Packaging's Place in Society

Resource efficiency of packaging in the supply chain for fast moving consumer goods

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Biffaward Programme on Sustainable Resource Use

Objectives

This report forms part of the Biffaward Programme on Sustainable Resource Use. The aim of this programme is to provide accessible, well-researched information about the flows of different resources through the UK economy based either singly, or on a combination of regions, material streams or industry sectors.

Sponsorship

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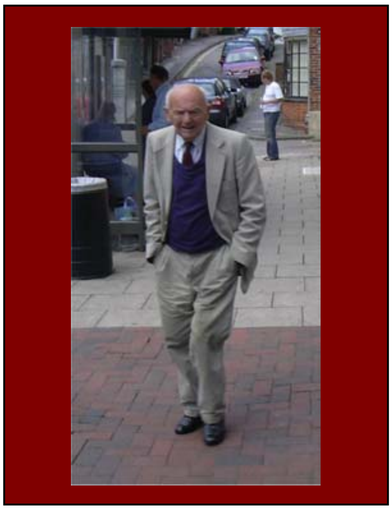
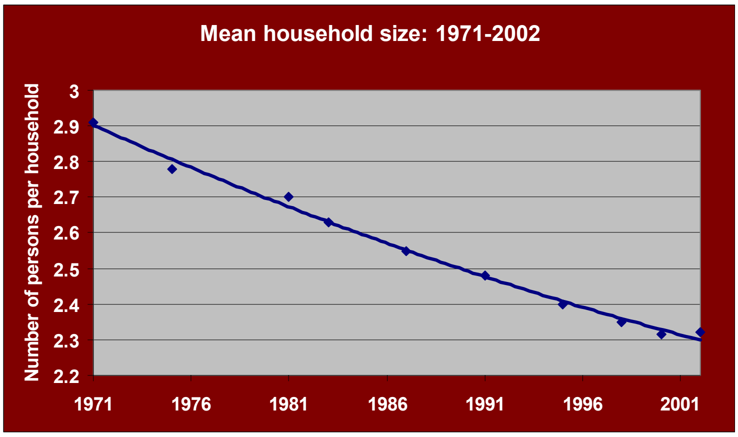
Introduction

We live in a changing world:



People are living longer

There were 19.8 million people aged 50 and over in the United Kingdom in 2002. This represented a 24 per cent increase compared to 1961. During the same period, the proportion of people in the UK population aged 85 and over more than doubled. This change is the result of low birth rates and declining mortality.
Source: http://www.statistics.gov.uk

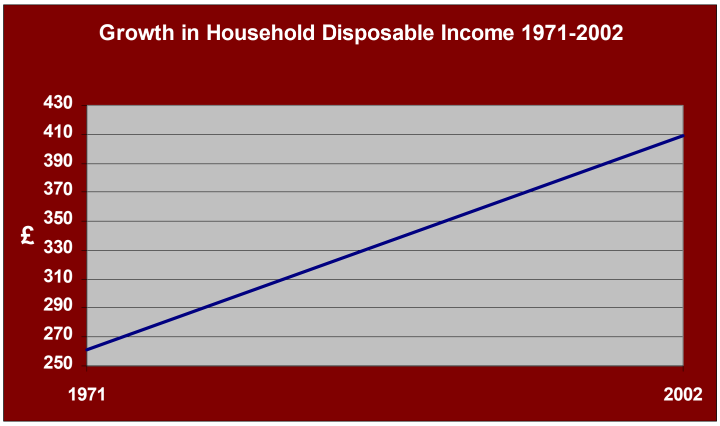


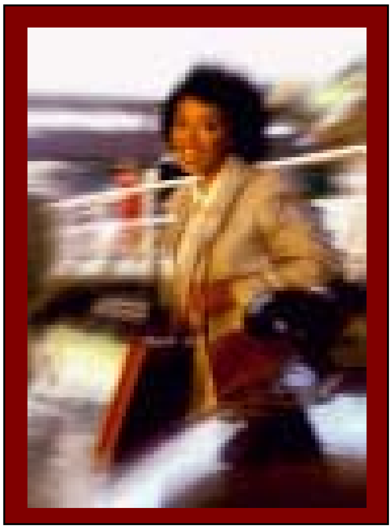
More of us live alone

The average household size in the UK fell by 20% between 1971 and 2002, a decline from 2.91 to 2.32 persons per household. This decline has resulted from a large increase in the proportion of people living alone, which has almost doubled during this period. By 2002, one-person households constituted almost a third of UK households.
Source: Living in Britain, General Household Survey 2002

We have more disposable income

After the Second World War, the middle class emerged as the dominant socio-economic sector in the UK. Since this time, disposable income has risen steadily. Between 1971 and 2002, the average disposable income in the UK increased (in real terms) from £261 per week to £409 per week.
Source: ONS Expenditure and Food Survey





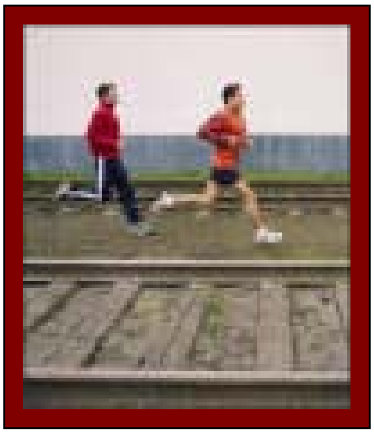
Our time is pressured (and precious)

On average, full time employees in the UK work 41.5 hours per week. This is higher than any other country in the EU. When we are not working, we like to use our free time on activities that improve our quality of life. Time spent entertaining friends and family increased significantly between the 1960's and early 2000's.
Sources: European Foundation for the Improvement of Living and Working Conditions, The Future Foundation

We are becoming more health-conscious

The time spent on sport and exercise has risen from 10 minutes a week in the 1960's to one hour a week by the early 2000's. Despite the increasing range of processed foods and snacks available in our supermarkets, we now consume fewer calories in the home per day (1870 Calories in 2002) than we did twenty years ago (2472 Calories).

Sources: Food Standards Agency, The Future Foundation



And greater choice is offered

Incredibly, there were 40,000 product lines on our supermarket shelves in 2002, compared to just 2000 product lines in the early 1960s.We can now choose from over 600 brands of coffee and 400 brands of shampoo.

Sources: Food Standards Agency, http://news.bbc.co.uk, 24th April 2000

Brands have become globalised

The emergence of global brands has had an impact on the packaging used. In some cases it has been possible to standardise packaging, in other cases different packs are needed to suit local market conditions.

But we like to be treated as individuals

There are brands and ranges targeted at specific consumer needs and tastes – for example, there are ranges directed specifically at children, healthy living, and special occasions.

This study investigates the effects these changes have on the way we consume products and the associated influence this has on the resource efficiency of the packaging used.

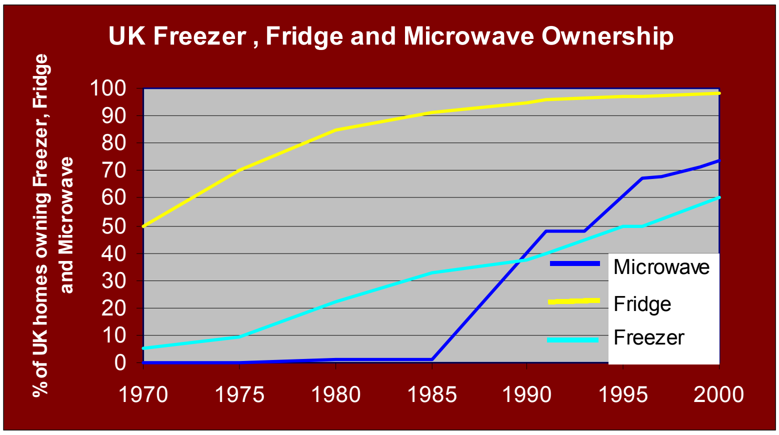
Eating our food

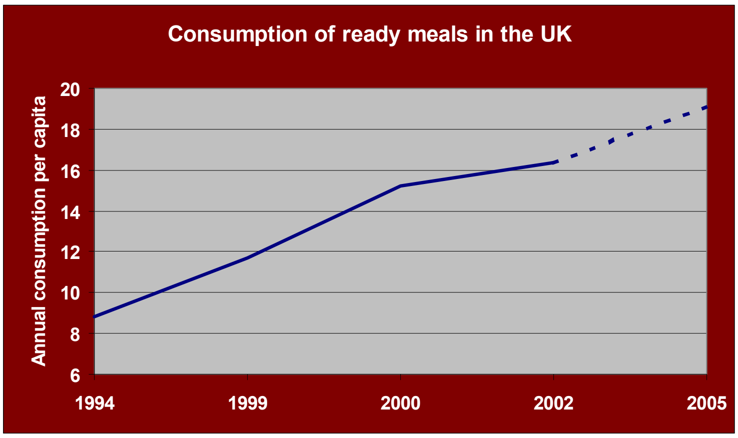
The food we consume and the way we prepare our food has changed:

We take advantage of available technologies

We have created more time for ourselves by taking advantage of time saving technologies. Ownership of freezers and microwaves has increased steadily in the UK – these technologies are now standard in most kitchens.

Sources: SEEDA, Pira International 2004





Source: Pira International 2004

And we consume more prepared food products

In 2002, 695million ready meals were consumed in the UK. This is nearly double the number of ready meals consumed in 1994. Increased consumption of ready meals reflects social changes such as:

- The movement towards smaller households – consumers living alone or in two person households are more likely to purchase convenience foods
- Less formal eating habits as members of the family pursue individual past-times and express individual tastes

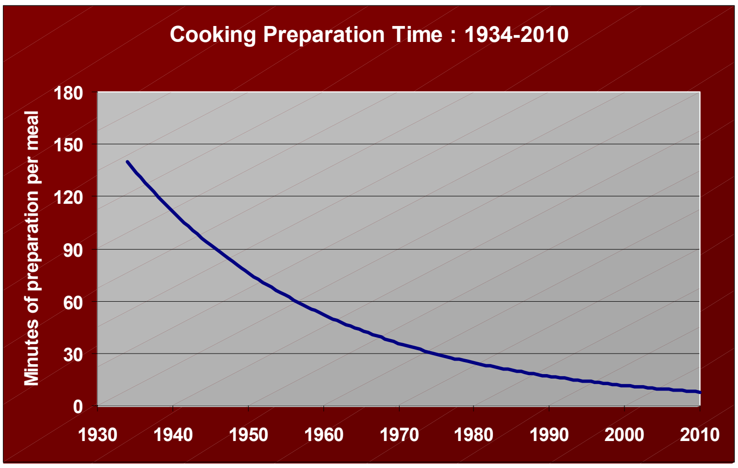
Ready meals also cater for our growing taste for ethnic cuisine.

Sources: Pira International 2004, Food Standards Agency

So we spend less time cooking

In many homes, the main meal is now prepared in less than 15 minutes, as opposed to 2.5 hours in the 1930s. Labour saving devices have helped reduce time spent in the kitchen, but this is also a reflection of the "opportunity cost" of time. We would rather have "quality time" than spend time on chores.

Source: INCPEN 2004



But we spend more time and money eating out

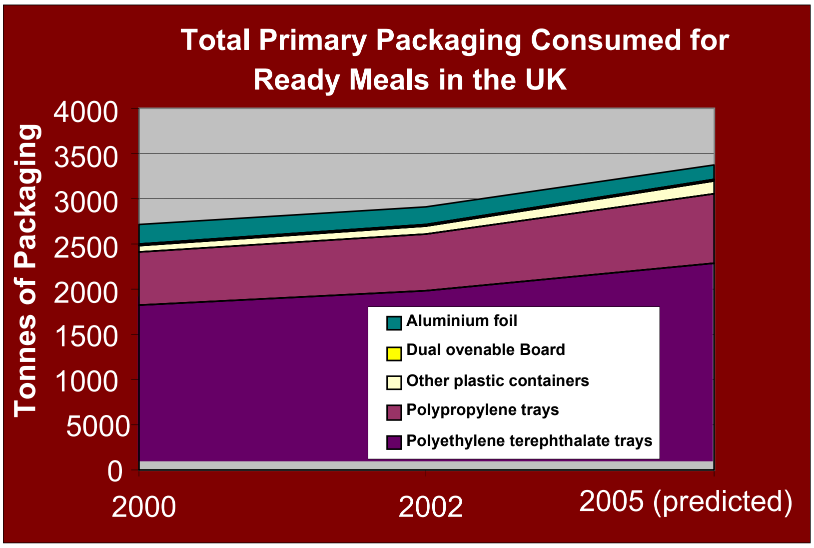
Food spending as a proportion of household spending fell from 26% in 1968 to 17% in 2000. Nearly a third of household food expenditure in 2000 went on eating out, takeaways and snack meals.

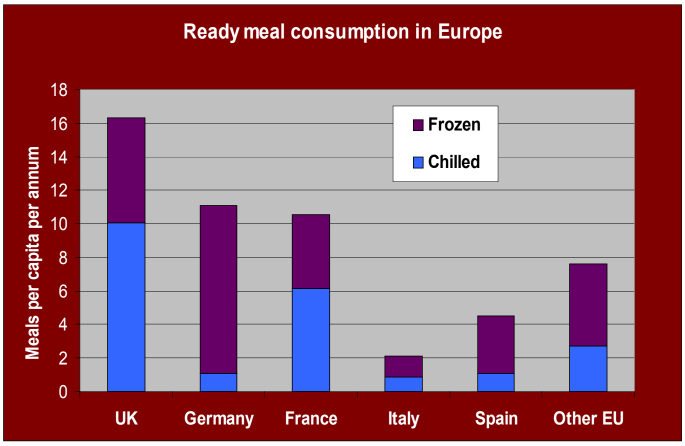
Source: ONS Expenditure and Food Survey

In the home, convenience foods require different packaging

We consume more ready-meals today, so there is more associated packaging in our homes. This packaging provides many functions. It must protect the meal in the distribution supply chain and it must preserve the meal in the freezer or refrigerator. Dual ovenable packs are particularly convenient, as they must be made to withstand the temperatures of the oven and microwave.

Source: Pira International 2004





Source: Pira International 2004

Cultural differences also influence the food we eat and packaging we use

We consume more ready meals in the UK per capita than any other nation in Europe. We are particularly fond of chilled ready meals, whereas in Germany, Italy, Spain and other countries frozen meals are preferred. These differences reflect social and economic differences between the countries:

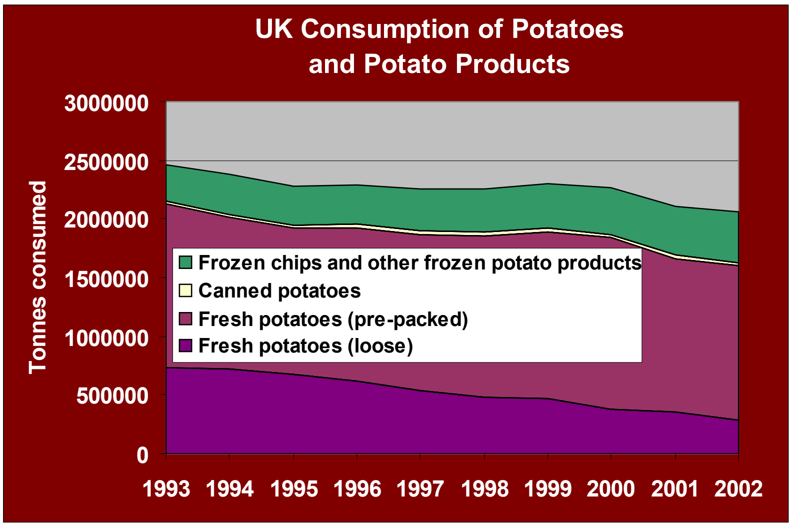
- Greater importance of the traditional family meal in Southern Europe – less formal eating has become a feature of UK households
- Higher disposable incomes – in the UK in particular, growth in income, a healthy economy and high consumer confidence has helped stimulate demand for value added convenience products such as ready meals
- Higher levels of microwave and freezer ownership in Northern Europe – the UK has the highest levels of microwave ownership in Europe

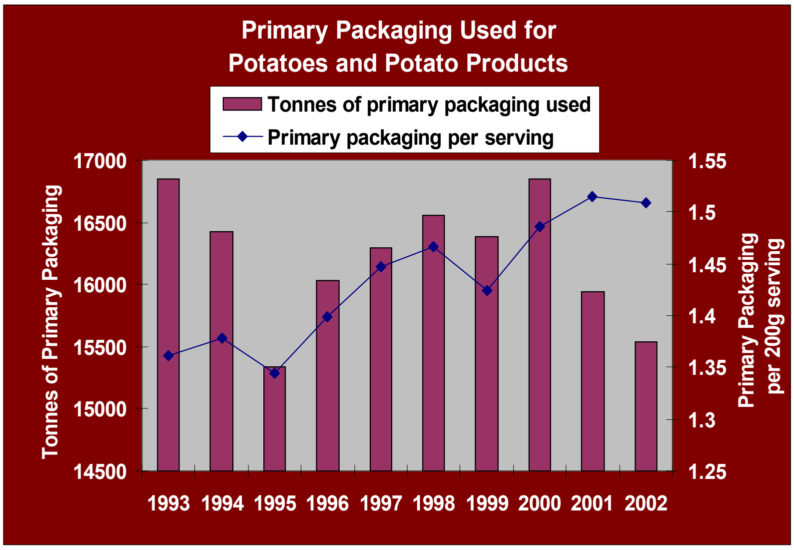
Sources: Leatherhead Food RA; Euromonitor; ACNielson,

Packaging facilitates product diversity

Potato has been a staple of the British diet for hundreds of years, but the way we choose to buy our potatoes has changed. In particular, we are buying less loose potatoes – we prefer pre-packed potatoes or pre-prepared product such as frozen chips. Overall, total consumption of potatoes has declined as we have turned towards alternatives such as rice and pasta.

Source: Raw data provided through TNS Sofres SuperPanel





The quantity of packaging used is dependent on our choices as consumers

Although the quantity of potatoes and potato products consumed in the UK declined steadily during the period 1993-2002, the quantity of primary packaging consumed fluctuated:

- Overall, we are buying more pre-packed potatoes or pre-prepared product such as frozen chips, so we are using more primary packaging per portion consumed. However, total packaging consumption has fallen as we consume less potatoes and potato products in total
- In 1995, there was a dip in consumption of frozen chips, leading to a dip in primary packaging per serving. Since 1995, consumption of frozen chips and other frozen potato products has increased steadily, contributing to the general increase in primary packaging used per portion
- Between 1996 and 1999, the market share of large volume paper sacks for pre-packed fresh potatoes grew, peaking in 1999. This contributed to the dip in primary packaging use per portion consumed in 1999. After 1999, the market share of large volume paper sacks fell markedly, contributing to the general increase in packaging use per serving

Source: Pira International 2004

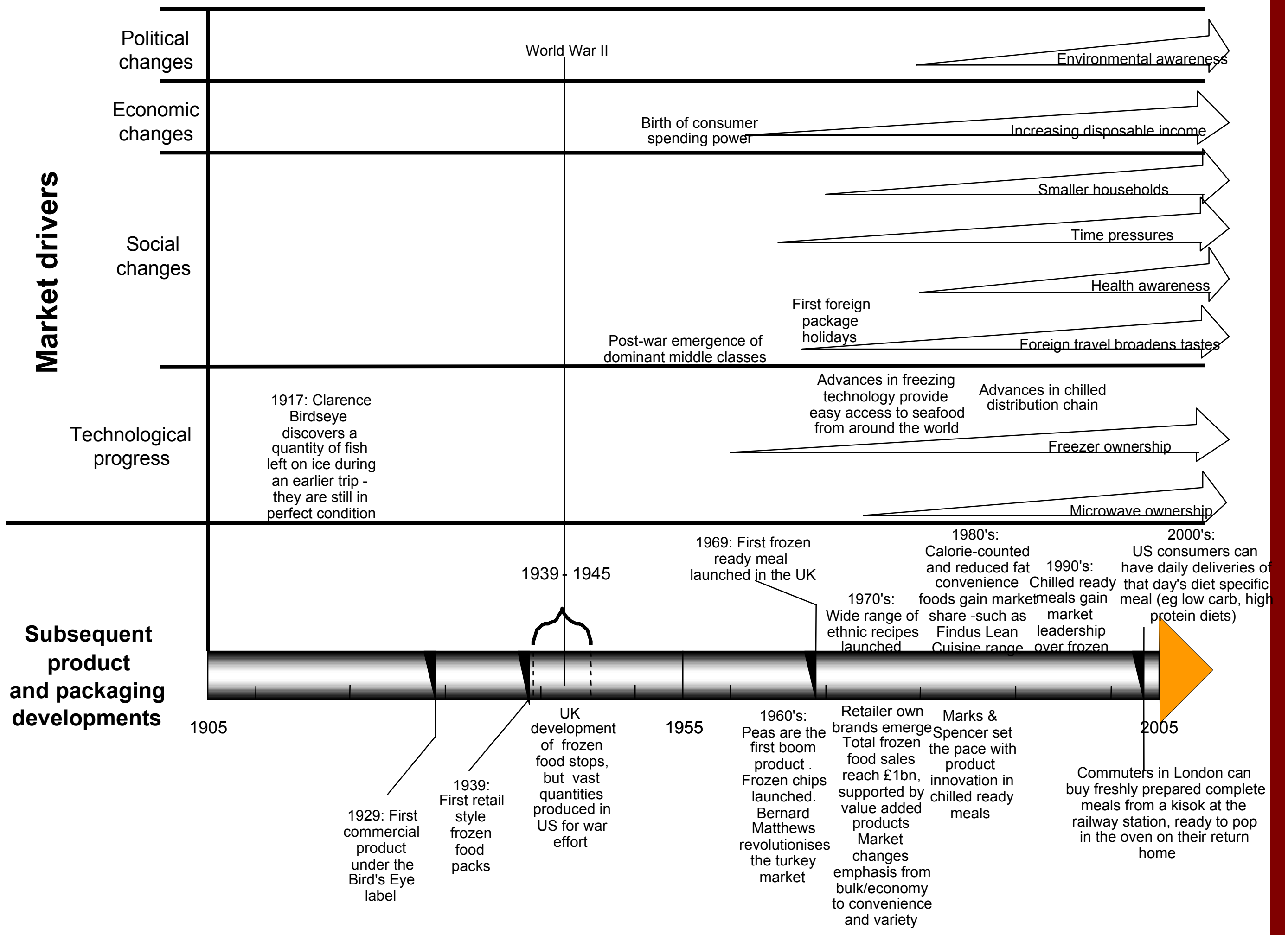
But using more packaging does not mean more waste

There is less product waste across the supply chain for a ready meal than for a meal prepared by the consumer at home. For the ready meal, the preparation waste is reused, and distribution waste is less than 1%. Only the pack and meal are transported. In contrast, for a meal prepared from ingredients in the home, there may be less packaging but 10-20% of the ingredients are wasted during distribution. The pack, product and preparation waste must all be transported, and the preparation waste is then discarded in the home.

Source: INCPEN 2004

100 Years of Frozen Food and Ready Meals

This diagram charts how frozen food and ready meal products and packaging have developed over time in response to changing market drivers.



Source: Pira International 2004

Conclusions:

There is more food packaging in our homes today than ever before. This is because the food we consume, more than any other product, is a reflection of our changing lifestyles and expectations as consumers.

More packaging does not mean more waste – across the food supply chain, there is less product wastage arising from prepared foods than there is from a meal prepared from ingredients in the home

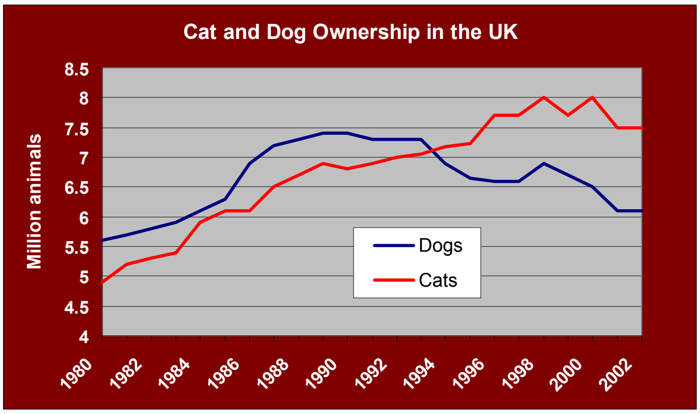
Feeding our pets

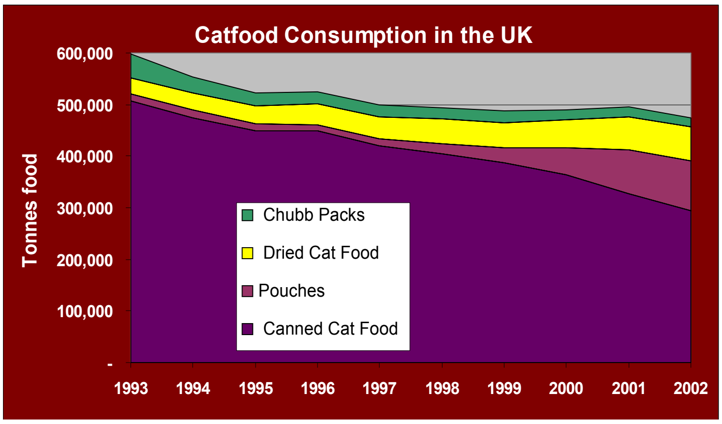
Our attitude towards feeding our pets has changed:

There are more cats than dogs in the UK

The UK has changed from a nation of dog-lovers to a nation of cat-lovers. The number of cats in the UK is now greater than the number of dogs, rising from 5million cats in 1980 to 7.5million in 2002.

Source: Pet Food Manufacturers Association





Source: Raw data provided through TNS Sofres SuperPanel

Despite this, we purchase less cat food by weight

Pet food as a packaged consumer good is a relatively new phenomenon. Before canned pet food was available, our pets were fed meals made at home from scraps and other cheap ingredients. Initially, prepared pet food products reflected our need for convenience. More recently, pet foods are also influenced by our demands for quality and health for our pets. There has subsequently been a trend towards feeding our cats dried food rather than moist/semi-moist food – this is both cheaper for us and healthier for our cats. We only need to feed a cat 70g per day of dried food, compared to 400g per day of moist food from cans or pouches. The impact of this change has been an overall reduction in the total weight of catfood consumed.

Source: Pira International

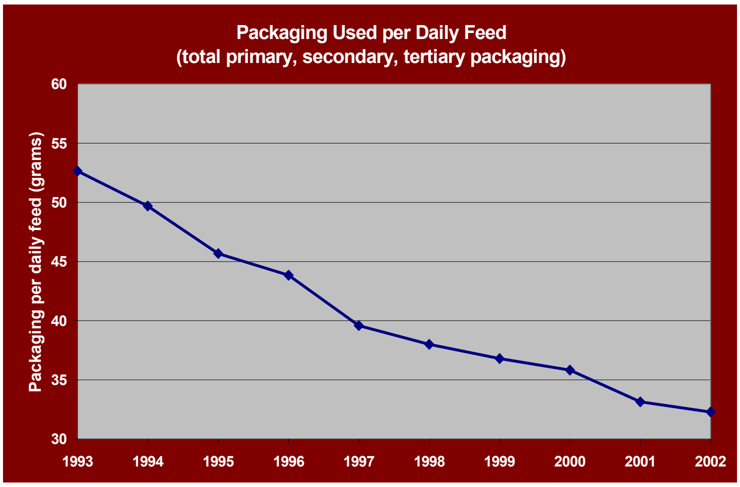
As a result, we use less packaging

There was a 35% decrease in the weight of cat food packaging between 1993 and 2002. During this time, the average weight of packaging required to pack the daily food consumed by a cat has fallen from 71g to 46g.

Changes in product consumption from moist/semi-moist to dried cat food have been a major factor behind the improvements in packaging resource efficiency. Dried cat food requires different packaging to moist and semi-moist packaging.

However, the contribution of lightweighting activities by the packaging industry should not be overlooked. During the period 1993 -2002, the weight of a 400g cat food can was reduced by 8.5% from 55g to 50.25g.

Sources: Metal Packaging Manufactuers Association; Pira International and University of Brighton, 2004

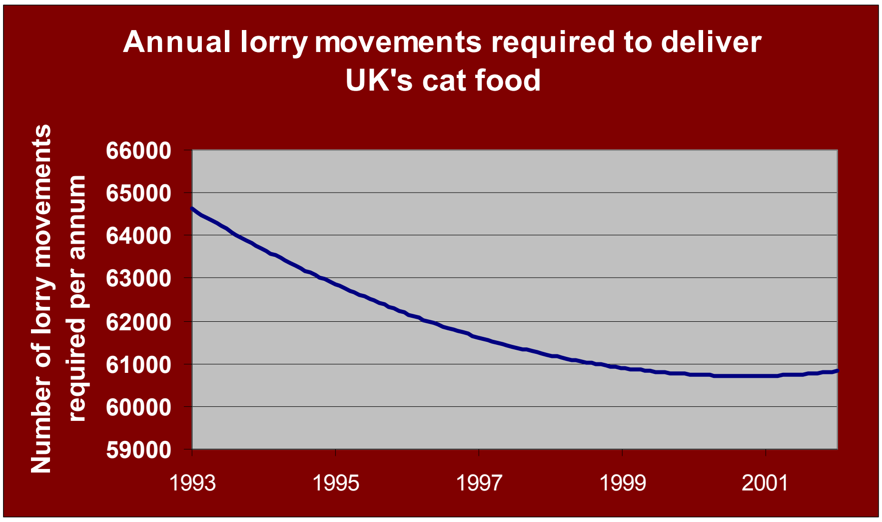


Transit packaging has also changed

Sales packaging also influences the transit packaging required during the logistics supply chain. Sales and transit packaging requirements must be carefully balanced to optimise the materials used and the pallet load configuration. The example below shows how a pet food manufacturer has reduced the transit packaging requirements for dried pet food. This redesign:

- Saved more than 2000t of packaging per annum (a saving of 60%)
- Allowed the number of sales units per palletised load to be increased by 48%
- Reduced transport requirements by 32%

Source: Conseil National de l'Emballage (French National Packaging Council)



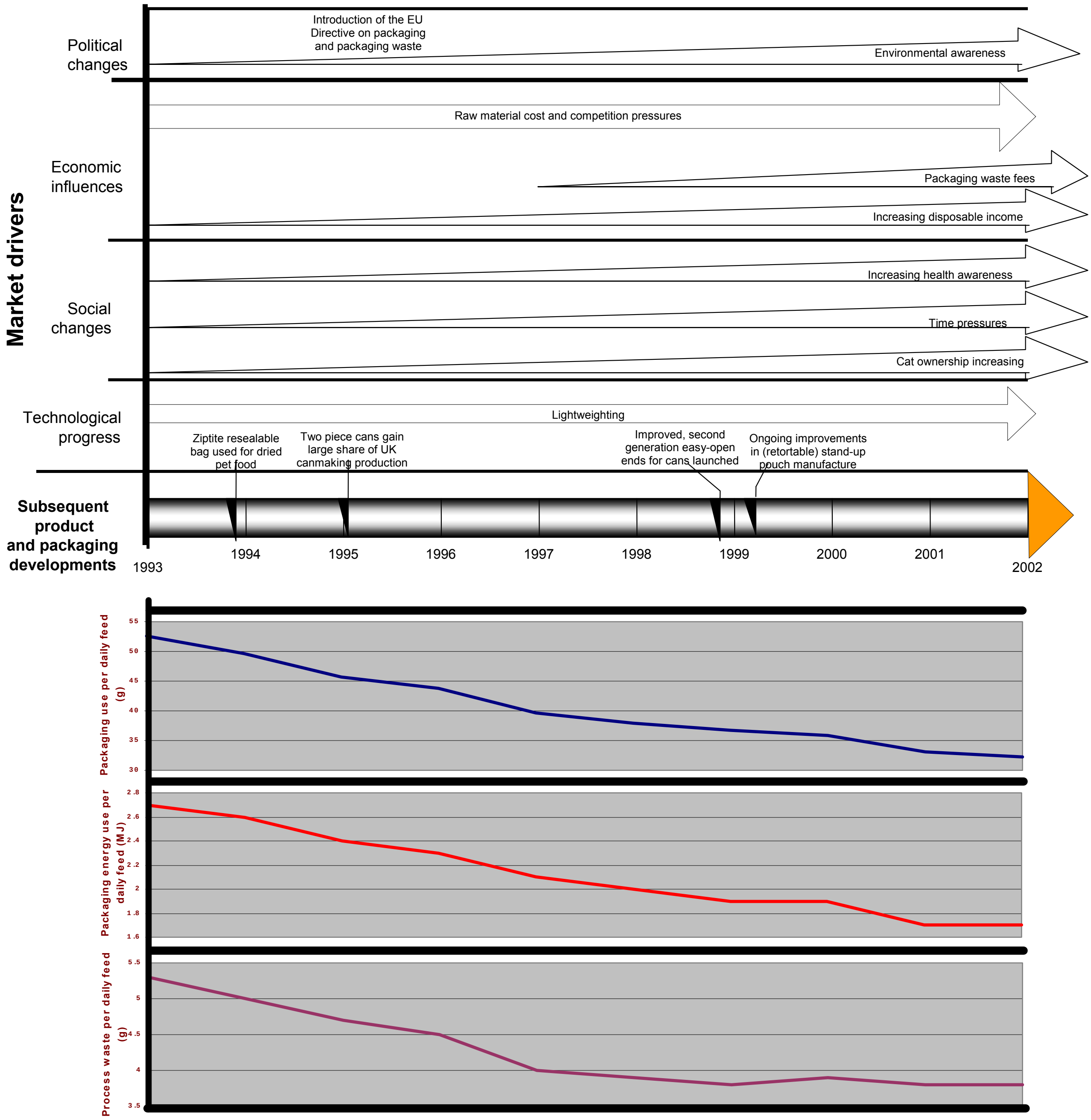
So overall, we need fewer vehicles to distribute the cat food we purchase

In 1993, the food we gave to one million cats each day would fill over 23 lorries. By 2002, the food we gave to one million cats each day would fill approximately 22 lorries. This means that, as a direct result of the trend away from moist/semi-moist food to dried food, 2690 fewer lorry movements are required each year to distribute cat food in the UK. This change has resulted in an important reduction in environmental impact during distribution – fewer lorries on the road means less fuel use and less transport-related air emissions, fewer accidents and less congestion.

Source: Pira International, University of Brighton, 2004

10 Years of Cat Food Packaging

This diagram charts how cat food products and packaging have developed over time in response to changing market drivers, and how the resource efficiency of the packaging used has improved as a result.



1993 *Source: Pira International 2004* **2002**

Conclusions:

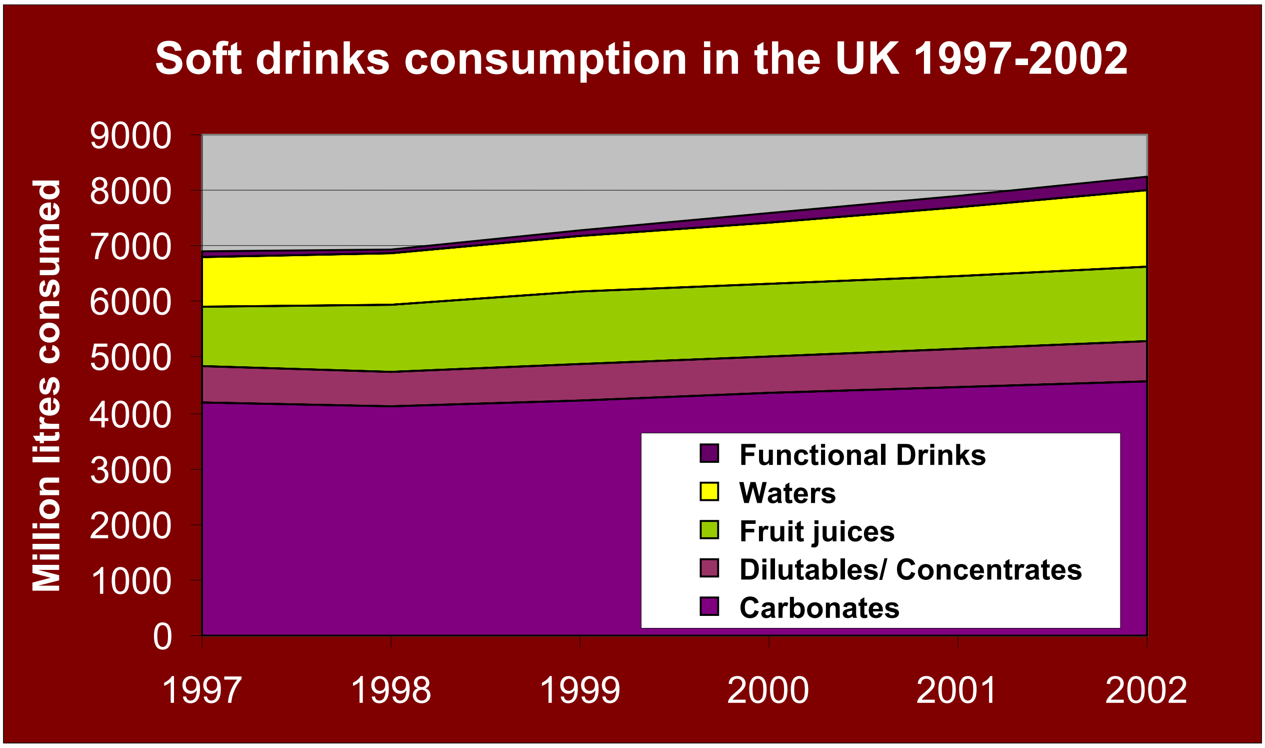
The product we buy dictates the packaging that will be used. The UK consumer's trend from moist and semi-moist cat food to dried cat food has resulted in a change in the type of packaging used. This change in purchasing habits has had positive environmental benefits. Less packaging is used and fewer vehicles are needed to distribute the product. This saves resources and fuel, prevents waste and avoids emissions.

Quenching our thirst

We drink more soft drinks now than ever before

Consumption of soft drinks in the UK is increasing markedly. Between 1989 and 2002 the total market expanded by more than 60% from 8 billion litres per annum to around 13 billion litres per annum. Growth has been experienced in all markets, with carbonated drinks and water gaining in particular. Growth has been organic, but has also been at the expense of other drinks such as tea and coffee, which are not as popular with the young as they are with older generations. Soft drinks now account for 25% of all drinks consumed in the UK.

Sources: Pira International and University of Brighton, 2004; Euromonitor; The Grocer,

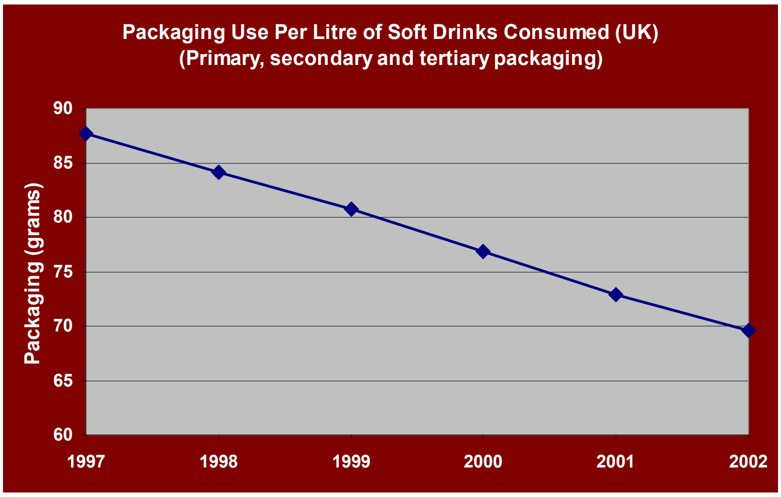


Soft drinks are available in tailored quantities

43% of soft drinks purchases are spur of the moment decisions, and 84% of soft drinks purchases are from a chiller cabinet.

Whether we want our drink at home or on-the-go, there are soft drinks products and packages available to suit our needs. Small size, light weight containers of ready-to-drink product can be purchased with sports caps or reclosable caps, or as single serve containers for convenient drinking while on-the-go. For the home, larger size containers and dilutable products offer appropriate quantities and prevent over-packing.

Sources: Pira International, The Grocer



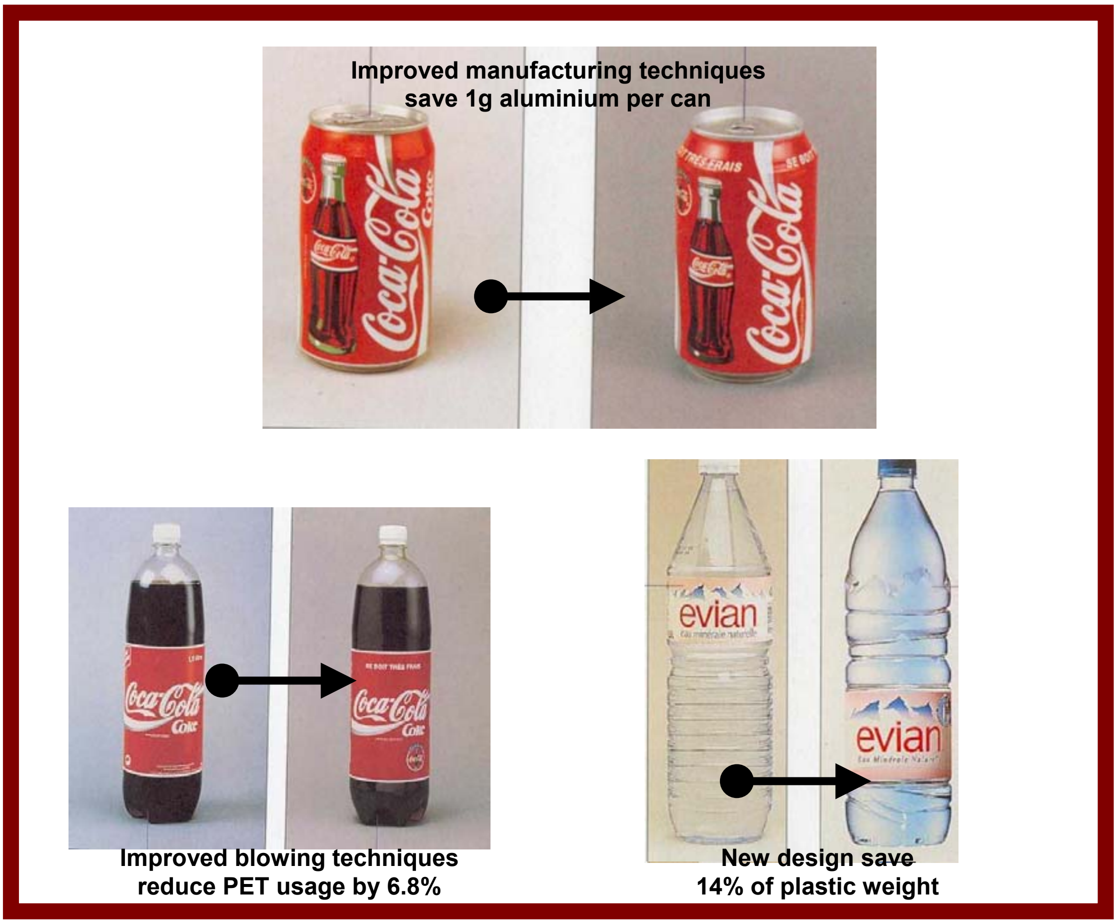
But soft drinks use less packaging per litre

In response to cost and environmental pressures, the soft drinks sector has been particularly active in packaging minimisation. These minimisation efforts, combined with the diversification of packaging formats in use, have resulted in a net reduction in packaging used per litre of soft drinks consumed. Overall, between 1997 and 2002, there was a 20% reduction in the quantity of packaging (sales and transit packaging combined) used to pack 1 litre of soft drinks in the UK.
Source: Pira International and University of Brighton 2004

And these packaging minimisation efforts prevent waste

Avoiding using resources saves energy and prevents waste production. Almost ***400,000 tonnes*** of resources were "saved" as a result of packaging minimisation activities in the soft drinks sector alone between 1997 and 2002.
Source: Pira International and University of Brighton 2004

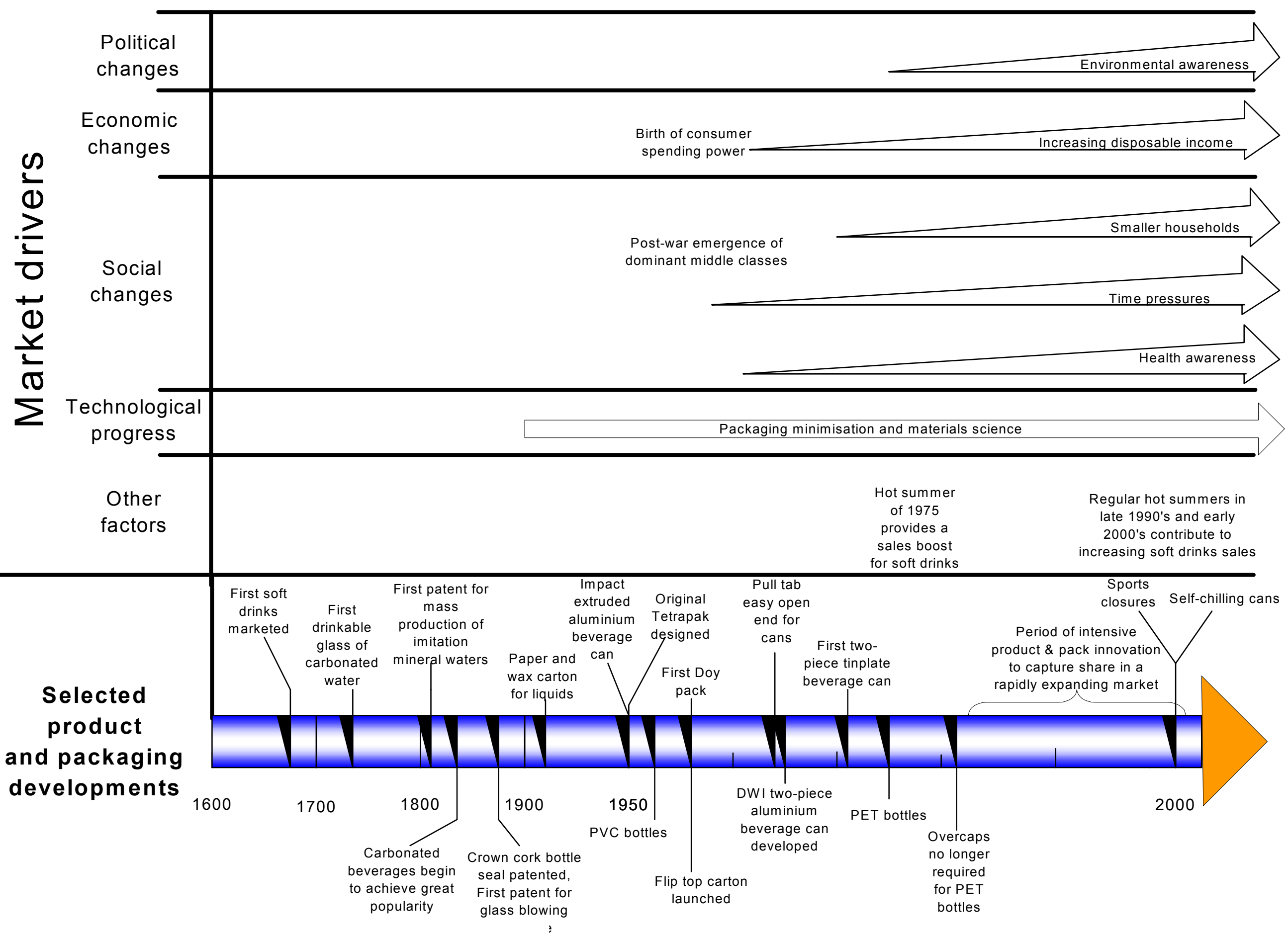
Examples of soft drinks packaging minimisation



Source: Conseil National de l'Emballage (French National Packaging Council)

400 Years of Soft Drinks

Some of the products we consume are the results of centuries of product and packaging developments. Soft drinks are a perfect example, with early origins almost 400 years ago. Today, soft drinks remains an expanding fmcg category, and brand owners must be innovative to maintain market share in this competitive sector



Source: Pira International 2004

Conclusions:

Brand owners adapt their packaging to suit changing consumer needs. In particular, products must be packed in quantities tailored to suit when and how they will be consumed.

For soft drinks, product consumption is increasing and with it total volume of packaging, but packaging weight per serving is decreasing due to minimisation efforts, which have helped reduce waste and save resources.

Washing our clothes

The way we wash our clothes has changed to reflect technological advances and social changes:

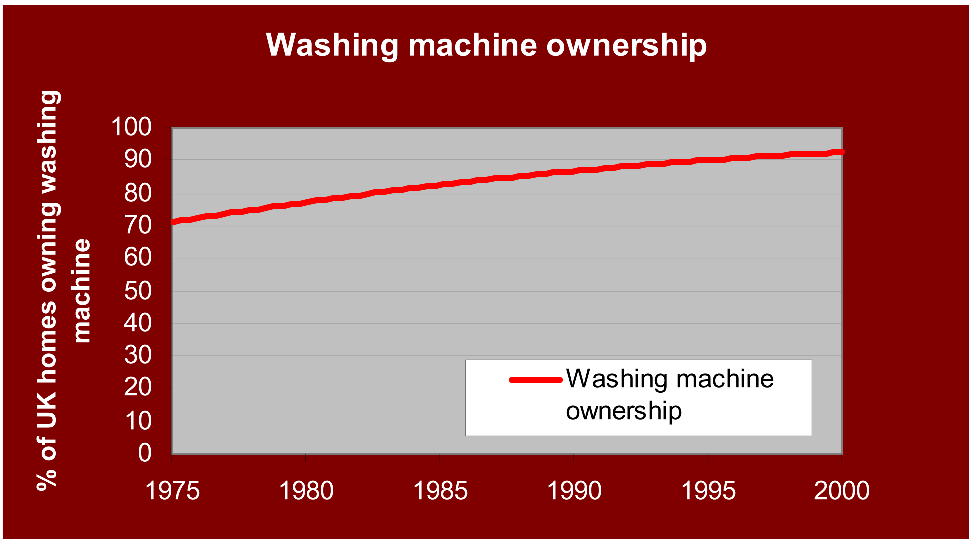
Washing machine technology and fabric detergents have improved

Over the past 30 years, these improvements have enabled consumers to

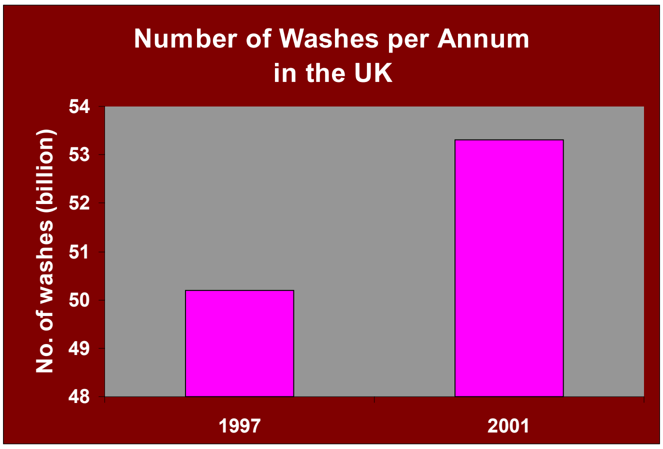
- Halve the amount of water used per wash
- Cut the amount of detergent used per wash by about one third
- Reduce average wash temperatures from 65°C to 45 °C

As a result, we now only soak 2% of washloads, compared to 20% thirty years ago, and only 1 in 10 washes are boil washed compared to 4 in 10 thirty years ago.

Source: Unilever



Source: SEEDA



But we wash our clothes more often

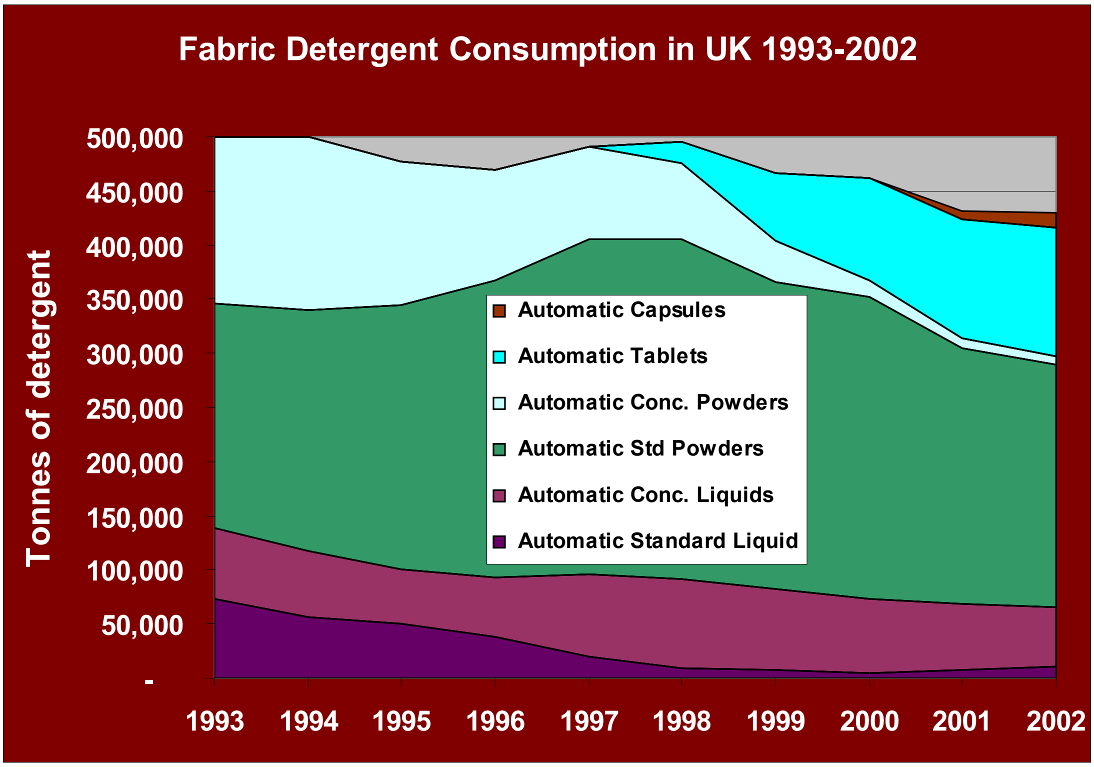
We did 3 billion more washes in the UK in 2001 than we did in 1997. There is a number of underlying factors:

- We live in smaller households, so we have fewer clothes per wash
- Our clothes are made from a greater range of fabrics requiring special washing programmes (for example, colours and delicates)
- We prefer to buy clothes that we can wash at home, so there has been a decline in dry-cleaning
- Many of us wear our clothes only once between washes

Source: AISE

There are a variety of detergent formats

The farbic detergents sector has seen massive product innovation over the years. During the early 1990s, standard liquids lost market share and are no longer an important category. Concentrated powders have remained fairly stable. Standard powder has always been the dominant category, but in 1990, concentrated powders were introduced. These use less ingredients and packaging materials and deliver the same performance as non-concentrates. Initially these gained an important share of the market, but in the mid-1990's they lost market share. Some consumers reverted to standard powder as poor dosing practices made concentrated powder appear less economical. Market share for concentrates has been further eroded by the launch of tablets which were introduced in 1998. These control and reduce the amount of detergent consumed per wash, while delivering equal cleaning and care performance.



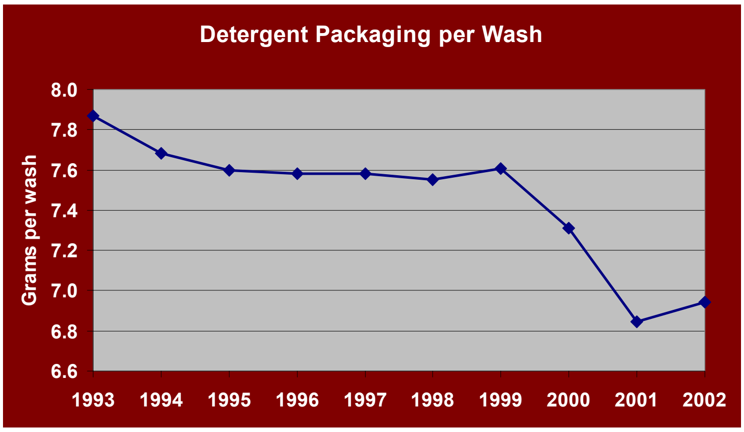
And our purchasing decisions influence the packaging required

The amount of packaging required per unit wash is influenced by many factors:

- The type of product we buy (for example, concentrated products use less packaging per unit wash, but more convenient products such as tablets may require additional packaging)
- As we live in smaller households, we buy smaller boxes and bottles of detergent, which use more packaging per unit wash.

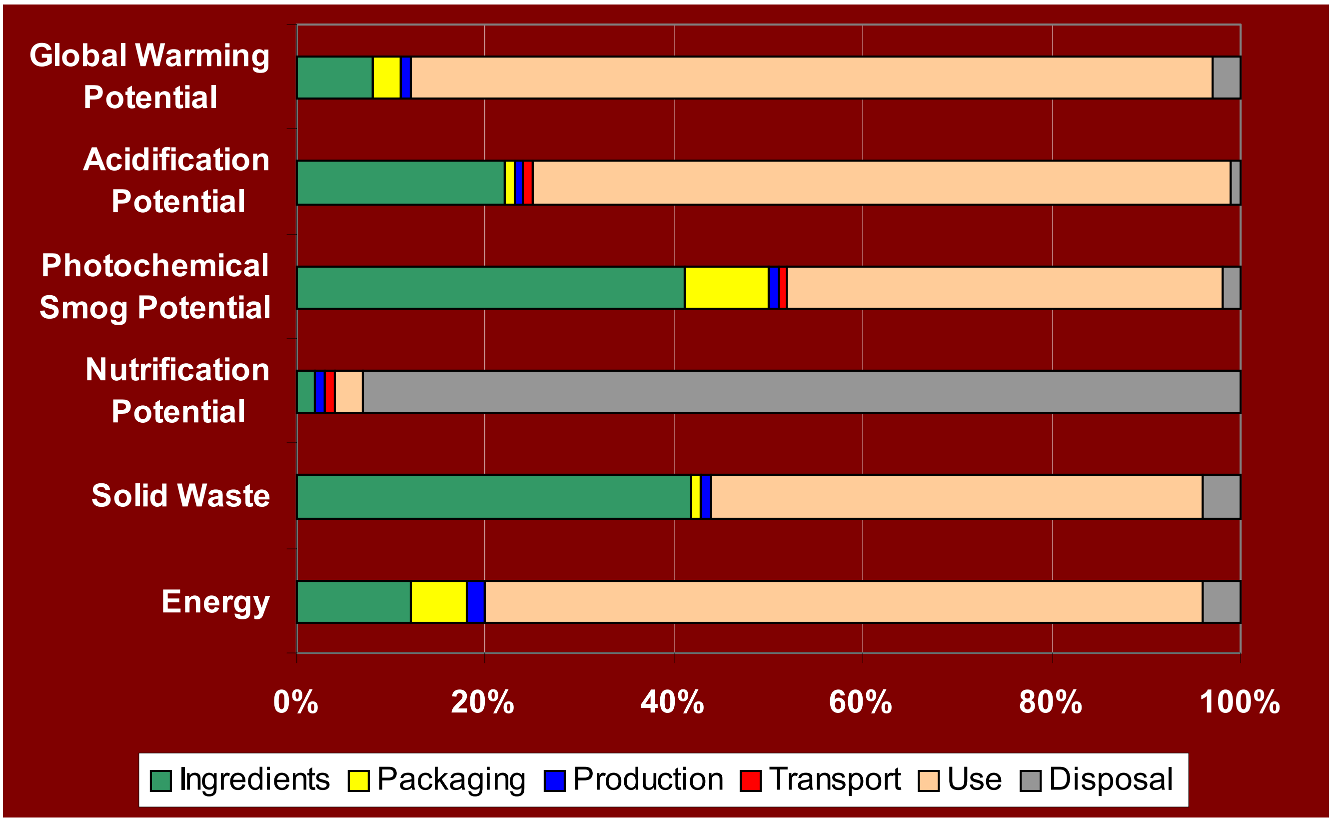
Nonetheless, during the period 1993 to 2002 there was an overall reduction in packaging used per wash.

Source: Pira International, University of Brighton, 2004



But packaging is not the main environmental impact

The use phase in the washing of clothes has a much greater environmental impact than the manufacture of either the washing machine or the fabric detergent production and associated packaging waste. Laundry habits such as how much detergent is used, the types of detergent chosen and water temperature influence the overall environmental impact a lot more than packaging. As consumers, we should choose the correct wash temperature, dose the right amount and use our washing machines efficiently, as recommended by AISE's Washright initiative.
Source: AISE



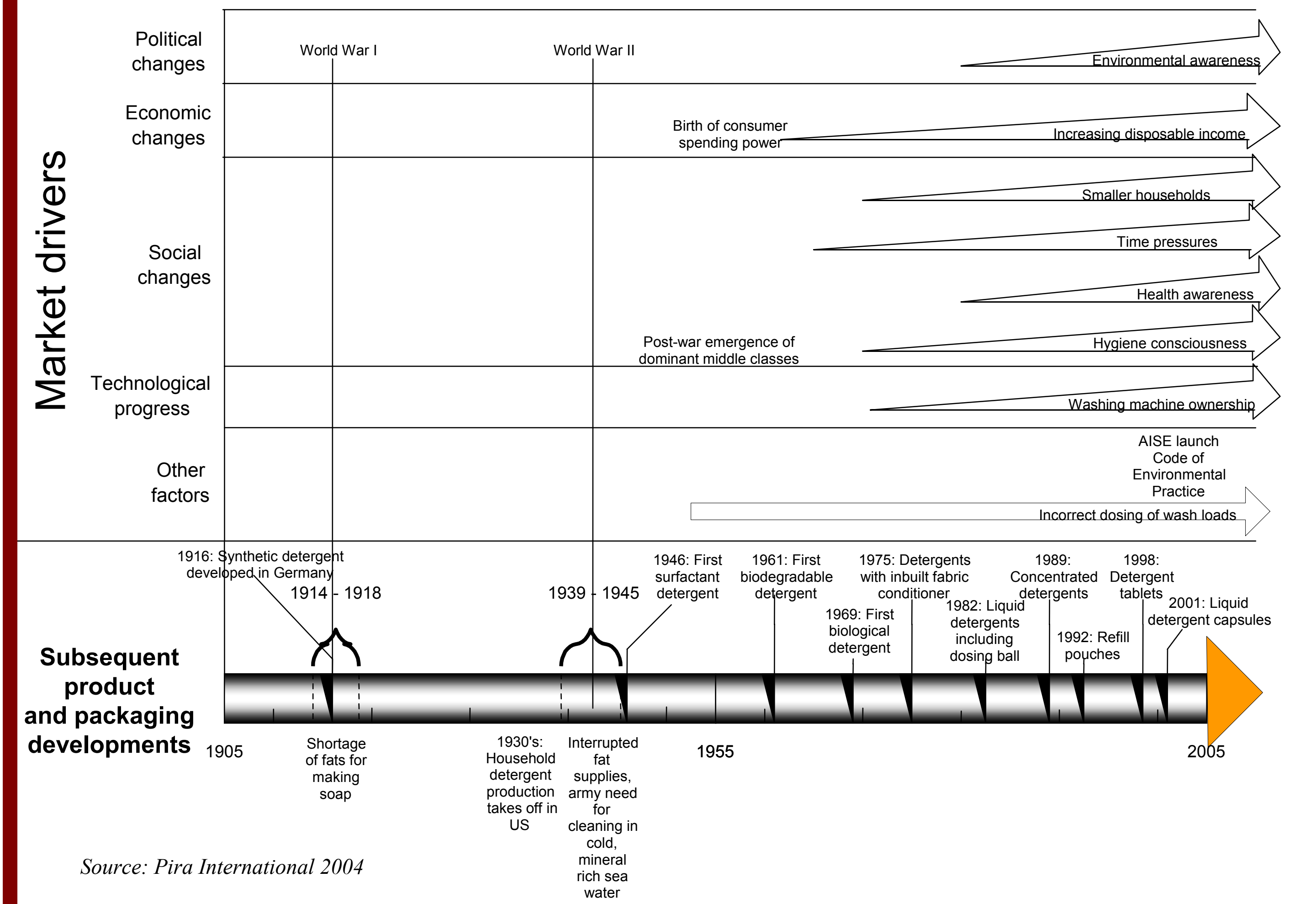
Source: Unit Dose, A Sustainability Step for Fabrics Liquids, Unilever 2001

Some technology and product developments have helped the environment

Improved formulations and better machine technology allow us to wash at lower temperatures and save energy. New products such as tablets and capsules provide convenience and at the same time ensure correct dosing. Preventing the consumer from adding "that little bit extra" prevents unnecessary use of resources. Capsules use a dose of 50g of product per wash, tablets use 83g. This compares to a typical dosage of 102g for standard powder and 114g for concentrated liquid detergent.
Source: Unilever

100 Years of Clothes Washing Detergents

This diagram charts how clothes detergent products and packaging have developed over time in response to changing market drivers



Source: Pira International 2004

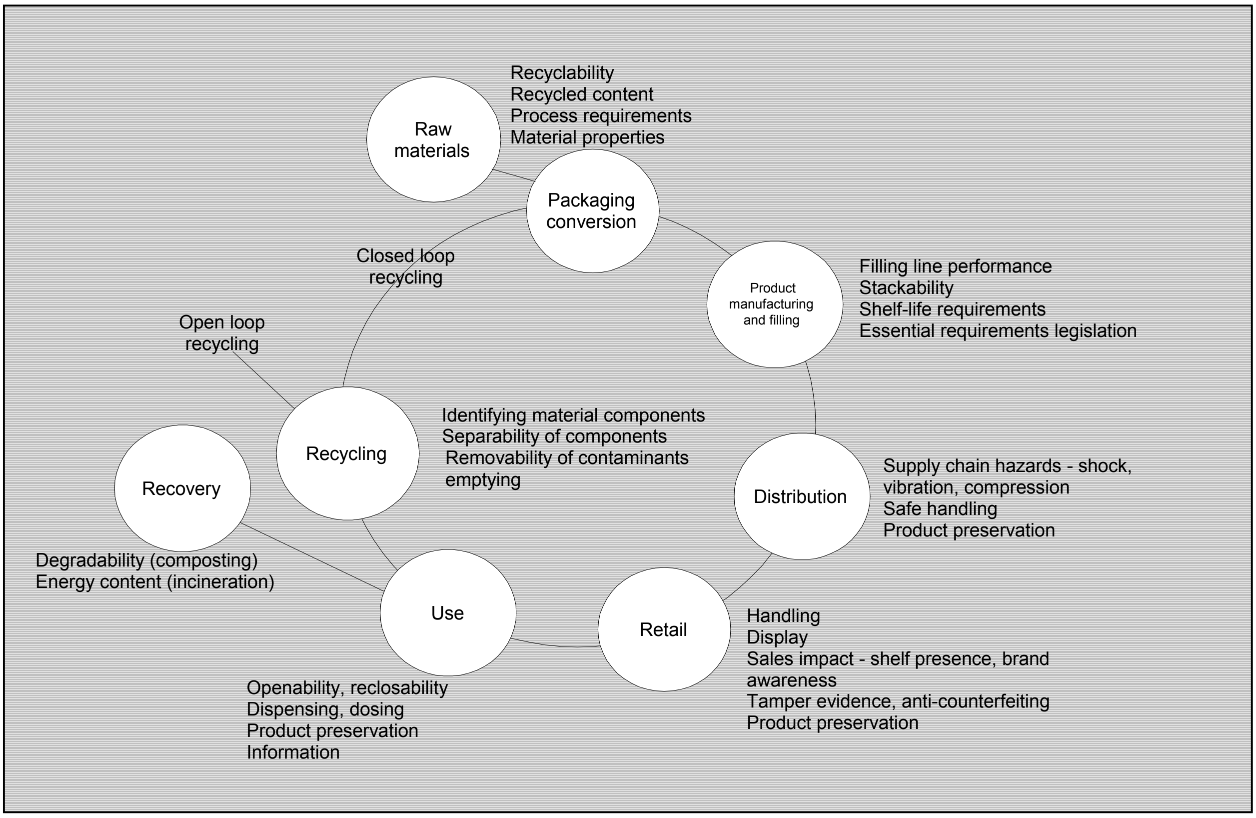
Conclusions:
How we use products is often more environmentally damaging than the packaging.
Washing machine technology developments have influenced detergent product developments. As washing machine technology has improved, detergent formulations have been able to adapt.
Product development and packaging design together can help improve product use and provide added convenience.

Packaging in perspective

Packaging performs many functions

Packaging does not exist without the products it delivers to us. It should not be viewed in isolation, but as part of the product supply chain. Throughout the supply chain, packaging must serve a range of functions. As well as preserving and protecting the products, packaging must also provide a diversity of information to the consumer. It must also allow for easy handling, opening, dispensing and sometimes reclosing. A packaging technologist must be able to develop cost-effective packaging that is in balance with the requirements of each stage of the supply chain.

Supply chain stages for fmcg packaging and considerations for packaging designers



Source: Pira International 2004

And modern lifestyles require more packaging

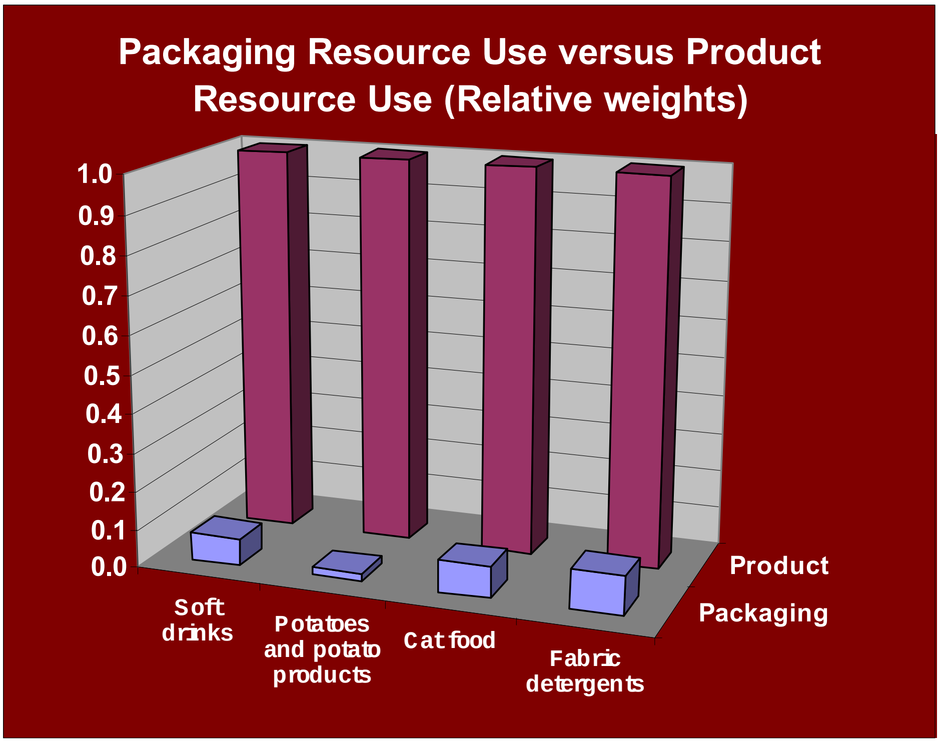
The more goods we consume, the more packaging we consume. But as well as consuming more products, we are demanding more from the products (and packaging) that we consume. Modern lifestyles demand that packaging provides even more functionality. Packaging must:

- Protect products throughout ever-longer supply chains
- Preserve products to provide longer shelf life – there is increasing emphasis on the preservation role of packaging materials as we seek to eliminate and replace preservatives in our foodstuffs
- Deliver products in quantities and formats tailored to suit how and when they will be consumed – we are demanding smaller product quantities and more on-the-go products
- Dispense products conveniently and safely – we demand convenient easy-open features, reclosability and child-resistant closures
- Add convenience to the products we use – for example, cook-in-pack convenience
- Improve sales – packaging is one of the key components that can provide a commercial advantage in the competitive arena of fast moving consumer goods

As a result, there is more packaging in the home today than ever before. It is not possible to quantify how much growth in packaging consumption has occurred, as data has not historically been collected. Data has only been collected in the UK since 1997, in order to monitor packaging waste recovery and recycling rates.

But packaging is just part of the supply chain

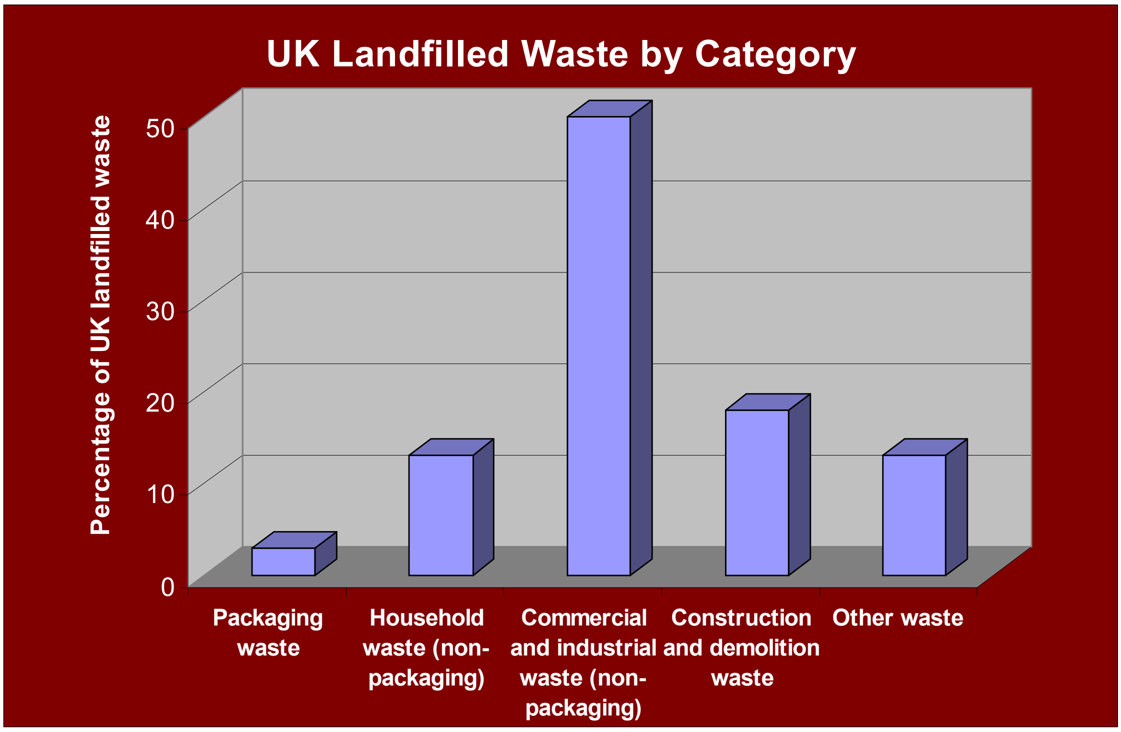
The product which packaging contains almost always has a far greater environmental impact than the packaging itself. It is essential that the packaging minimises product wastage in the supply chain and in the home. In this way, packaging has a positive role to play in the protection of the environment.



And packaging is just a small fraction of UK waste

Each year we produce over 100 million tonnes of waste from households, commerce and industry in the UK. Despite public perceptions of packaging as wasteful, less than 10% of this waste is packaging. According to official statistics submitted by the UK Government to the European Commission, around 57% of this packaging waste is already recycled (including composting), and a further 7% is also recovered (through energy recovery). As a result, packaging makes up less than 3% of total landfilled waste in the UK.

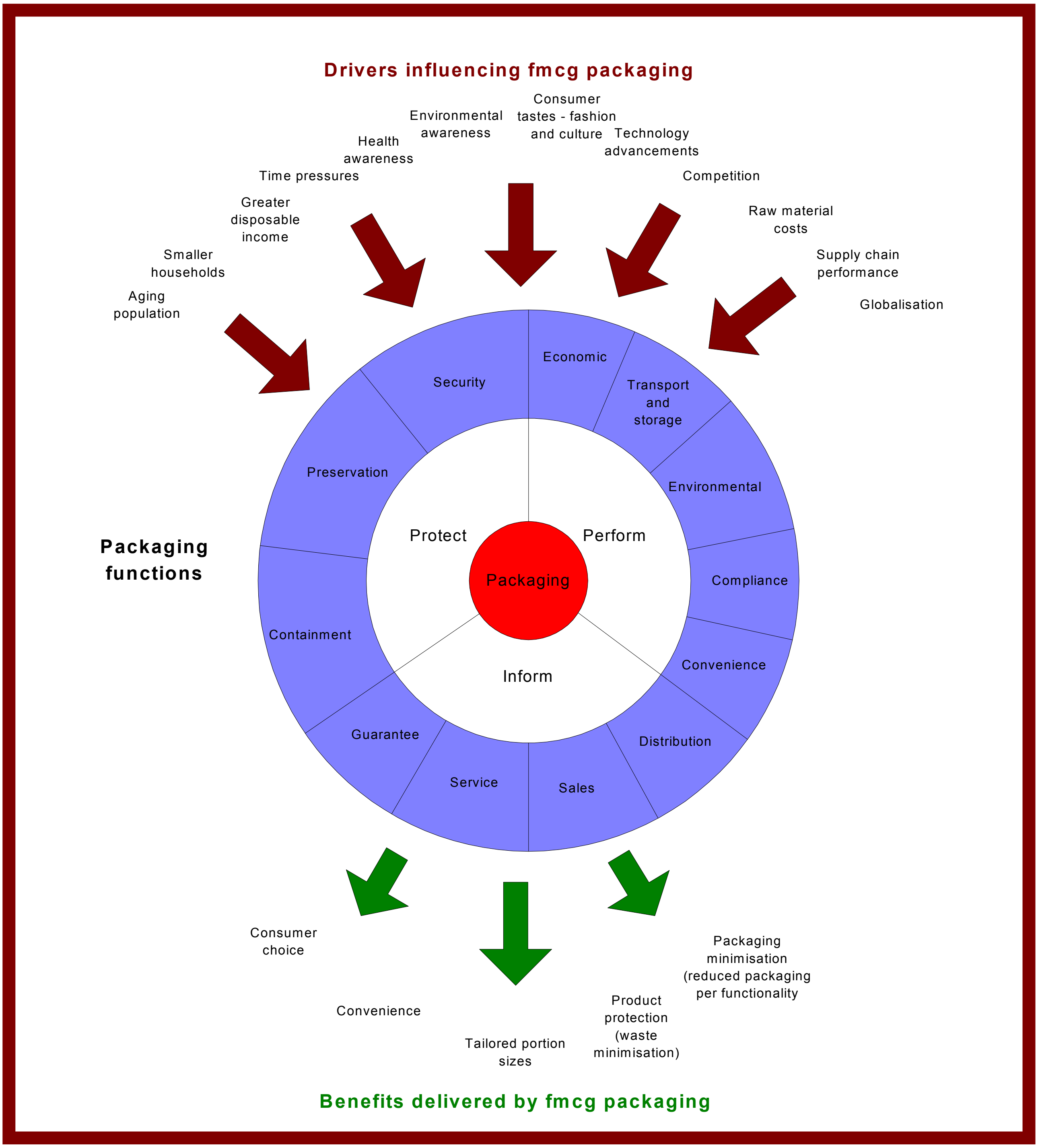
Source: DEFRA



Conclusions

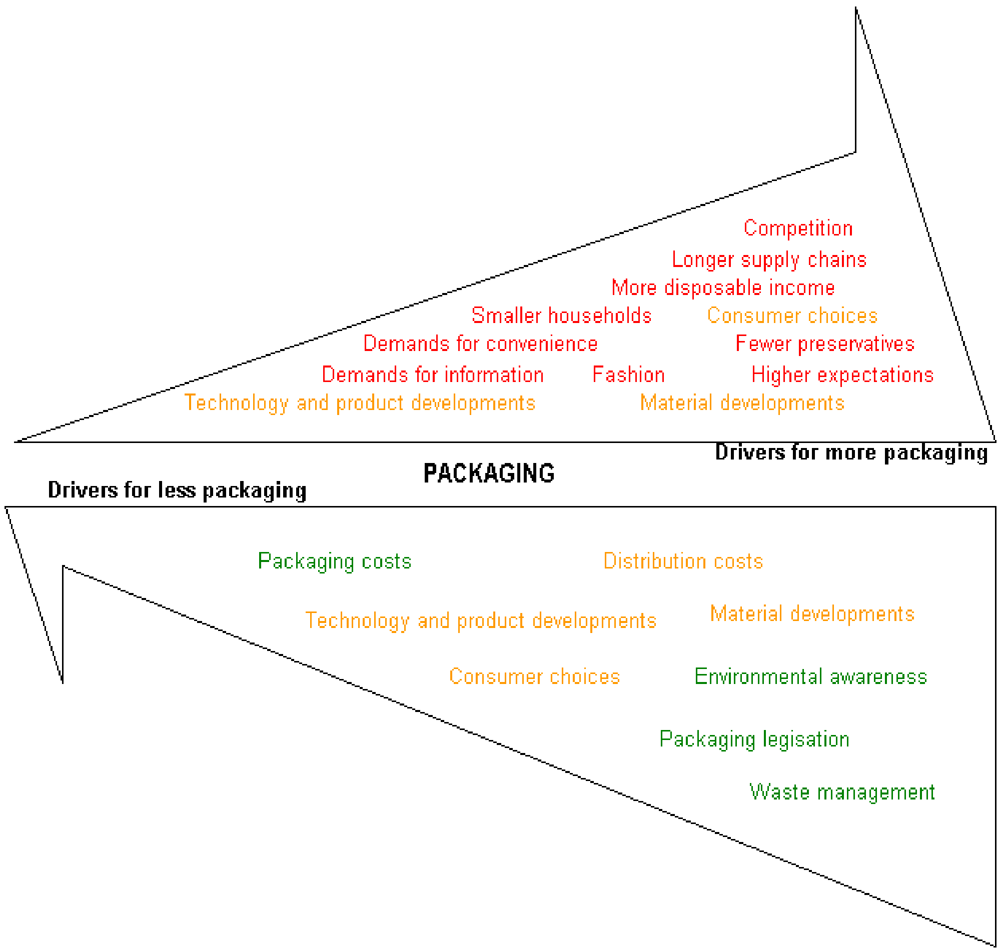
Packaging is a reflection of the society in which we live

The packaging we use reflects a range of external drivers, such as demographics, changing lifestyles and aspirations, economic growth and globalisation, competition, product and technology developments, and supply chain demands.



Source: adapted from Beeton, D.A. "Technology Roadmapping in the Packaging Sector", PhD First Year Report, Institute for Manufacturing, University of Cambridge, UK, February 2004.

Some of these drivers lead to increases in packaging use, others lead to reductions in packaging use



Source: Pira International 2004

Increased consumption of products is a major factor influencing the total packaging consumed in the UK

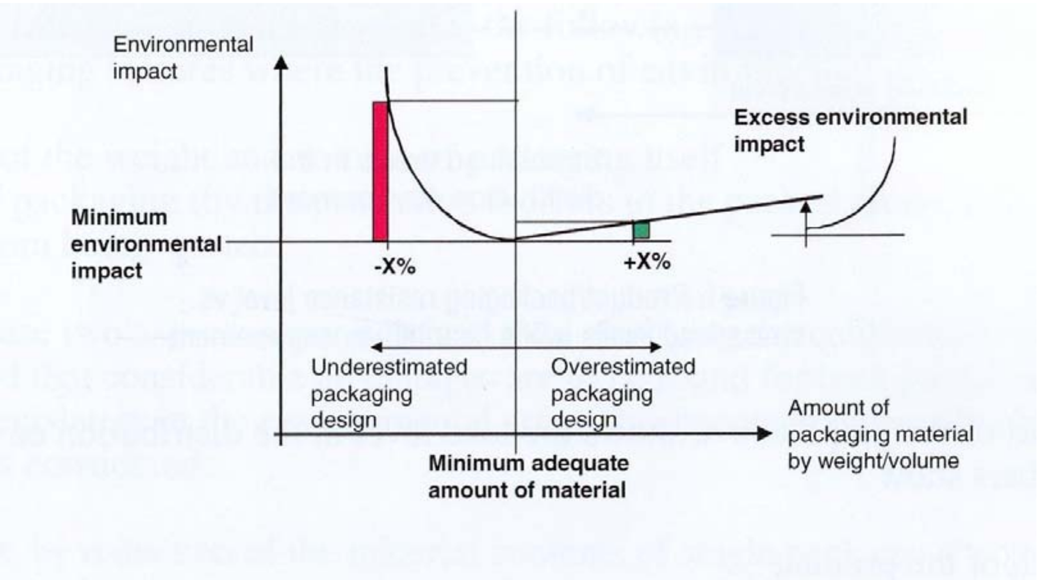
Packaging usage cannot be considered in isolation from product consumption. We consume more products today than ever before, so there is evidently going to be more packaging in our homes and offices. Packaging efficiency can only be addressed within the context of wider production and consumption patterns.

Although total volume and units of packed goods consumed in the UK has increased, packaging today is more efficient overall

The total volume and units of packaged goods consumed in the UK – and the rest of the world – continues to grow as we continue to consume more goods. However, the case studies in this report illustrate that product and packaging developments and changes in consumer demand have counteracted this growth to deliver more resource efficient packaging (by weight) per product function.

Packaging has a positive role to play in environmental protection and sustainable development

Considering the overall life cycle of a product, packaging almost always has a small environmental impact compared to the product it contains. In fact, by protecting and preserving products, packaging can make a positive contribution to environmental protection and sustainable development by preventing more significant product wastage. The figure below shows how under-packaging leads to product damage, which has a high environmental impact as resources are wasted. In contrast, over-packaging has a smaller environmental impact – only the additional packaging material is wasted, which is much less significant than the product it protects.



Source: Packaging – a tool for the prevention of environmental impact, Lars Erlov, Catherine Lofgren and Anders Soras, Packforsk, June 2000

Packaging facilitates choice and convenience

As consumers, we expect products to be easier to use and deliver more functionality. As an integral part of the product system, packaging is an excellent medium for delivering choice and convenience, and is therefore an important tool for fmcg manufacturers and brand owners operating in a highly competitive environment.

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- Metal Packaging Manufacturers Association
- Michael Coe & Associates
- Pro Carton
- Exel's Packaging Datastore
- UK Cleaning Products Industry Association

Project Panel

Throughout the project, the team was assisted by a Project Panel made up of various stakeholders. This group raised issues and gave feedback, enabling real issues to be highlighted and practical solutions to be proposed.

The Project Panel comprised:

Adrian Hawkes	Valpak
Ian Dent	The Packaging Federation
Jane Bickerstaffe	INCPEN
Peter Jones	Biffa Waste Services

INCPEN, the Industry Council for Packaging and the Environment, is a research organisation set up in 1974 to study the environmental and social impacts of packaging. It promotes best practice in packaging manufacturing, distribution and use and supports research into resource-efficiency and recovery methods.

The Packaging Federation is the representative body of the UK packaging manufacturing industry. The Federation actively promotes the industry, its economic importance, the products it produces, the benefits to the community deriving from packaging, and the industry's responsible concern for the environment and the community as a whole.

Biffa Waste Services Ltd is the waste management company that in 1997 set up the landfill tax credit scheme, Biffaward, to provide accessible, well-researched information about the flows of different resources through the UK economy.

Valpak is the UK's leading Producer Responsibility scheme, helping over 5,000 companies comply with the Packaging Waste Regulations.

Further Copies of this report and Copies of the Technical Annex

Further copies of this report, plus a technical annex providing details of the methodology and assumptions behind the research and providing further results and conclusions for each case study can be found on the following websites:

- www.piranet.com
- www.brighton.ac.uk/environment/consultancy/beb.htm
- www.packagingfedn.co.uk
- www.valpak.co.uk