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Editorial

Remediation, recycling and reuse pose some of the major challenges facing civil/structural engineers and material scientists of the 21st century. Almost every society in the world is confronted with the problem of waste and refuse created by modern life. And we know now that it is not just a question of household and domestic waste, but the mountains of disused fridges and tyres, electronic and medical waste as well as municipal solid waste and sludge that challenge solutions that are economic, cost–effective and environmentally friendly. The precise amount and nature of these waste management issues cannot easily be assessed, but the need for creative and innovative technologies to find safe, efficient and reliable solutions to these problems is urgent and paramount.

The UK, for example, produces a million tonnes of electrical and electronic waste ranging from TVs, washing machines, computers to toasters. It is estimated that in Europe, every consumer produces 14 kg of electrical waste every year. The fridge mountain in the UK is estimated to cost some £40 million to solve. On the other hand, some fifty million tyres are discarded in Britain every year—about 30 million are reused, recycled or burnt for fuel whilst some 200,000 tonnes are disposed of to landfill. But it is the illegal dumping that often exposes the public to risk from fire and pollution.

However, it is the domestic and household waste that creates the major threat to society. In Britain, for example, we produce some 435 million tonnes of rubbish every year—of which some 28 million tonnes are household waste. Humans, in general, have an abysmal record of reuse and recycling household waste. At present, Britain recycles just 11% of its household waste—Government targets aim at an average recycling rate in England at 17% by 2003–04, and 25% two years later. In comparison Europe's recycling league table varies from about 50% in the Netherlands, Austria, Germany and Switzerland to about 15% in Italy, France and Spain. There is again a general widespread public resistance to build incinerator plants, whilst on the other hand, there is growing awareness that waste going into landfill sites needs to be cut drastically. The current targets are that half the rubbish that went into landfill sites in 1995 should, by 2009, be reused, composted or recycled.

Solutions to our mountains of waste vary from country to country. In the Netherlands, in 1998 some 4000 large waste containers were built underground in residential areas with electronic measuring equipment. Hong Kong has long exported recycled waste—some 1.3 million tonnes of recyclable waste were exported in 1993. In the US, legislation is controlled at State level, and in California for example, waste going into landfill is targeted to be reduced by 50%.

Civil Engineers and material scientists can play a leading role in transforming the waste from a useless pollution product to a usable construction material. PVC plastic waste and glass, and particularly glass medical waste, produce the highest amount of pollutant emission gases from burning. A major advantage of incineration process is that it enables to reduce the volume of material, but it can also liberate carbon dioxide into the atmosphere. There is also the problem of the emission of heavy metals and products of incomplete combustion such as dioxin. The emission of these pollutants can be controlled, but we need more research—holistic, inter-disciplinary research—to find safe, non-polluting environmental solutions to this massive problem of waste disposal.

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