PARAGON
PRINT & PACKAGING

Environmental

responsible packaging

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Environmental Policy

Conscious of the growth toward ethical consumerism and in support of our **responsible packaging** policy five year objective.

Paragon Print and Packaging are committed to the development, manufacture and supply of **responsible packaging** products to our customers.

Our paper and board is sourced from sustainable managed forests and our film division has developed a biodegradable, compostable alternative to conventional oil based products.

We have attained EN 13432 biodegradable and compostable accreditation for our labels, sleeves and film a first in the UK!

Our five pillar five year environmental objectives are industry leading and wide ranging, to deliver **responsible packaging** today and for the future.

We have already reduced landfill from our eight manufacturing sites by 60% this year and are ahead of target to achieve our no landfill objective by 2012.

compostable

PEFC™

FSC ©

‘Responsible Packaging’

Packaging and Society

What is meant by packaging and why society needs it?

What is "packaging"?

To most people "packaging" means the carton, sachet, jar etc. which contains a product at the point of sale, and during storage, transportation and use.

However, to all involved in the producing and marketing of food and all types of goods for sale, the term "packaging" includes all types of containers and wrappers used to protect, transport and distribute goods - including corrugated cases, trays, crates and pallets.

What role does packaging play in society?

Packaging is indispensable in modern society. It allows a multitude of goods to reach the consumer undamaged, in a safe and hygienic condition and to communicate important brand and product information.

Packaging maintains quality and protects the consumer from perished goods through the display of "sell by" and "use by" dates. It also deters tampering and pilfering.

Without packaging it would simply not be possible for consumers to have access to, and use most of the products, which are available today.

Is packaging wasteful?

If there was no packaging, food and other goods would be lost because of poor distribution, handling damage, lack of hygiene and insufficient information on product use. The truth is, packaging prevents waste.

FAO (Food and Agricultural Organisation of the United Nations) has at various times from the mid-1970s to the present day, expressed concern about post-harvest food waste in the less well developed parts of the world. Case studies have shown that wastage is highly variable and between 10-90% depending on the product and the location. This is due to the absence of an infrastructure which includes adequate packaging. By contrast, food wastage in more developed countries is as low as 2-3%.

Food packaging also prevents waste by extending product shelf life.

The principle for specifying packaging today is that it should be the minimal amount commensurate with providing adequate protection for the product.

Isn't packaging expensive?

No! The cost of packaging is only a small proportion of the price of a packed product.

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Packaging and Society

Would prices fall if there was no packaging?

No - prices would rise! Without the benefits of modern packaging, supermarkets could not handle, store and display the range of products they now offer and the cost of transportation and storage together with handling at the point of sale would inevitably rise.

Without packaging the amount of product waste would rise and this would have to be paid for in higher selling prices.

What are the costs of packaging?

The packaging cost is much more than the cost of the primary pack, handled by the consumer.

In addition to the cost of the primary pack, the total packaging cost must also include the cost of the secondary and tertiary packaging, the storage and transportation costs and the production cost of the packaging operation.

The way in which these different components interact determines the overall cost of packaging the product.

What do the terms primary, secondary and tertiary packaging mean?

Primary packaging surrounds the product as received by the consumer.

Secondary packaging surrounds multiples of primary packs such as shrink wrapped trays or cases for cans of processed foods and carrier packs for cans and bottles of beer.

Tertiary packaging is the transport packaging unit - usually a pallet.

Is paper based packaging bad for the environment?

The environmental impact of packaging as a result of its manufacture and use, together with the implications of its ultimate disposal, must be balanced against the benefits it provided in preventing the waste of more expensive resources, especially of food.

Depending on the product, severe environmental damage can occur if the product as a result of inadequate packaging escapes or leaks into the environment.

The main raw material resource used in paper and board manufacture is wood, which is naturally sustainable. The paper and board industry does not use wood from tropical rainforests. In the forests from which the wood for Paper and Board is derived more trees are planted than are cut down. In addition, the annual growth of new wood in these forests exceeds the amount harvested by a large margin - around 45%. These forests are sustainable, they are managed according to the best environmental practices, they help to reduce the greenhouse effect, they benefit wildlife and provide opportunities for people to work and enjoy their leisure.

Nearly 50% of the fibre used to make carton board is derived from recovered paper and board. Roughly the same proportion of the energy, another major resource used in manufacture, is derived from the wood itself and is, therefore, largely sustainable.

The local environmental effects of manufacture are minimal and water consumption has been reduced. When carton packaging has completed its function its inherent resources can be recycled as fibre, or, through composting or energy recovery.

Hence looked at from the point of view of its use of resources, manufacture, use and ultimate disposal, folding cartons have a low environmental impact.

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Packaging and Society

What is the "packaging chain"?

The "packaging chain" describes all those companies involved in making and using packaging. They are: raw material providers, such as label, sleeve and carton manufacturers, converters, who print labels and make sleeves and cartons, packer/fillers, such as the manufacturers of food and other products, who use packaging, such as folding cartons, and, finally, retailers and other distributers who provide packaged products to consumers.

What is meant by the "packaging industry"?

The packaging industry is usually understood to comprise manufacturers of packaging materials, converters who print and make packaging and packaging components, ink and adhesive makers, packaging machinery suppliers and companies providing contract packaging services.

Packaging in terms of its value is one of the leading manufacturing industries. It also plays an important role in the manufacturing industry, where packaging is used to deliver food and other products to their markets, customers and consumers.

What are the different types of packaging material?

The main packaging materials are paper and board, plastics, metals, glass and wood.

Paper and board based packaging as a whole is the most important packaging material. It accounts for 42% of European packaging by value - a larger proportion than any other material. It is the only material based on a naturally renewable raw material.

What is the main issue to consider when specifying packaging?

The main issue in specifying packaging - in other words, choosing the most appropriate packaging for a product - is to ensure that it is "fit for purpose". The packaging must fulfil its functions of protecting the product throughout the life of the product, ensuring an efficient packaging operation, efficiency in storage and distribution, in providing product information, display features at the point of sale or use, product and consumer safety, consumer convenience etc. as appropriate to the specific product and its market.

The type of packaging therefore differs from product to product. Manufacturers need to prioritise the functions they need the packaging to achieve in order to choose the most appropriate type of packaging.

Packaging in Europe has to comply with "The Essential Requirements of the European Packaging and Packaging Waste Directive, 94/62/EC". Guidance in achieving these requirements is provided by CEN, the European Committee for Standardisation, in EN 13427:2004, "Packaging -Requirements for the use of European Standards in the field of packaging and packaging waste". This is supported by 5 Standards referring, respectively, to Source Reduction (minimisation), Reuse, Material Recycling, Energy Recovery and Composting and Biodegradation. ISO Standard 14021:1999 provides further guidance on environmental labels and declarations.

EUROPEN has issued "Essential Requirements for Packaging in Europe - A Practical Guide to Using the CEN Standards" .(http://www.europen.be)

Specifiers of packaging are well aware that packaging must be functionally adequate in providing protection, identification etc., that it must be cost effective and never excessive or deceptive.

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Naturally Renewable

Retailers and product manufacturers are now asking packaging manufacturers for environmental information such as the sustainability of raw materials or energy use. The paper industry has a positive story to tell on both of these important issues.

Labels, cartons and other paper-based packaging, have one thing in common - cellulose or wood fibre from trees as its raw material. Cellulose fibre makes up 40% - 45% of wood and managing the forests sustainably, benefits both the environment and industry. As a living material, the forest thrives from care and attention from the forester, which requires a regular harvesting of the smaller trees in order to allow the stronger ones to develop. This tidying up process, together with off-cuts from the saw mills supplies the raw material for the paper and board industry.

The European paper and board industry does not use trees from tropical forests. But if half of the tropical forests have disappeared within the last 50 years, it is rarely, if ever, by reason of felling for the board industry, but rather to clear the land for short term agricultural gain; perhaps cattle ranching or soya bean production. This contrasts with the managed forests in developed countries, where the forestry industry, working closely with the paper packaging sector, has seen the development of sustainable practices. The volume of wood in the established forests is increasing, as the volume of annual new growth exceeds the volume harvested by around 45%. Growing trees also absorb and fix $C0_2$ which is in the air. Thus well maintained forests, with many newly-planted trees, help to combat the greenhouse effect by absorbing carbon which helps to stabilise the climate.

Cellulose fibre is the building block which can be reused to make new paper and board products. Through recycling, too, the fibre keeps both its energy and the carbon dioxide that it has absorbed in the forest.
The recycling process for paper and board needs an injection of new fibres, due to the loss and degeneration of fibres during use and the industrial process. These losses, without any addition of new fibres, would, in the short term, rapidly escalate the price of paper and board and would quickly disincentivise the use of the most sustainable of packaging raw material media.

A large proportion of the paper and board packaging industry's production is now made from recovered paper. The industry reached an impressive 77% recycling rate by 2005 in Europe, according to the Paper Packaging Coordination Group based in Brussels. This is well beyond the 60% target set for paper in the European Packaging Directive, which had to be achieved by 2008.

On the issue of energy use, the paper and board industry including carton board, is Europe's largest industrial producer and consumer of renewable energy. In integrated mills, where pulp and paper or board is made at the same site, the wood by-products provide energy in the form of electricity and steam for the manufacturing process. This renewable, sustainable energy source accounts for around 50% of the energy consumed in pulp, paper and carton board production.

The paper and board industry is amongst the best examples of a sustainable economic model. The traditional model is linear: extraction of resources, production of goods, consumption and then disposal or destruction. This old way of doing things can only lead to the disappearance of natural resources and increase in waste.
However the paper and board industry's closed loop is sustainable and allows for minimal use of non renewable resources, the facility to recover and reuse large amounts and less waste.

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Recycling

Definition and importance of recycling and fibre quality.

What is meant by "recycling"?

Recycling occurs when a product having completed its original function is reprocessed to convert it into useful new material.

When labels, sleeves and folding cartons are discarded after use they become part of the packaging waste stream. They can be recycled by reprocessing whereby the fibres are separated. The recovered fibre is then used to make another paper or board product. Alternatively, they can either be composted, a process also known as "organic recycling", or their energy content can be recovered in an energy-from-waste incinerator.

For recycling to happen, the packaging waste must be recovered, i.e. collected and sent to a mill. Waste arising during manufacture is relatively easy to recover, such as trimmed waste in paper-board mills and from paper-board manufacturers. However, the bulk of carton board, along with all paper and board products, is ultimately dispersed throughout society and an infrastructure is required for its recovery. It may be segregated in the home, or other point of disposal, and either collected or taken to a collecting location.

The paper and board industry has always had a recovery infrastructure and the recycling of paper and board predates the modern industrial era. Before the use of wood as a raw material the main cellulose based raw material for hundreds of years was obtained by recycling fibres from discarded linen (flax fibre).

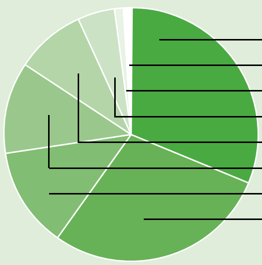
How important is recycling in the paper and board industry?

Recovered fibre, including fibre from recovered paper and board packaging, contributes nearly 50% of the total fibre used in the paper and board industry world-wide. The amount of recovered fibre used is around 150 million tonnes per annum. Used packaging including folding cartons and corrugated board, is not therefore the only source of fibre for recycling in Europe. Other major sources include newsprint and magazines, office stationery and general paper waste from printers.

Rates for the recovery and recycling of packaging in Europe, including that from paper and board based packaging, are set by the European Commission, as required by the Directive on Packaging and Packaging Waste, 94/62/EC.

WASTE IN THE UK

Estimated total annual waste arising by sector 2004: total 335m tonnes



32%	construction and demolition
1%	sewage sludge
1%	agriculture inc. fishing
5%	dredged materials
9%	household
12%	commercial
13%	industrial
29%	mining and quarrying

Sources: DEFRA, ODPM, Environment Agency, Water UK

Recycled fibre from waste paper and board provides approximately 50% of the fibre requirements of the paper and board industry world-wide.

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Recycling

Is all recovered fibre of equal quality?

The quality of recovered fibre depends on a number of factors:

- whether they are long or short fibres
- how they were separated from the original wood
- whether they were bleached
- to what extent are they associated with other materials such as coatings, ink, plastics, wet strength resins and adhesives

Fibre quality therefore depends on the initial separation and treatment, how they were made into paper or board and, finally, how those products were used.

The quality of fibre ranges from virgin pulp substitute (unprinted white trimmings), office waste, newsprint, brown (unbleached) packaging to mixed papers and boards. The grade or type of waste and market demand determines the price.

Recovered paper and board is therefore graded. A list of defined grades has been agreed between CEPI and BIR.

This list was published in 1999 and it describes 57 grades of recovered paper and board, including several carton board grades. It differentiates in terms of the type of carton board , which takes into account the fibre composition and the extent of the print coverage.

Can the fibres be recycled indefinitely?

In technical terms the number of times a fibre can be recycled depends on the original virgin fibre, its initial processing and use, and the uses of the resulting paper or board products. Laboratory work suggests that fibres can be recycled between 5-7 times.

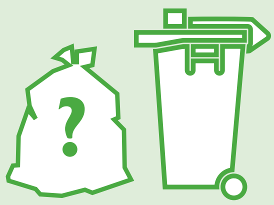
Fibres ultimately fail by loss of strength caused by reductions in length and inter-fibre bonding - fragments of fibre becoming sludge during reprocessing.

In practice, the number of times a fibre is likely to be recycled depends on what it was used for and the probability of its recovery (collection), for recycling.

Assuming one starts with 100 tonnes of paper and board made from virgin fibres and that the products reflect the proportions of different products in the market. With a recovery rate of 50%, and reprocessing losses of 20%, the amount of product remaining after the third recycling is only 8 tonnes.

Some products by nature of their use take the fibres out of the paper cycle altogether. Examples include the baseboard for plasterboard, archived printed material, book covers, graphic board, cigarette paper, tissues, and some food cartons.

WHAT DOES HOUSEHOLD WASTE CONSIST OF?



23% **Garden waste** Grass cuttings, leaves, hedge clippings and soil
18% **Paper & Cardboard** Boxes, drinks cartons, paper bags, newspapers, magazines and mail
17% **Kitchen waste** Vegetable peelings, leftover food
9% **General household sweepings** Dust, fluff and cigarette ash
8% **Plastic** Plastic drinks bottles, food containers and clingfilm
7% **Glass** Bottles and jars
5% **Scrap metal** Old electrical equipment, batteries
5% **Wood** Old furniture, fencing, DIY offcuts
3% **Textiles** Old clothes and rags
3% **Metal packaging** Tin cans and aluminium foil
2% **Nappies**

Source: The Waste and Resources Action Programme

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Recycling

Can cartons be used more than once?

Re-using cartons in their original form is not usually practical for the following reasons:

- difficulty in collecting used cartons . problems of cleaning used cartons
- damage caused by opening and, possibly, repeated opening and reclosing
- reduction in board stiffness which would be caused by re-use
- tamper-evident packaging can only be used once
- time limited nature of on-pack promotions
- difficulty in running recovered cartons on packing lines efficiently

What is de-inking?

It is a process whereby ink is removed from printed paper and board prior to reprocessing.

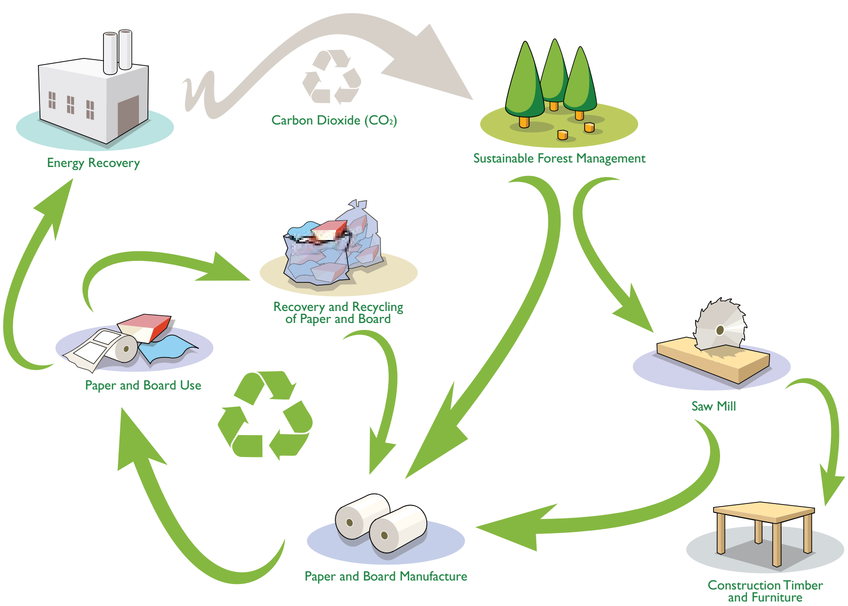
Recovered paper and board is dispersed in water and the resulting fibres are treated with surfactants which extract the ink particles. The fibre is separated from the ink particles by a cascading, floatation process based on the difference in density between the two materials. Finally, a mild bleaching treatment may be included to increase the brightness of the pulp.

The major uses of de-inked fibre are in the manufacture of tissues, newsprint and stationery products. It is not widely used in carton board manufacture.

What is "organic recycling"?

Organic recycling occurs when organic material in waste is broken down by micro-organisms to produce a soil conditioner, or mulch, which can be used in agriculture and horticulture. Carton board is ideal for composting because cellulose fibre is biodegradable. This means that it can be broken down into natural substances by bacteria using microbial enzymes, thereby producing carbon dioxide, water and compost (humus).

PAPER AND BOARD ECO-CYCLE



European packaging regulations stipulate the amounts of packaging waste to be recovered and recycled

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Recycling

Composting is suitable for that part of the post consumer used paper-board stream that cannot be recycled as fibre due to technical and cleanliness reasons.

Compost can be made from raw materials high in carbon, such as carton board, combined with a material containing nitrogen. For waste managers and local authorities this will provide an alternative process to recover part of the packaging waste stream.

The first stage is the source segregation of paper-board at the household. Paper and paper-board are collected, often with other dry recyclable materials, separately from other wastes. The materials collected together can then be sorted at a Materials Recycling Facility (MRF) before onward transfer to the recycler. After the components suitable for recycling are sorted and sent for reprocessing, any residual material comprising carton board and paper is suitable for composting.

An organic waste, such as sewage sludge, provides the source of nitrogen. The selection of the source is guided by what is most easily available from waste treatment facilities and waste from agriculture.

Pro Carton and ADAS Consulting, a company with wide experience of working in the environmental and agricultural sectors, have co-operated in developing specific processing guidelines for the processing of cartonboard packaging and agricultural wastes.

This work has shown that the waste sources must be combined in proportion to give an optimum carbon to nitrogen ratio of around 30:1.

For a typical carton board and sewage sludge mix this is 3 parts carton board to 4 parts sludge by weight. It is essential to laboratory test the feedstock for carbon, total nitrogen, dry matter and trace metals to achieve the right mix. For the best results, the paper and cartonboard should be shredded before mixing with the other materials. Alternate layers of cartonboard and sludge should be built into a windrow (heaped row) 2.3m wide and 1.3m high.

A wheeled loader or a compost turning machine is used to mix and turn the windrow. The windrow should be turned twice in the first week, by which time temperatures will have risen towards the target of 60°C. The windrow should then be turned weekly for up to 8 weeks. Following screening to remove any contraries such as plastics, the compost is ready for use as a soil improver.
The screened compost is visually attractive, being fine in texture, light brown in appearance and odourless. Its main application is as a soil improver for both large scale landscaping use and in the garden. It can be used as a replacement of peat-based materials in proprietary composts. It has been used as a soil improver for planting trees on a site in the National Forest in Central England.

What are the benefits of composting post consumer paper-board packaging?

- Diversion of used carton board packaging from landfill
- Recovery and recycling of packaging material
- Results in a beneficial soil improver
- Provides a sustainable alternative to peat and proprietary composts
- Diversion of used carton board from mass burn incineration

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Forests -

Raw Material for Paper & Cartonboard.

Importance of forests for the environment, and sustainable forest management. Use of trees as a renewable resource for paper and board production

Why are forests important for paper and board packaging?

All paper and board, is made from cellulose fibres. World-wide around 50% of paper and board is based on cellulose fibre derived directly from wood and whilst the rest is derived from recovered paper and board even that material is initially dependent on fibre derived from wood.

Forests are, therefore, the main source of raw material for paper and board.

Why are forests important for the environment?

Forests are essential for the well-being of the planet. They reverse the greenhouse effect, stabilise climate and water levels, prevent soil erosion and store solar energy.

They also provide habitats for animals, plants and insects, promote bio-diversity, protect watercourses and preserve the landscape.

Are there any other benefits from forestry in Europe?

Forestry Provides work and supports rural communities. Forestry creates opportunities for leisure and recreation.

What is the "greenhouse effect"?

The greenhouse effect occurs when heat from the sun is unable to escape from the earth's atmosphere. This is considered to be due to the build-up of certain gases in the atmosphere which prevent the heat from escaping - acting, in effect, like glass in a greenhouse - and so cause the temperature at the earth's surface to rise. This is known as "global warming".

The most common greenhouse gas is carbon dioxide. It is released when fossil fuels like coal, oil and natural gas are burnt to produce energy in the form of heat, electricity and in the internal combustion engine. The world's use of fossil fuels releases about 5 billion tonnes of carbon per annum. In the period from 1959 to 2005 the amount of carbon dioxide in the atmosphere has increased by around 20%.

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How do trees reverse the "greenhouse effect"?

Trees grow by absorbing carbon dioxide and releasing oxygen. As trees grow, therefore, they remove carbon from the atmosphere and so help to reverse the "greenhouse effect". This is known as "fixing" carbon.

Trees absorb carbon dioxide by a process known as photosynthesis. In sunlight, trees, in common with all green leafed plants, convert carbon dioxide and water into simple sugars and oxygen. The sugars are polymerised naturally forming cellulose fibres.

How much of the world is forested?

About 30% of the earth is forested.

79% of forest is broad leafed (hardwood) and 21 % is coniferous (softwood). Coniferous forests provide the main raw material for timber-based industries, including cartonboard.

How much of Europe is forested?

In Europe, about 46% overall of the land is forested.

Europe's forests account for 27% of the world's forests.

The largest forests are in Finland and Sweden, where they account for 72% and nearly 66 % of the area respectively.

How much wood is harvested world-wide per year and for what purposes?

The world consumption of wood is around 3,500 million cubic metres annually. Over 50% of this volume is used for fuel, and 30% for sawn timber products.

12% of harvested wood is used for paper and board. Less than a tenth of which is used for carton board.

Where does the timber for the European paper and board industry come from?

Around 80% of the timber used in the European paper and board industry comes from European forests. Most of the rest comes from Russia. No rain forest trees are used.

DETAILS OF FORESTRY LAND USE

Country % of land under forest

Finland	72.0	France	27.9
Sweden	65.9	Canada	26.5
Russian Frederation	50.4	USA	24.7
Austria	47.0	China	17.5
Portugal	40.1	UK	11.6
Germany	30.7	Netherlands	11.1
Switzerland	30.3	Denmark	10.7
Norway	28.9	Ireland	9.6
Spain	28.8		

Source: FAO

Paper and Board packaging is based on cellulose fibre derived from wood. Over 80% of the timber used in the European paper and board industry is derived from European forests - most of the rest comes from Russia.

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Are tropical rain forests destroyed in order to produce paper and board?

No - the paper and board industry does not use wood from tropical rain forests. This wood is not technically suitable. The real threat to tropical rain forests comes from land hunger. Every year about 12 million hectares of forest world-wide are cleared for agriculture and fuel in the less well developed parts of the world.

Are any forests destroyed in order to produce paper and board?

No! European forests are large enough to provide all the fibre needed on a sustainable basis.

Forest area in Europe is increasing not decreasing. It increased annually by an area the size of Cyprus between 1990 and 2000, (FAO).

Additionally, the volume of wood in the established forests is increasing as the volume of annual new growth exceeds the volume harvested by around 45%,(CEPI).

Are there any threats to forests in Europe?

The greatest direct danger to trees in Europe is from air pollution. This arises from the burning of large quantities of non-renewable fossil fuels, such as coal and oil, which produces nitrous oxides and sulphur dioxide, in the more heavily populated and industrialised parts of Europe. This can be reduced by more efficient energy generation, flue gas cleaning and the use of "cleaner" fuels and sources of energy.

Who owns the forests?

In the major fibre producing countries - Finland and Sweden - two-thirds of forests are privately owned by very large numbers of small land owners. Private ownership is also common in other countries together with a significant ownership by the state and other public bodies. Overall, the paper and board industry owns less than 10% of the forest area.

If paper and board can be recycled why do we cut down trees?

At least 30% of paper and board used is "lost". There are two main causes for this loss:

Firstly, by the way in which the paper and board product is used, e.g. as tissues for personal hygiene, food contaminated packaging, cigarette paper, archived material and books. Such loss can only be replaced by new fibres from wood. Secondly, when recovered paper and board is recycled as fibre, its quality, with respect to fibre length and inter-fibre bonding, is reduced and some is lost in processing.

Therefore in order to ensure that quality is maintained in products incorporating recovered fibre it is necessary for new fibre from wood to enter the paper and board chain on a regular basis.

What species of trees are used for paper and board production?

In northern Europe the main species are spruce, pine and birch.

In Spain and Portugal eucalyptus is grown commercially.

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Which parts of the tree are used for paper and board manufacture?

The paper and board industry uses forest thinnings, i.e. small trees which are removed so that the remaining trees grow to maturity and can be used for sawn timber.

The industry also uses the small diameter tops of large trees and the round sections of the trunks which are removed in the saw mills (saw mill waste).

How can the European community be sure that forests are being managed properly?

The forest industry has accepted the principles of sustainable development.

What is "sustainable development"?

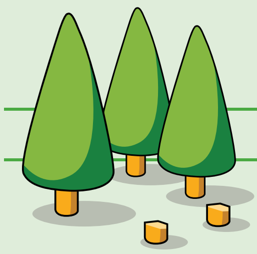
In 1987, the World Commission on Environment and Development ("Bruntiand" Commission") issued it's report, "Our Common Future". This discussed the world's forests, climate change and other global environmental and development issues. The report introduced and defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

At the 1992 United Nations' Conference on Environment and Development in Rio de Janeiro, ("Earth Summit"), world leaders committed their countries to Sustainable development. This was re-emphasised at Johannesburg in 2002.

How does "sustainable development" apply to forestry?

Sustainable forestry is, in the words of the European Agreement signed in Helsinki in 1993, "the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their bio-diversity, productivity and their Potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems".

According to this definition European forests used by the paper and board industry are sustainable. Every year new growth exceeds the wood harvested. Forests offer a natural habitat to vast numbers and different species of plants, animals and insects - they preserve this biodiversity and make a significant contribution to the maintenance of the world's gene bank.



HOW THE TRUNK IS USED

The smallest wood is used to make particleboard and chipboard. This timber as well as small trees, is also used as fuel.

Small trunk parts are used to make paper and also paperboard - from which cartons are made.

Thicker parts of the trunk are sawn into planks in the sawmill. Sawmill waste is used to make paper and also paperboard - from which paperboard from which cartons are made. The bark is used for fuel or for garden purposes.

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Forests - Raw Material for Paper & Cartonboard.

How can forest owners prove that their forests are sustainably managed?

In order to promote sustainability, National Standards for forestry have been issued by European governments following extensive consultation with other interested parties, including the Forest Stewardship Council (FSC) and the World Wildlife Fund for Nature (WWF).

Forest owners wishing to demonstrate that their forestry management practice conforms with the appropriate standard can apply to independent, third party, auditing bodies for an assessment of their performance.

A number of assessment or "certification" schemes are in current use with over 50% of the forest area in Europe certified, (CEPI). In 2005, 21 million hectares were certified through the FSC (Forest Stewardship Council) scheme and 49 million hectares through the PEFC (Programme for the Endorsement of Forest Certification Systems) scheme. Whilst there is overlap in the types of forest certified by these schemes, the FSC scheme is more generally applied to large forest areas typical of State and Forest Industry ownership, whilst the PEFC is generally used for the certification of smaller private and family owned forests.

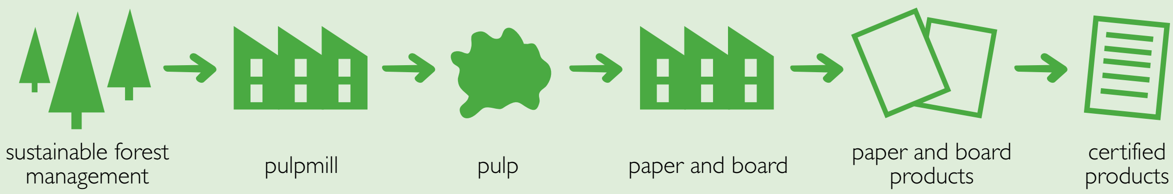
By 2005 nearly all the forest area actually owned by the paper and board industry was certified.

Forest owners can also apply for independently audited environmental management schemes. Examples of such schemes are those based on ISO 14001 together with the EMAS scheme. A common feature of these schemes is a commitment to continuous, demonstrable, environmental improvement.

What is meant by "chain of custody"?

In order to demonstrate that wood originates from a certified forest, producers of forest products need a "chain of custody" certificate. This provides traceability at each stage of processing.

CHAIN OF CUSTODY



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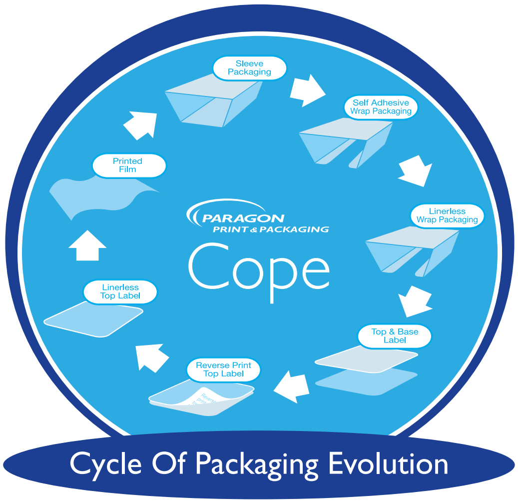
Packaging Solutions

Packaging Minimisation

Paragon have created a portfolio of packaging products to compliment the **c**ycle **o**f **p**ackaging **e**volution (**cope**).

- Our strategic portfolio of products enable us to **cope** with all packaging minimisation initiatives to support our environmental objectives and deliver courtauld commitment complient packaging to our customers.

- **cope** also ensures product knowledge is retained through this process ensuring a smooth transition into new packaging formats.



- Our artwork input can reduce the amount of additional packaging used for flash labels or additional information required by their inclusion at concept stage.

- We have several product initiatives to support packaging minimisation.

UNZIPme™ freshlife bio™ STACK & WRAP LinerLess LABELLING

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Sustainable Packaging

All of our Paper and board are obtained from either Forest Stewardship council or equivilent sustainable sources.

- Our Film portfolio includes two sustainable films both with EN 13432 accreditation.
- freshlife bio™ a plastic film manufactured from PLA resin from a non crop based source is sustainable, biodegradable and 1 year renewable.
- freshlife bio™ a cellulose film manufactured from wood pulp is sustainable, biodegradable and 7 year renewable.
- Users of freshlife bio™ can display the European compostability logo.
- freshlife bio™ films are available for vertical bagging, horizontal flowrap and top seal lidding applications.
- Top seal lids are weld seal or peelable.

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Recyclable Packaging Explained.

Paragon Print and Packaging supply PE and PP labels and sleeves to enable mono composite packaging to be recycled closed loop. This creates the potential for waste packaging to be recycled into new products diverting them from Landfill.

Recyclable packaging materials.

Closed Loop recycling involves the provision of compliant (recyclable) packaging materials which can then be taken back after use and recycled and remanufactured into new end use materials, there by diverting them from landfill.

The following packaging materials can be recycled in the UK:

Paper based packaging

Paper based packaging made from a combination of recycled and virgin paper to food grade standard, the corrugated board serves as a great insulator of heat, provides strength and is 100% recyclable. It provides a sustainable alternative to expanded polystyrene packaging (foam), which has no recycling stream. Once the material is used, it can be incorporated into the paper recycling stream, pulped, processed and remanufactured into new corrugated board. However containers must be relatively free of food waste. For example of burger clams, sandwich cartons, snack pack boxes, chip cups, hot dog boxes, pizza boxes and open trays.

PET packaging (polyethylene terephalate)

PET is a plastic material that shares many similarities with glass, its clarity, strength and barrier properties. It is tough and unbreakable and doesn't shatter or splinter and is the only polymer type that can be recycled back into food grade material and is 100% recyclable.
Popular uses for PET plastics: beverage bottles – water, coke, juices etc, drinking cups, some sandwich, yoghurt and salad containers and household cleaning products – dishwashing liquid etc. PET is identified by the number 1, often appearing in the centre of the mobius loop. It is interesting to note that the mobius loop appears on many different materials, it doesnot however mean that the material is recycled, as there may be no recycling stream or process to handle the material type. The current recycling rate of PET in the UK is 5% (Australia 55%). Approximately 25,000 bottles are required to produce a tonne or recycled PET. PET can be recycled back into food grade bottles/packaging and sheet material, textiles – polafleece and rope and non-woven, carpets.

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HDPE (high density polyethylene)

HDPE is an opaque plastic, used for containers such as milk bottles and plastic food tubs. HDPE is identified by the number 2, often appearing in the centre of the mobius loop. It can be recycled back into food grade bottles and packaging.

PP (polypropylene)

PP is a relatively strong and tough material, perfectly suited to the manufacture of cutlery as it doesn't snap or splinter and can tolerate high temperatures without losing form.
Clear PP is also used for drinking cups. PP can be recycled and remanufactured into new end use materials such as planter pots, toy components and building industry parts.

Plastic identification chart

1 PETE — **(PET) Polyethylene terephthalate -**
Fizzy drink bottles and oven-ready meal trays

2 HDPE — **(HDPE) High-density polyethylene -**
Bottles for milk and washing-up liquids

3 V — **(PPVC) Polyvinyl chloride -**
Food trays, cling film, bottles for squash, mineral water and shampoo

4 LDPE — **(LDPE) Low density polyethylene -**
Carrier bags and bin liners.

5 PP — **(PP) Polypropylene -**
Margarine tubs, microwaveable meal trays

6 PS — **(PS) Polystyrene -**
Yoghurt pots, foam meat or fish trays, hamburger boxes and egg cartons, vending cups, plastic cutlery, protective packaging for electronic goods and toys

7 OTHER — **Any other plastics that do not fall into any of the above categories. -**
An example is melamine, which is often used in plastic plates and cups.

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Biodegradable containers or bioplastics

Biodegradable containers or bioplastics are made of organic plant based starches. It is widely accepted in Europe that for packaging to be described as biodegradable it must comply with the standard BS EN 13432: "Packaging. Requirements for packaging recoverable through composting and biodegradation. Test scheme and evaluation criteria for the final acceptance of packaging". This standard is compatible with the American Standard ASTM D6400 and both the EU and American systems make a clear distinction between 'Biodegradable' materials that undergo degradation by biological processes to yield CO_2 and water and 'Degradable', often referred to as 'Oxodegradable', materials that involve a multi-stage process using a chemical additive to initiate degradation. In the UK, one final criterion required of plastics claiming to be 'Compostable' is that the resultant compost should meet the quality standards set out in the British Standards Institution's 'Publicly Available Specification for Composted Materials' (PAS100:2005). This requires that any packaging inputted to a composting process complies with one of the relevant standards, BS EN 13432 or ASTM D6400. Due to their similar appearance bioplastics products can not be easily differed from conventional plastic products. The product certification based on the EN 13432 testing standard therefore introduced a label that has been protected in Europe and many countries abroad. The protected compostability mark "seedling" is accepted and used in Germany, Switzerland, the Netherlands, Poland and the United Kingdom.

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Biodegradable, Degradable & Compostable Packaging Explained.

Board paper and plastic packaging all have the same requirement for compostable certification under European standard EN 13432:2000 recognisable by the seedling logo.

compostable

Paragon Print and Packaging have attained EN 13432:2000 for their Labels, Sleeves and Film.

We will concentrate on plastics for the purpose of our explanation because there are some exciting new technologies emerging in this field.

Biodegradable plastic will degrade as a result of bacterial activity. In order to also be classified compostable, the degradation must meet certain specified criteria such as rate biodegradation, maximum residue of material left at a specific point in time and a requirement for the material to have no harmful impact on the final compost or the composting process. All compostable plastic is therefore also biodegradable. The standard for compostable plastic used is the European standard EN-13432.

Degradable plastics are not compostable. Most of the products using the label Degradable plastic, degrade as result of physical and chemical impact (fracture into smaller pieces of plastic). They are oil based products with special additives that assist their 'fragmentation'. Biological activity is not a significant part of the degradation of these products, or the process is too slow to earn the classification **Biodegradable or Compostable** (the biological degradation will typically take many years).

Bioplastics are a new generation of biodegradable & compostable plastics, derived from renewable raw materials such as starch (e.g. corn, potato, tapioca etc), cellulose, soy protein, lactic acid etc., not hazardous in production and decompose back to carbon dioxide, water, biomass etc. in the environment when discarded. Corn starch is currently the main raw material being used in the manufacture of bioplastic resins. Mater-Bi (main component corn-starch), and PolyActide (PLA) (made from corn-starch as well) are currently the 2 main resins (raw materials), being used today in the production of compostable & biodegradable plastics and are certified for compostability under standards set by international organisations. However, other resins are coming into the market made from potato starch, soybean protein, cellulose etc. Most of these are currently not certified for compostability, though some are for biodegradability. The field of bioplastics is constantly evolving with new materials and technologies being worked on and being brought to market.

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Heat Resistance
Corn-starch based products (bags, corn cutlery, cold cups, drinking straws) 120 degrees F Potato and tapioca starch based products (potato cutlery) 220 degreesF.

Biodegradability & Compostability
Bioplastics can take different length of times to totally compost, based on the material and are meant to be composted in a commercial composting facility, where higher composting temperatures can be reached and is between 90-180 days. Most existing international standards require biodegradation of 60% within 180 days along with certain other criteria for the resin or product to be called compostable.
It is also important to make the distinction between degradable vs. biodegradable vs. compostable as often these terms are used interchangeably.

Compostable Plastic is plastic which is "capable of undergoing biological decomposition in a compost site as part of an available program, such that the plastic is not visually distinguishable and breaks down to carbon dioxide, water, inorganic compounds, and biomass, at a rate consistent with known compostable materials (e.g. cellulose). and leaves no toxic residue." American Society for Testing & Materials (ASTM).

In order for a plastic to be called compostable, three criteria need to be met:

- **Biodegrade** - break down into carbon dioxide, water, biomass at the same rate as cellulose (paper).
- **Disintegrate** - the material is indistinguishable in the compost, that it is not visible and needs to be screened out
- **Eco-toxicity** - the biodegradation doesn't produce any toxic material and the compost can support plant growth

Biodegradable Plastic is plastic which will degrade from the action of naturally occurring micro organism, such as bacteria, fungi etc. over a period of time. Note, that there is no requirement for leaving "no toxic residue", and as well as no requirement for the time it needs to take to biodegrade.

Degradable Plastic is plastic which will undergo a significant change in its chemical structure under specific environmental conditions resulting in a loss of some properties. Please note that there is no requirement that the plastic has to degrade from the action of "naturally occurring microorganism" or any of the other criteria required for compostable plastics.
A plastic therefore may be degradable but not biodegradable or it may be biodegradable but not compostable (that is, it breaks down too slowly to be called compostable or leaves toxic residue).

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Standards

There are currently few international organizations which have established standards and testing methods for compostability, namely:

- American Society for Testing and Materials ASTM-6400-99
- European Standardisation Committee (CEN) EN13432
- International Standards Organisation (ISO) ISO14855 (only for biodegradation)
- German Institute for Standardization (DIN) DIN V49000

The ASTM, CEN and DIN standards specify the criteria for biodegradation, disintegration and eco-toxicity for a plastic to be called compostable.

Biodegradability is determined by measuring the amount of CO_2 produced over a certain time period by the biodegrading plastic. ASTM, ISO and DIN standards require 60% biodegradation within 180 days. The EN13432 standard requires 90% biodegradation within 90 days.

Disintegration is measured by sieving the material to determine the biodegraded size and less than 10% should remain on a 2mm screen for most standards.

Eco toxicity is measured by having concentrations of heavy metals below the limits set by the standards and by testing plant growth by mixing the compost with soil in different concentrations and comparing it with controlled compost.

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