



General Certificate of Education
Advanced Level Examination
January 2011

General Studies (Specification A)

GENA4/PM

Unit 4 A2 Science and Society

Case Study Source Material

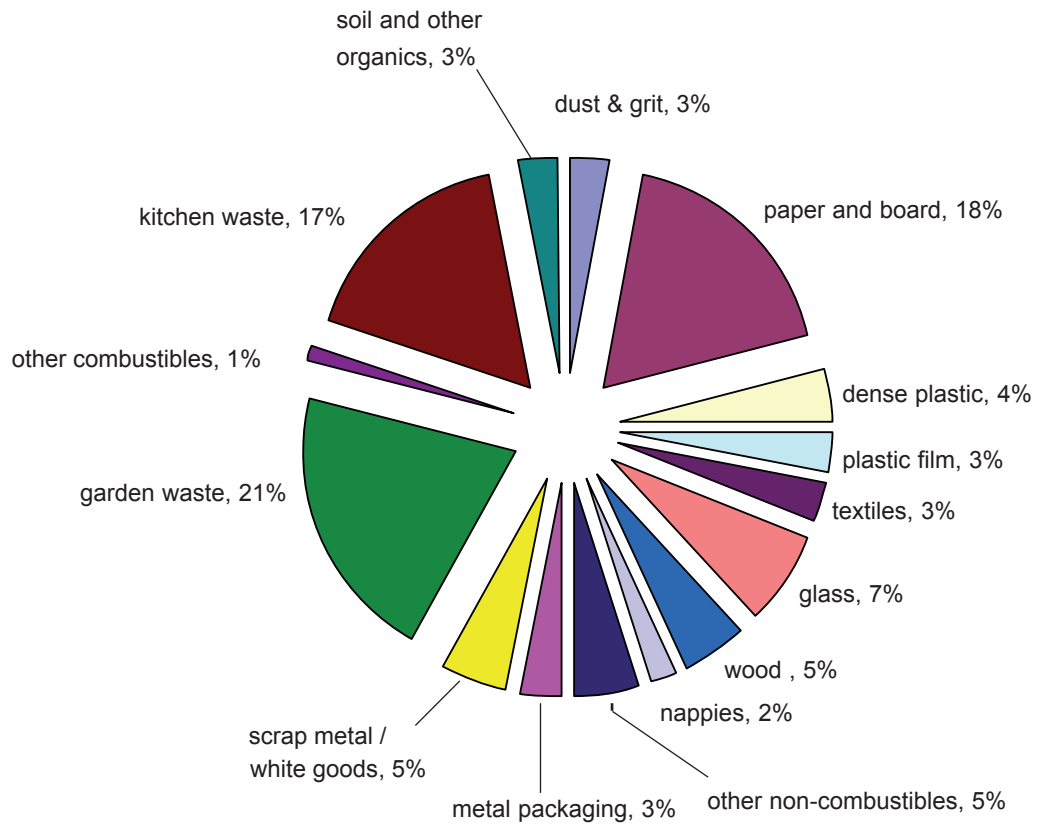
For use with **Section A**

- The material consists of five sources (A, B, C, D and E) on the subject of **Consumption, the creation of waste and issues related to waste disposal**. These sources are being given to you in advance of the Unit 4 examination to enable you to study the content and approach of each source, and to consider issues which they raise, in preparation for the questions based on this material in Section A.
- A further Section A source (F) will be provided in the examination paper.
- Your teachers are permitted to discuss the material with you before the examination.
- You may write notes in this copy of the Source Material, but you will **not** be allowed to bring this copy, or any other notes you may have made, into the examination room. You will be provided with a clean copy of the Source Material at the start of the Unit 4 examination.
- You are not required to carry out any further study of the material than is necessary for you to gain an understanding of the detail that it contains and to consider the issues that are raised. It is suggested that three hours' detailed study is required for this purpose.
- In the examination room you are advised to spend approximately one hour and fifteen minutes reading a previously unseen extract and answering a range of Section A questions based on all the source material.

**Case Study Source Material on:
Consumption, the creation of waste and issues related to waste disposal**

Source A

Figure 1: What's in your bin?



Source: analysis of household waste composition and factors driving waste increases, DR J PARFITT, WRAP, December 2002

Figure 2: Top green facts

The top 10 'Green House' facts on recycling and the environment:

1. Each year in Britain, we throw away 28 million tonnes of rubbish from our homes. This weighs the same as three and a half million double decker buses. A queue of buses that long would go around the world one and a half times. (Source: The Green parent website).
2. You can make 20 cans out of recycled material with the same amount of energy it takes to make one new one. (Source: The Green parent website).
3. The UK produces 420 million tonnes of solid waste every year. That's the weight of 5 cars for each person every year. We only recycle 11% of it. (Source: The Green parent website).
4. Incinerating 10,000 tonnes of waste creates 1 job, landfill the same amount of waste creates 6 jobs, but recycling the same 10,000 tonnes creates 36 jobs. (Source: The Green parent website).
5. In just over a week, we produce enough rubbish to fill Wembley stadium. Over half of that waste can be recycled. (Source: DETR).
6. Every tonne of paper recycled saves 17 trees. (Source: The Green parent website).
7. Every year in the UK we use 13 billion steel cans which if you placed them end to end, would stretch to the moon three times! (Source: Steel Can Recycling Information Bureau).
8. The energy saved from recycling one glass bottle is enough to run a light bulb for four hours. (Source: www.practicalhelp.org.uk).
9. Recycling one plastic bottle can save the same amount of energy needed to run a 60-watt lightbulb for six hours. (Source: Recoup).
10. We use over six billion glass bottles and jars each year. It would take you over three and a half thousand years to sing "Six Billion Green Bottles"!



Source: <http://www.recycle-more.co.uk/nav/page651.aspx>

Turn over ►

Figure 3: Recycling facts and figures

- Up to 60% of the rubbish that ends up in the dustbin could be recycled.
- The unreleased energy contained in the average dustbin each year could run a television for 5,000 hours.
- The largest lake in Britain could be filled with rubbish from the UK in 8 months.
- On average, 16% of the money you spend on a product pays for the packaging, which ultimately ends up as rubbish.
- As much as 50% of waste in the average dustbin could be composted.
- Up to 80% of a vehicle can be recycled.
- 9 out of 10 people would recycle more if it were made easier.

Aluminium

- 24 million tonnes of aluminium is produced annually, 51,000 tonnes of which ends up as packaging in the UK.
- If all cans in the UK were recycled, we would need 14 million fewer dustbins.
- £36,000,000 worth of aluminium is thrown away each year.
- Aluminium cans can be recycled and ready to use in just 6 weeks.



Glass

- Each UK family uses an average of 500 glass bottles and jars annually.
- The largest glass furnace produces over 1 million glass bottles and jars per day.
- Glass is 100% recyclable and can be used again and again.
- Glass that is thrown away and ends up in landfills will never decompose.



Paper

- Recycled paper produces 73% less air pollution than if it was made from raw materials.
- 12.5 million tonnes of paper and cardboard are used annually in the UK.
- The average person in the UK gets through 38kg of newspapers per year.
- It takes 24 trees to make 1 tonne of newspaper.



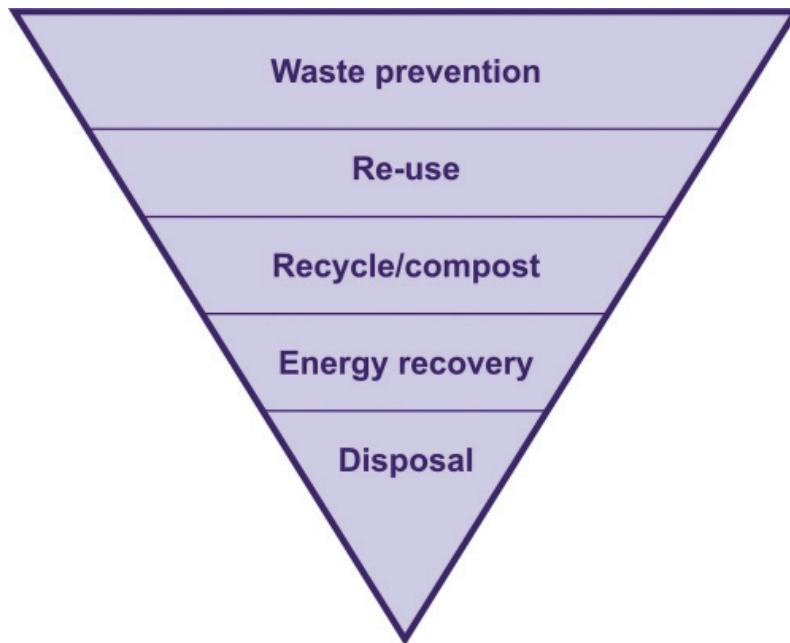
Plastic

- 275,000 tonnes of plastic are used each year in the UK, that's about 15 million bottles per day.
- Most families throw away about 40kg of plastic per year, which could otherwise be recycled.
- The use of plastic in Western Europe is growing about 4% each year.
- Plastic can take up to 500 years to decompose.



Source: <http://www.recycling-guide.org.uk/facts.html>

Figure 4: The waste hierarchy



Turn over for the next source

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Figure 5: Recycle for your community

Recycle for your community



In the brown bin

Plastic bottles, drink/food cans and aerosols, foil and foil trays, tins, all glass bottles and jars.



In the blue bin

Paper, cardboard, liquid food & drink cartons (ie. Tetra Paks), newspapers, magazines, junk mail, catalogues, envelopes, directories and Yellow Pages.

Please do not put **plastic bags, plastic film, plastic food trays, yoghurt pots or plastic bottle tops** in your recycling bin as they cannot currently be recycled

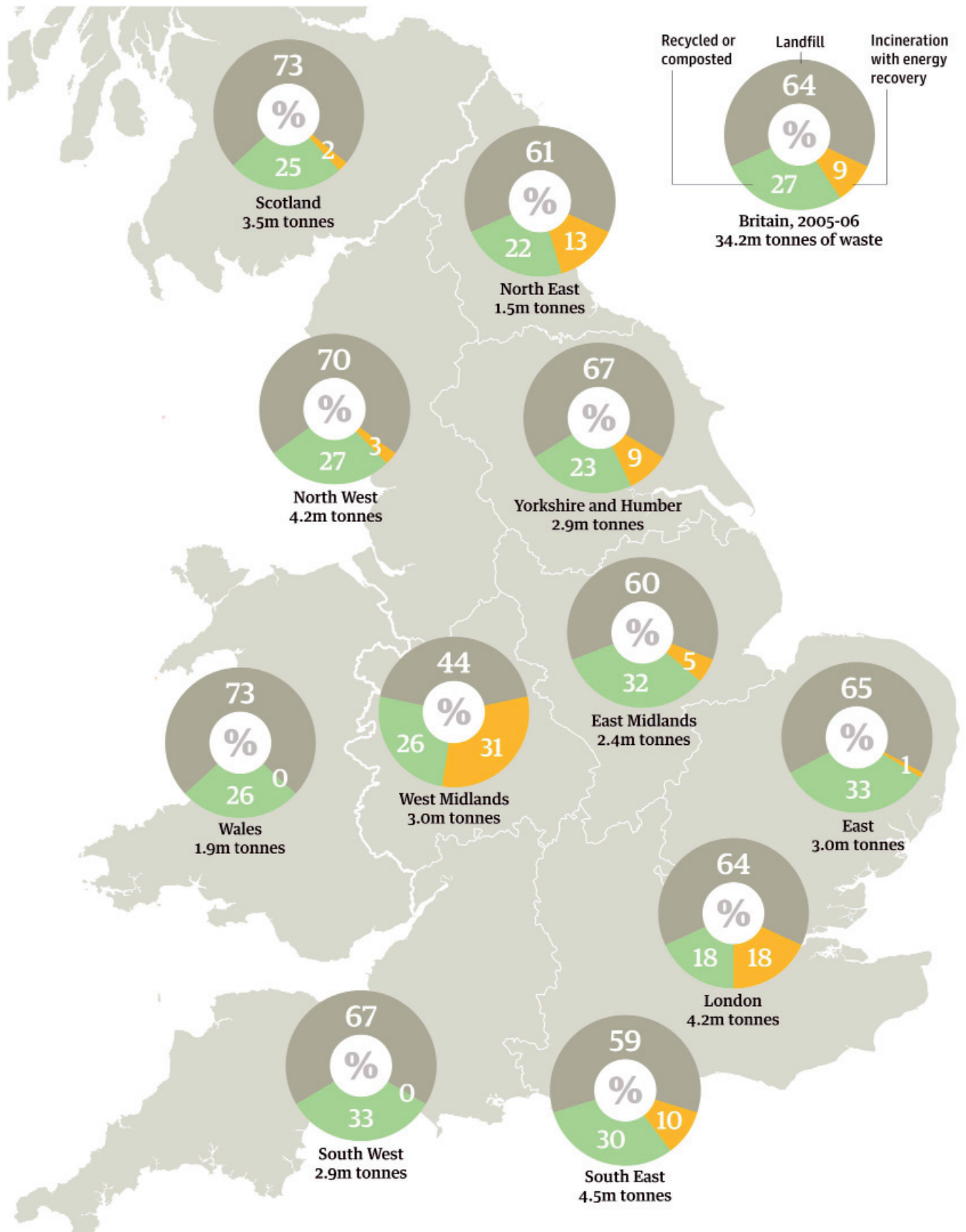
This leaflet is available in other languages, large print, Braille and on audiotape. Please contact us on 0161 234 3193 if this would be useful to you or anyone else you know such as a relative or neighbour. If you require a copy in one of the languages below, please contact 0161 234 3193.

یہ لیفلٹ دوسری زبانوں، بڑی لکھائی، بریل اور آڈیو ٹیپ پر بھی دستیاب ہے۔ اگر یہ آپ یا آپ کے کسی جاننے والے لٹلے کسی رشتہ دار یا مسائے کیلئے مفید ہو تو براہ مہربانی ہمارے ساتھ 0161 234 3193 پر رابطہ کریں۔ اگر آپ کو یہ لیفلٹ کسی دوسری زبان میں چاہئے تو براہ مہربانی 0161 234 3193 پر رابطہ کریں۔

اے ای لیفلٹ ایٹ باہر کے زبانوں، بڑی لکھائی، بریل اور آڈیو ٹیپ پر بھی دستیاب ہے۔ اگر یہ آپ یا آپ کے کسی جاننے والے لٹلے کسی رشتہ دار یا مسائے کیلئے مفید ہو تو براہ مہربانی ہمارے ساتھ 0161 234 3193 پر رابطہ کریں۔ اگر آپ کو یہ لیفلٹ کسی دوسری زبان میں چاہئے تو براہ مہربانی 0161 234 3193 پر رابطہ کریں۔

這傳單可以其他語言、大字印刷、盲人用點字和錄音帶的版本來提供。如這資料對你或你認識的任何人士有用的話，請致電0161 234 3193聯絡我們。閣下如欲索取其中一種語言的副本，請致電 0161 234 3193查詢。

Figure 6: How we dispose of our waste (not all areas add up to 100%)



Source: KAREN McVEIGH, 'How green are we?', *The Guardian*, 9 May 2008

Turn over ►

Source B

Waste disposal

The more waste we generate the more we have to dispose of. The most common disposal methods, particularly in the UK, are landfill and, to a lesser extent, incineration. Each year approximately 111 million tonnes of controlled waste (household, commercial and industrial waste) are disposed of in landfill sites in the UK. Some waste from sewage sludge, along with waste from mining and quarrying, also ends up in one of the UK's 4000 landfill sites.

As landfill waste decomposes, methane is released in considerable quantities – currently estimated at over 1.5 million tonnes annually in the UK. Methane is a strong greenhouse gas and contributes to global warming. Furthermore, the leachate fluids from decomposing waste can permeate through the underlying and surrounding geological strata, polluting groundwater which may be used for drinking water supplies.

Incineration is the second largest waste disposal method in most countries. In the UK, approximately 5% of household waste, 7.5% of commercial waste and 2% of industrial waste is disposed of by incineration. When burning waste, a large amount of energy, carbon dioxide and other potentially hazardous air pollutants are given off.

Modern incinerators, however, can use this waste energy to generate electricity and hence prevent the energy from being wasted. Incineration plants range from large scale, mass-burn and municipal waste incinerators to smaller clinical waste incinerators used in hospitals. Today hospitals tend to share one large incinerator to dispose of the waste for a number of hospitals.

A less common, but more sustainable, method of waste disposal is anaerobic digestion. In this process, waste decomposes in an enclosed chamber, unlike in a landfill site. Digestion takes place in an oxygen-free environment. Certain bacteria thrive in this environment by using the oxygen that is chemically combined within the waste. They decompose waste by breaking down the molecules to gaseous by-products (methane) and small quantities of solid residue.

Anaerobic sewage plants produce significant quantities of methane, which can be burnt to generate electricity. Liquid and solid organic fertilisers are also formed and can be sold to help to cover operating costs. Currently the UK only has a small number of such plants although they are forecast to increase.

Individuals can also compost any organic waste such as food and garden waste. Organic waste breaks down over a few weeks into a mulch which can be used as a soil fertiliser. Large-scale composting schemes are also being developed, with the collection of waste from parks and civic amenity sites. Garden and food wastes are collected directly from households in separate kerbside collections. Large central facilities can then compost the organic waste. These schemes are to help the UK to meet its target of recycling and composting 33% of household waste by 2015.

Source: adapted from http://www.ace.mmu.ac.uk/eae/Sustainability/Older/Waste_Disposal

Source C

Rubbish reaches its tipping point

Britons are Europe's biggest tippers. Nothing to do with our post-prandial generosity compared with the French or Germans. We just like sticking our rubbish in holes in the ground. However, legislation from both Brussels and Westminster is making the burial of rubbish in landfill sites more expensive and increasing the pressure to re-use and recycle. The land available for filling with rubbish is running out.

The drive to find alternatives to interment is changing the way waste is managed, with local councils outsourcing more to the private sector, including the building of expensive facilities and long-term management contracts, through a raft of private finance initiatives. By some calculations Britain needs to spend some £10 billion on new waste management infrastructure to meet the new rules.

"We need to change our approach to waste but that will be neither cheap nor easy," says John Raspin of consultants Frost & Sullivan. "Tough choices need to be made at both government and local levels over technology adoption and the large sums of money that need to be spent."

Britain generated 335 million tonnes of waste in 2004, according to the Department for Environment, Food and Rural Affairs (Defra). More than half is produced by construction and demolition, mining and quarrying, much of which is either inert, recycled or both. Industrial and commercial sectors generate 25% of the total and the national waste strategy insists that business cuts the amount it sends to landfill by 85% of the 1998 levels by 2010. Household waste accounts for only 9% of the waste mountain but that still means about 30 million tonnes a year, much heading for landfill.

The Local Government Association reckons we dump twice as much waste in the ground as Germany, which has a bigger population. With the remaining landfill capacity put at between six and nine years, something has to give. According to Paul Bettison of the LGA: "Britain is the dustbin of Europe, with more rubbish being thrown into landfill than any other country on the continent. For decades people have been used to being able to throw their rubbish away without worrying. Those days are over."

The government has set targets for the amount of household waste local authorities can send to landfill. By 2010 councils will have had to cut the amount of biodegradable waste dumped in the ground to 75% of the 1995 total and to 50% by 2013 and 35% by 2020. This is trickier than it looks. Britain is generating more waste now than it was a decade ago. So by 2020 the UK will need to ensure 65% of 1995 waste levels does not go into landfill. Failure means fines - £150 a tonne over quota, unless a council can buy another's unused allowance.

One option is to burn waste in an incinerator. Sending it up in smoke indiscriminately, however, ranks alongside landfill at the bottom of the waste management 'hierarchy'. Schemes which burn rubbish generally have ways of extracting energy. However, getting such schemes off the ground can be an uphill struggle.

Cory Environment wants to build a £200 million energy waste plant on the Thames at Belvedere. Cory says the plant can handle up to 670 000 tonnes a year and generate enough electricity for 66 000 homes. The original proposal dates back to the early 1990s and has been through three applications and two enquiries.

Another alternative is mechanical biological treatment (MBT). The system uses bugs which occur in the waste naturally to absorb the water in the waste, a process at which they are so adept that they eventually die of thirst. That takes out about 25% of the waste by weight. The remainder has metal extracted and then bits such as ceramics, glass and stones - all of which can be recycled. But, though MBT can be used for household waste it is not suitable for the sort of items that go to the local tip such as old bikes and out-of-date paint.

According to Defra, the UK is already ahead of its target for recycling, with some councils achieving up to 50%, and the department is confident of meeting the Brussels targets. Change should be good with many local authority contracts up for grabs. Varity Mitchell, utilities analyst at HSBC, said: "The UK is a great market because we're so behind our European counterparts. Legislation on muck is producing brass."

Source: adapted from: MARK MILNER, 'Rubbish reaches its tipping point' *The Guardian*, 19 January 2007

Turn over ►

Source D

Fortnightly rubbish collection leads to more recycling, says government

The wide-scale change to fortnightly, rather than weekly, rubbish collection has been defended after a study showed that it had increased recycling and saved public money with no harmful health effects.

The analysis, by the Local Government Association, suggests that the 144 councils that collect household rubbish one week and food waste the next are managing to recycle or compost 30% of what they pick up. This compares with 23% among the authorities that are not using the new system. The association said that the top 10 councils in the national recycling league had all introduced these alternate weekly collections. If these systems were used nationally, it is claimed that they could save the taxpayer £22 million in landfill fees, and cut landfill by 1.2 million tonnes.

However, the government has admitted that alternate collections were not suitable for all areas. "I doubt it would work in some built-up areas like London where so many people live in flats," said a spokeswoman for the Department for the Environment, Food and Rural Affairs (Defra). "You would not implement it in high rise blocks." More problems are expected if councils in more densely populated areas with more transient populations make the switch.

Nearly 40% of English and Welsh councils have switched to fortnightly collections as a direct result of new recycling targets imposed by Europe. Britain is one of the worst recyclers in Europe and councils face hefty fines if they fail to increase the proportion of domestic waste recycled from 27% to 40% by 2010. The tax on waste dumped in landfill now stands at £24 a tonne but will increase by 33% a year for four years and, by 2010, councils will face fines of up to £150 a tonne over the set quota. The LGA has warned that landfill space will run out within nine years unless recycling rates are boosted.

But there is conflicting evidence on the potential health risks posed by fortnightly collections. A detailed government study found no adverse effects in one local authority which had switched, but scientists in Norway have found that organic waste separated out for recycling could be putting refuse collectors at risk.

World Health Organisation guidelines recommend that rubbish is collected weekly in countries like Britain, and a Canadian study suggested increased asthma rates from extra dust when rubbish was collected less frequently. Other reports suggest smells will increase considerably in warm weather, as well as rodents.

The National Pest Technicians Association said that the switch to fortnightly collections was one of several reasons for a substantial recent increase in the rat population in Britain. "Household refuse stored in black plastic bags and overflowing wheelie bins causes a 24/7 source of rodent food." Yet South Kesteven district council in Lincolnshire, one of the best recycling authorities in Britain, has reported that its switch to alternate weekly collections led to a fall in rat numbers. It attributed this to the introduction of wheelie bins to replace plastic bags which rats can break into.

As long as it is combined with proper education about what to do with waste food, the alternate weekly collection system works," said a Defra spokeswoman.

FAQ Councils and costs

Why the rush to switch? 144 councils out of 354 have changed. By 2010 they will have to pay £150 for every tonne of waste they put into landfill beyond their quota.

Do councils profit from alternate weekly collections? The cost of landfill is rising as space runs out. The more councils recycle, the less they will pay in landfill tax.

Are there health risks, especially in summer? Commonsense measures, such as keeping waste tightly wrapped and bin lids closed, should deal with most problems. Otherwise there will be more flies, smell and possibly rats.

What's wrong with landfilling? It wastes resources, chews up land and impacts most on the poorest communities. At the present rate, landfill space in England will run out in nine years.

Do alternate-week collections reduce rubbish? Anecdotal evidence suggests that the more councils pick up rubbish, the more is put out.

Source: adapted from: JOHN VIDAL, 'Fortnightly rubbish collection leads to more recycling, says government', *The Guardian*, 26 April 2008.

Source E

Cutting my waste was easier said than done

Business may be the biggest baddie but I feel as if I'm putting out a good chunk of the tonnes of waste generated last year. With a family of seven, our wheelie bins are always overflowing, while the large bags of recyclables make a long line on the pavement.

I'm no saint. I enjoy reading cereal packets and salivating over pictures of 'finest' contents, but enough is enough. After my latest trip to the supermarket for a day's food, I tried buying the same items – or near enough – from low-packaging outlets.

Eight slices of salmon for dinner came in plastic trays from Sainsbury's (my local supermarket); from the market they came wrapped in a piece of paper. "Ours are fresher and they don't get sweaty in polystyrene," pointed out the fishmonger, excusing a considerably higher bill.

Asparagus, tomatoes, grapes and cherries all came similarly gift-wrapped, as did the pastries, cereal, croissants and cheese. I chose the pasta in a cardboard box, but even that had a plastic peephole. The pitta bread came in a plastic wallet and the chocolates in three layers of packaging. The wine was a two-pack of ready-filled plastic glasses – easy for picnics but slightly shocking.

Admittedly, Sainsbury's seems to be making more of an effort than its rivals to provide alternatives. My local branch is a 'market' branch, where meat and fish, vegetables and cheese are sold at counters. The worst offenders were either branded goods – with triple-packaged dishwasher tablets for the truly hygiene conscious – or premium brands, where they seem to add frills to the packaging to justify a higher price.

Nor are markets as virtuous as they once were. The grapes came in a plastic bag, the cucumbers came wearing condoms and smoked salmon was pre-packaged. And even if you do shop for fresh produce daily, there remains the problems of groceries.

Unpackaged, a new shop in Islington, north London, is one answer. There, instead of buying flour in boxes and brownies in sarcophagi, I was landed with some zip-lock and paper bags to fill with muesli, lentils, herbs, chocolates and freshly ground coffee.

Shovelling dry goods into bags is satisfying, though more time-consuming than racing through the aisles with a trolley – and you get 50p off when you bring a bag back to refill, which is a natty way of ensuring repeat business. Oil and vinegar, dishwashing liquid and shampoo can be poured into bottles, which you pay for, or re-used containers, which you don't.

Unfortunately, such shops are rare and still offer a narrow range. Wine bottles aren't refillable; dishwasher tablets still come in boxes; there's no tomato puree, and I had to dump my over-packaged supermarket ready meal because there was no less packaged alternative that would last more than a few hours. The ham and bacon also had to be sidelined because I couldn't find a butcher anywhere in the area to provide paper-wrapped equivalents.

Having dragged it all back to the office, the pile of waste the two shopping sessions generated were dramatically different in size. But I must admit that the brownies, muffins and muesli bars from Unpackaged had been crushed into an unappetising mush. If businesses are to try harder, consumers are going to have to relearn the art of carrying things carefully.

Source: adapted from CASSANDRA JARDINE, 'Cutting my waste was easier said than done', *The Daily Telegraph*, 20 August 2008

END OF SOURCES

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