

Energy & Waste Resource Management

Processes of Dealing with Waste
and Attitudes towards Food
wasteage

Waste and resource management

- Today's Class:
 - Redefining waste as a resource



What is waste?

- Items become waste when they are discarded without further potential for re-use, recovery or recycling
- Put another way one man's waste is another man's resource.











Stuart Haygarth – a London designer created this chandelier from 3,000 unwanted prescription lenses

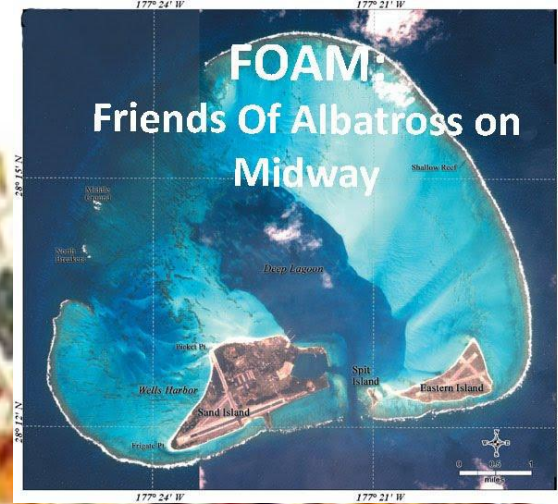


Stuart Haygarth, 2004

The Great Wave by Japanese artist Hokusai







WASTE



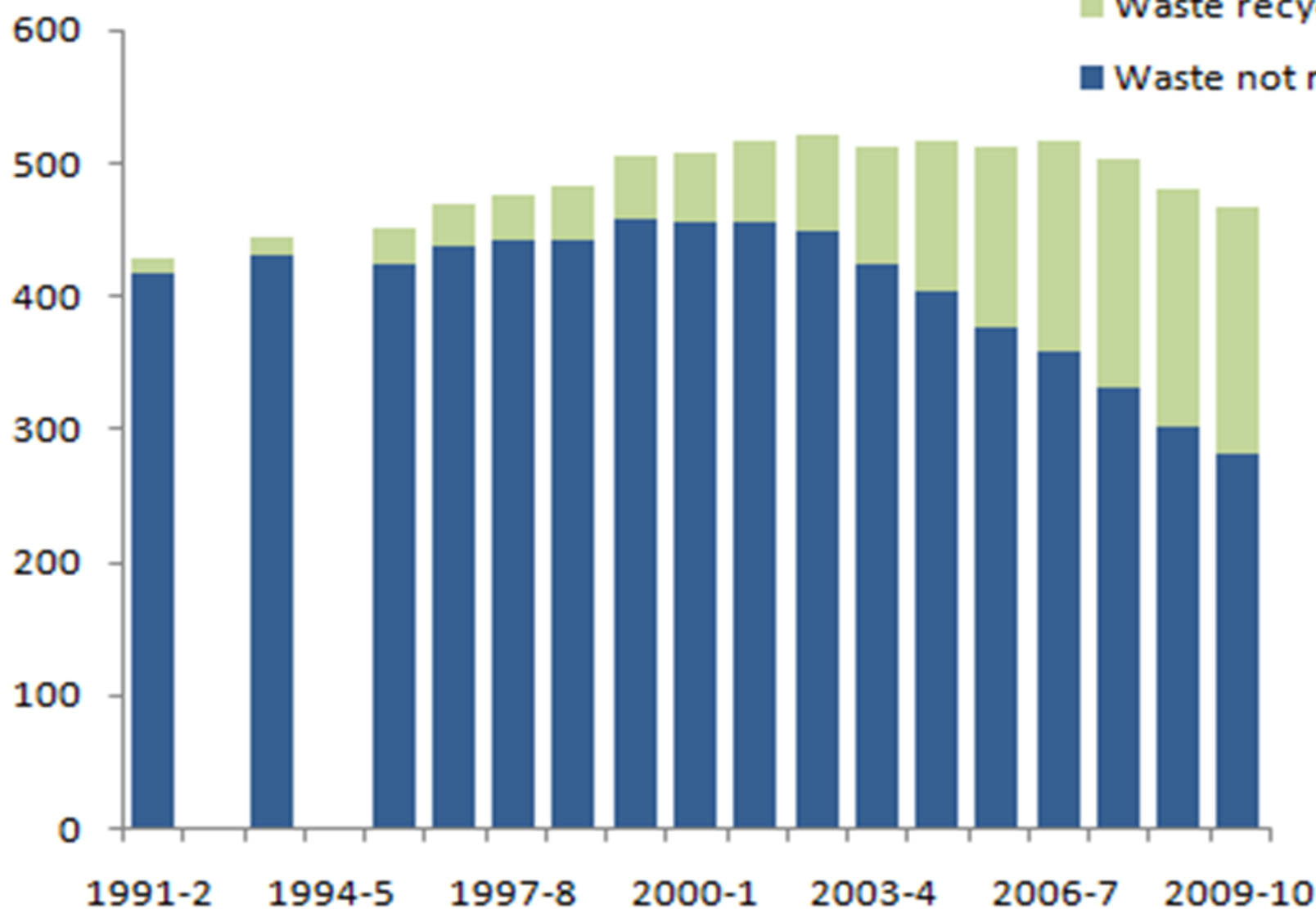
Recycling mountain
An employee is dwarfed by a pile of plastic and paper from household recycling bins at a plant belonging to waste management firm Grundon
Photograph: David Levene

Katrina



Kg per person

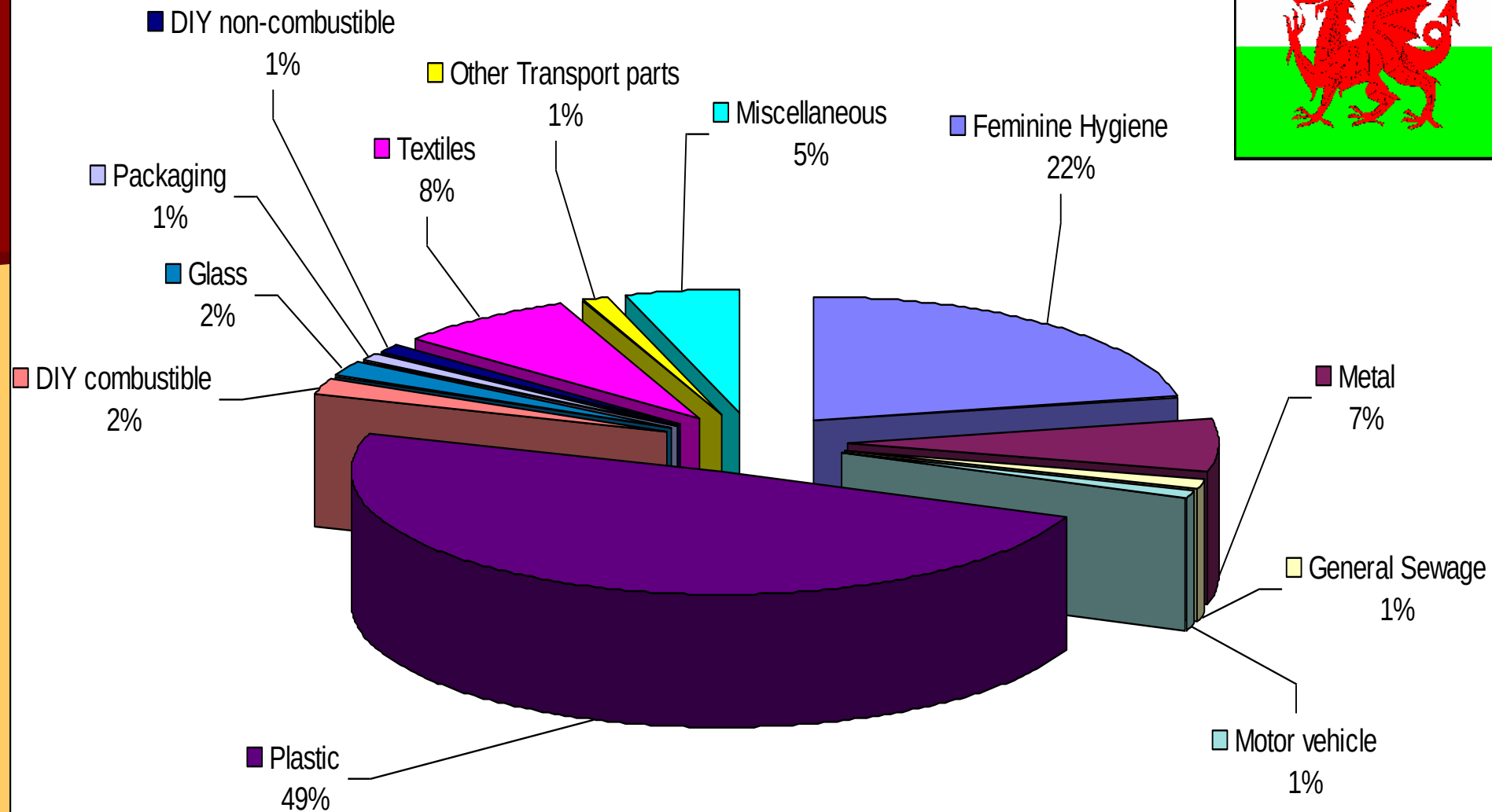
Waste recycled
Waste not recycled



Source: Defra, Environment Agency, Scottish Environment
Protection Agency, Welsh Assembly



In the 20 years since devolution, Wales's recycling rate has increased from just under 5% to 64%. We are well on track to meet our 70% target by 2025 (The Guardian, 2017.)

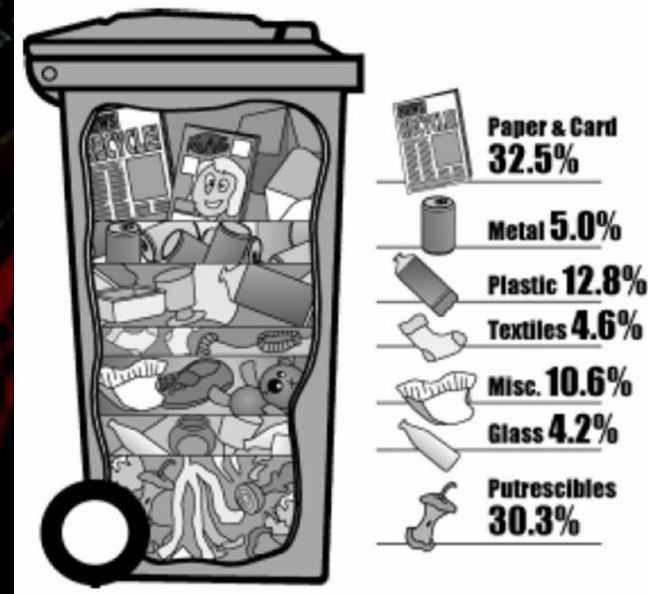


Feminine Hygiene	Metal	General Sewage	Motor vehicle	Plastic	DIY combustible
Glass	Packaging	DIY non-comcombustible	Textiles	Other Transport parts	Miscellaneous

Some Facts and Figures

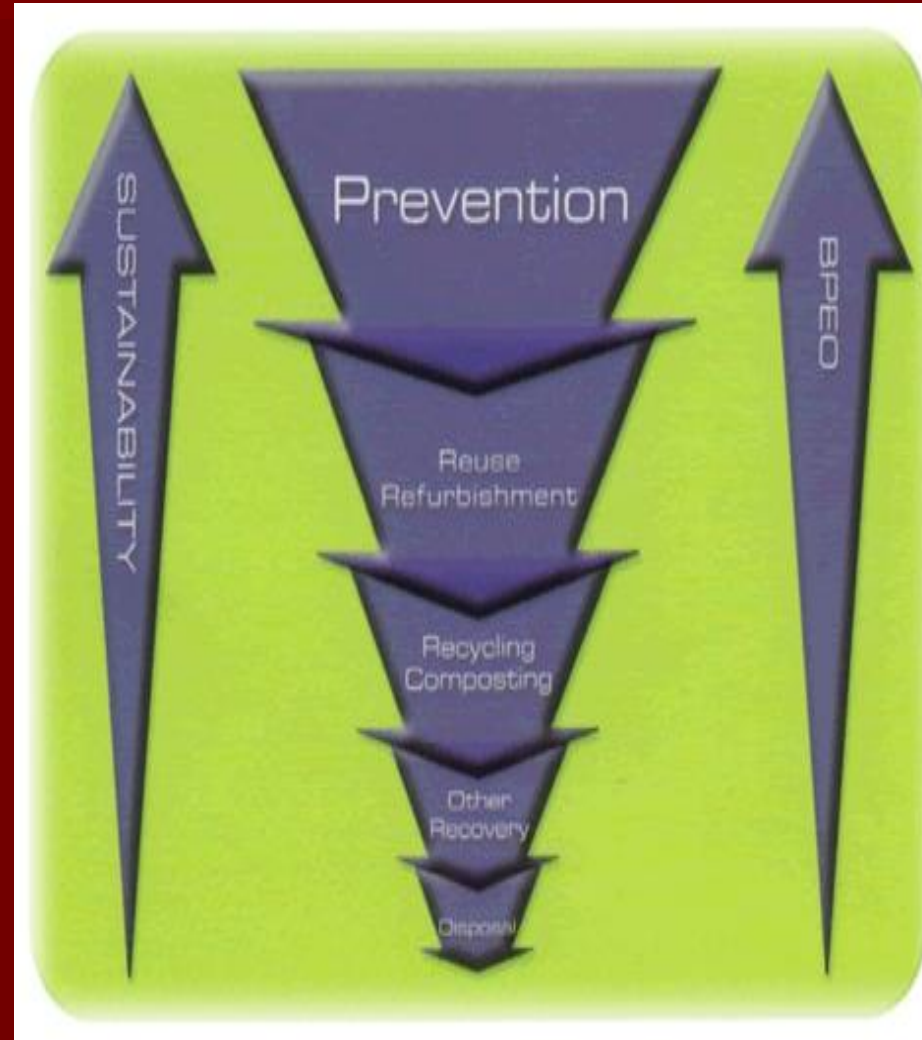
- A typical household produces one tonne of waste every year
- We use over 6 billion glass bottles and jars
- We need a forest the size of Wales to provide all the paper we use
- One million tonnes of nappies are thrown away, that's 8 million nappies every day.
- We use 7 billion plastic carrier bags
- We fill about 300 million square metres of land with rubbish
- Every day 80 million food and drinks cans end up in landfill!

(South Ayrshire Council 2010)



Waste Hierarchy

- Waste management encompasses waste avoidance, treatment, recovery, reuse and final disposal
- Ecological and economic considerations
- Environment Agency regulate recovery and disposal (Now NRW) – Waste Management Licensing system
- Siting of facilities through land use planning system – Town & Country Planning Act 1990
- Making Waste Work – Government White paper 1995
 - Reduce quantity of waste
 - Make best use of waste
 - Adopt practices that are safe



Waste Research - Reduction

- Consumption behaviour
- Collection method – wheeled bins increase quantity by 25%
- Local authority schemes variable
- Socio-economic status – wealthier households generate 50% more
- Environmental Technology Best Practice Programme (ETBPP) – Gov't 1994
- Best Available Techniques Not Entailing Excessive Cost (BATNEEC) - EA



Re-Use

1. Products designed to be used a number of times before obsolescence
 2. New uses found for items which have served their original purpose
- Advantages:
 - Reduces need for manufacturing new products
 - Reduces disposal costs
 - More robust products - longevity
 - Disadvantages:
 - Transport
 - Cost of manufacture
 - Motivation

Disposal



- It is not foreseeable that the need for disposal can be completely avoided
- Methods which have been used:
 - Landfilling
 - Incineration
 - Specialised destruction
 - Permanent storage
 - Export
 - Dumping at sea

What is a Landfill?

- 4 critical elements:

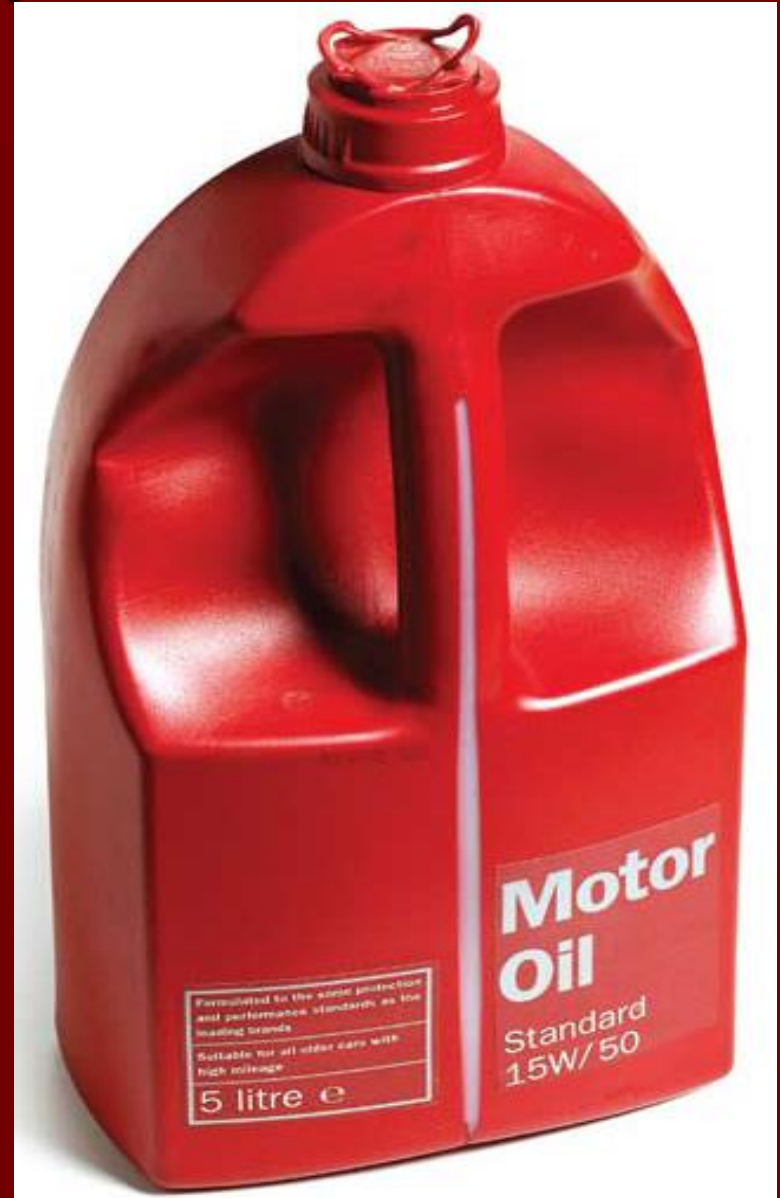
- Natural setting
- Bottom liner
- Leachate collection system
- A cover



- The first can be selected to minimise escapes to groundwater beneath landfill
- The last three can be engineered.
- Largest landfill is the Fresh Kills Landfill on Staten Island – volume of 2.9 billion cubic feet (154m high)

Waste Disposal

- Landfill – inert waste; biodegradable waste; aqueous liquids; sludge and certain special wastes
- Incineration – hazardous wastes; clinical waste; plastics; pharmaceutical drugs
- Specialised destruction – hazardous wastes
- Permanent storage – mineral extraction wastes; nuclear waste
- Export } no longer
- Dumping at sea } possible



Problems Associated with Landfill

- Health & safety issues
- Vermin
- Contaminated ground water and soil
- Odour
- Aesthetics
- Traffic in residential areas
- House prices
- Greenhouse gas emissions



Leachate

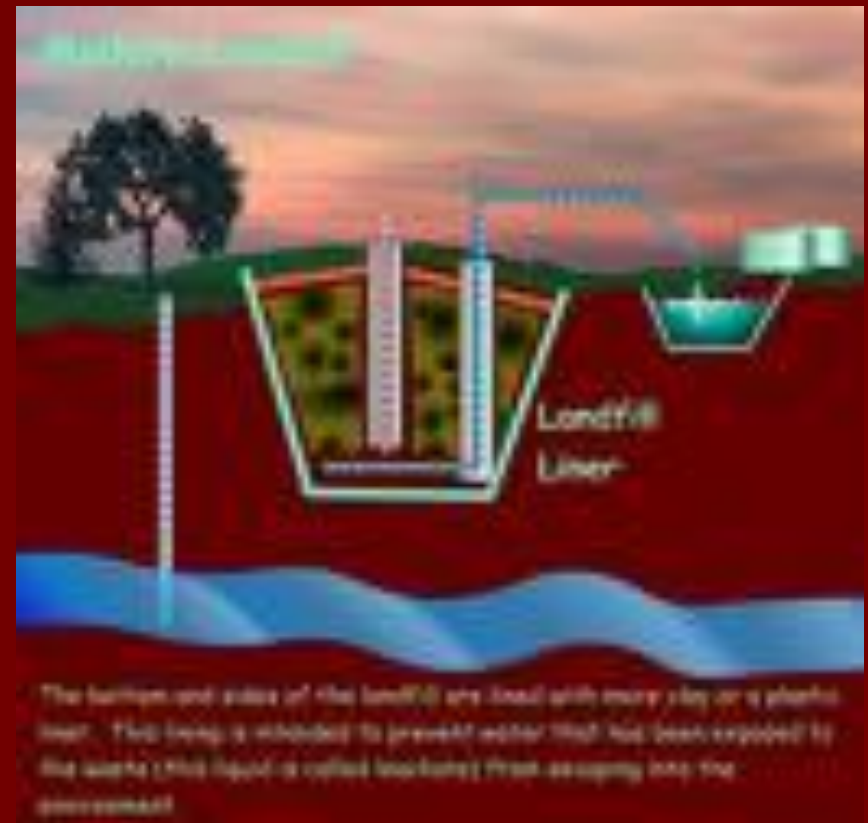
- Contaminated water having been in contact with waste materials
- Organic strength can be 20-100 times the strength of raw sewage
- Generally quantity decreases as landfill ages
- Treatment on or off site:
offsite at a sewage treatment plant; Hydro Industries (Electro-coagulation)



Landfill Gas

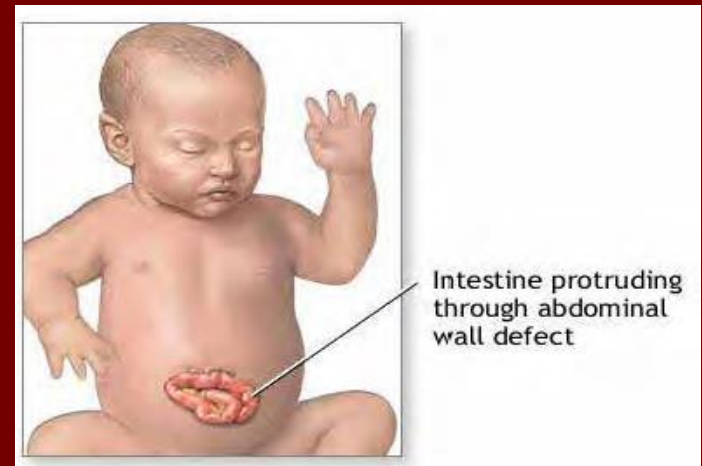
- During anaerobic decomposition - CO_2 and CH_4
- Natural venting through the landfill surface is no longer acceptable
- Noxious odours, damage to vegetation, risk of explosion

(Renewable energy from waste to be discussed later)



Health Statistics

- Increased incidence of cancer – 1995 study in Montreal revealed higher incidence of cancers of the stomach, liver, lung and uterus
- Significant excesses of disease and congenital abnormalities
- Lancet declared statistics revealed an unusual cluster of babies with gastroschisis (intestine forms outside the abdomen)
- Babies born with lower birth weights



Nantygwyddon – why it was closed

- Sited in an unfavourable location – annual rainfall of 2500mm; wind speeds of up to 80mph across the peak; 20,000 people living at its base. Opened 1988
- In 1996, new management took over – all previous records had disappeared
- Dumping of hazardous waste – calcium sulphate filter cake (from filtering chemical and engineering effluents)
- EA acknowledged complaints of Nantygwyddon residents of odour, eye infections, ill health etc
- Lancet report looked at health issues
- Traces of Caesium 136, Plutonium 236 and tritium were found in a water survey – no official explanation as to how radioactive isotopes were found there.
- Closed in 2002 due to health implications. Trecatti still operates and is a larger landfill site – lies above Merthyr Tydfil



Landfill Types

- 1. Attenuate and disperse landfill** — slow, uncontrolled release of leachate into surrounding environment. Leachate diluted by groundwater and then acted upon by biological, physical and chemical processes. No longer acceptable. 1980 EC Groundwater Directive. (NH_3 , Cu, Pb, Zn, As, Cd, Hg)
- 2. Containment landfill** — aims to contain waste and by-products within the boundaries of the site. Predominantly used for municipal solid waste (MSW):
 - Co-disposal landfill
 - The entombment (dry) landfill
 - The sustainable (Flushing bioreactor) Landfill

Landfill Forms



1. Closed-pit landfill
2. Open-pit landfill
3. Area - landfill

Area Landfill in Malta



- Since 2004 – a programme of 'landfill rehabilitation'
- 350 gas wells; 80km pipework



NEW YORK'S NEW PARKLAND FRESH KILLS • lifescape

**LIFESCAPE: A MODEL OF PUBLIC
ENGAGEMENT AND CREATIVE REUSE**

**THIS WEBSITE WAS PRODUCED FOR THE NEW YORK DEPARTMENT OF STATE WITH
FUNDS PROVIDED UNDER TITLE 11 OF THE ENVIRONMENTAL PROTECTION FUND.**

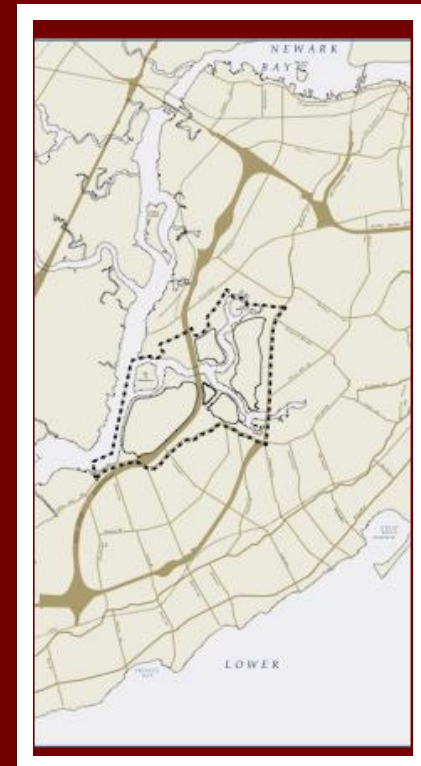
What Type of Landfill is Fresh Kills?

Like most landfills constructed in the 1940s, the ***Fresh Kills Landfill was not designed with a liner or any other form of leachate control.*** Thus, for many years, untreated leachate from the landfill flowed directly into local surface waters and groundwater, ***allowing chemicals in the waste to gradually dissolve into the rainwater and snow melt that flowed through the garbage piled within.***



Staten Island

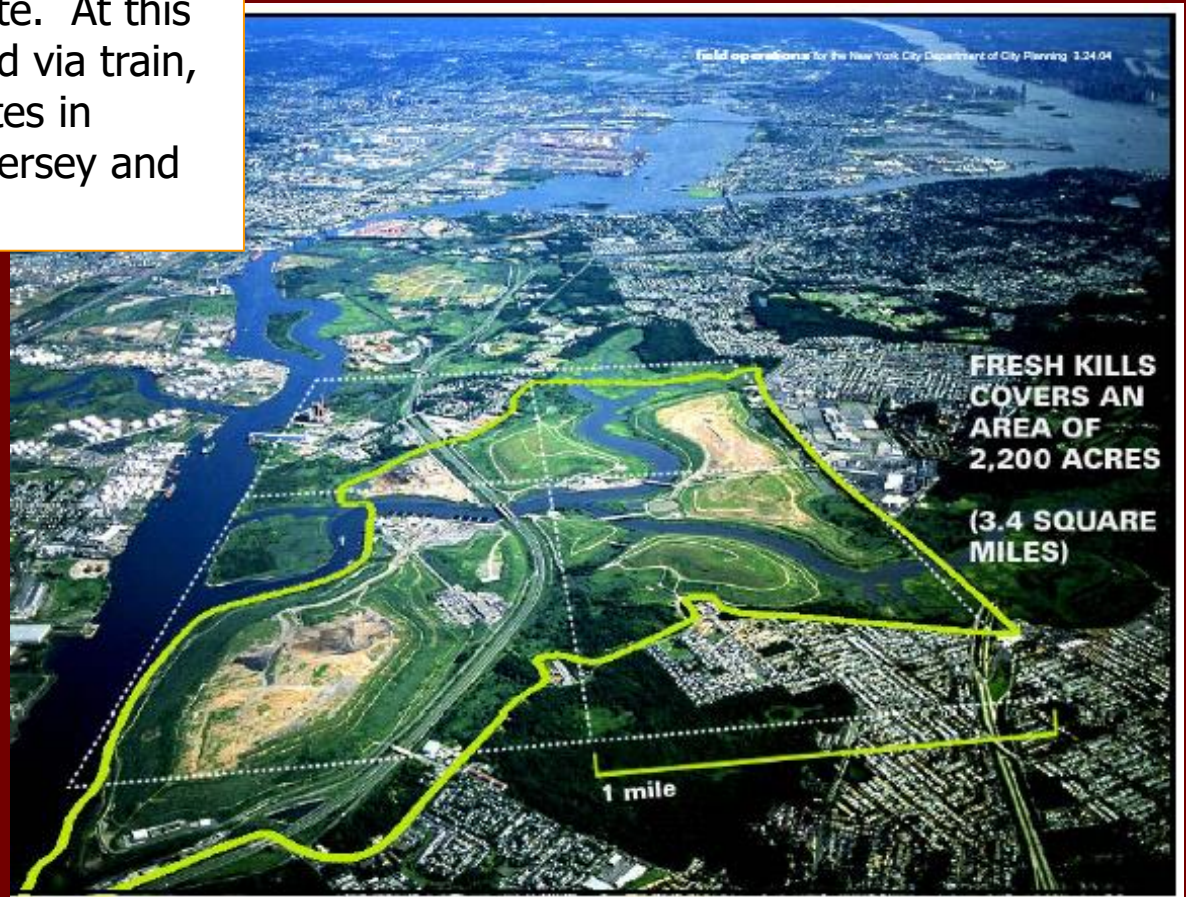
Fresh Kills Landfill is located on the northwest side of Staten Island, New York City's southernmost borough.



A "Temporary Landfill"

Before Fresh Kills was opened, 13 landfills, in various states, were home to 80% of New York City's Waste. At this time waste had to be shipped via train, truck and barge to landfill sites in nearby states such as New Jersey and Pennsylvania.

Opened as a "temporary landfill" to house New York City's waste in 1947, today the Fresh Kills Landfill covers 2200 acres, can be seen with the naked eye from space, and at a height of 225 feet, is taller than the Statue of Liberty.

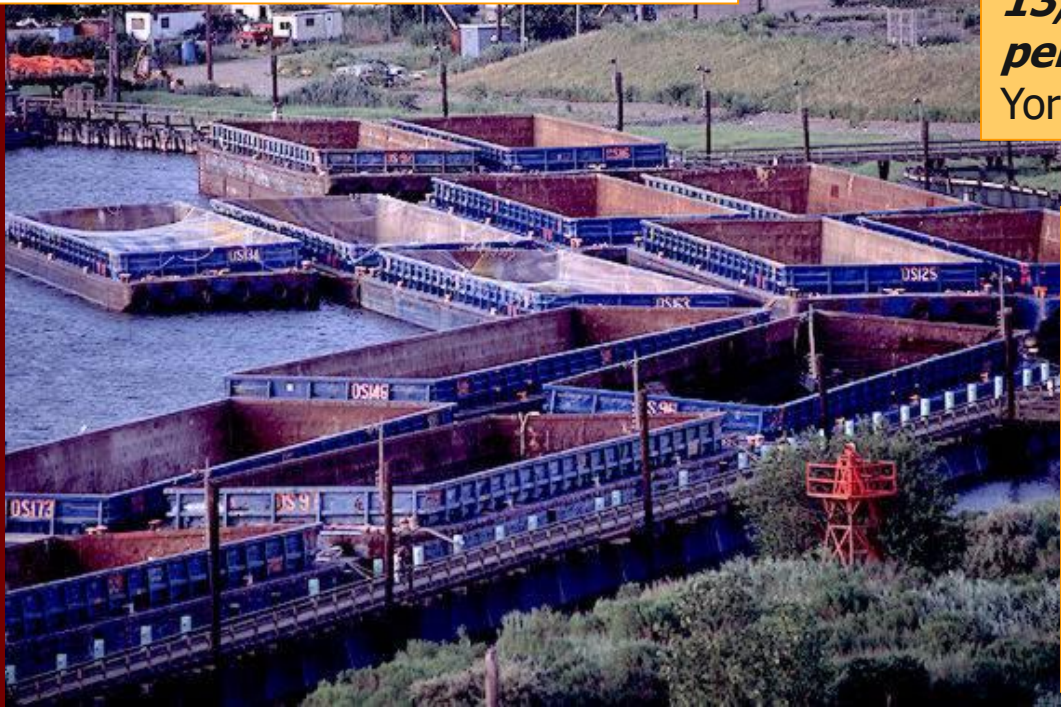


(Brown, 2004)

13,000 tonnes of Waste Per Day

From its location on Staten Island, only a short barge ride from New York City, Fresh Kills was an extremely convenient waste disposal alternative for the city.

In 2001, each of the 20 barges arriving at the landfill daily carried 650 tonnes of waste. That amounts to ***13,000 tonnes of waste per day*** generated by New York City alone.



For over 50 years, massive dumping into tidal wetlands left over 100 million tons of garbage rotting in place, generating harmful leachate into soil and water and producing hazardous air emissions.

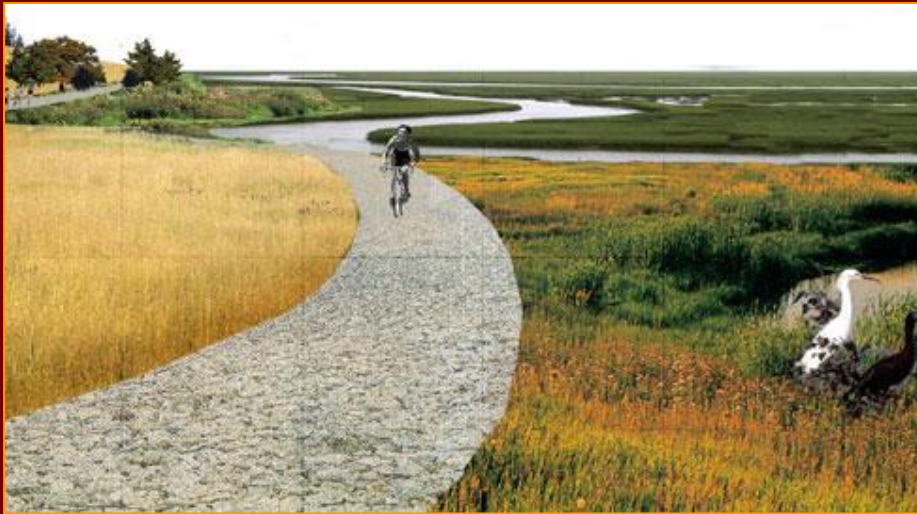
Fresh Kills is Located Only Yards from Residential Neighborhoods



World Trade Center debris is stored in view of residential neighborhood (Brown, 2004)

Fresh Kills Was Closed Permanently in 2005

Since Fresh Kills was closed, NYC trash has been shipped to landfills in other states.



Starting in 2003, the site was to be transformed into reclaimed wetlands, recreational facilities and landscaped public parkland, the largest expansion of the New York City parks since the development of the Bronx chain of parks in the 1890s.

A New Life For Fresh Kills

New York's New Parkland at Fresh Kills will be one of the most ambitious public works projects in the world, combining state of the art ecological restoration techniques with extraordinary settings for recreation, public art, and facilities for many sports and programs that are unusual in the city. At 2,200 acres, the site is 2.5 times the size of Central Park. It has the potential to become an international model of creative reuse that will transform how we experience vast, reclaimed urban landscape.

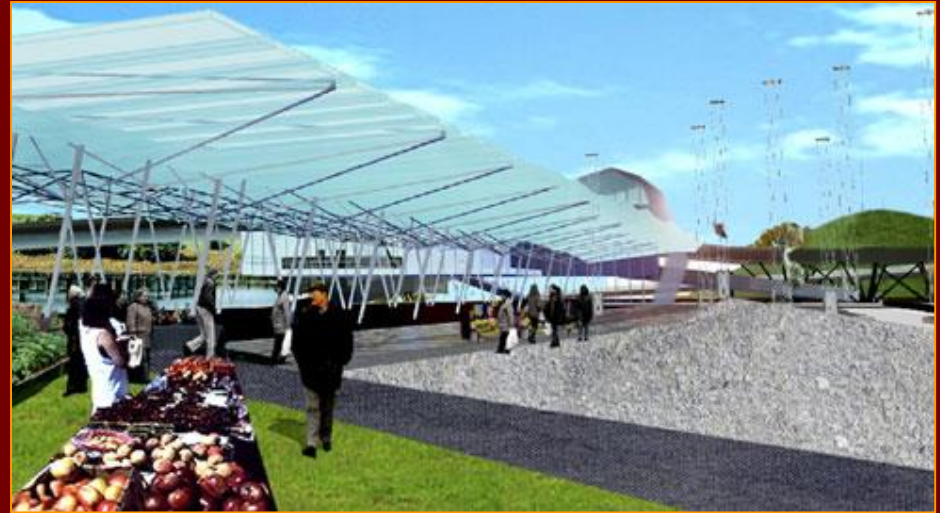


Image 31. Composite of projected activities at Fresh Kills

NEW ACTIVITIES Fresh Kills Parkland will be a world-class park with an incredible variety of public spaces and facilities for social and physical activity, for learning and play. The site is large enough to support many sports and programs that are unusual in the city:

sports fields boating* cycling, hiking* nature trails,
education* community events * mountain biking* extreme
sports* public art*

Visible Costs



Invisible Costs

One Wales, One Planet

'If everyone on earth lived as we do in Wales we would need 2.7 planets worth of resources'.....

'Unchecked, our Ecological Footprint could increase by 20% by 2020' (Davidson, 2009:5)

Take a moment....

How much does your household waste?

- Detail items you think you throw away every week?
- Estimate how much of each item/activity you waste

PRUDENTIAL

**Easy said than done..... The
Challenge facing all Local
Authorities:.....**

SOGGY LETTUCE
REPORT 2004

ARE WE A NATION
OF WASTE NOT



" the average British adult wastes a massive £1,725 on food, luxury items, entertainment, travel, gadgets and hobbies each year. Combined our nation throws away a staggering £80.6 billion every 12 months" (Prudential, 2004:2)

**£424 per person is wasted every year
on food (UK)**

**A third of people admit
to throwing food
regularly.**



% of people who throw the item away in an average week

ITEM	PERCENTAGE
Lettuce / bag of salad	61
Loaf of bread	60
Fruit	57
Pint of milk	45
Cooked meat	43
Packet of food (Biscuits)	42
Spreads and dips	37
Cheese	33
Prepared meals	24
Fresh fish and meat	23
Unfinished bottle of wine	17

Which gender wastes more?

	Male	Female
Food	£467	£387
Luxury items	£287	£381
Gadgets	£94	£33
Entertainment	£280	£206
Hobbies	£400	£353
Travel	£313	£241
OVERALL	£1841	£1601

Soggy Lettuce Report (2004:7)

Men admit they are susceptible to peer pressure – more toys for the boys mentality.

The idea of waste doesn't bother them



Women don't believe they are wasteful or that they don't mean to be wasteful

How do people feel about the fact they waste so much?

29% said waste didn't bother them

16% adults said they felt guilty about waste

9% felt resentful and stressed

4% felt powerless to stop

4% said they could afford to waste money!

13% admitted they get some pleasure out of a little waste.

Regional Differences?

Wales wins again!



Wales and South West - £9.4 billion

Adults in this region waste less money each year than anywhere else in Britain. The average person here wastes £1,567 pa on food, luxury goods, entertainment, travel, gadgets and hobbies. 9% lower than the national average. Soggy Lettuce Report (2004:8)



- Idea of being able to waste money/resources – psychologically comforting
- Easy access to credit (buy now, pay later)
- 'Live for today' culture
- 'Keep up with the Joneses'
- Comfort spending – recession/bad day

- **How wasteful is society?**
- **What stops people avoiding/recovering more waste than they do?**



Attitudes and Behaviour

Perceived capacity to make an impact on waste problems

Access and communication of information

People are more comfortable in discussing their own actions in relation to others

Inter-generational themes

Increased affluence

Governmental/manufacturers responsibility

Personality – habitual behaviour

Attitudes & Behaviour cont'd

- Practicalities & compatibilities with lifestyle (lack of facilities, time, space etc)
- Culture – some rebel against authority
- Most likely to be a combination of
 - Accessibility to appropriate facilities
 - Pessimistic or optimistic personality traits
 - Socio – cultural norms
 - Weakly or well-defined sense of civil responsibility



Picking up on the Soggy Lettuce Report's findings on food waste:..... Is it just consumer behaviour to blame?









- Reject Bananas dumped in a ditch
- Sometimes supermarkets say they are just too straight!



Waste Food

59,625 tonnes of food waste sent by Sainsbury's to landfill in 2007/8..... and then there is the horse meat scandal!



Waste Food (the updated figures)

- We throw away a quarter of all we buy! (Skidelsky, 2009)
- WRAP in 2008 survey – 6.7m tonnes pa:
- 1.6bn apples untouched
- 484m unopened yoghurt pots
- 2.6bn slices bread
- Food left on plates & in restaurants
- Tip of the iceberg – supply chain



Waste Food

- Globalisation – transportation/ warehouses/ processing plants & supermarket distribution centres
- At each stage, a proportion gets wasted
- 1/3 global food supplies wasted and a billion people still starve
- As much as 50% in richer countries



Supermarket villains

- Not legally obligated to reveal how much they waste – Co-op do voluntarily
- Self reported figure is 1.6bn tonnes pa (EA, 2009)
- Cause waste elsewhere in food chain – “uniformity” shape & size for eg
- “Reserve the right to change their mind”



Supermarkets vs Consumer

- Over ordering in stores – 2-for-1 offers
- 'Sell by' and 'use by' dates – confusing and unnecessary? – EU legislation
- Food banks – more popular in UK since recession
- Fareshare – not just a charity!





IRELAND

A charge of €0.15 (10p) for every plastic bag was brought in five years ago. The number of bags used has fallen by a billion a year.



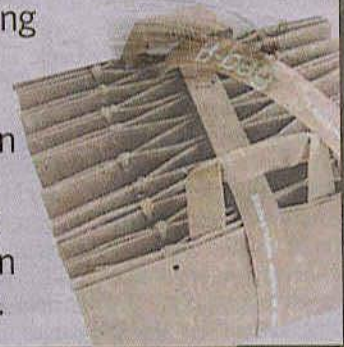
GREECE

Rather than purchase olive oil in small, luxury bottles, Greeks buy their supplies in bulk directly from the source - in aluminium cans



DENMARK

Packaging based on natural products such as corn starch is being pioneered so that food will be sold in edible containers.



GERMANY

At supermarkets, there are three separate recycling bins in which to throw away the plastic, paper or metal packaging of products.



BELGIUM

Supermarkets take deposits on plastic and glass bottles with a refund voucher given when the empty is returned.



TEN WAYS TO CUT WASTE

The lessons Britain can learn from our European neighbours



SWEDEN

Producers of tyres, packaging, vehicles and electrical goods have to dispose of their products in an environmentally friendly way when their life span ends.



AUSTRIA

A ban has been enforced on tinned drinks. Empty bottles are dumped in special machines, which return a deposit.



Waitrose's bananas
 'They used to sell croissants in minimal packaging but I recently found out they have double-wrapped larger packaging.'
Martin Carr, Sheen, Surrey
 Waitrose: 'We plan to minimise packaging in the first instance and transfer the remaining packaging to biodegradable.'

Sainsbury's bananas
 'I can't see the reason for so much packaging for fruit and veg. Why do we need packaging at all and why don't they provide biodegradable bags with all fruit and veg?'
Sandra Regan, Didcot
 Sainsbury's: 'We already have a target to reduce our use of packaging by 5 per cent every year.'

Tesco ready-meal pizza
 'One pizza has a cardboard box, then plastic wrapping and a foam tray. I've stopped buying them because the packaging makes me so angry.'
Mitesh Shah, Hemel Hempstead
 Tesco: 'We are committed to making sure packaging is not excessive.'

Flash memory card
 'I was astonished when it arrived in a 2 x 1.5 x 1.5ins cardboard box, shrink-wrapped to the base, enclosed in its own 6ins long plastic display case and further enclosed in a plastic storage case. What a waste.'
Robert Ashton, Brighton
 Staples declined to comment.

Recycled lavatory rolls
 'It defeats the whole object if you're buying something that's recycled but you find it's in non-recyclable plastic. I'm seriously considering looking into alternatives for all products that are damaging to our environment.'
Steve Chatterley, South Wales

Multi-vitamins
 'The container was about 3ins tall but, when I opened it up, I found it was barely full to 1in. The rest of it was air. It's infuriating to buy something which has oversized packaging.'
Donald Smith, Haddington, Scotland

Toothpaste
 'Why does toothpaste need to be sold in a box? Why not, like Biros, have one large box sitting on display and in that box have a dozen or so tubes that people can just put in their basket. It would reduce the waste of a lot of cardboard.'
Pritesh Shah, Harrow

Bagged carrots
 'Maybe we have become spoilt as consumers but it all seems so unnecessary to put something such as carrots in a plastic bag. It serves no purpose other than a misguided attempt to make something more sellable. I spend most of my time in the kitchen dealing with the fall-out from all the packaging, stuffing plastics and containers in the bin.'
Martin Clarke, Ottershaw, Surrey

Tesco 'Finest' apples
 'The encasing on a lot of fruit and veg 'Finest' products can't be recycled and when I get home and unpack, I've got 20 different cases that I can't recycle which leaves me feeling really bad. I'm just going to stop buying items from this range because I don't want the waste.'
Allison Burns, London



ITALY
 When Italians have finished their wine they go to 'vino sfuzo' wholesalers and refill their bottles from vats instead of buying more bottles.



FRANCE
 Carrefour, the supermarket chain, sells 'soap sausages': shower gel, soap and shampoo refills in polythene tubes which reduce the need to buy new bottles each time.



SPAIN
 A market culture means wrapped produce is viewed suspiciously. Food is displayed in the open to be checked for freshness.

Changing Behaviour



- **Facilities provision**
- **Enforcement of regulations**
 - **Education**
 - **Consultation**
 - **Evolution**

Changing Behaviour

- “The idea that people can be persuaded to change their behaviour supposes that behaviour is something that can be adjusted at will” (Shove, 2004:9)

Personal Study

- Evaluate the waste management strategy of a Local Authority of your choice. Must reinforce your notes with current statistics and information.
- Consider the paper placed on Moodle for you. There is a gap between attitudes and actual behaviour. How do we overcome this?