



Towards Greener Households
Products, Packaging and Energy

Introduction

This booklet is based on a study of the environmental impact of households commissioned by INCPEN from Dr Jan Kooijman, a Dutch expert on supply chain analysis. It follows his 1995 study for INCPEN of the UK food supply chain.



The study uses UK government statistics on household consumption of goods to provide a 'big picture' of society's overall environmental impact. Management of the world's resources is a prime challenge facing society today. If we are to achieve sustainability we need to understand our impact on the environment in order to identify where things need to change. This report is a contribution to that process.

INCPEN and the Packaging Supply Chain

Companies in the packaging business are more aware of environmental issues than many other industries. They have been in the environmental spotlight since the early 1970s.

INCPEN was established at that time to study packaging's impact on society and the environment. Its members are companies that are involved in all aspects of the distribution of packaged goods: suppliers of packaging raw materials, packaging manufacturers, and manufacturers and retailers of packaged goods.

Since the 1970s, companies throughout this supply chain have made significant efforts to reduce the resources used in packaging. They also fund a number of packaging recycling schemes.

Despite economic growth and the vastly increased range of goods which we, as consumers, now buy (which means an increased number of packs), the weight of packaging in household waste has stayed roughly stable.

This is mainly because technical innovation has enabled much less material to be used to protect the same amount of goods. This is in stark contrast to other items, such as newspapers, which have doubled or trebled in size - so much so that the Sunday papers are now too heavy for paper boys and girls to deliver.

Industry will continue to improve packaging for both commercial and environmental reasons. It is likely, though, that the biggest changes have already been made.

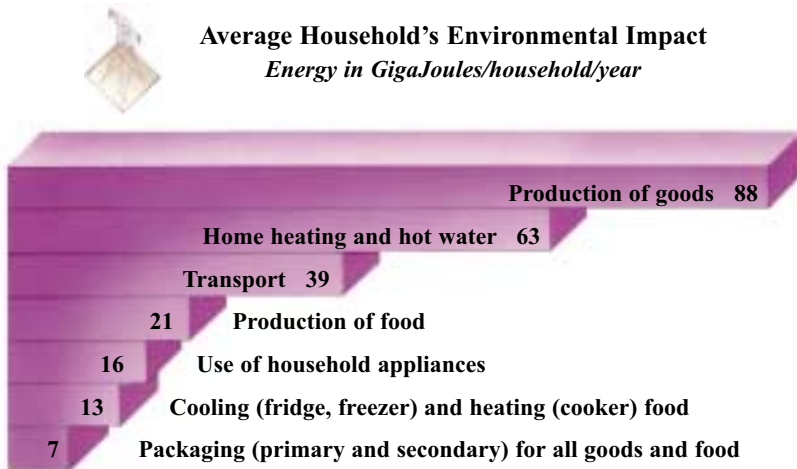
While technology will allow for further gradual improvements, the only way the total amount of packaging will reduce is if we reduce the total number of goods that we buy. That depends on our needs and desires as well as the economic climate and demographic trends.

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Key Findings and Recommendations

The following are the key findings from the research:



- ◆ A person living alone has roughly double the environmental impact of a person living in a large household.
- ◆ One person in a large household uses only 60% of the amount of materials and only 40% of the energy used by a person who lives alone.
- ◆ The environmental difference between glass, metals, paper and plastics packaging is insignificant compared to the impact of everyday activities.



As a result of these key findings, the following are recommendations for action:

Recommendations for industry:

- ◆ Minimise waste by providing a wider range of size of products so people can choose those that best suit their circumstances (eg smaller portions for people who live alone)
- ◆ Provide clear, reliable information to the public and regulators
- ◆ Practise and promote high environmental standards
- ◆ Provide longer-life goods capable of repair



Recommendations for consumers:

- ◆ Reduce use of private transport
- ◆ Choose a more fuel-efficient car
- ◆ Make energy savings at home
- ◆ Avoid wasting food and goods
- ◆ Focus attention on big impacts

Recommendations for government:

- ◆ Design policy to tackle the areas that have largest environmental impact and where there is most scope for improvement
- ◆ Ensure that policy on packaging allows companies to respond to the varied social needs with minimum environmental impact
- ◆ Planners need to take account of the impact of small households eg require developers to consider apartments with shared facilities such as launderettes



Why INCPEN commissioned the study

Much has been said about persuading consumers to reduce the environmental impact of their everyday lives but there has been little real guidance on the relative impact of different activities. INCPEN commissioned this study from Dr Kooijman, to:

- ◆ identify the product sectors that have the largest impact and greatest potential for improvement
- ◆ look at packaging in the context of the total environmental impact of our daily lives

It set out to understand the environmental impact of everything that happens in a household, from feeding the dog to doing the gardening and taking the children to school. It looked at the materials and energy used to produce, distribute and use all the *actual* goods and services used by UK households in 1998.

Measurement

Most of us can visualise living in a smaller or larger household and the effect that it would have on what we buy. The household's use of products is a good way to assess the environmental effect of the differences in households.

The study used energy as the main measure for comparing environmental impact because use of fossil fuel energy is believed to be the major contributor to global climate change. However, the materials used in the products and their packaging are shown alongside energy use.

Sources of information

The basis for the work was UK government statistics on household consumption, particularly the Family Expenditure Survey and National Food Surveys. This was supplemented by many other published and unpublished reports.

Global context

The 20% of the global population that consumes 80% of the world's raw materials lives mainly in the industrial countries. It is the production, consumption and behaviour patterns of the industrial nations that are responsible for the increasingly rapid depletion of raw materials and energy and for emission of climate change gases.



The study looks at the relative environmental impact of all household activities



Consumer Information

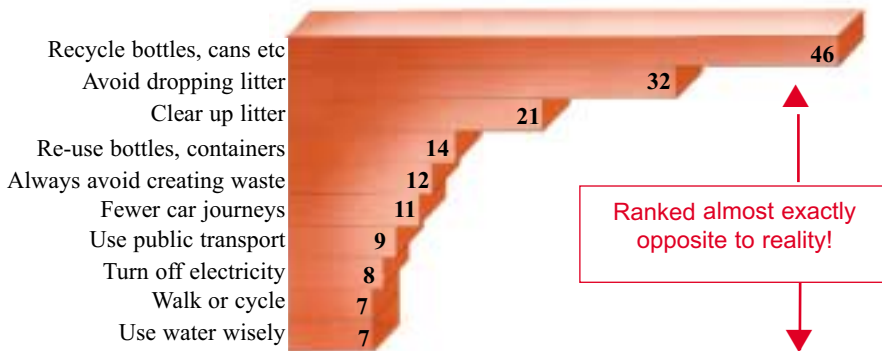
Most of us are largely unaware of the environmental impact of everyday activities and have no accurate idea of what is or is not important. For example, does it matter if you choose a paper or a plastic bag; is it more important to turn down the heating thermostat or drive your car less?

When it comes to taking action to protect the environment, the most significant thing many people say they do is to recycle some of their used packaging. In fact, a MORI study shows that the public's view of what is important environmentally is almost exactly opposite to reality.



MORI General Public Survey
(1999)

Q. What kind of things can people do to help protect and improve the environment?



Choosing a car wisely can save more energy each year than four centuries of bottle recycling

There are many other things we could do that would make a larger contribution to environmental protection and sustainable development, such as buying a more fuel-efficient car.

A household whose car travels 40 miles per gallon (family saloon car) instead of only 20 miles per gallon (a typical 4-wheel drive) saves in one year the energy equivalent to recycling all of its glass bottles for 400 years.

Lowering the room temperature by 2°C (and putting on an extra sweater) saves 6 GigaJoules (GJ) of energy a year - nearly the same amount as used for the total year's supply of packaging for the average household.



Trends in Consumption

As more of us work outside the home - making money - we have less time to make other things, such as clothing and meals from scratch, or to grow our own food. We therefore rely much more heavily on manufactured goods.

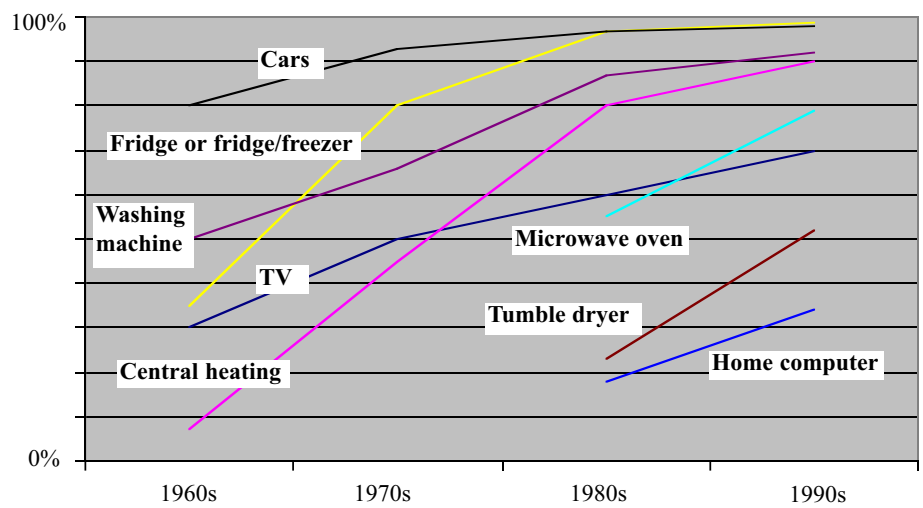
In the 1960s a typical grocery store offered 2,000 products, while today's supermarket offers over 20,000 products.

The chart shows the growth in a selection of consumer items since the 1960s.



Trends in Household Consumption

Goods owned by % of UK households

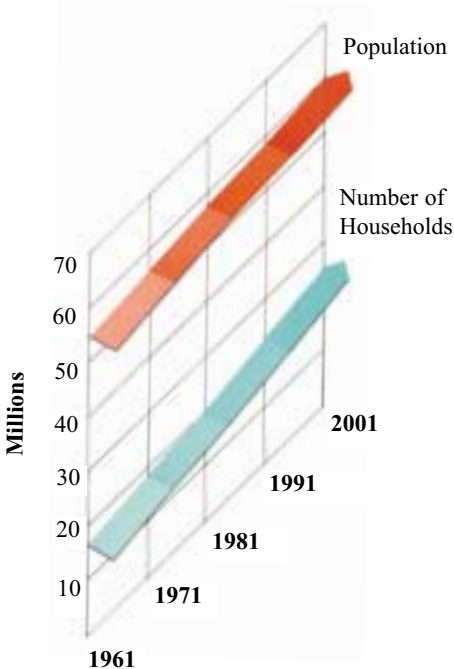


Source: Social Trends, Office for National Statistics

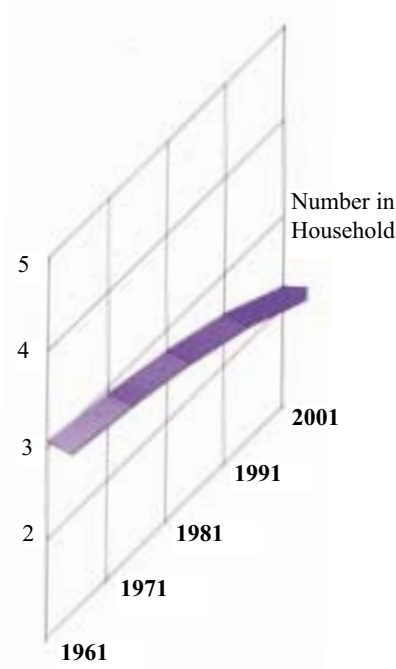
Population and Household Size

Since 1961 UK population has grown by 11% from 55 million to 60 million. In the same period, though, the number of households has grown much faster - by almost 50%. This has meant that the average household size has dropped (from 3.1 to 2.3 inhabitants) with a consequent huge increase in environmental impact.

Population & Number of Households



Average Household Size



There are a third fewer people in each household than a generation ago

The average household is 2.3 people, 0.4 cats, 0.3 dogs

What we Consume

The average UK household today is made up of 2.3 people, 0.4 cats and 0.3 dogs. In a year, the average household buys 4,300 items of all kinds, ranging from televisions to chewing gum. These purchases weigh 2.8 tonnes and require 110 GJ of energy to produce.

In total the 25 million households in the UK buy over 100 billion goods a year.

For the study, these goods were grouped under 4 headings:

- ◆ **food and drink**
- ◆ **clothing and personal care** (eg footwear, jewellery, detergents, cosmetics, medicines, spectacles, hearing aids, nappies)
- ◆ **home and interior** (eg heating of house and water, paint, plants, furniture, kettle, fridge, iron, lamps, batteries, candles)
- ◆ **education, leisure, transport** (eg paper, envelopes, newspapers, computers, TV, CDs, sporting equipment, pet food, tobacco and related products, transport and holidays, telephone and post)

The average household uses 2.8 tonnes of goods each year

Household Annual Consumption of Goods

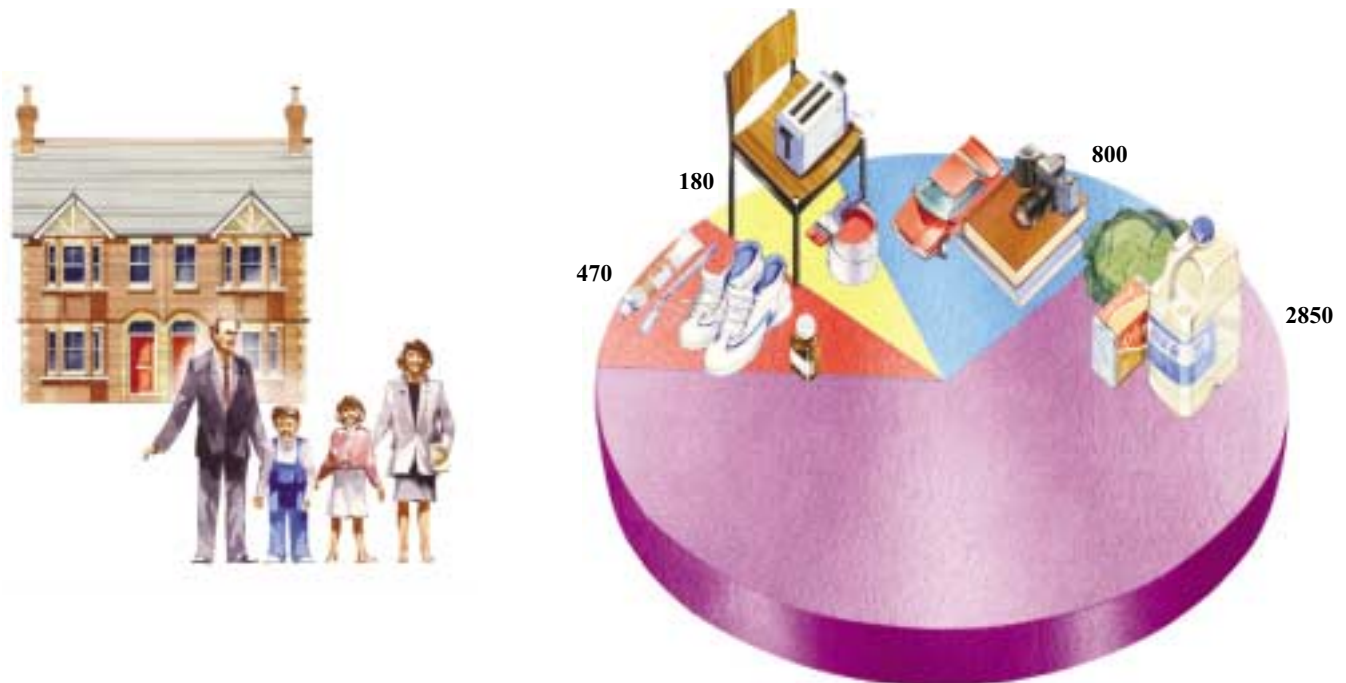
Obviously the more people there are living in a house, the more food and goods they need to buy. The following four charts show the number of items bought **per household** by:

- ◆ the average household
- ◆ a typical one-person household
- ◆ a typical household with 2 people
- ◆ a typical household with at least 3 people

In addition, the study assessed consumption (and its associated environmental impact) **per person** within each of the different sizes of household - *see page 12*.

Note that total figures throughout this report have been rounded up.

Number of Items Purchased by Average Household
4,300 items per year



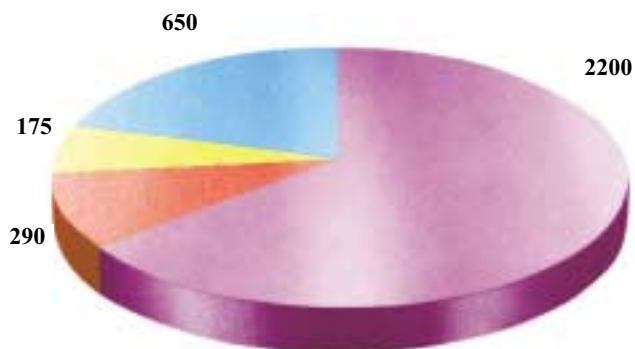
Key:

- Food and Drink
- Clothing and personal care
- Home and Interior
- Education, Leisure and Transport

To understand individual household consumption we need to know the number of inhabitants. One person living alone has a very different shopping list from a family of two adults and two children.

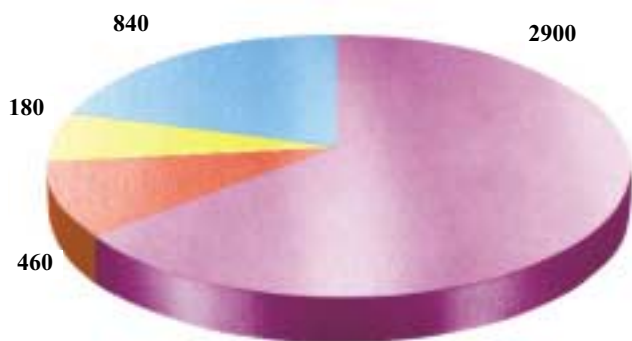
Annual Consumption Number of goods/year

One person household
3,400 items per year

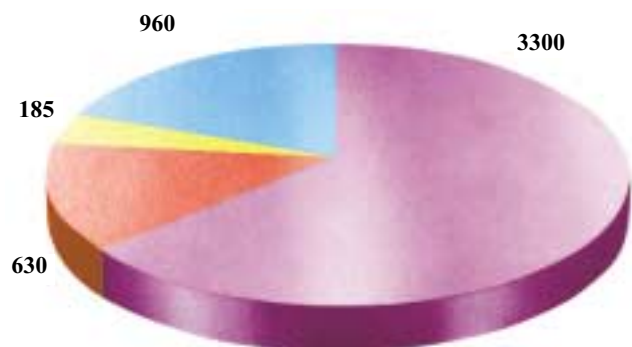


**Larger households
are far more
efficient than
single person
households**

Two person household
4,300 items per year



Three plus person household
5,100 items per year



The Average Household and all the Goods it Buys and Uses (its Supply Chain)

Environmental impact can only be judged by considering the whole supply chain

Each product has its own supply chain with links running from production or manufacture of the product and its packaging via distribution to the consumer until finally it ends up as waste. Some items such as daily newspapers become waste quickly, while others, a hi-fi system for instance, last for many years.

The critical point to note is that the chain has interconnected links and if any link is changed this has implications for the rest of the chain.

The whole purpose of the supply chain is to get products from the point of production to the point of consumption or use. Therefore, to judge a product's environmental impact (or the impact of its packaging) it is essential to assess the amount of material and energy needed at each stage.

The energy and the materials were assessed for each stage:

- ◆ Production of goods
- ◆ Packing goods
- ◆ Distribution
- ◆ Retailing (heating, lighting and storage in shops)
- ◆ Consumer use (includes driving, heating the home, using household appliances)

The data shown here is just for the average household but the study also includes an analysis for the three different household sizes.

If any link in the chain is changed (eg the packaging, the method of distribution or the consumer's behaviour) it has implications for the rest of the chain

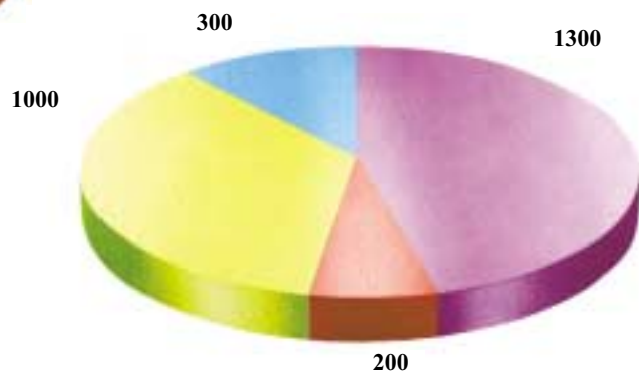
Production of goods

The first stage in the supply chain is the production of goods. These charts show the weight of goods, and the energy used to make them - from growing a field of wheat to manufacturing a car.



Weight of Goods Purchased per Household

Total 2,800 kg/year



Energy to Produce Goods

Total 110 GJ/year



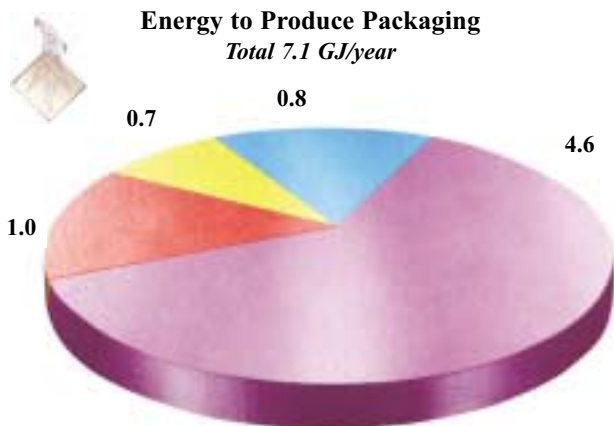
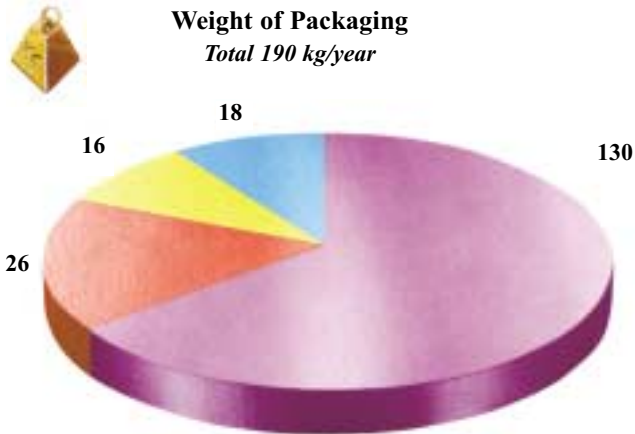
Key:

- Food and Drink
- Clothing and personal care
- Home and Interior
- Education, Leisure and Transport

Packaging

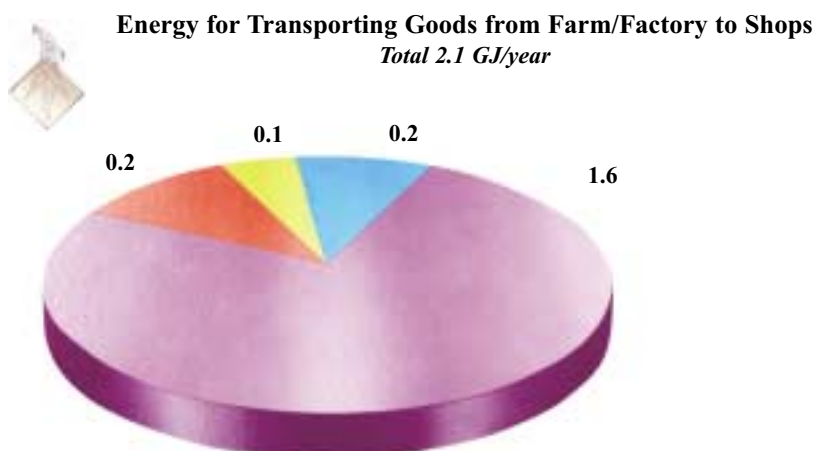
Most goods need to be packed in sales (or primary) packaging to contain and protect them - this is the packaging we see on the shop shelf. But cans, bottles and fresh fruit and vegetables cannot be put loose into a lorry. Secondary packaging is used to group and contain them during distribution - this can be a cardboard box, plastic film or tray. Wooden pallets or trolleys that the secondary packs are stacked on were not included.

Packaging has many roles. As well as containing and protecting the goods, it makes it possible to transport and handle them efficiently, which helps keep costs to consumers down.



Distribution

Packaged goods are then transported to the shops.

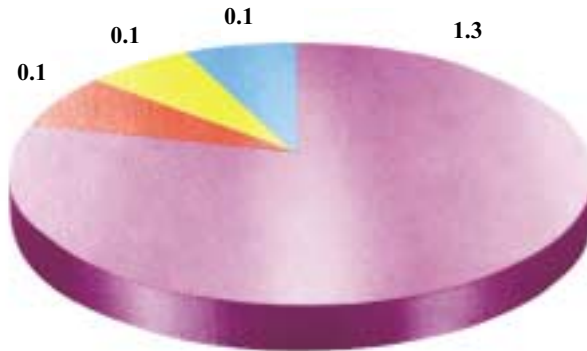


Retailing

Energy is used to heat and light shops and also to keep food at the appropriate temperature.



Energy for Heating, Cooling and Lighting Shops
Total 1.6 GJ/year



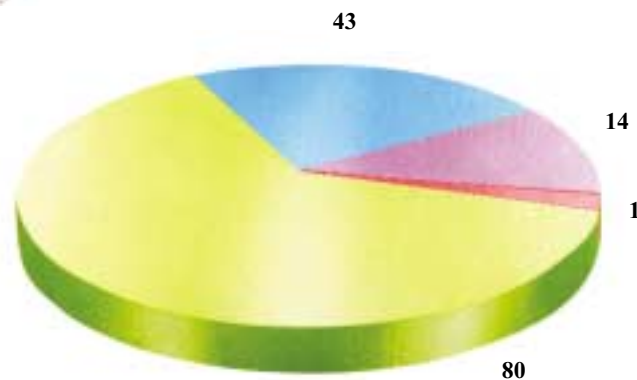
Energy used in the home is about twenty times the energy used in packaging

Household use of energy

As consumers, we have an effect on the environment simply by choosing to buy goods but how we behave and how we use goods often has an even bigger impact. For example, we can walk rather than drive to the shops, put on another jumper and turn the heating thermostat down one degree or use the low temperature washing cycle.



Energy used by Consumers at Home and for Transport
Total 140 GJ/year



Key:

- Food and Drink
- Clothing and personal care
- Home and Interior
- Education, Leisure and Transport

Waste and losses along the chain

The materials in the supply chain at some stage all end up as waste. Some losses and wastage occur all along the chain, such as off-cuts from manufacture and damaged goods at home.

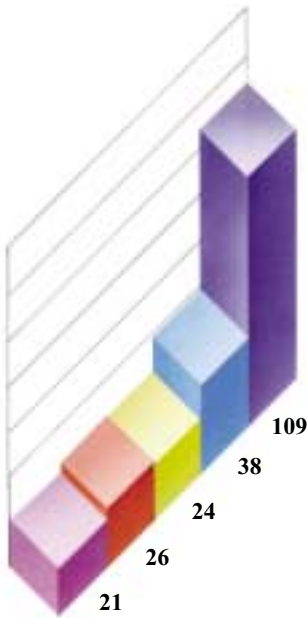
For the general public, waste and packaging are often equated but there are many other wastes that are just as or more significant but either less visible or more difficult to assess.



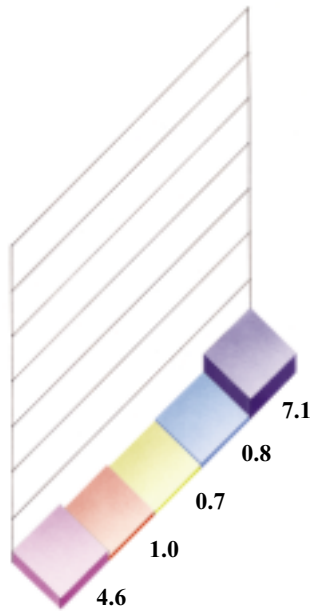
Summary of Energy Use throughout the Supply Chain

Total 260 GJ/year

Production of Goods

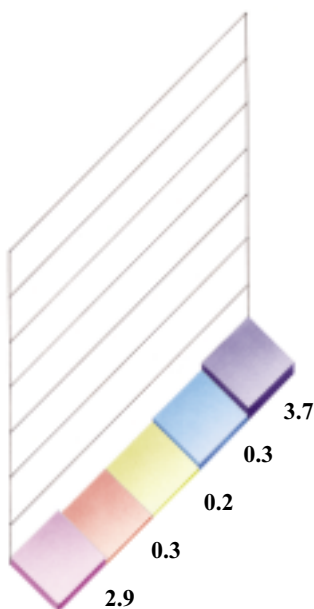


Packaging

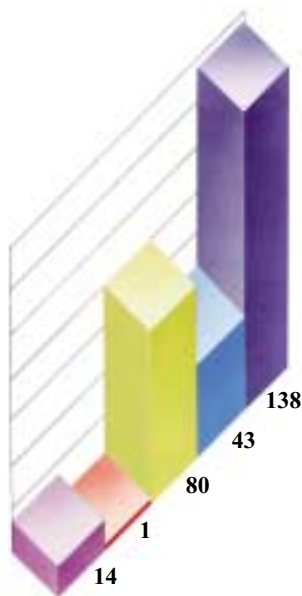


The two dominant areas of environmental impact are producing goods and using them

Distribution and Retailing



Use at Home



We need to aim to be less wasteful of home energy, food and car fuel and be more conscious of the goods we buy

Key:

- Food and Drink
- Clothing and personal care
- Home and Interior
- Education, Leisure and Transport
- TOTAL

Effect of Declining Size of Households

A single person household obviously buys fewer products than a large household but, on a per person comparison, someone who lives alone buys far more goods and uses far more energy than an individual who lives in a large household.

This is simply because each household needs hot water and heating and most have a cooker, a fridge, a TV and a host of electrical gadgets such as toasters, food mixers and drills. Some of us even own gadgets such as electric knife sharpeners, coffee bean grinders, nail polish dryers and foot spas that may never be used (so the resources used in manufacturing, packing and distributing them are totally wasted).

Cooking food has a much greater impact in smaller households - it takes nearly the same amount of energy to boil one or four eggs at the same time.

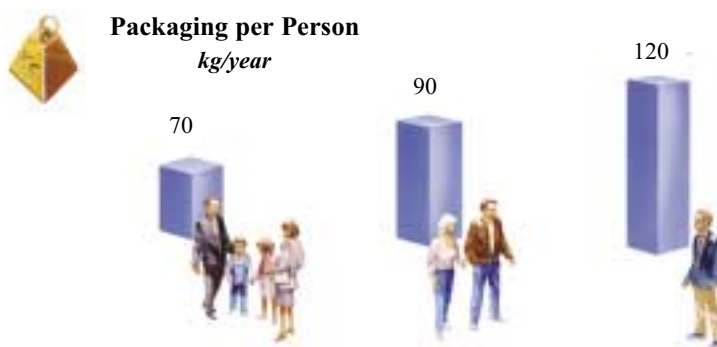
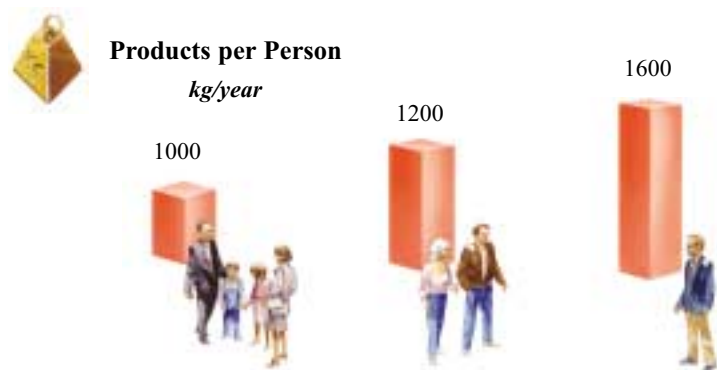
Large households are relatively efficient in terms of food use. They buy larger sizes, eat more meals together, and per person therefore generate far less waste. One person in a large household uses only 60% of the amount of materials and only 40% of the energy used by a person who lives alone.

A single person has roughly double the environmental impact of a person in a large household.

A single person has roughly double the environmental impact of a person living in a large household



Armed with better information, people can focus on the areas where they can make the most difference



Where the Big Impacts Occur

Some choices have a huge impact on the environment, others are negligible.

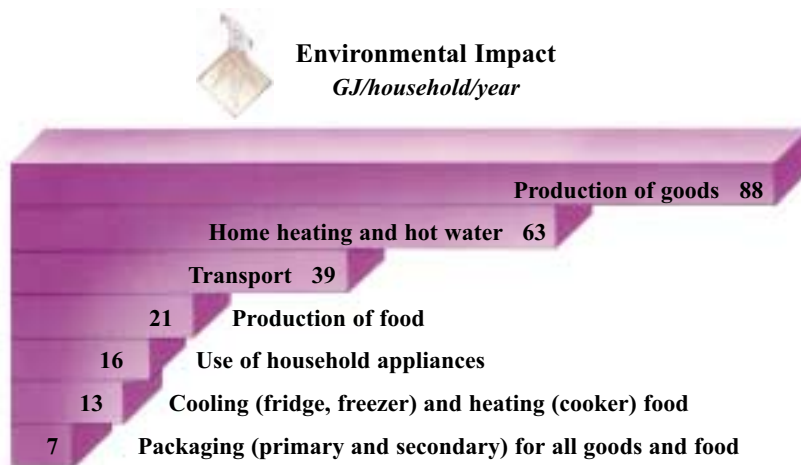
An American think tank, the Union of Concerned Scientists, carried out a similar overview of consumers' actions. Their findings matched this study.

In reviewing their book, *The Consumer's Guide to Effective Environmental Choices*, the Chairman of Earth Day 2000 said: *"Too many people drive their Land Rovers to the grocery store and think that 'paper or plastic' is a meaningful choice."*

Both studies show that the household activities with the highest environmental impact are:

- ◆ production of food and goods
- ◆ home heating and hot water
- ◆ transport
- ◆ use of household appliances

From Dr Kooijman's study, the relative importance of activities is shown below.



Relative to its job, the environmental impact of packaging is small. The difference between glass, metals, paper or plastics packaging is even smaller. Industry should aim at continuous improvement of all packaging but consumers should not worry about the environmental difference between types. They should simply choose what best suits their needs.

From a policy-making point of view this overview of the total supply chain for the country's households gives a much clearer perspective on environmental impact than sector by sector analyses. However, real improvement has to happen at the specific product sector level while taking account of the fact that the whole chain is inter-related and that different households have different needs.

It is not easy for the regulators to make changes that will affect people's lifestyles. But if society wants to achieve sustainable development, all sectors will have to make changes. And if people have better information they can at least focus on the areas where they really can make a difference and not feel guilty about the trivial decisions.



The environmental difference between glass, metal, paper and plastic packaging is insignificant compared with the impact of everyday activities

Packaged Goods in the Supply Chain

There have been many studies of the environmental impact of packaging but few, with the exception of Dr Kooijman's surveys of food supply systems, have looked at packaging in the context of what it actually does.

Packaging is just one of the links in the chain and by no means the most significant. However, because it has received a huge amount of attention, the study looked in more detail at packaged goods.

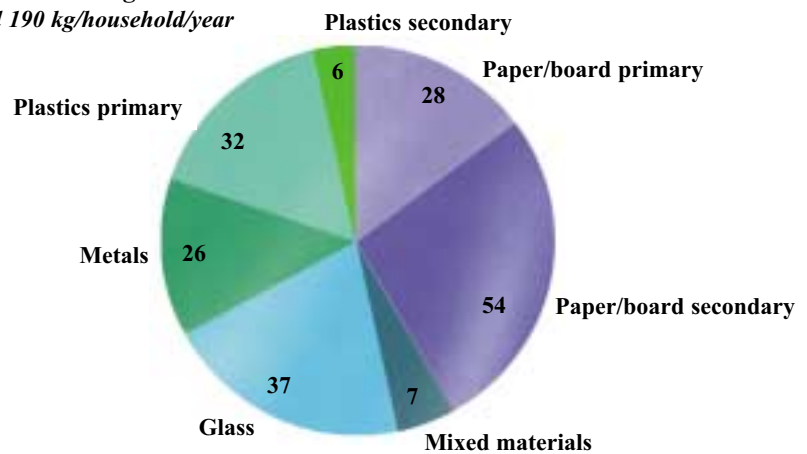
Removing goods that are not packaged, such as cars, reduces the total weight of goods by 30%. Removing energy use that is not associated with packaging, such as heating, transport and holidays, halves the total energy used.

The average household buys goods packed in 190 kg of packaging, using 7 GJ energy each year. Packaging is typically 9% of the weight of the packaged product and uses 8% of the energy for producing and delivering all products to the household.

Packaging protects more than ten times its weight of goods

Packaging for All Packaged Goods

Total 190 kg/household/year



Because there is such a diverse range of products available, they need widely varying levels of protection - from a string bag for a dozen oranges to 'breathable' plastics films for packs of bacon and a strong padded box for a computer monitor. A wide range of materials (often in combination with each other) provide these different properties.

The study defined secondary packaging as the grouping containers, including shop display materials and board dividers between loads.

A significant proportion of secondary packaging stays at the shop. If 50% of it were taken home and ended up with primary packaging in household waste, the maximum amount would be 4 million tonnes a year. Total household waste is 16 million tonnes.

On average, a maximum of 4 million tonnes of used packaging ends up in the household waste stream or is recycled each year



Household Waste Million tonnes/year

OTHER WASTE
Kitchen & garden waste, textiles, newspapers, etc 12

PACKAGING
Paper/board 1.4
Mixed materials 0.2
Glass 0.9
Metals 0.6
Plastics 0.9

Comparison of weight of packaging with number of packaged items

The weight of different packs varies greatly. Plastics represent 20% by weight of all packaging materials and are used to package over 50% of all goods. Glass is also 20% of all materials but packages only 10% of all goods.

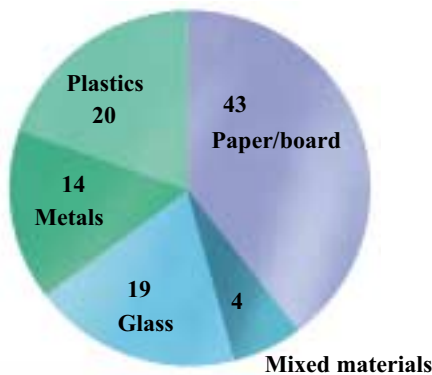
These differences have to be taken into account in setting environmental policy.

Some thin, lightweight packs may not be worth collecting for recycling because too much energy would be needed to collect and clean them. But they have environmental advantages in other ways, such as allowing more goods and less packaging to be packed in fewer lorries thus reducing transport pollution. Other packs, made of more material, may be worth recovering for further use.

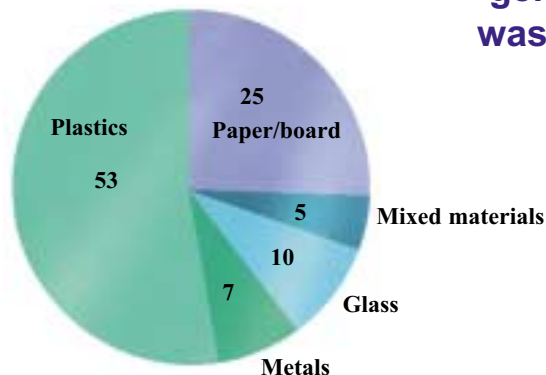
All ways of treating and managing waste have their own environmental impact. Avoiding resource consumption in the first place is always preferable.

Plastics and glass each account for 20% of the weight of all packaging - 53% of all goods are packed in plastics, 10% in glass

Weight of packaging %



Number of packaged items %



Food sold pre-packed generates less *total* waste than food sold 'loose'

Packaging use by type of goods

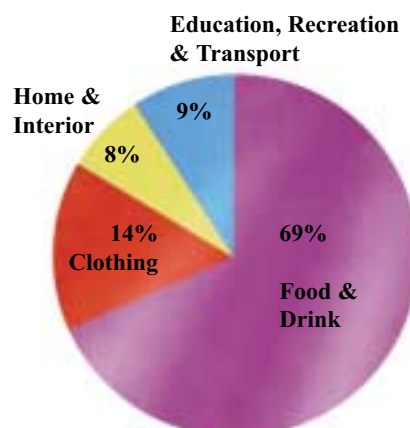
There has been much discussion about reducing packaging, so it is helpful to identify where it is used. The pie chart shows a break-down by type of use.

Over two-thirds of packaging is used for food, where it is essential to ensure that food is delivered safely to consumers.

Some foods are sold 'loose' in shops but they still need packaging during transport to the shops and wastage from 'loose' foods is typically 10% to 20% whereas it is less than 1% for the pre-packed equivalent. Food sold 'loose' from a delicatessen counter, such as slices of cold meat, surprisingly always needs more packaging than pre-packed slices.

Foods sold 'loose' from the delicatessen counter always need more packaging than the pre-packed equivalent

Packaging by Type of Goods %



Packaging and Sustainable Development



There is room to improve some packaging by reducing the resources used to make it, or in other ways such as by making it easier for people to open. This is happening as a result of commercial pressures, regulatory requirements, environmental management systems and initiatives such as 'greening' supply chains.

Imposing regulations on all packaging in order to improve the very few sub-standard packs is self-defeating. It imposes huge costs on companies (and indirectly consumers) and inhibits innovation.

Because the environmental impact of packaging is inextricably linked to the product it contains and the actual needs of the consumer, there is no such thing as 'good' or 'bad' packaging, *per se*. For example, a 300 gm glass bottle would be excessive packaging (thicker than needed) for 300 ml of fruit juice, appropriate for 300 ml of a fizzy fruit drink but inadequate (too thin) for the same amount of champagne.



Similarly, a 2 litre milk container has less environmental impact than four 0.5 litre containers, but if even a small amount (5%) of the milk goes 'off' and has to be thrown away, this wastes more energy than the total energy in making any size or type of container. Research has shown that people often throw away up to 20% of the milk they buy.

The widest possible range of types of packaging needs to be available so that companies can choose the most appropriate to match functional, social, environmental and economic needs. Relative to its job, the environmental impact of packaging is small. The difference between glass, plastics, paper or metal packs is even smaller.

A company knows the properties of its products, feedback from customers tells it whether the products have been under-packaged and cost pressures discourage over-protection.



Packaging makes a positive contribution to sustainable development. For example, modified atmosphere packaging for broccoli extends its shelf-life so it can be transported by sea instead of by air, with consequent environmental improvement.

Packaging should always be considered in the context of the goods it contains and how they are going to be used. This applies to its design and also any policy intended to influence the use of packaging.

Recycling schemes should target all items - packaging and non-packaging - that can be collected and treated economically. Small, dirty items should not be collected because the cost of doing so makes good recycling schemes unviable. They should be left in the waste stream and sent to landfill or an incinerator.

All sectors in society need to take action to contribute to sustainable development - consumers, governments, industry and industry bodies like INCPEN.



The full study on which this booklet is based: *Environmental Impact of Packaging: Performance in the household* (August 2000) by Dr JM Kooijman is available from INCPEN price £30 including postage and packing (reduced rate for students).

The more detailed report on food: *Environmental Impact of Packaging Performance in the Food Supply System* (November 1995) is also available from INCPEN price £30 including postage and packing (reduced rate for students)

Similar supply chain studies by Dr Kooijman were commissioned by INCPEN's equivalent Dutch organisation SVM-Pact in The Hague. Results are reported in *The use of packaging in Dutch households: survey of products, quantities and energy* (December 2000) and *The use of packaging in Dutch households: influence of social and demographic changes* (June 2000)



INCPEN promotes good packaging practice. *The Responsible Packaging Code of Practice* and a range of other publications are available from INCPEN.

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British Polythene Industries
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Rexam
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