described by Act;
- Ensure during transfer of waste that a written description of the waste, sufficient to avoid committing an offence under the Act accompanies the waste, and;
- Prevent persons disposing, treating, and sorting controlled waste either without a license, in breach of a license condition or in a manner likely to cause pollution or harm to health.

(2) Environment Act 1995

This Act translated into national legislation the requirement to produce a National Waste Strategy. Besides this, the 1995 Act was largely concerned with changes to legal and institutional arrangements for waste management. Some important points include:

- The introduction of the principle of Best Practice Environmental Option for each waste stream.
- The prioritization of selected waste streams such as tyres and construction waste.
- The introduction of the Producer Responsibility Obligations (Packaging Waste) Regulations.
- The recycling of waste disposal plants, the preparation of which was a duty of each waste regulation authority under the 1990 Environment Protection Act.

(3) The Finance Act and Landfill Tax Regulations 1996

Government proposals to introduce a new tax on waste disposal of on landfill sites on 1st October 1996, at rate of £ 7 per tonne for active waste (increased to £ 10 in 1999 and escalator of £ 1 per year, culminating in a rate of £ 15 per tonne in 2004/2005) and £ 2 per tonne for inactive waste. Projects carried out, which assisted through the landfill Tax Credit Scheme related to the waste management, covering the following areas:

- Research, development and education on recycling,
- The use of energy from waste,
- The collection and dissemination of information regarding the development of products from the recycling of waste, and,
- The development of markets for recycled products.

(4) The Producer Resonsibility Obligations (Packaging Waste) Regualtions 1997

This is designed to place the responsibility for the environmental costs of waste on those who use or produce it. In this respect, packaging waste is the only waste currently subject to producer responsibility regulation in the UK. The 1997 Regulations place obligations on business (the producer) which satisfy the following threshold tests:

- To have an annual turnover in excess of £ 5 million (from 1997-1999) drops to £ 2 million in 2000.
- To handle in excess of 50 tonnes of packaging per annum.

Obligations on such businesses under the Regulations include the recovery of specified tonnage of packaging waste. In addition, obligated businesses must recycle given amounts of each packaging material handled, with the regulations covering the following materials: paper and fireboard, glass, steel, aluminium and plastic (wood and other packaging are to be included from 2000). Businesses must prove that a specified tonnage has been recovered and recycled. These obligations are calculated using the recovery and recycling targets set out in the Regulations for the relevant year, as shown in table (4) below:

Table (4)

Recovery and Recycling Targets

Year	**Targets for obliged producers**		**Expected minimum overall recovery achievement***
	Recovery	**Recycling** +	
1998	38%	7%	32%
1999	43%	10%	36%
2000	45%	13%	41%
2001	52%	16%	50%

* Accounted for by businesses excluded from the Regulations

\+ Refers to the recycling target for each packaging material

Soruce: Waste Watch Information Sheet ,
http://www.wastewatch.org.uk/information/legisl.htm

The above obligations are shared out between the different parts of the packaging chain, under the 'shared producer responsibility' approach. As such, percentage obligations for different classes of producer are also used to calculate actual recovery and recycling obligations, as detailed in table (5) below.

Table (5)
Shared Producer Responsibility

Producer	**Share**
Manufacturers	6%
Converters	11%
Packers and fillers	36%
Sellers	47%
Secondary provider	83%

Source: Waste Watch Information Sheet ,
http://www.wastewatch.org.uk/information/legisl.htm

B- American Legislation Affecting Recycling & Waste:

The following are the American "Hazardous Waste Program"[13]

1- Resource Conservation and Recovery Act (RCRA):

The Resource Conservation and Recovery Act, passed by Congress in 1976, gives the U.S. Environmental Protection Agency the authority to regulate the disposal of hazardous waste. The control of hazardous waste is achieved by identifying and tracking the waste from the time it is generated until its final disposal. This is referred to as "cradle-to-grave" management.

In 1984, major amendments to RCRA were enacted by the Hazardous and Soil Waste Amendment (HSWA) to address shortcomings in the initial Act. The amendments included mandates for corrective action at hazardous waste to the environment as well as provisions to regulate underground storage tanks.

The Hazardous Waste Management Law and the Protroleum Storage Tank Law. Address the issues of, generation, management and disposal of hazardous waste, cleanup of hazardous substance releases, management and removal of petroleum storage tanks, and cleanup of leaking petroleum storage tanks.

2- Toxic Substance Control Act (TSCA):

The Toxic Substance Control Act of 1976, was enacted by Congress to test, regulate, and screen all chemicals produced or imported into United States. Many thousands of chemicals and products are developed each year with unknown toxic or dangerous characteristics. To prevent tragic consequences, TSCA requires that any chemical that reached the consumer marketplace be tested for possible toxic effects prior to commercial manufacture.

3- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA):

In the late 1970's, after RCRA was enacted, three waste sites were discovered. In Each of the three sites, hazardous wastes had been dumped many years before site discovery. In the early history of chemical use in industry, it was common practice to dump hazardous wastes on the ground, in rivers or streams, along roadsides or in old abandoned quarries. RCRA did not cover wastes that were abandoned or uncontrolled. So, in 1980, in response to growing concern over health and

environmental risks associated with hazardous waste, Congress passed CERCLA, which was nicknamed Superfund. CERCLA established a trust fund for the cleanup of abandoned or uncontrolled hazardous waste. The Superfund was capitalized with $ 1.6 million.

Initially it was believed that there were only a few Superfund sites, requiring about five years to clean up. However, many more sites were identified nationwide. The problem was so widespread that many states, including created programs to work with Environmental Protection Agency (EPA).

4- Federal Facility Compliance Act (FFCA) 1992:

The FFCA amends the Resource Conservation and Recovery Act (RCRA), the law that defines requirements for the management of hazardous waste. RCRA contains specific restrictions on the land disposal of hazardous waste, including treatment standards that must be met prior to disposal or storage. In general, DOE sites that store mixed waste were not in compliance with these land disposal restrictions because of the lack of capacity for treating mixed waste.

SECTION (4): INSURANCE COVERAGE AND RECYCLING AND WASTE REDUCTION PROGRAMS

This section discusses einviromental insurace coverages and waste management programs as follows:

(1)- Environmental Insurance Coverage:

In the following, we will focus on the environmental insurance[14] as follows:

The major areas of environmental insurance are:

- General Liability;
- Professional Liability;
- Pollution Liability

General Liability Insurance:

General liability insurance protects against claims for bodily injury or property damage, which result from occurrence on the insured's premises, or involved operations of the insured conducted away from its premises or from an insured's product. For example, when an insured is working on a client's property and an accident occurs that leaves the property damaged, the policy would respond. This insurance is a business requirement for most environment firms. The most relevant part of the profession is the pollution extension. Most carries have specially excluded pollution of all types.

Professional Liability Insurance:

Professional liability insurance (referred to also errors & omissions, malpractice, and professional indemnity) is the coverage that applies to the legal liabilities and duties that one's owe to clients and third parties. For example, environmental consults offering consulting services to third parties expose themselves to 'professional liabilities'.

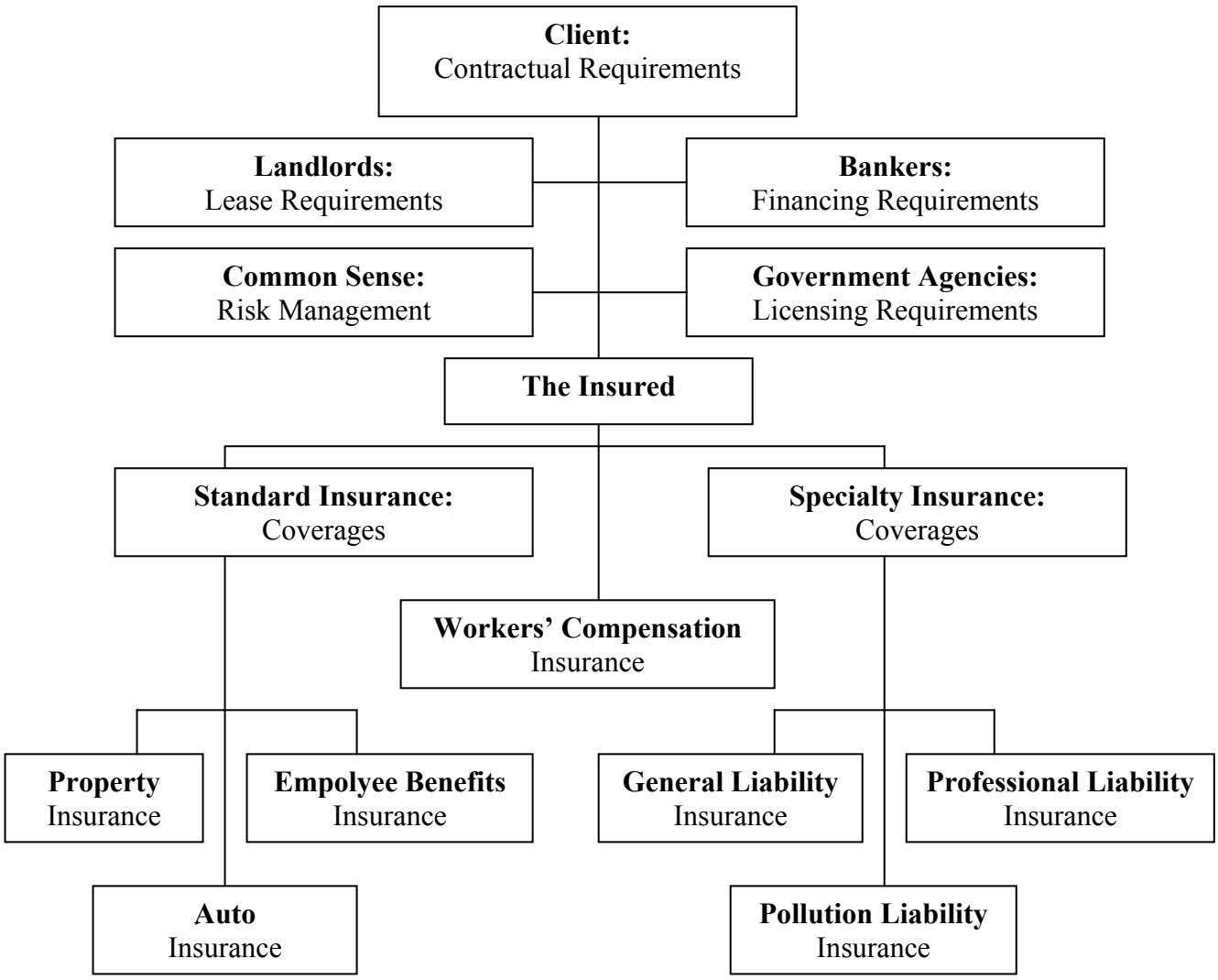
Most qualified firms should buy the coverage to protect their business, avoid the last-minute rush to buy the insurance (when bidding on a new contract with a specific insurance requirement) and use it for marketing purposes.

Pollution Liability Insurance:

Pollution liability insurance covers exposure for unintentional pollution. For example, if an insured accidentally releases a pollutant (like an oil spill), there is a liability exposure.

The following chart (5) illustrates basic insurance requirements for environmental firms.

Chart (5)
Basic Insurance Requirement for Environment Firms



Environmental Liability Insurance Coverage Law[15]:

United States Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Suprfund 1980, imposes liability upon resposible parties for cleaning up hazardous waste sites. Liability based on the polluter pays principle, and the government has several options to get responsible parties to clean up a site: it can:

- Finance the cleanup itself and then sue the property owner for reimbursement;
- Issue an administrative order requiring the property owner to perform cleanup activities, or
- Invite the property owner to enter into a negotiated agreement providing for cleanup costs.

Government Studies indicate that Superfund Liability Site Cleanup Projects take about ten years to complete and cost approximately $ 30-40 million. So that responsible parties are seldom anxious to accept the government's invitation to cleanup a site. Most of them try to shift their liabilities to someone else either another responsible party or their insurer.

Most Superfund sites are industrial facilities that carried Comprehensive General Liability Insurance Policy (CGL). The Language in most (CGL) policies does not clearly exclude or provide coverage for pollution liability. Thus insurers and responsible parties have been battling over the meaning of the policy language to determine whether coverage exists.

The litigation that has transpired over the meaning of the terms "legally obliged to pay as damage", "property damage", and "suit" are illustrative of the confusion and uncertainty in this area of the law. This litigation has proven costly for litigants and has been criticized by the insurance industry and policyholders alike for increasing transaction costs average 20-25% of the total cleanup cost. So policy makers are considering alternative methods for solving the Hazardous Waste Site Cleanup problem. Alternatives include creating an Environment Insurance Resolution Fund "EIRF" to reduce policy coverage litigation, or overhauling the present liability scheme.

Comprehensive Environmental Response Compensation and Liability Act (CERCLA) or Superfund governs liability for hazardous waste site cleanup. The goal of CERCLA is to cleanup releases of hazardous substances in air, water, groundwater, and land. CERCLA contains a section entitled Pollution Insurance, however it only applies to risk retention group.

According to the above analysis, the American insurance market responses to legislation and laws provides environmental insurance polices as follows:

The main Policies[16] of environmental insurance are:

- Remedial Action Contractors Liability Insurance Program
- Environmental Consultants Professional Liability Insurance Program
- Miscellaneous Consultants Professional Liability Insurance Program
- Site Liability Environmental Exposures Policy

- Service Industry
- Transportation
- Contaminated Properties

The following available coverage in American insurance market as example of specialising[17] environmental insurance industry:

1- Contractor's Coverage

Representative Types of businesses:

- Asbestos & Lead Abatement
- Remediation Contractors
- Residential/Commercial Developers
- Storage Tank Contractors
- Plumbing Contractors
- Painting Contractors
- Roofing Contractors
- Drilling Contractors
- Street and Road Contractors
- UST Contractors

Principal Coverage available:

- Commercial General Liability
- Contractors Pollution Liability
- Professional Liability
- Supporting Coverage:
  - Third Party Site Pollution Coverage
  - Transportation Pollution Liability
  - Automobile Liability
  - Workers Compensation

2- Environmental Professionals' Coverage

Representative Types of Businesses:

- Environmental Consultants
- Permitting & Compliance Contractors
- Contractors with design responsibilities
- Waste Brokers
- Testing Laboratories
- Industrial Hygienists
- Wetlands Delineators

Principal Coverage Available:

- Commercial General Liability
- Contractors Pollution Liability
- Supporting Coverage Available
  - Automobile Liability
  - Workers Compensation
  - Following Form Umbrella
  - Treasury Listed Surely

3- Fixed Facilities / Site Specific Pollution Coverage:

Representative Types of Businesses:

- Manufacturing
- Hazardous Waste Landfills
- Bulk Storage Facilities
- Dray Cleaners
- Aviation Facilities
- Warehousing
- Landfills & Transfer Stations
- Office Buildings
- Self Storage Facilities
- Agricultural

Principal Coverage Available:

- Site Specific Pollution Liability
- Supporting Coverage Available
    - Commercial General Liability
    - Workers Compensation
    - Following Form Umbrella

4- Underground / Aboveground Storage Tanks Coverage:

Representative Types of Businesses:

- Service Stations
- Convenience Stores
- Contractors with fueling facilities
- Aviation Facilities
- Any owner of a storage tank
- Hospitals
- Bulk Storage Facilities
- Agricultural

Principal Coverage Available:

- Storage Tank Pollution Liability
- Supporting Coverage Available
    - Commercial General Liability
    - Workers Compensation
    - Following Form Umbrella
    - Boarder Site Specific Pollution Liability

5- Property Transfer Pollution Coverage:

Representative Types of Businesses:

- All Commercial Real Estate Transactions
- Properties Obtained in Wills
- Donated Properties
- Refinanced Properties

Principal Coverage Available:

- Site Specific Pollution Forms
- Supporting Coverage available:
  - Commercial General Liability
  - Workers Compensation
  - Following Form Umbrella

6- Redemption Stop Loss / Cost Cap Coverage:

Representative Types of Businesses:

- Any sites of facilities planning to undergo remediation
- Brownfield Sites

Principal Coverage Available:

- Cost Cap or Stop Loss Coverage
- Site specific Pollution Liability
- Supporting Coverage available:
  - Commercial General Liability
  - Workers Compensation
  - Following Form Umbrella

7- Hazardous Waste & Material Transporters Coverage:

Representative Types of Businesses:

- Transportation exposures
- Fuel Oil/Petroleum Transporters
- Emergency Response Contractors with transportation exposure

Principal Coverage Available:

- Automobile Liability
- Commercial General Liability
- Site Specific Pollution Liability
- Supporting Coverage available:
  - Commercial General Liability
  - Workers Compensation
  - Following Form Umbrella

(2)- Recycling & Waste Reduction Program:

Recycling and waste reduction program includes the following aspects:

Managing Recovered Material: This fact sheet is for anyone planning to recover materials from solid waste for sale, reuse or recycling. The Missouri Department of Natural Resources strongly supports resource conservation. Recovery materials that would otherwise be disposed of as waste are one way to conserve resources.

Missouri Buys Recycled: Recycling / waste reduction activities within the state.

Recycling Economics: Higher Costs are an Illusion: One page trifold brochure explains why recycling is economical due to hidden costs, depletion costs, environmental costs and energy savings.

Show-Me State Sets Recycling Precedents: One page trifold brochure The Missouri General Assembly passed legislation including several ways that individuals, businesses, governments and organizations can promote and benefit from recycling.

State Agency Policy for Recycling and Waste Reduction: Booklet, each department and state agency shall develop in cooperation with the office of Administration and implement a policy for recycling and waste reduction.
Tree R's: Reduce, Reuse, and Recycle: Brochure includes tips on reducing waste and conserving resources.

- Hydropower Environmental Mitigation:

Hydroelectric power contributes about 10% of the electricity generated in the United Sates and a nearly 20% of the world's electrical energy. This renewable energy source can help reduce greenhouse gases by offsetting electricity generation using carbon-based fuel. However, hydroelectric generation has declined in recent years because of concerns about environmental problems. For many projects, these concerns center on restriction of fish passage and alteration of water quality and river flowers. Hydropower Turbine System (AHTS) Program is developing turbine technology to minimizing adverse environmental effects. The initial phases of the AHTS program produced several new turbine designs that are expected to generate electricity efficiently while minimizing damage to fish.

Further development of the turbines is hindered by a lack of information about the sources of injury to turbine-passed fish. To supply the needed data, ORNL scientists reviewed the literature on fish responses to the types of biological stresses associated with turbine passage and analyzed the data to develop provisional biological criteria for hydroelectric turbine designers. To fill the gaps in the available information, ORNL scientists developed a laboratory approach for studying the effects of shear stress and turbulence on fish, using appropriately small spatial and temporal scales. ORNL scientists are providing technical direction for these laboratory experiments, which are being preformed at the Pacific Northwest National Laboratory. In addition, ORNL will host a workshop of experts in fluid dynamics to refine the understanding of both the adverse and potentially beneficial effects of turbulence in river systems.

SECTION (5): RECOMMENDATIONS

Resistance to new lanfills, concerns about incineration plants, increased disposal costs, and environmental ecology, have drawn public attention to the subject of recycling and waste management. Many countries have adopted programs aimed at a significant reduction in the volume of waste. Almost all of these programs contain the following stages:

Avoidance:

The simplest and most effective method is the avoidance of waste. This is becoming more common in the field of packaging, where addition sales-enhancing secondary packaging is being dispensed with. Avoiding non-returnable and disposable products also means saving materials and reducing waste.

Reduction:

It is possible to reduce today's material flow significally even without shunning certain things completely. More concentrated detergents, which have double the washing power of conventional products, for example, constitute a saving on raw materials and a reduction in the amount of packaging needed. The same effect is also achieved with smaller, lighter types of packaging.

Reuse, recovery:

The repeated use of products (reuse) and materials (recovery) also reduces the consumption of raw materials and the amount of waste to be disposed of. A prime example of the former is the repeated use of packaging for beverages. Deposit bottles can be filled and put into circulation up to fifty times, which saves enormous of glass. If domestic waste were always sorted in the conventional manner and the materials it contains were reclaimed, only one-fifth of it would have to be tipped and waste disposal sites. Glass and paper are collected and sorted in many households and then taken away for separate recovery. Appropriate logistics for their collection from containers and depots must be motivated to take part in the system. Only on this basis is it possible to achieve the very desirable aim of extending the recycling of domestic waste to other materials. Other resources like metals and plastics are removed from the residual waste after it has been taken away. This is often done by hand. As domestic waste is a mixture of very different materials and contains only small quantities of resources, extracting these usable materials is an extremely laborious operation.

Recycling:

After reducing and re-using waste, we can then think about recycling. At least half of the contents of our dustbins could potentially be recycled. In addition, we could compost the 20% of vegetable peelings and other organic waste that we throw away. Despite this potential to recycle or compost around 7% of our waste, the current recycling rate for the UK is only around 9%, with 82% being buried in landfill sites and 9% incinerated.

Comprehensive Environmental Response Compensation and Liability Act (CERCLA) or Superfund governs liability for hazardous waste site cleanup. The goal of CERCLA is to cleanup releases of hazardous substances in air, water, groundwater, and land. CERCLA contains a section entitled Pollution Insurance, however it only applies to risk retention group.

1- Solid Waste Management Program

The Solid Waste Management Program works to help businesses property manage their solid waste to protect public health and the environment. Through the combined

efforts of citizen, industry and government, the state can continue to increase the recovery of solid waste. Recycling the amount of solid waste generated that is destined for landfills continues to be a primary goal of the program. Solid waste management issues are as follows:

- **Planning**

To lessen dependence on landfills, the program promotes waste reduction, reuse, recycling and composting. The program works closely with Missouri's 20 solid waste management districts to plan regional solutions to waste management problems

- **Financial Assistance**

Funds are available for waste reduction, recycling, composting, solid waste management disrict planning, plan implementation, tire playground material and market development incentives for recovered materials.

- **Technical Assistance**

The program provides assistance on short-and long-range planning to Missouri's solid waste management districts, counties and cities.

- **Public Information**

Informational/educational activities inform the public of the relationship between and individual's consumption of goods and services, the generation of different types and quantities of solid waste and implementation of solid waste management priorities.

- **Permits**

One of the program's primary responsibilities is issuing permits and permit modifications for solid waste disposal and processing facilities. Staff review premit applications for proper facility, design, construction, operation and monotring controls.

- **Research**

Through EPA Grants, program staff perform research to increase their knowledge of waste and solid waste technology.

- **State sponsored Tire Clean-ups**

The program overseas waste tire cleanups using funds from the fifty-cent per tire fee collected on new tires sold.

- **Inspection**

Through quarterly inspections of permitted facilities by regional office staff, the Solid Waste Management Program oversees the operations of solid waste disposal and processing facilities. Inspections help to ensure that landfills do not have a negative impact on human health and the environment.

- **Enforcement**

Program staff work with the Attorny General's office to bring violatros into compliance and penalize serious noncopliers.

- **Training**

Through the solid waste technician certification-training program, landfill operators learn about departmental regulations. The training also provides a forum for discussion of landfill issues between facility operators and department staff.

Recycling Insurance:

Property insurance will find very interesting fields of activity in the wake of ongoing innovation recycling insurance. The following is the Swedish experience[18] in recycling insurance:

In Swedish society, the recycling of non-durable such as paper and glass has become integral to life and is supported by a growing waste management infrastructure. The same cannot be said for durable products such as computers or television. According to new Swedish environment regulations, the manufacturer, importer or retailer of any product when it is discarded at the end of its service to the consumer service. This legislation imposes a difficult task upon manufactures, importers and retailers and increases their risk. As the insurance industry is constituted to deal with long-term planning, risk assessment, and financial management, LF Milj developed the idea of converting an unknown recycling cost into a small, manageable insurance premium, and created the world's first Recycling Insurance.

How Recycling Insurance Works

When a durable product is purchased, included in the price is a premium, which guarantees that when it is discarded, it will be recycled. During the lifetime of the product, the small premium is placed in a fund along with numerous other premiums, and that fund is managed by LF as it would manage any other fund. When the product is to be discarded, it is returned to the retail outlet where it was purchased so it can be passed on to a recycling company. The recycling company dismantles the product and recovers the components. All costs are covered by insurance policy. In this way recycling is paid for at the beginning of the product's life span, which helps ensure that it will be directed back into resource cycles. Consumer does not incur any additional costs or problems.

Eventually cost differentials between one insurance Permian and another will stimulate improvement. Premiums would be lower for products containing fewer environmentally damaging substances or products designed to be recycled. With the right incentives, companies will alter their products. Consumers will choose environmentally friendly products that have a lower cost.

A long as products are returned to designed collection points; they will be efficiently and expertly recycled, even when the original manufacturer or retailer has gone out of business. Rather than individual companies trying to calculate their own recycling costs, LF works with the recycling industry to produce the necessary figures for fixing insurance premiums. These small recycling premiums will first earn interest for a number of years and then paid out to companies providing the best, most efficient recycling service in their own field. As an increasingly important customer of the recycling industry, LF expects to be able to exert pressure on development of the recycling industries as well as keep prices down.

LF has already attracted clients with new insurance, especially among computer manufacturers. Already some municipalities are beginning to specify that suppliers of computers must be "recycling insured". For example, in 1998 a new type of telephone was introduced in Sweden, and all of these are "recycling insured". The applications for this insurance are legion including the car industry and white good industry.

According to the above illustration:

- Recycling needs a lot of organizations and special equipment's;
- There must be uses for the recycled materials;
- There are difficulties in recycling some material, particularly plastics and paper, others, like glass and metal are easier;
- There must be uses for recycled materials;
- Someone must want to buy it and use it to make new things they can sell.
- Recycling initially requires a series of national-wise measures, namely the collection, separation, storing, and preparation of the materials to be covered.
- Insurers will focus on the particular hazards which may have to be taken into account for the insurance of recycling plans:
    - Fire and explosion,
    - Loss of profits,
    - Prototypes,
    - Environment impairment,
    - Bodily injury
- In case of fire and explosion, the following aspects are to be taken into account:
    - The amount and energy density of the old materials used and the process materials
    - The typical hazards of the processes at the various plans, higher temperatures and pressures being associated with greater hazards
    - The values and concentrations of values at the plants

Any management program of environmentally ecology in any country needs:

Environmental education, identification of ways to improve environmentally, demonstrated commitment and willingness introducing ecological thinking into a financial services. Building a knowledge base through education and training is fundamental aspect of successful integration of environment thinking and action into a society's operations.

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