Paper and Cardboard Recycling
Greenhouse Gas Benefits Explained

Fact Sheet

Calculating the carbon benefits of waste management options is not always as straightforward as it may first appear. This fact sheet discusses the difficulties which can occur when calculating the carbon savings associated with the recycling and disposal of waste paper and board.

How Carbon Benefits are Calculated

Measuring the carbon benefits arising from the recycling of many materials is put forward as a reasonably simple calculation. It is generally a measure of the savings available from the substitution of primary raw materials with secondary raw materials plus the energy efficiency gains achieved through the reprocessing stage.

Once the finished product has been manufactured, the carbon costs of the products' lives are similar as they are no longer distinguishable. This is because finished products that are made from recycled materials generally have to perform to the same standards as those made from virgin materials to compete in the market place. This is why products such as glass, steel and aluminium appear to be in the position to offer a specific carbon reduction number associated with secondary raw material use over primary raw material.

Why Paper is Difficult to Calculate

It is possible to calculate specific carbon numbers for the paper recycling process. However, paper manufacturing is extremely varied in terms of production processes, raw material inputs, energy sources, output products and locations.

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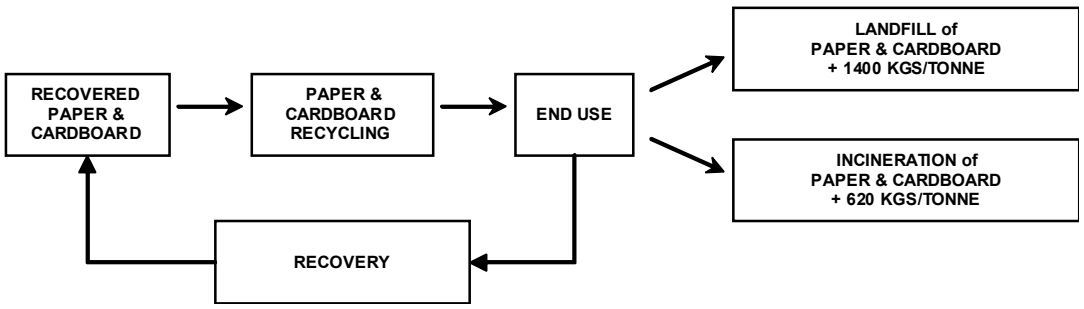
This makes it far more difficult to specify carbon benefits on an overall material basis than for other product sectors.

The Confederation of European Paper Industries (CEPI) has set out a framework for paper manufacturers to measure their carbon footprints in the future. It will be up to the various paper industry sectors, and possibly individual companies, to determine this number based on their own unique circumstances. Users of paper products will be encouraged to seek information on the carbon footprint of product groups and in some circumstances specific products from their suppliers.

The complexity of this situation makes it difficult for the paper industry to put forward what many stakeholders, such as government, local authorities and businesses, want, which is a specific number associated with recycling to allow them to measure their carbon performance while recycling paper products.



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Recycling Carbon Benefits over Disposal

One of the key benefits of paper recycling is that there are carbon savings available from simply diverting paper products from alternative disposal routes such as landfill and incineration.

Paper is biodegradable and when landfilled creates methane, a powerful greenhouse gas, which has been recognised as contributing to climate change. Paper is also a carbon-based product and when incinerated releases carbon dioxide, again recognised as contributing to climate change. However, paper is a readily recyclable product, and through recycling the carbon is retained in the product for longer and contributes to reducing the primary fibre requirements in the industry. This allows forests to be managed over longer periods and contributes very significantly to the sustainability of the overall paper industry.

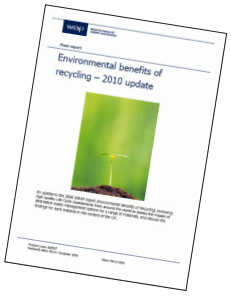
A recent global Life Cycle Analysis (LCA) study by the Waste and Resources Action Programme (WRAP) looked in detail at the carbon balances between paper recycling and the disposal options of landfill and incineration. This report, *Environmental Benefits of Recycling*[1] published in 2006, reviewed over 108 global life cycle assessments for paper, rejecting 99 for a number of issues including incomplete life cycle review, and studying 9 in detail.

The results showed enormous variation for paper and board. A minority of situations existed where both incineration and landfill were found to be preferable to recycling but these typically involved extreme scenarios (such as high efficiency energy recovery compared to inefficient recycling).

In the majority of studies recycling was the preferred option and for reduced greenhouse gas emissions, 73% of scenarios favoured recycling.

Based on the study, WRAP considers that it is reasonable to say that recycling 1 tonne of paper and cardboard will avoid 1.4 tonnes of carbon dioxide equivalent compared to landfill, and 0.62 tonnes of carbon dioxide equivalent compared to incineration.

The findings of the WRAP 2006 LCA report were recently confirmed by a further study of LCA's carried out since 2006, *Environmental Benefits of Recycling – 2010 Update* [3].



Arriving at a Carbon Saving

In the UK, approximately 90% of residual waste is landfilled with 10% being incinerated. Using this information WRAP took 90% of the savings from recycling versus landfill and added 10% of the savings from recycling versus incineration to arrive at a figure of 1.32 tonnes of carbon dioxide equivalent savings per tonne of material recycled. When applied to the amount of paper recycled from the UK waste stream in 2009, this represents a carbon saving of over 10.8 million tonnes arising just from diversion from other disposal routes.

This is a broad-brush figure, but it is a reasonable estimate of what is likely to be typical in the UK. As more research is published and technologies improve, this figure is likely to be modified up and down depending on where the technological changes occur.

The Importance of Quality

As was seen with some of the extreme scenarios in the WRAP report, landfill and incineration can be the best options given low efficiency recycling. This report stresses the importance of the performance of paper collection methods in protecting the integrity of the paper recovered from the waste stream in ensuring carbon benefits are achieved through efficient reprocessing. People with an interest in this subject should view our factsheet, *Quality Counts*[2] .

References

[1] *Environmental Benefits of Recycling*, WRAP 2006
http://www.wrap.org.uk/wrap_corporate/about_wrap/what_does_wrap_do/environmental.html

[2] *Quality Counts Fact Sheet*, PaperChain 2010
http://www.paperchain-recycling.org.uk/publications.html

[3] *Environmental Benefits of Recycling – 2010 Update*
http://www.wrap.org.uk/wrap_corporate/publications/benefitsrecycling.html

Where can I get more information?

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