Sustainable Waste Management

Definition

Article 1(a) of the Waste Framework Directive provides that: "waste" is "..any substance or object……which the holder discards or intends or is required to discard."

There is no definitive list of what is and is not waste. Whether or not a substance is discarded as waste - and when waste ceases to be waste - are matters that must be determined on the facts of the case and the interpretation of the law is a matter for the Courts. It rests, in the first place, with the producer or holder of a substance to decide whether it is being discarded as waste and the Environment Agency is responsible, as a "competent authority", for the enforcement of waste management controls in England and Wales.

The European Court of Justice ("ECJ") has issued several judgments on the interpretation of the definition of waste and the meaning of "discard". ECJ judgments are binding on Member States and their competent authorities. In March 2004 the European Commission published a dossier on key environmental judgments by the ECJ which is available at http://europa.eu.int/comm/environment/law/leading_cases_en.pdf

Sustainable Waste Management can be defined as using material resources efficiently to cut down on the amount of waste produced, and, where waste is generated, dealing with it in a way that actively contributes to the economic, social and environmental goals of sustainable development.

Current Applications

Recycling

Recycling is the reuse of materials that would otherwise be considered waste, collecting and reprocessing ready manufactured materials for remanufacture. Recycled materials can be derived from pre-consumer waste (materials used in manufacturing) or post-consumer waste (materials discarded by the consumer)[1].

Recycling is a multi-phased process, which includes removal, separation and/or diversion of materials from the waste stream and their use as raw materials in the manufacturing process. For example, recycled wastepaper is utilised by the paper industry[2], recycled organic material can be used as fertiliser or processed to extract biofuels.

Current Recycling Applications

In 1998, a pilot feedstock recycling plant went operational at BP's Grangemouth site in Scotland, with a capacity to process 400 tonnes of mixed plastic waste per annum. A feasibility study into its viability concluded that a 25,000 tonnes per annum plant could be supported from the area's municipal waste sources alone.

In 1991, LINPAC Plastics Recycling opened a unique plant with the ability to recycle post-consumer polystyrene products. The plant, based in Allerton Bywater, West Yorkshire, has a capacity of over 14,000 tones per year, which is set to increase to 25,000 tonnes per year by 2005. The plant is able to process fast food boxes, meat trays, egg cartons, yoghurt pots, vending cups, and a range of other polystyrene products. In addition, the plant processes a range of polyethylene and polypropylene goods, such as bottles, crates, sheets, caps, pipes and fibres[3].

Current Barriers to Recycling

Recycling is limited - where the production of the recycled product uses more energy, time or materials than the production of virgin material; or result in a greater quantity of; or more harmful by-products associated with the recovery and recycling process, the recycling process fails to reduce the impact of waste on the environment. With the introduction of Life Cycle Management, researchers have become aware of the true nature of the impacts of recycling and the recovery

1 http://en.wikipedia.org/wiki/Recycle
2 http://www.wipapercouncil.org/fun7.htm
3 http://www.wasteonline.org.uk/resources/InformationSheets/Plastics.htm

process. Also, restrictions within the regulations and unfavourable tax and trade policies have had an adverse affect on the global economics of the recycling sector.

Reuse

The use of a product more than once in the same form, either for the same purpose – such as refilling a soft-drink bottle at the bottling company – or for a different purpose – such as reusing an empty peanut butter jar as a container for leftover food. Reuse is repairing, refurbishing, washing, or recovering worn or used products, packaging appliances, furniture or building materials for internal use. Reusing packaging and products prolongs the useful life of items and delays the final disposal or recycling[4].

Current Applications of Reuse

Reusing plastic is preferable to recycling as it uses less energy and fewer resources. Long life, multi-trip plastics packaging has become more widespread in recent years, replacing less durable and single-trip alternatives, so reducing waste. For example, the major supermarkets have increased their use of returnable plastic crates for transport and display purposes four-fold from 8.5 million in 1992 to 35.8 million in 2002. They usually last up to 20 years and can be recycled at the end of their useful life[5].

Potential Applications of Reuse

Many believe the optimal application of reusable materials resides in closed-loop situations, such as eateries, open-air catering events and theatres – anywhere where discarded items can be easily recovered. Reuse is most successfully employed in conjunction with an incentive. Incentives for the domestic consumer have most successfully been adopted in Germany (the pFand system) and Belgium (the Fost Plus system). Another example common to many regions is the recovery and reuse of milk bottles, again demonstrating the value of closed-loop environments when considering recovery and reuse.

Current Barriers to Reuse

With the current social and political climate, elevated consumer awareness of food safety issues and, in the extreme, the heightened treat of terrorism, concerns about the safety of reuse and the potential for any contamination (whether accidental or otherwise) of, for example, plastic bottles between uses have limited the successful application of reuse. However, current solutions under development include electronic `noses` to detect harmful contaminants, which can be installed inline – thus reducing any disruption to the refilling process to a minimum.

Waste Collection Methods

Methods for collecting waste for reprocessing vary from central collection points to `recycling centres` and even door-to-door collection services. Industrial activities resulting in the generation of excessive waste streams are often treated differently, for example, in Europe a `Producer Responsibility Note` scheme has proved successful. In Belgium the introduction of the Fost Plus system where consumer are rewarded for returning certain waste packaging items, has proved successful with consumers.

[4] http://www.mass.gov/epp/info/define.htm
[5] http://www.wasteonline.org.uk/resources/InformationSheets/Plastics.htm

Current Waste Collection Applications

An increasing number of local authorities are now providing plastics collection services. Research by RECOUP has shown that local authorities can achieve cost-effective high-achieving plastics collection systems by integrating plastic bottle collection with other recyclable materials. For example, Daventry District Council (UK) introduced such a system in 1998 and has been able to increase recycling rates from 12% to nearly 50%.

In Adur, West Sussex, and Milton Keynes in Buckinghamshire, (both UK) plastic bottles and polystyrene are collected through 'blue box' schemes, where residents place recyclable materials in a separate box for sorting by the refuse collectors at the kerbside. Plastics and other materials are sorted into a compartmentalised vehicle, then taken to the Materials Reclamation Facility for final sorting before transport to reprocessing plants[6].

Biodegrading

The chemical breakdown of materials by living organisms in the environment. The process depends on certain microorganisms, such as bacteria, yeast, and fungi, which break down molecules for sustenance. Certain chemical structures are more susceptible to microbial breakdown than others; vegetable oils, for example, will biodegrade more rapidly than petroleum oils. Most biodegradable products will completely biodegrade in the environment within two months to two years.

Biodegradable polymer science has lead to the development of a vast range of materials offering different properties for different applications

Current Applications of Biodegradation

A number of manufacturers have been exploring alternatives to plastics made from non-renewable fossil-fuels. Such alternative 'bio-plastics' include polymers made from plants sugars and plastics grown inside genetically modified plants or micro-organisms.

Health and safety concerns have arisen over potentially hazardous chemical additives to plastics and consumer pressure has contributed to manufacturers switching to plant-based plastics in such cases. For example, the world's largest toy manufacturer Mattel announced in 1999 that PVC would be replaced with plant-based plastics in new products from 2001 onwards. A range of other companies, including LEGO, IKEA, Nike and The Bodyshop have made similar pledges.

A number of UK retailers have recently introduced degradable carrier bags. These bags are made from plastic, which degrades under certain conditions or after a predetermined length of time. There are two types of degradable plastic: bio-degradable plastics, which contain a small percentage of non oil-based material, such as corn starch; and photodegradable plastics, which will break down when exposed to sunlight.

Degradable plastics are already being used successfully in Austria and Sweden, where McDonalds has been using biodegradable cutlery since 2001. This enables all catering waste to be composted without segregation.

Potential Applications of Biodegradation

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[6] http://www.wasteonline.org.uk/resources/InformationSheets/Plastics.htm

Carriers for packs of beer cans are now being manufactured in a plastic, which photo-degrades in six weeks. There is also potential to use such plastics in non-packaging applications such as computer or car components, for example. In short, the future of these materials lies not only in their further development, but also in attention to detail with regards to their appropriate and effective application.

Current Barriers to Biodegradation

Biopolymers are not currently approved for food packaging materials due to concerns surrounding safety; the possible migration of fragments of plastic into foodstuffs and their subsequent ingestion by consumers. Technical barriers such as the positive list system and unattractive taxation systems also exist in Europe.

There are a number of concerns over the use of degradable plastics. First, these plastics will only degrade if disposed of in appropriate conditions. For example, a photodegradable plastic product will not degrade if it is buried in a landfill site where there is no light. Second, they may cause an increase in emissions of the greenhouse gas methane, as methane is released when materials biodegrade anaerobically. Third, the mixture of degradable and non-degradable plastics may complicate plastics sorting systems. Finally, the use of these materials may lead to an increase in plastics waste and litter if people believe that discarded plastics will simply disappear.

Landfill

Landfill is the most common method of final disposal of solid waste on land. Refuse is spread and compacted and a cover of soil applied so that effects on the environment (including public health and safety) are minimized. Under current European regulations, landfills are required to have liners and leachate treatment systems to prevent contamination of ground water and surface waters. An industrial landfill disposes of non-hazardous industrial wastes. A municipal landfill disposes of domestic waste including garbage, paper, etc. This waste may include toxins that are used in the home, such as insect sprays and powders, engine oil, paints, solvents, and weed killers[7].

Potential Landfill Applications

MBT – mechanical biological treatment – is a family of technologies that partially process mixed household waste by mechanically removing some materials and by biologically treating others so that the residual fraction is smaller, more stable and available for a number of possible uses.

MBT is not a single process, but can vary considerably with the 15-month Juniper study looking at the technologies offered by 27 different companies worldwide, including the appraisal of 30 existing plants in nine countries.

Joe Schwager, managing director of Juniper, advised local authorities not to focus too much with what a potential MBT process may involve, but instead attention should be centred on what the end products and residues are

The finding of a landmark study on mechanical biological treatment (MBT), were published by the SITA Environmental Trust on the 23rd of March 2005. The £250,000 study has been funded through the Landfill Tax Credit Scheme and is being made freely available to the public.

Despite the claims from some policymakers and NGOs that MBT can be part of zero waste, we do not agree. MBT will produce a certain amount of waste that cannot be recycled or used.

[7] http://www.nsc.org/ehc/glossar1.htm#l

- Joe Schwager, Juniper In a largely positive report on MBT technologies, consultants Juniper found that systems have the potential to achieve diversion rates of up to 95%". However, the study warned that if local authorities opt for the wrong system, diversion rates could be as low as 14%.

The actual proportion of dry recyclables recovered, though, was "modest", the Juniper study said, typically between 3% and 15%. But, the way composting contributes to recycling rates meant "reported recycling rates" could be "as high as 85%"[8].

Among the process, the Juniper study identified 24 possible end uses, with four main MBT routes; processes could be combinations of these four options:

Stabilising material to send it to landfill
Use of material as compost
Use of material as a solid fuel
Focus on producing a biogas fuel

Current Barriers to Landfill

Recent changes to the Landfill Directive in Europe have restricted the types of waste that will be accepted at landfills and lead to further, costly certification requirements for the growing list of hazardous wastes. This, in conjunction with similar restrictions to incineration emissions has increased the need for novel materials manufacturers and waste managers to work together more closely to tighten lifecycle management strategies and close the loop on waste streams with refinements to technologies such as compostable or reusable packaging, and more efficient collection methods.

Incineration

The destruction of solid, liquid, or gaseous wastes by controlled burning at high temperatures. Hazardous organic compounds are converted to ash, carbon dioxide, and water. Burning destroys organics, reduces the volume of waste, and vaporises water and other liquids the wastes may contain. The residue ash produced may contain some hazardous material, such as non-combustible heavy metals, concentrated from the original waste[9].

Current Incineration Applications

Göteborg has Sweden's largest district heating system, supplying over 165,000 households with heating, which is equivalent to about 65% of the heating requirements. Waste heat from the refineries and the incineration plant at Sävenäs accounts for almost three-quarters of the district heating, together with heat from heat pumps at the Rya sewage treatment works. The rest of the district heating is produced by Göteborg Energi's power and heating plant at Rosenlund, and at the high-temperature water stations. Natural gas, bio fuel and oil are used for this. In the summer the district heating energy is used to cool the buildings.

About 20% of the energy supplied in Göteborg is renewable. It comes from the waste incineration at Sävenäs, electricity from hydroelectric power, bio fuels and electricity from eleven wind turbines[10].

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8 http://www.letsrecycle.com/news/archive/news.jsp?story=4309

9 http://www.nsc.org/ehc/glossar1.htm

10 http://www.goteborg.se/prod/sk/goteborg.nsf/1/press,mediaservice_(english),the_book_of_records,the_largest_waste_incineration_plant_in_northern_europe?OpenDocument

Potential Incineration Applications

LidsterCorp are currently involved with a project aimed at introducing an incinerator system which can be used within the bounds of European regulations and possibly beyond. This technology would enable the ecologically benign disposal of waste tyres, potentially reducing the massive impact of aircraft and automotive tyre waste on the environment, as waste rubber cannot currently be disposed of through landfill or incineration within the confines of European legislation and existing technologies. We are also aware of a range of pan-European initiatives relating to `wet scrubbing` of incineration emissions which reduce the introduction of harmful gases into the environment.

Current Barriers to Incineration

Recent changes to the incineration emissions legislation (Directive **2000/76/EC**) and the ever-present stigma attached to incineration plants have limited their introduction in most of Europe to industrial centres. In Italy, there is significant public concern over incineration as poorly managed incineration plants have lead to smoke and ash deposits on surfaces of nearby habitations. Couple these issues with the more obvious necessity for unsightly chimneys and the increasing `not in my back yard` attitude of citizens and it becomes clear that this sector has a significant challenge to face if the future of the industry is to maintain a reasonable level of economic growth.

Regulations

Regulatory Summaries

Panorama
General provisions
Sustainable development
Waste
Air pollution
Water
Soil protection

Legal Texts

Treaty establishing the European Community (Articles 2 and 6, Title XIX)
Legislation in force
Legislation in preparation and monitoring of the decision-making process between institutions
Search in the Legislative Observatory of the European Parliament
Search in the Public Register of the Council of the European Union
Search in PreLex
Opinions of the European Economic and Social Committee
Opinions of the Committee of the Regions
Recent case-law of the Court of Justice and the Court of First Instance
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General Framework

The landfill of waste
Framework Directive on waste disposal
Strategy on the prevention and recycling of waste
Implementation of legislation on waste
Waste management statistics
Competitiveness of the recycling industries
Supervision and control of transfrontier shipments of waste
Integrated pollution prevention and control: IPPC Directive

Specific Waste

Packaging and packaging waste
Management of waste from the extractive industries
Disposal of PCBs and PCTs
Disposal of spent batteries and accumulators
Disposal of waste oil
End-of-life vehicles
The reusing, recycling and recovering of motor vehicles
Removal and disposal of disused offshore oil and gas installations
Use of sewage sludge in agriculture
Environmental problems of PVC
Waste electrical and electronic equipment
Titanium dioxide
Disposal
Surveillance and monitoring
Programmes for the reduction of pollution

Incineration of Waste

Waste incineration
Incineration of dangerous waste
Incineration plants
New incineration plants

Hazardous Waste

Controlled management of hazardous waste
Basel Convention on the control of transboundary movements of hazardous waste

Radioactive Waste and Substances

Transfer of radioactive waste: supervision and control
Shipments of radioactive substances
Situation in 1999 and prospects for radioactive waste management
Management of spent nuclear fuel and radioactive waste

Resources

Commission

Environment
Grants

European Parliament

Committee on the Environment, Public Health and Food Safety

Council of the European Union

Environment
The European Ombudsman
European Environment Agency
European Investment Bank

Documentation

Press releases
Bulletin of the European Union
General Report on the Activities of the European Union
Publications
Statistics