



Impacts and Opportunities Reducing the Carbon Emissions of CD Packaging

February 2009

“Rather than [the recession] pushing the environment into a lower order of priority, the environment is part of the solution... We must build tomorrow today... and use the changes we have got to make as a result of the downturn to take the next step towards building a far more environmentally sustainable economy.”

Gordon Brown, Prime Minister
January 4 2009

“My presidency will mark a new chapter in America’s leadership on climate change that will... create millions of new jobs in the process”

Barack Obama, US President Elect
November 18 2008



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Foreword

Tony Wadsworth

Chairman: CD Packaging working group

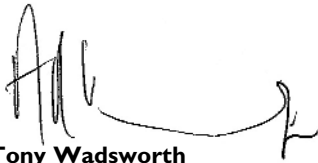
Before reading this report it is worth remembering why we are doing this.

Carbon dioxide levels in the earth's atmosphere are higher than at any time during the last 750,000 years. We are experiencing unprecedented climatic change which will accelerate before it slows down as we pump more CO₂ into our atmosphere than ever before. Our energy infrastructure, based on 200 years of fossil fuel sourcing, has to change rapidly and radically if we are to prevent the globe from warming beyond tolerable levels. Climate change is undoubtedly the most urgent and complex problem of our age and we are compelled to do whatever we can to help solve it.

Julie's Bicycle has brought together the UK music industry in an unprecedented show of strength and commitment to undertake joint initiatives that will significantly reduce our CO₂ emissions.

This report collects the combined research, expertise, wisdom and goodwill gathered over the last nine months and presents us as an industry – but also as a collection of intelligent, concerned and responsible human beings – with a 95% reduction challenge for CD packaging.

I hope we can meet it.



Tony Wadsworth

Chairman: BPI

Acknowledgements

I would like to thank the following for their outstanding contributions to this research:

Firstly my thanks to Alison Tickell who has driven this project with unstinting commitment and vision. Secondly thanks to Catherine Bottrill who wrote the original First Step report and has guided much thinking at all subsequent stages; and to Catherine Langabeer, Helen Heathfield, the research contributors, volunteers and the team at JB, listed later in this document.

Heartfelt thanks to Graham Crawshaw for his expertise and outstanding generosity.

Also to Geoff Lye and Rachel Stones.

Thanks especially to the CD working group: Kim Bayley, David Bryant, Paul Denyer, Justin Morris, Emma Pike, Mandy Plumb, Paul Redding, Simon Robson and Joe Smith; to Paul Firth, David Green and Clare O'Brien; and to Ged Doherty, David Joseph, John Reid, and our chairman Jazz Summers.

My thanks to ERA and BPI for providing generous and invaluable financial support, particularly to Kim Bayley for going the extra mile on our behalf, and to the Beggars Group, EMI, Sony BMG, Universal and Warners. Finally I continue to be extremely grateful to the Environmental Change Institute, Oxford University, for expertise and inside knowledge generously given.

Introduction

Professor Diana Liverman

Despite efforts to address the problems of climate change, global greenhouse emissions have continued to increase. Scientists now suggest that if we do not act soon to make deep cuts in emissions the world could be up to 7°C warmer by 2100¹ with devastating impacts on food, water, health, coastal regions and ecosystems. As we look towards the Copenhagen climate negotiations at the end of 2009 the international community must renew its commitment to avoid dangerous climate change by implementing serious greenhouse gas reductions, protecting forests, funding low carbon sustainable development and helping the vulnerable adapt to climate changes already underway. In the UK, the government has been advised that the Climate Bill should include an 80% emission cut by 2050, and there are hopes that the Obama administration will make similar promises in the US.

All sectors of the economy and society will need to contribute to solving the climate problem and the work of Julie's Bicycle to reduce the carbon emissions of the music industry provides an example of how, with good information and great leadership, an industry can identify and implement emission reductions and sustainable practices. This report shows how a shift in packaging can bring a dramatic cut in emissions associated with sales of CDs, and that both the industry and consumers are willing to implement this change. In combining scientific, technical and behavioural analysis we start to see how working together, from supply chains to consumers, we can promote the changes we need to reduce the risks of climate change.

**Professor Diana Liverman,
Director, Environmental Change Institute,
Oxford University**

¹ UK Hadley Centre simulations which look at four alternative emission scenarios ranging from early and rapid cuts (47% global emission cut by 2050 with a 2.1-2.7 C temperature increase by 2100 to a business as usual with a 132% emission increase by 2050 and 5.5 to 7.1 C temperature increase by 2100)
http://www.metoffice.gov.uk/research/hadleycentre/news/evidence_cc.html

Executive Summary

In 2007 Julie's Bicycle commissioned the Environmental Change Institute to carry out a study scoping the carbon footprint of the UK music industry, First Step.¹

This pivotal study recommended that the industry undertake immediate reduction plans for three of its most intensive sources of carbon emissions: venues and office buildings, festival travel and plastic packaging for CDs.

For the live sector Julie's Bicycle has created a set of energy management and measurement tools, provided environmental audits and benchmarks, with further research into festival travel to be published shortly.

For the record industry the First Step report identified CD packaging as the largest direct source of Greenhouse Gas (GHG) emissions, accounting for a third of the recording sector and around 10% of the total emissions from the UK music market.²

Julie's Bicycle convened a working group of industry, science and specialist experts under the leadership of Tony Wadsworth, to scrutinise the science and the business of CD packaging and come up with some solutions. The group commissioned leading consultancy Arup to analyse the impacts more closely and produce recommendations for reducing them. In July 2008 Arup produced the report: Reducing the Impact of CD Packaging³ (Appendix I). It provided a detailed analysis of packaging options and a startling result: that the recording industry could reduce its packaging emissions by up to 95% by switching from the plastic jewel case to pure card.

The JB working group understood that, in difficult economic times science had to be underpinned by a realistic appreciation of business constraints and so two further pieces of research were undertaken, both supported by the Environmental Change Institute.

The first was to identify tolerance levels amongst CD buyers; would people buy card casing in significant quantities or would the industry bear the brunt of unpopular product packaging?

A detailed survey was carried out with ERA (Entertainment Retail Association). We were surprised to find that, not only did the majority of buyers prefer card, but that the appetite for environmentally responsible product, and product labelling, was keen.

Despite the increasing prevalence of card-based product we had no idea of the market readiness, or tolerance levels, of our manufacturing sector so we conducted a second survey with manufacturers. Again we were pleased to discover that manufacturers were enthusiastic about a shift towards environmentally responsible product. In fact, a significant proportion are already investing in reducing the negative environmental impacts of their products.

¹ Bottrill, C et al., Julie's Bicycle First Step: UK Music Industry Greenhouse Gas Emissions for 2007 Environmental Change Institute Oxford University 2008

² The summary for Chapter 4 First Step which deals with the recording sector has four main recommendations:

- 1) CD packaging, the subject of this study
- 2) CD distribution logistics: ERA has convened a retail grouping and is developing a strategy to address logistics
- 3) Building energy management
- 4) Digital music delivery and distribution: JB commission 2009

³ Owen A, Roberts S, Dowdell D, Arup: Reducing the Impacts of CD Packaging 2008, Ove Arup 2008

The interest in sustainability in the UK music industry is growing. It is being driven firstly by the urgent warning voices of our most eminent scientists as they seek to explain profound temperature shifts and consequent weather events. But the voices of artists, audiences and consumers are growing louder, and global issues of energy security, economic downturn, and equal entitlements to natural resources are fuelling a range of climate-related regulatory and voluntary initiatives – initiatives that will inevitably accelerate over the next decade. There is increasing pressure for companies to reduce both their direct greenhouse gas emissions and those of their supply chain.

Julie's Bicycle has developed an **Industry Green** mark which we hope will provide the recognition and environmentally responsible branding that signals to the wider world that the UK music industry has already taken a lead in dealing with climate change.

We are presented with a huge challenge that is morally impossible to ignore. In sheer tonnage of emissions CD packaging is not comparable to heavy industry but in the context of climate change every single low carbon choice makes a positive difference.

Many of the recommendations contained in Arup's July report have been, to a large extent, achieved. However, the biggest opportunity still remains: to make the shift from plastic to card so that our industry standard is high and our collective carbon emissions are brought down – perhaps by 95%. That is an achievement that would exceed the targets being set by governments and one of which we should be tremendously proud.

This document pulls together all the work that has been undertaken since the launch of First Step. The full reports are contained as Appendices but all exist as stand alone research projects.

Alison Tickell

Director: Julie's Bicycle

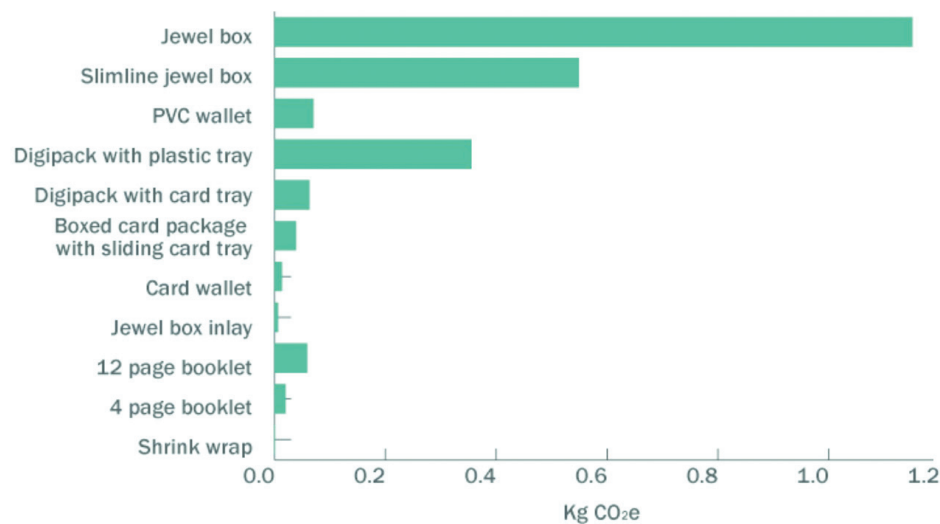
Note: There is a differential between the findings of The First Step report and Arup's report in CD packaging emissions. First Step was a conservative estimate based on best available evidence; Arup used LCA methodology (ie. PE International GmbH-GaBi4) as well as updated emissions factors (ie. Plastic Materials; Association of Plastic Manufacturers in Europe (APNE)). For the purposes of industry overview and the apportionment of percentages across the music industry Julie's Bicycle will maintain the First Step emissions profile but acknowledge that the in-depth GHG analysis by Arup indicates that CD packaging accounts for **at least** 10% of the UK music market's GHG emissions.

Key Findings

Emissions

- CD packaging is one of the music industry's largest sources of direct GHG emissions.
- It accounts for a third of the recording and publishing sectors emissions and at least 10% of the total emissions from the UK music market.
- A range of alternatives to the plastic jewel case are already in use.
- Significant reductions in climate change emissions would result from moving away from the jewel case to any of the other forms of packaging analysed in this project.
- The greatest savings come from moving to a pure card option.
- All alternatives are substantially better than the jewel case.
- Moving to a pure card option would reduce greenhouse gas emissions by around 95%.
- Moving to a combined card and plastic option would reduce greenhouse gas emissions by over two-thirds.

Climate Change Emissions for Different Types of Packaging



Please note: The IG mark applies to the packaging, not the CD itself. The manufacture of a compact disc generates approximately 9% of the emissions associated with the entire CD product as compared to packaging which produces in the region of 34%, and a further 6% with a 12 page booklet.

Consumers

- More than half of those surveyed (55%) preferred the card wallet version of Coldplay's Viva la Vida (EMI 2008) to the jewel box version.
- Heavy CD buyers are significantly more likely to state a preference for card-based packaging.
- Half of CD buyers (50%) thought CDs should only be sold in environmentally-friendly card-based packaging.
- The majority of CD buyers (73%) stated that the digipack was equal to, better, or much better than the plastic jewel case.
- The majority of CD buyers (75%) agreed that it would be a positive step to shift to environmentally-friendly card-based packing with only 13% disagreeing and 10% not knowing.
- A significant proportion (79%) of CD buyers that stated a preference for the plastic jewel case format said that a change to card-packaging would not make a difference to their decision to buy a CD.
- Almost half of CD buyers (47%) said an environmental accreditation label for packaging would give them a more positive view of the product. A fifth of respondents (19%) thought it might and a third (33%) said it would not make a difference.

Manufacturers

- All companies surveyed were embarked, or embarking on environmentally responsible initiatives.
- Almost all suppliers surveyed are addressing carbon measurement and are working on initiatives to reduce their carbon footprint.
- All suppliers surveyed responded that they were working towards product weight reduction.
- All suppliers surveyed expressed an interest in a certification system specifically for CD packaging.
- Suppliers were asked to compare environmentally friendly products against the industry standard jewel box, tray, book and inlay in terms of cost, materials, weight, carbon emissions and lead time.
 - a. Cost – premiums reduced as quantities increased. Production quantities below 5,000 units remain prohibitively expensive
 - b. Materials – all products (with exception of digipack) highlighted the elimination of plastic trays. Most board had a high recycled content with other environmental credentials.
 - c. Weight – the environmentally friendly products saw a typical saving of 50% of the weight of a jewel box, tray, book and inlay. Suppliers highlighted the reduced cost of transport.
 - d. Carbon emissions were estimated by suppliers as a 30% to 80% reduction.
 - e. Lead time – all suppliers highlighted that the lead time for alternative packaging was longer.
- All suppliers source their material from within Europe.
- Many suppliers use a high percentage of post consumer waste.
- More packaging is capable of being automatically assembled by the replicator.



Recommendations¹

1. **The UK music industry should commit to discontinuing the use of plastic jewel cases and make card-based packaging the industry standard.**
2. **All stake-holders within the UK music industry – artists, managers, record companies, retailers, promoters, manufacturers – have a part to play in supporting the 95% emissions reduction opportunity: shifting from a carbon intensive packaging product to one that demonstrates climate responsibility.**
3. **The UK music industry should collectively agree to reduce its greenhouse gas emissions by percentage targets year on year in line with, or exceeding, international targets. The first target should be a 10% reduction in greenhouse gas emissions associated with CD packaging in the first 12 months starting from a 2008 baseline.**
4. **The UK music industry could consider the other environmental implications of a shift to card, including adaptation of the existing infrastructure to accommodate the effect of climate change, as part of a concerted approach towards climate responsibility.**
5. **The UK music industry should ensure the change has the greatest possible positive impact.** The UK music industry is in a powerful position to catalyse wider action on climate change:
 - **Catalysing wider change in the UK music and associated industries.** A well promoted phasing out of the jewel case that generates positive publicity should help strengthen commitment amongst key players, particularly as an industry wide approach is seen to be beneficial.
 - **Influencing the global entertainment industry.** The UK music industry could use its international position to catalyse similar action on reducing climate change impacts in the global music and wider entertainment industry.
 - **Promoting climate change action by young people.** The music industry has a better understanding of how best to engage young people than most other industries and governmental and non-governmental organisations. The industry should use the shift to card based packaging to promote action on climate change in this key group.
6. **Labels should encourage manufacturers and replicators to focus on assembly automation.** By increasing volumes of card based product there will be improved economies of scale, which will help reduce overall cost.
7. **A card packaging specification should be produced as a template for industry standard packaging.**
8. **An Industry Green mark should be applied to CD packaging that demonstrates evidenced commitment to carbon reduction and environmental responsibility.**

¹ These recommendations amalgamate the three research studies, and have been approved by Julie's Bicycle CD packaging group. Not all the recommendations can be attributed to all contributors.

List of Contributors

Tony Wadsworth

Tony Wadsworth is Chairman of the BPI and former head of EMI Music. Hugely respected in the industry, in 2008 he was the winner of the prestigious STRAT Award for Outstanding Contribution to the Music Industry. He is a Director of Julie's Bicycle and has steered the CD packaging group for the last nine months.

Professor Diana Liverman

Diana Liverman is Director of the Environmental Change institute, Oxford University. She was recently appointed to the Institute for Environment and Society at the University of Arizona as a member of the new US National Academy of Sciences 'Committee on America's Climate Choices' appointed by the US congress to examine the serious and sweeping issues associated with global climate change, provide advice, and convene a summit in Washington in spring 2009.

Diana has held many senior advisory posts internationally. She is a Director of Julie's Bicycle.

Julie's Bicycle

Julie's Bicycle is a cross industry not-for-profit company committed to reducing the carbon impact of the music industry, and promoting broader sustainable business practices. It was formed in April 2007 and supports industry-wide research initiatives, carbon reduction programmes, audits, energy management tools and accreditation.

CD Packaging Group

The JB CD packaging group was brought together to agree, and support, carbon reduction strategies in the recording industry, specifically focused on CD packaging. It consists of

Kim Bayley: ERA

Catherine Bottrill: Surrey University

David Bryant: Universal

Paul Denyer: Universal

Catherine Langabeer: Julie's Bicycle

Justin Morris: EMI

Emma Pike: Sony

Mandy Plumb: EMI

Paul Redding: The Beggars Group

Simon Robson: Warners

Joe Smith: The Beggars Group

Alison Tickell: Julie's Bicycle

Arup

Arup is a global forum of business consultants, designers, planners and engineers who aim 'to shape a better world'. The company exerts a significant influence on how we reduce and adapt to climate change, through the built environment and other critical aspects of everyday life. Arup are the creative force behind many of the world's most innovative and sustainable designs. Arup has over 10,000 staff working in more than 90 offices in 37 countries.

Catherine Bottrill

Catherine Bottrill was the principle researcher for the First Step Report, UK Music Industry Greenhouse Gas Emissions 2007 (Environmental Change Institute, Oxford University, 2008). She is an expert in music industry carbon measurement and reduction, as well as personal carbon allowances, calculators and labelling.

Vishnu Ganglani

Vishnu Ganglani gained an MSc in Applied Statistics from Napier University, Edinburgh and has worked on a range of public sector projects including for the Scottish Funding Council and Scottish Government. He is currently pursuing a second postgraduate degree at the department of statistics at Oxford University.

Graham Crawshaw

Director, Purchasing for Profit Ltd. With 20 years of purchasing and packaging experience within the music industry, gained in the UK and US predominantly with EMI Music, is working now as an independent consultant.

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Julie's Bicycle would like to thank all those many people who have contributed to this work with especially warm thanks to:

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Graham Crawshaw	Beth Gooderham	Sarah Moore	Paul Redding	
Paul Denyer	Helen Heathfield	Justin Morris	Sarah Roberts	
David Dowdell	Anica Korte	Clare O'Brien	Simon Robson	
Rose Fernie	Rudra Kapila	Alice Owen	Joe Smith	

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Appendices

1: Julie's Bicycle, Reducing the Impact of CD Packaging, Ove Arup & Partners Ltd, 2008

2: Consumer Research Study into CD Packaging
Catherine Bottrill and Vishnu Ganglani, 2008

2A: Consumer Survey Form

3: Manufacturing Packaging Survey
Graham Crawshaw 2008

3A: CD Packaging Survey Form

Appendix I:
Julie's Bicycle,
Reducing the Impact
of CD Packaging

Ove Arup & Partners Ltd,
2008

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Appendices

Appendix A

Methodology & Assumptions

Appendix B

References & Bibliography

1 Acknowledgements

The authors would like to thank the following people for their time and expertise:

Catherine Bottrill of Oxford University's Environmental Change Institute for talking us through her research and the data behind it.

The Julie's Bicycle CD Packaging Working Group for assisting us with information and contacts.

Chapter 7 of this report has been authored by Graham Crawshaw, (Director, Purchasing for Profit) to ensure that it reflects the practical experience that music companies have in this field.

The following people for providing time to be interviewed by us and help us source specific pieces of information:

Hans Arensten at PaperFoam

Graham Crawshaw at Purchasing for Profit

Tim Crouch, Mandy Plumb and Claire O'Brien at EMI

Anthony Daly at SonoPress

Wim Hieltjes at St Ives

John 'Jonjo' Hobbs at Universal

Suzanne Klose at Topac

Matti Koski at Stora Enso

Ross MacFarlane at Virgin Music

Will Moore at Will Moore Music

Mark Riddleston at Warner

Dean Rose at Think Tank

Ben Scales at The CarbonNeutral Company

Li Shen at the University of Utrecht

Joe Smith at Beggars Group

Martin 'Timmy' Treu at Pozzoli

Alison Wenham of the Association of Independent Music (AIM)

Peter Wergens at JakeBox

2 Executive Summary

Analysis carried out by Oxford University's Environmental Change Institute (ECI), for Julie's Bicycle on the UK music industry's climate emissions revealed that CD packaging is one of the industry's largest direct sources of Greenhouse Gas (GHG) emissions, accounting for a third of the recording and publishing sector's annual emissions and around 10% of the total annual emissions from the UK music market.

Julie's Bicycle therefore commissioned Arup to identify options for reducing the impact of CD packaging and to develop a 'roadmap' that the industry could follow to make the changes required so that low-impact packaging becomes the industry norm.

While the clear plastic jewel case with paper inlay and booklet remains the norm for CD packaging a number of alternatives are already in use by all the major companies and independent labels and seem to have been accepted by retailers and consumers. These range from different formats of entirely card packaging to card outer shells containing plastic or biodegradable trays.

In terms of greenhouse gas emissions, all alternatives are substantially better than the jewel case. Pure card options have only 5% or less of the emissions associated with jewel cases, whereas the mixed card and plastic option have around one-third of a jewel case's emissions. Varying key assumptions still resulted in around 90% savings for the card options and similar results (34% of jewel case emissions) for the mixed card and plastic option.

The 95% difference in carbon emissions is so stark that the music industry should commit to an industry wide switch to card based packaging and completely discontinue the use of plastic jewel cases by September 2010, provided that the supply chain can be successfully reconfigured to provide sufficient quantities of card packaging at an acceptable price.

3 Background & Approach

3.1 Background

Julie's Bicycle was set up to find ways of reducing the climate change impacts of the UK music industry. In 2007, Julie's Bicycle commissioned Oxford University's Environmental Change Institute (ECI) to scope out the UK music industry's climate emissions as a first step in understanding the industry's carbon footprint. The ECI study¹ revealed that CD packaging is one of the industry's largest direct sources of GHG emissions, accounting for a third of the recording and publishing sector's annual emissions and around 10% of the total annual emissions from the UK music market.

In June 2008, Julie's Bicycle therefore commissioned Arup to identify mechanisms for reducing the climate change impacts associated with CD packaging and develop a 'roadmap' that the industry could follow to make the changes required.

3.2 Approach

This was a short piece of analysis, designed to build on the work already carried out by the Environmental Change Institute and previous studies of the environmental impacts of CD packaging commissioned by the industry, in order to develop conclusions and recommendations in time for the Julie's Bicycle Working Group meeting at the end of July.

The aim was to bring together existing knowledge and then use Arup's carbon and life cycle analysis expertise to carry out a quick but robust technical analysis to demonstrate the climate change impacts of utilising different packaging options. The Arup team would then use its knowledge of corporate responsibility, sustainability and change management to make recommendations on effective routes that the music industry could take to move to lower impact CD packaging. The six main tasks undertaken in completing the work are outlined below.

Setting climate change impacts in the context of wider issues

While the key focus is on reducing the climate change impacts associated with CD packaging, these need to be understood within the context of the wider environmental, social, regulatory and business issues facing the music industry. Initial discussions within the project team and with the Julie's Bicycle team enabled us to map these out, see Section 4 below.

Understanding data availability and gaps

The next step was to understand what data was currently available on the climate change and other environmental impacts of different types of CD packaging and where in the supply chain the key impacts occurred. Existing data on the CO₂ emissions from CD packaging was based on limited data, some of which was nearly ten years old and the breakdown of emissions across the supply chain was not entirely clear. Through discussions with the CD Packaging Working Group, the project team identified companies in the CD packaging supply chain who could provide us with the information required to update life cycle analysis data and fill in key gaps.

Identifying mechanisms for change

Based on the information available and discussions with the Julie's Bicycle team, the Arup team identified the possible mechanisms for reducing the impact of CD packaging and the

¹ Bottrill et. al, (2008). Oxford University, Environmental Change Institute. First Step UK Music Industry Greenhouse Gas Emissions for 2007

issues associated with them. A meeting was held with the CD Packaging Working Group to discuss the:

- current situation with CD packaging and the key influences on it
- experience with alternative approaches
- focus of the project – optimising manufacturing, supply and disposal or focusing on material changes
- access to data

Analysing different packaging options

The CD Packaging Working Group concluded that the focus should be on identifying the impact of switching from the current industry norm of the polystyrene jewel case to alternative forms of packaging rather than on optimising current manufacturing, supply and disposal.

The project team therefore focused on finding and analysing the data for the following packaging alternatives:

- jewel case
- slimline jewel case also known in the UK as Maxi Single
- PVC wallet
- shrink wrap
- digipack with plastic tray
- digipack with card tray
- boxed card package with sliding card tray
- card wallet
- 12 page booklet (industry average number of pages)

In each case the climate change emissions associated with the packaging was calculated and the results compared, in order to understand the potential reduction in greenhouse gas emissions if an alternative to the jewel case became the packaging norm for CDs.

Sensitivity analysis

Assumptions always have to be made in analyses such as these, so to test the robustness of our conclusions, a sensitivity analysis was carried out. Key assumptions were varied to reduce the emissions associated with the jewel case and increase the emissions associated with card packaging. The differences in greenhouse gas emissions between the different packaging types were then recalculated and compared to the previous figures.

Moving to lower impact packaging

Having identified the potential carbon savings from using different types of CD packaging and tested the robustness of the conclusions the implications of the figures were analysed. The final step was to outline the possible route for an industry-wide move to lower impact packaging.

4 Current Situation

4.1 Packaging criteria

Packaging is there for a purpose. It needs to protect the contents and encourage people to buy the product inside. Discussions with the CD Packaging Working Group revealed six key criteria behind decisions relating to CD packaging.

Durability

The key purpose of packaging is to keep the contents safe. CD packaging needs to be durable as CDs may be transported long distances, flicked through in shop racks for months and stored by purchasers for decades. There are concerns about using some alternative packaging on durability grounds, for example cardboard and potato starch can degrade if users spill liquids on them and biodegradable shrink wrap degrades at lower temperatures than conventional shrink wrap.

Attractiveness to consumer

Now that music can be purchased via digital download, the attractiveness of the CD is especially important. People who can download music may choose to buy particular CDs as presents or because they want to have the music physically on display.

Attractiveness to artist

The packaging needs to be able to project the desired image of the artist. An increasing number of artists are interested in climate change and other environmental issues and are seeking to demonstrate their credentials in this area by specifying environmentally friendly packaging. However, some have found themselves making trade-offs, for example rejecting recycled card options originally specified due to concerns that the quality of the finish that this allowed was not high enough.

Attractiveness to retailer

The main criteria for retailers are 'rackability' and attractiveness to consumers. They need to be able to display CDs in a way that attracts consumers to purchase them. Therefore they need to continue to look good when they have been in store for a period of time and extensively handled and be in a format that makes it easy to see the titles. Retailers often shrink wrap plastic jewel cases and are even more likely to shrink wrap card cases due to concerns about the corners becoming dog eared when handled.

Cost

Low cost is a key factor in the attractiveness of different packaging options and this is heavily related to the ease of manufacture (see below). Clear polystyrene jewel cases are a cost effective option as they can be used to package any CD; a process which is fully automated. The cost equation may change with the volatile price of oil.

Ease of manufacture

Jewel case manufacture has a highly automated production process which enables high throughput, quick turnaround times and low costs. Many of the alternative packaging options are less automated, although this is beginning to change.

4.2 Current trends

4.2.1 Sales of physical CDs

It is estimated that over 131 million physical CD albums were sold in 2007. While the trend to digitisation has transformed the singles market, it has had only a relatively small impact on albums, so far. Downloads now account for over 80% of single sales but only 4.5% of

album sales. Although album sales have declined slightly over the last few years they are still significantly higher than a decade ago.^{2,3}

4.2.2 Trends in packaging

The clear plastic 'jewel case' with a paper insert containing artwork and information about the music is the current standard form of packaging for CD albums. It has not been possible to obtain industry wide use figures but major music companies such as EMI estimate that 90% of CD albums that they produce are packaged in jewel cases.

Jewel cases have got thinner and lighter since the 1980s and consequently are more prone to cracking. An updated 'Super Jewel Box' with improved hinges and durability which uses more plastic was launched six years ago. A lighter 'slimline' jewel case which uses less plastic is often used for packaging CD singles.

Jewel cases have many positive attributes as a packaging material but concerns about their environmental impact has led to interest in alternative options, particularly as awareness about climate change grows. The Beggars Group of companies, home of key independent labels, reports that around 90% of their artists request alternative packaging for their releases. All the large music companies are also using card based packaging for certain CD releases. Key reasons for using alternatives to jewel cases for the large companies are if a major artist has specifically requested it or to package 'special editions'.

Although the jewel case remains the norm for CD packaging, different forms of card based packaging have become a common sight in retailers racks and customers homes and some of the more innovative forms are seen as adding value to the product,

Some music companies are using packaging to promote environmental issues. For example, Sony BMG has released their 'classic album' series in card based packaging using the brand 'Carbon Neutral® Entertainment'. All CDs sold in this series included 10 energy savings tips and Sony BMG has pledged to offset all carbon emissions generated in the production of each album.

4.2.3 Current supply base

The majority of jewel cases are manufactured by companies located Europe or Asia and it appears that most CDs sold in the UK are manufactured in Europe. Music companies generally have a relationship with a single broker who sources all their discs and packaging or with a single replicator who produces their packaged discs. The replicator sources jewel cases, print and card packaging as appropriate.

² BPI Annual Statistics 2007

³ Packaging News, October 1 2007. Media packers respond to the threat from downloads with more innovative formats

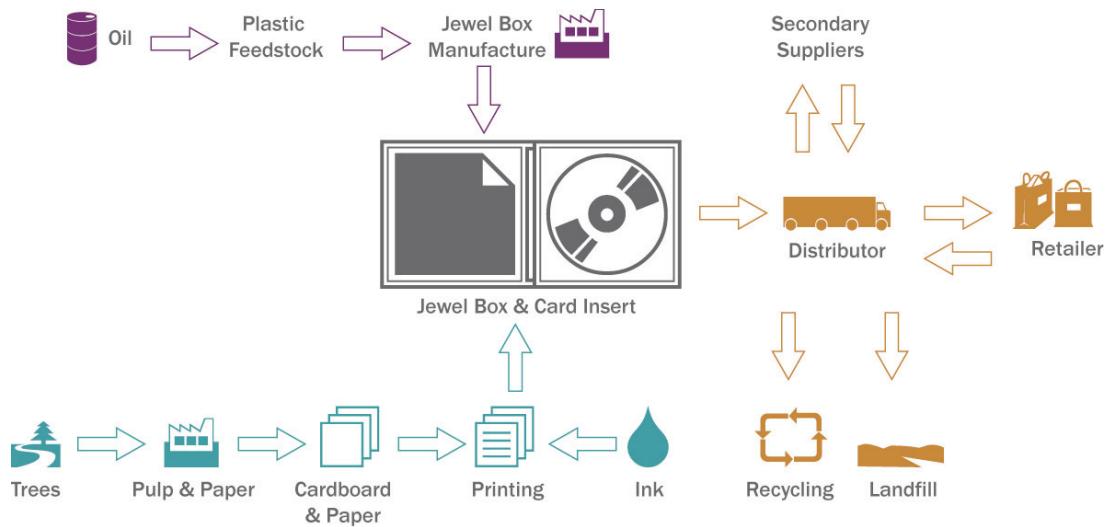


Figure 1 - Current CD Packaging Supply Chain

4.3 Sustainability issues in CD packaging

All products have a range of sustainability issues associated with them. The key issues for CD packaging are set out in Figure 2 below.

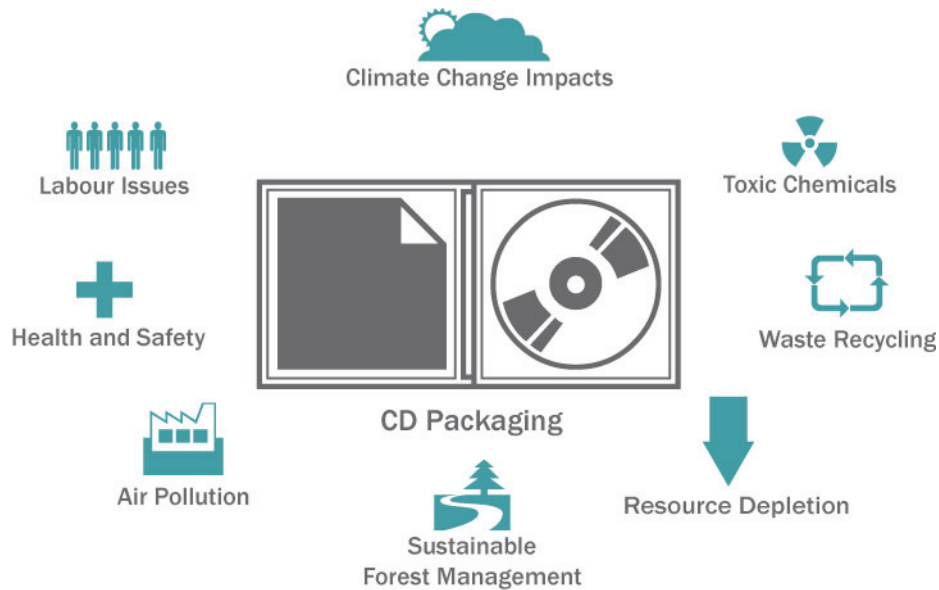


Figure 2 - Sustainability Impacts for CD Packaging

4.3.1 Sourcing and transporting raw materials

The sourcing of the raw materials for CD packaging has a big impact on its sustainability. The raw material for virgin plastic is oil. Recycling rates for polystyrene are low, so the vast majority of jewel cases are made from virgin polystyrene, which contributes to the depletion of natural resources. Polypropylene is easier to recycle than polystyrene and the US music industry is currently investigating the potential for a greater use of polypropylene jewel cases.

Paper and card can be made from virgin wood fibre or recycled fibre. The sustainability of the wood fibre source is important since poorly sourced fibre can lead to ecosystem destruction and there are well established certification schemes that can be used to ensure

that fibre comes from well managed sources. The best known of these is the Forest Stewardship Council scheme which is utilised in some card packaging used by the music industry.

The location of raw materials, their production and transport can have a significant impact on the climate change emissions of the packaging. Pulp production can be an energy intensive process, however, if the energy comes from predominantly renewable resources (wood and paper waste and hydroelectricity in the case of Scandinavian pulp production), the associated emissions of greenhouse gases are low.

Similarly, the mode of transport is as important as the distance travelled since shipping has lower climate change emissions associated with it compared to road and air transport.

4.3.2 Manufacturing

The sustainability of the manufacturing process depends on the energy intensity of the process and the source of that energy. The manufacture of plastic is energy intensive and the level of climate change emissions associated with the process depends on the source of that energy. The mix of sources that contribute to grid electricity varies in different countries, so the location of manufacturing has an impact of the greenhouse gases associated with the process.

Other impacts associated with manufacturing are pollution from the production process and health and safety and labour issues. CD packaging is manufactured in a number of countries which have different labour standards. The main sources of packaging for the music industry are Europe and Asia. The music industry needs to ensure that high labour and health and safety standards are adhered to throughout the supply chain. This gets more complicated if companies are procuring from multiple suppliers, particularly if they are located in countries with low levels of labour law enforcement.

4.3.3 Printing and finishing

The printing and finishing process has a number of environmental issues associated with it, including:

- the storage, handling and use of solvents, inks and other chemicals;
- emissions to atmosphere,
- effluent from washing-down processes; and
- solid waste arising from the production process.

Traditionally inks are made up of various components such as pigments which create the colour, a petroleum based liquid that is mixed with the pigment and then dries, and a binding agent made of either organic resins or polymers. The petrol and alcohol content evaporates in the drying process, releasing Volatile Organic Compounds (VOCs) into the atmosphere.

The more environmentally friendly alternative is vegetable based ink. The base liquid for this ink is made from a variety of vegetable oils such as corn, linseed, or soy bean. Vegetable oil is a renewable raw material, unlike petroleum, so using vegetable oils reduces the levels of VOCs. Eco-friendly inks should also lead to a large reduction in solvent and water used during press washups.

The look and durability of card packaging and printed inserts can be finished with a process such as varnishing. Some finishing processes such as the ultraviolet (UV) coating process can be damaging to the environment and utilise significant amounts of energy. Solvent based varnishes should also be avoided as these emit VOCs. Cleaner alternatives include vegetable based sealer or a water based varnish.

4.3.4 Waste, recycling and disposal

Recycling reduces the need for virgin material and generally leads to lower energy consumption. The impact that this has on greenhouse gas emissions depends on the source of the energy

The impact of the disposal of packaging depends on its destination. In most countries, there is currently a far better infrastructure established for recycling cardboard than there is for recycling plastic. Both materials generate energy if incinerated. If landfilled, jewel cases remain inert for a long period of time, while paper and cardboard will degrade releasing greenhouse gases.

Another issue is the extent to which CDs and CD packaging is oversupplied and the fate of the products that are surplus to requirements. With the jewel case, it is only the paper inlay and booklet that is specific to the individual CD, so any oversupply of the jewel case can be used for future CDs. In contrast, cardboard packaging is printed with a design specific to a particular artist and release and cannot be used for alternative CDs. As unit costs decrease with the size of the print run, in countries where there are relatively long lead times in producing packaging, the tendency is to over-specify the amount of packaging to ensure there are no supply gaps. This leads to wasted packaging that needs to be recycled, incinerated or disposed of. According to members of the UK music industry, European lead times are lower than those in the US, so this is not such a big issue in Europe.

4.3.5 Overall environmental impact

In 1998, EMI commissioned a life-cycle analysis from Ecobalance of different packaging options⁴ which covered five key environmental impacts:

- Climate change emissions
- Air acidification
- Ozone depletion
- Depletion of non-renewable resources
- Eutrophication⁵

The Ecobalance work revealed that packaging options with lower climate change emissions also had lower scores on the other environmental impacts. Therefore moving to packaging with lower climate change emissions is likely to result in a range of environmental benefits.

⁴ Ecobalance Life cycle inventory analysis. Comparison of CD packaging options. EMI Recorded Music.

⁵ Eutrophication is the enrichment of water courses due to excess nutrients which can lead to death and damage to the water inhabitants

4.4 Societal and regulatory trends

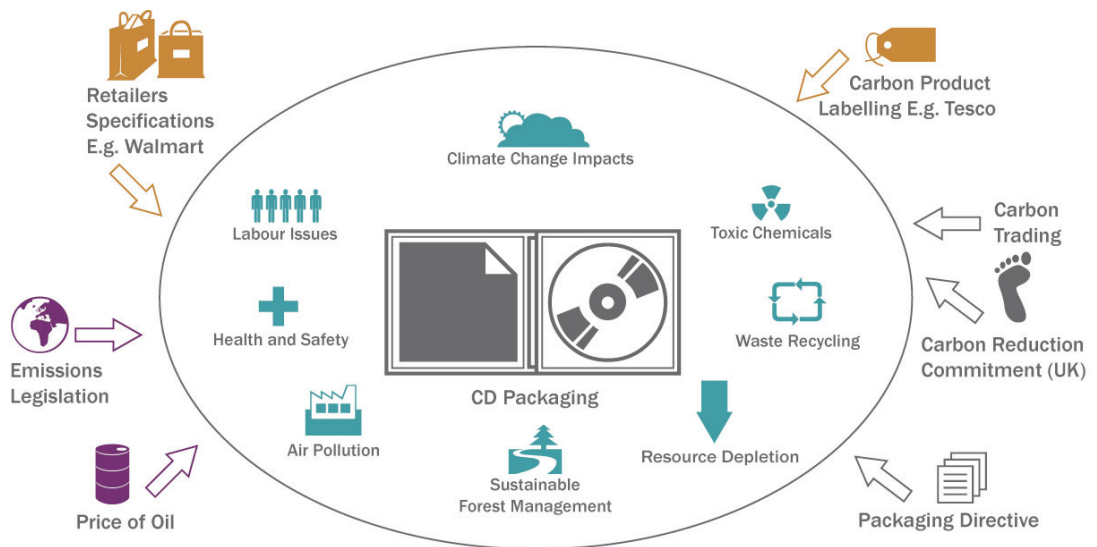


Figure 3 - Societal and Regulatory Trends

The sustainability agenda in the UK music industry is being driven by a range of factors. Rising oil prices are driving up costs and may contribute to increased efforts to reduce use of non-renewable resources. Environmental concern, particularly growing awareness about climate change has led to a range of regulatory and voluntary initiatives to reduce the impact of packaging. There is now increasing pressure for companies to reduce both their direct greenhouse gas emissions and those of their supply chain.

Key retailers are leading the way, for example Wal-mart’s packaging scorecard, designed to reduce packaging in its supply chain by 5% by 2013, is having reverberations throughout the packaging industry. The scorecard rates packaging on seven issues including greenhouse gas emissions and compares suppliers scores to those of their peers.

Tesco, where more CDs are sold than any other outlet in the UK, is an early adopter of product carbon labelling using a methodology that measures the life cycle greenhouse gas emissions associated with products. The aim of carbon labelling is to give companies and consumers information about the climate change impacts of the products that they are purchasing and assist them to make low carbon choices. As product carbon labelling becomes more common the music industry may find retailers and consumers asking more questions about the greenhouse gases associated with CDs and their packaging.

5 Alternative Types of Packaging

5.1 Different types of packaging currently in use

There are a whole range of alternative packaging options currently being used by the music industry. These range from different styles of pure card packaging, to card combined with plastic or biodegradable materials such as potato starch or composite biodegradable options such as the package PaperFoam®, see Figure 4 below for some examples. The most common are described in more detail below.

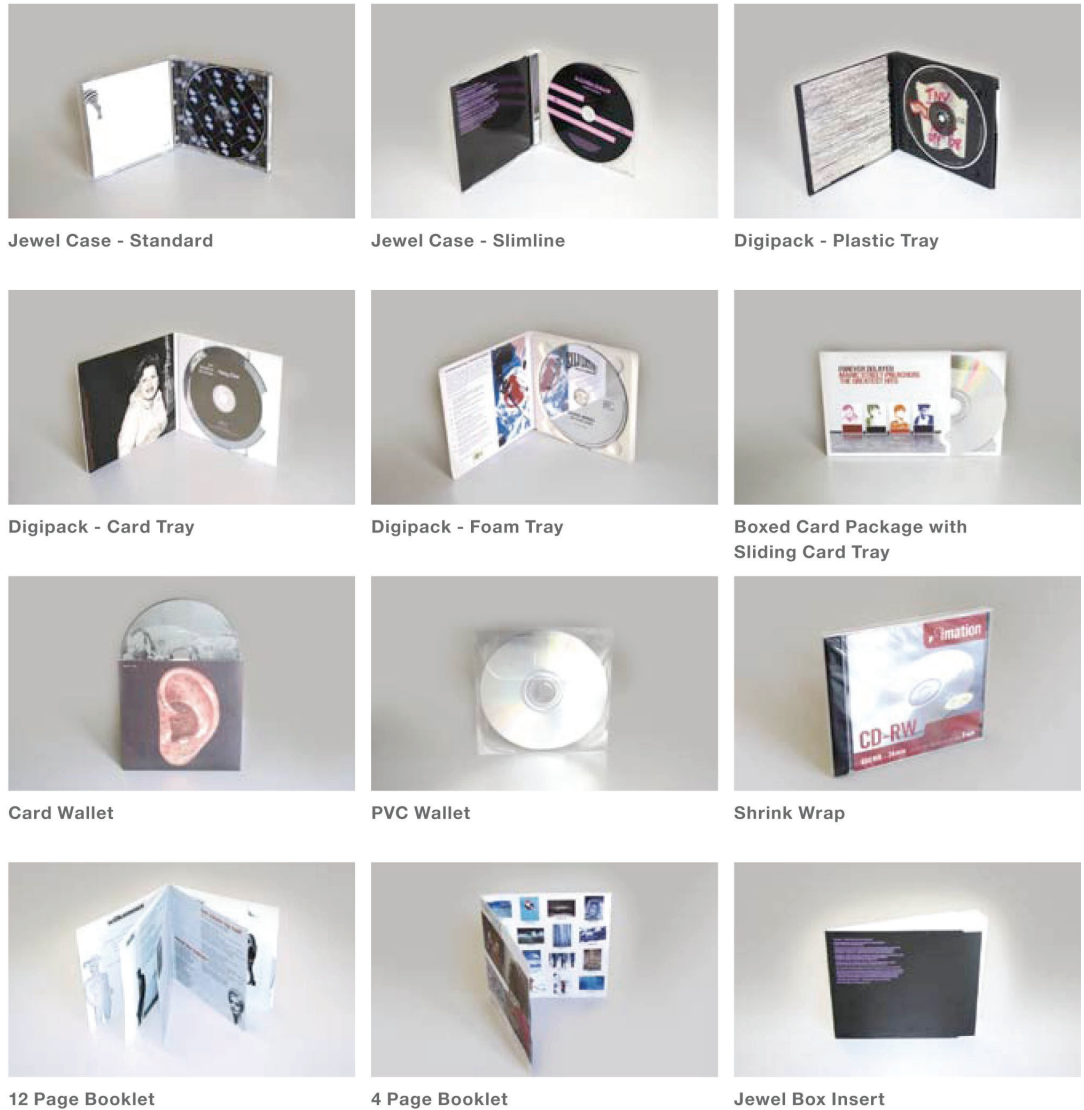


Figure 4 - Examples of Different Packaging Options

5.2 Plastic based options

Jewel Case

The 'jewel case' is the original and standard form of packaging for CD albums. In Europe the plastic case is manufactured from polystyrene. The jewel case consists of a three-piece case usually measuring 142 mm _ 125 mm _ 10 mm. Two opposing transparent halves are hinged together to form the casing, the back half containing a tray with a circular hub of teeth (known as a spider) which holds the CD.

The jewel case usually includes a paper insert and booklet at the front and an additional paper inlay at the back. The front cover artwork is held in the front part of the jewel case and this will contain information such as lyrics, liner notes, photos and artist acknowledgements. The track listing will be featured on the back. Typical jewel cases are made of transparent plastic (polystyrene), however they are occasionally produced with tinted or black plastic.

Super Jewel Case

An upgraded version of the jewel case is the "Super Jewel Box" which offers an updated design offering improved look and a stronger packaging product. It looks very similar but has improved hinges and durability. The super jewel case has a more negative environmental impact due to its greater use of plastic, meaning more raw materials are

required, more energy is used in its manufacture and it is slightly heavier and bulkier, increasing storage and distribution requirements.

Slimline Jewel Case

A variation on the typical jewel case is the 'slimline' jewel case often used for packaging CD singles. Slimline jewel cases are very similar to the standard jewel case but thinner and lighter. The environmental performance of the slimline jewel case is better than the standard jewel case as it uses less plastic in the manufacturing process meaning it requires less raw materials, energy to produce and is lighter for storage and distribution.

Polypropylene Jewel Case

Jewel cases are traditionally manufactured from polystyrene which is difficult to recycle. In the United States the music industry is discussing greater use of polypropylene which is much more widely recyclable.

Plastic Sleeve

A light-weight, low cost option is the plastic sleeve. However, the plastic sleeve has little scope for making the CD look attractive and projecting the artist's image, so is generally only used for promotional discs.

5.3 Card based options

Digipack

The digipack is the most popular alternative to the jewel case. The gate-fold packaging is made from card stock or other paper or cardboard with a moulded plastic tray (often known as the flexi-tray) which opens like a book.

The digipack will usually include a booklet containing artwork, lyrics, liner notes, photos and artist acknowledgements. The track listing and additional artwork are displayed on the back.

The digipack is more expensive than the jewel case packaged product (see section 7), however, it is often regarded as more attractive and more versatile as the three section's sleeves offer considerable design options. Consequently some members of the music industry feel that the digipack provides greater added value to the CD.

The digipack is generally perceived as less durable than the jewel case as the packaging is more susceptible to abrasion and if the teeth of the flexi- tray break the CD is prone to slip out of the packaging. To improve the durability of the product it can be coated with a UV matt or gloss varnish or even a laminate, however, this leads to additional environmental impacts.

Some manufacturers are developing particularly environmentally friendly versions of the digipack by including recycled materials such as post-consumer polyethylene terephthalate (PET) in the trays and recycled material in the card board stock. For example, the 'Digipak I save' range offers a number of options including biopolymer packaging which is biodegradable and compostable. It uses 100 per cent recycled polystyrene, 100% recycled paperboard, has a recyclable tray and is printed using vegetable inks and water-based lacquer finishes.

Boxed card package with sliding card tray

This type of packaging is 100% cardboard so is fully recyclable and is lighter and thinner than the standard jewel case. The case opens up from the side by moving the slider part (on which the disc is resting) from the sleeve. The packaging can hold one or two discs and a booklet. The DiscBox Slider® is an example of such a product.

This type of packaging is more expensive than the jewel case packaged product. This appears to be due to the extensive use of board and that the production process is not fully automated, however, some manufacturers have recently introduced fully automated

processes. There is also an issue around the durability of the package as it is more susceptible to abrasion or scuffing than the plastic product.

Card Sleeve

A low cost, light-weight option, card sleeves can also be produced with a transparent window which enables the disc to be visible. However, it offers little space for design and information and does not meet retailers need for 'rackability'. It also has durability issues and is generally only used for promotional CDs.

Potato Starch Packaging

Potato starch is being combined with products from the paper industry to form a biodegradable tray which can be combined with card to produce relatively low impact CD packaging. Starch is used as a polymer feedstock, replacing petrochemical-based materials. Sony BMG recently adopted the product for its Carbon Neutral® Entertainment music range whilst EMI and Universal Music also include paper starch in their packaging options.

Potato starch is a renewable raw material and discarded trays degrade quickly through the action of water and micro-organisms. Additionally there could be benefits for the British potato industry, turning potato waste from a cost to a resource.

The drawback to the product is that it degrades when wet and many in the music industry and retail trade do not like the aesthetics of the tray.

6 The Climate Change Impact of Different Packaging Options

6.1 Approach

A life cycle approach was taken to calculate the greenhouse gas emissions from sourcing and transporting raw materials, manufacturing the base product (i.e. cardboard or plastic) and turning the base product into CD packaging. The results reported in this study are on a "cradle to gate" basis, where the "gate" is defined as the manufacturing facility that produces the CD packaging. Downstream greenhouse gas emissions from this point are excluded due to lack of data. The transport of CD packaging after it leaves the manufacturing site is likely to make a relatively minor contribution to the life cycle emissions. In addition, it is likely that the transport requirements at this stage will be very similar whatever type of packaging is used and therefore will make very little difference to the overall comparison. The impact of the disposal phase is unclear.

Where emissions of methane and/or nitrous oxide contribute more than 0.5% to the climate change impact, their contribution has been included in this update. Therefore, results are provided on a "carbon dioxide equivalent" (CO₂ e) basis.

A detailed description of the methodology is set out in Appendix 1.

Type of Packaging	Greenhouse gas emissions Kg CO ₂ e per unit	% of jewel case emissions
Jewel box	1.151	
Slimline jewel box	0.549	48
PVC wallet	0.070	6
Digipack with plastic tray	0.355	31
Digipack with card tray	0.063	5
Boxed card package with sliding card tray	0.039	3
Card wallet	0.013	1
Jewel box inlay	0.006	0.5
12 page booklet	0.059	5
4 page booklet	0.020	2
Shrink wrap	0.001	0.1

Table 1 - Climate Change Emissions for Different Types of Packaging

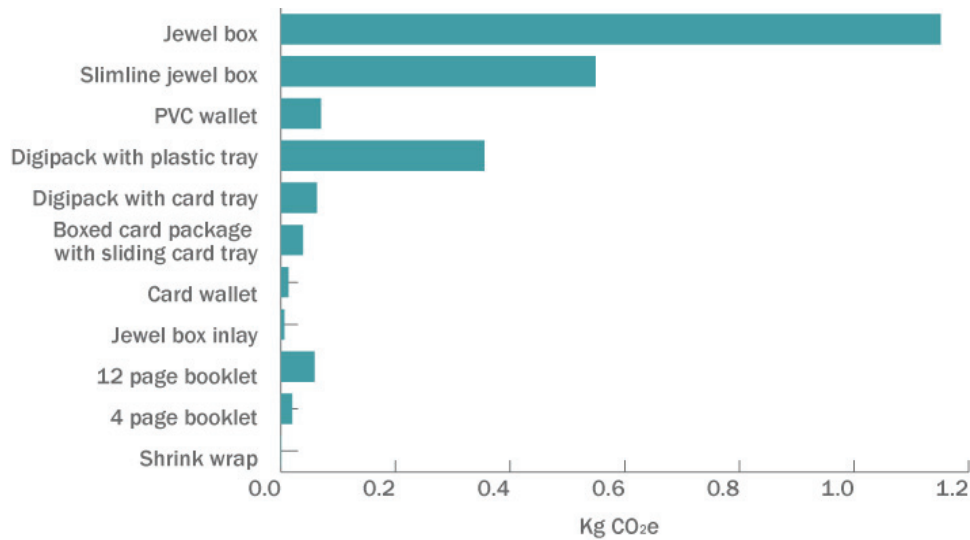


Figure 5 - Comparison of Greenhouse Gas Emissions for Different Packaging Types

As Figure 5 shows, the greenhouse gas emissions for packaging options containing plastic are significantly higher than for the pure card options. Moving to a pure card option would reduce greenhouse gas emissions by around 95%. Moving to a combined card and plastic option would reduce greenhouse gas emissions by over two-thirds.

6.2 Sensitivity analysis

The difference in climate change emissions between the jewel case and the other forms of packaging is stark. Clearly, in this type of analysis a number of assumptions need to be made, so to test the robustness of the results, we altered two key assumptions, lowering the emissions relating to the jewel case and raising the emissions related to card based packaging.

In Table 1, it was assumed that the jewel case was produced using a thermoforming process. An industry source had suggested that if an injection moulding process was used, energy consumption during the manufacturing process could be substantially reduced. We therefore reduced the energy use associated with jewel case manufacture by 50% and analysed the results.

In Table 1 it was assumed that the card used for CD packaging was standard wood pulp card which has a lower set of emissions associated with its production than coated packaging paper. We therefore substituted the emissions associated with coating packaging paper numbers to see what difference this made.

Type of Packaging	Original wood pulp calculations Kg CO ₂ e per unit	Original wood pulp calculations % of jewel box emissions	New coated packaging assumptions Kg CO ₂ e per unit	New coated packaging assumptions % of jewel box emissions
Jewel box	1.151		0.686	

Digipack with plastic tray	0.355	31	0.235	34
Digipack with card tray	0.063	5	0.084	12
Boxed card package with sliding card tray	0.039	4	0.052	8

Table 2 - Sensitivity Analysis

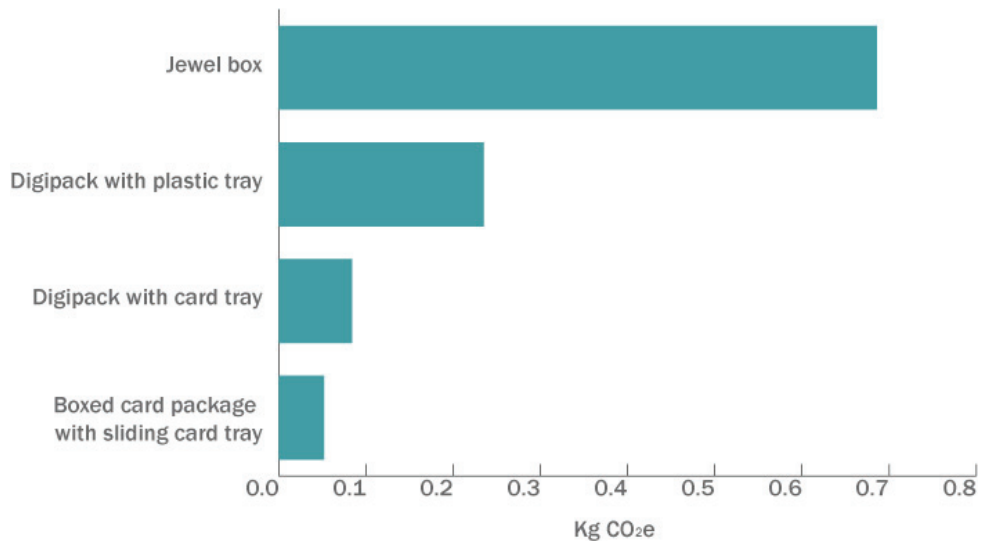


Figure 6 - Comparison of Greenhouse Gas Emissions for Key Packaging Types Using New Assumptions

Changing the assumptions leads to a significant reduction in the emissions associated with plastic options, with jewel case emissions 60% of those previously calculated in Table 1. It also led to an increase in the emissions associated with card options.

However, even under these assumptions, the emissions associated with pure card options are only 8-12% of those of the jewel case and the mixed card and plastic option still has only just over 1/3 of the emissions of the jewel case.

7 Barriers to Greater Utilisation of Card Based Packaging⁶

Graham Crawshaw

7.1 Cost

The most intractable barrier to a greater use of card based packaging is cost: at the moment board packaging tends to cost more unless purchased in larger quantities.

There is over-capacity in jewel case production which keeps prices relatively low although the product is dependent on the volatile cost of polystyrene, an oil derivative.

However, this belies the complexity of the issues that significantly impact purchasing choices. For example, it is important to ensure that price comparison is made between the complete retail package. Jewel box packaging typically includes four different printed components produced on different stocks (thicknesses) of paper: booklet, inlay, insert card and sticker. In contrast most card based packaging involves fewer components. Taking into consideration all the accompanying costs of the product gives a true account of packaging cost, rather than confining the differential to the plastic jewel box alone.

A brief analysis of the historical predominance of the jewel case is helpful in assessing the current cost differentials:

7.2 Inventory

Jewel boxes have been the standard package for compact discs since the launch of the product in the mid 1980's. License for producing the standard jewel box was granted free of charge to manufacturers thereby defining the standard up front and focussing all production on this type of package.

The physical dimensions (width, height and thickness) of the jewel box have become global standards for retail racking (and indeed domestic storage). Alternative packaging would, to a large extent, need to comply with the existing size requirements.

Alongside the jewel box other printed materials need to be produced and processed through manufacturing (booklet, inlay, insert card and sticker). These are now relatively cheap due to standardisation and are provided by suppliers who specialise in producing these components. However, there is a hidden cost in managing multiple stock units and the inventory associated with these items.

Card packaging is title specific – produced specifically for a particular release. There is no generic version which can be prepared in advance. However, unlike the jewel box package there is only one component to manage through production as everything connected with the release is built into the card package. For example, with a jewel box package a sticker is an additional component, while in card packages the wording on the sticker is typically incorporated into the artwork.

Print technology is changing so that smaller production runs are becoming cheaper. Pre-press set up and computer to plate processes have dramatically reduced the cost of set up. This trend continues.

⁶ This chapter of this report has been authored by Graham Crawshaw, Director, Purchasing for Profit Ltd.

7.3 Volume

The impact of volume is more evident on title specific board packaging compared to jewel case packaged discs. This is because for jewel case products only the booklet and inlay are title specific whereas for most alternatives the entire package is title specific.

Within the industry 80% of orders are for quantities less than 5,000 units. At this level a jewel box packaged product costs around 30 pence compared to a board based package which is closer to 50 pence.

When producing larger volumes (50k+) the differential between jewel box product and board packaging is reduced to around 2 pence.

Music companies will often consider alternatives to the jewel box for initial runs (which tend to be larger) reverting to the standard jewel box for re-orders or after the initial stock has been depleted.

Production lead times for jewel cased products that are automated and assembled with components that are printed using standard templates are much quicker than board packaging, that typically takes the supplier longer to produce and the replicator longer to assemble.

In order to achieve volumes necessary to reduce per unit cost and also because of the longer lead times on card packaging, labels will often over order – exposing themselves to greater stock risk than would otherwise be the case. Increased stock risk is therefore an additional barrier to the move to card.

7.4 Trade names

Supplier trade names and patents are confusing and can make it difficult to establish a package that can be produced by multiple suppliers across multiple countries. Establishing generic board packaging will remove this complexity.

7.5 Assembly Considerations

The assembly of the jewel box and its components has been automated for almost 20 years. Product can therefore be packaged at several thousand units per hour; in contrast, manual assembly is limited to an average of 300 units per person per hour.

Standard digipack and wallet products are now automated as these products have become established within the market. More complex board packaging still needs to be manually assembled.

There are many variations of board package from many suppliers. It is important that replicators, who assemble the disc into the packaging, are provided with guidance in making investment decisions for automating the replicator process. To achieve this some standardisation needs to be encouraged.

The cost of assembly can be double that of an automated product. Replicators and packaging suppliers need to assess the value of investing in equipment to enable automation. However, contractually it is not always in the direct interests of replicators to automate production as manual assembly is generally considered a profitable activity.

Decisions not to use board based packaging by the music company are often on the grounds of being prohibitively expensive. This would significantly change if the assembly costs were reduced due to automation and standardisation.

7.6 Conclusions

To eliminate barriers and encourage greater utilisation of card based packaging industry changes need to occur, including:

- Guidance on establishing card based alternatives by giving direction to suppliers
- Focus on assembly automation (speed of production and cost of assembly)
- Increasing volumes of card based product will improve economies of scale, which will help reduce overall cost.
- Technology changes will enable card based products to be produced in smaller quantities cost effectively.

8 Recommendations & 'Roadmap' for Change

The analysis of greenhouse gas emissions associated with different types of CD packaging show that significant reductions in climate change emissions would result from moving away from the jewel case to any of the other forms of packaging analysed in this project. The greatest savings come from moving to a pure card option.

Given the level of carbon savings to be made, the UK music industry should commit to discontinuing the use of jewel cases completely by September 2010 and make card based packaging the industry norm by that date.

To ensure this shift results in the biggest positive impact, and occurs in the most effective manner possible, actions in three key areas are recommended.

1. *More detailed assessment of the supply chain and cost implications*

To generate the industry wide commitment required, more detailed work is required on the business and practical implications of discontinuing the use of the jewel case than has been possible for this report, where the primary focus was on the climate change impacts of different packaging options. Now that environmental case is clear, the practical changes required need to be examined further and ways of overcoming cost and procurement barriers identified. Specific issues that need to be addressed include:

- *Reducing the cost of card based packaging.* In the context of an industry shift to card based packaging, detailed discussions need to be held with procurement staff and card based packaging suppliers to identify the potential for bringing down the costs of card based packaging to a price that is sufficiently close to jewel case prices for the industry to feel able to make the commitment to phase out the use of jewel cases.
- *Ensuring that there is sufficient capacity.* Detailed discussions need to be held with card based packaging suppliers to ensure that sufficient capacity is available or can be brought on stream within the required timeframe.
- *Developing new sourcing arrangements.* Individual companies have their own procurement processes, existing relationships and in some cases long-term contracts with preferred suppliers. Each company will need to examine the changes that discontinuing jewel cases will require and how best to implement them.
- *Managing related sustainability issues.* The industry should work with suppliers to ensure that sufficient quantity of card can be procured from sustainable sources (i.e. either certified well managed forests or recycled fibre). The capacity to deliver packaging printed using environmentally friendly processes at acceptable quality and cost should also be assessed.

2. *Developing a workable industry wide commitment*

The CD Packaging Working Group should determine the best way of agreeing an industry wide commitment to phase out jewel cases that the entire UK industry can commit to.

The CD Packaging Working Group should develop the detailed content of the agreement, including:

- The date of change
- Whether the change should be to entirely card packaging or whether combined card and plastic options should be allowed
- The public declarations that should be made
- On-going monitoring and reporting of progress

3. *Ensuring the change has the greatest possible positive impact*

As the Julie's Bicycle First Step report pointed out, the nature of the UK music puts it in

powerful position to catalyse wider action on climate change. By using its creative and marketing expertise, the industry could use its commitment to changing CD packaging to catalyse wider awareness and action on a range of levels:

- *Catalysing wider change in the UK music and associated industries.* A well promoted process for phasing out the jewel case that generates positive publicity for the UK music industry should help generate further commitment and action amongst key players, particularly if an industry wide approach is seen to be beneficial.
- *Influencing the global entertainment industry.* The UK music industry could use its international position to catalyse similar action on reducing climate change impacts in the global music and wider entertainment industry.
- *Promoting climate change action by young people.* The music industry has a better understanding of how best to engage young people than most other industries and governmental and non-governmental organisations. The industry should use the shift to card based packaging to promote action on climate change in this key group.

Figure 7 below shows the proposed sequence of activities to enable jewel cases to be phased out by September 2010.

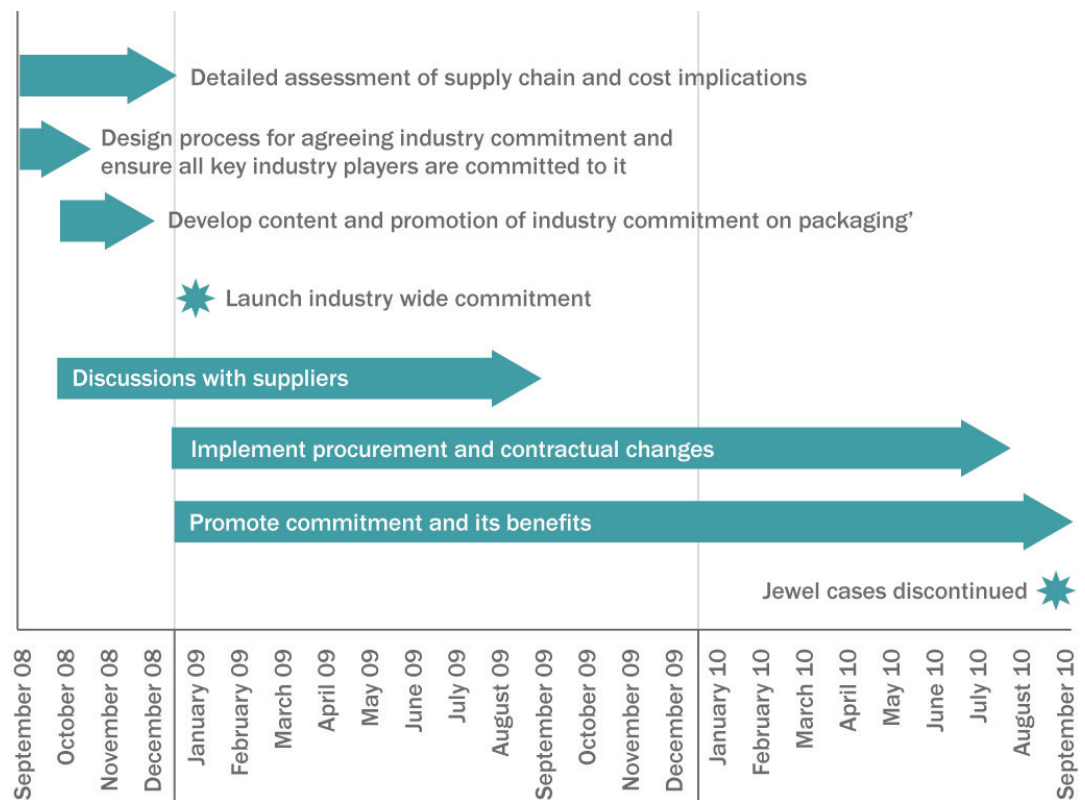


Figure 7 - Roadmap for Change

Appendix A

**Methodology &
Assumptions**

A1 Introduction

Carbon footprinting (or “greenhouse gas assessment”) is a systems analysis and accounting tool for quantifying greenhouse gas emissions, and their associated impact on climate change. It is a systematic approach, where the system of interest comprises the operations that collectively produce a product or deliver a service. The system being assessed is linked to other industrial systems supplying and transporting inputs and carrying away and disposing of outputs, for which the greenhouse gas emissions associated with these activities are also taken into account.

Carbon footprinting offers a clear and comprehensive picture of the potential climate change impact arising from flows of energy and materials through a system and gives a holistic and objective basis for comparisons. Results are presented in terms of a system function so that the value of that function can be balanced against the climate change impact with which it is associated.

Results of a carbon footprint quantify a potential climate change impact, and do not consider other environmental impacts, such as air acidification, waste generation and non-renewable resource depletion (for example), as well as wider sustainability criteria, such as local job creation (for example). They are used to help identify opportunities for improvement and to indicate less carbon intensive options. Results may also contribute to the design process by facilitating understanding of significant processes contributing to climate change in the supply chain and targeting effort towards these for carbon reductions.

The purpose of this work is to provide an update of key packaging components (currently used and potentially providing an alternative) using data where available and making assumptions where necessary. Therefore, whilst results may not be 100% accurate, they will provide a good indication of the differences between packaging elements for the purposes of decision making.

A2 Process for Carbon Footprinting Used in this Study

A2.1 Review of existing studies and choice of CD packaging elements

A number of studies have previously been carried out to determine the climate change impact associated with different forms of CD packaging. These studies, which have used a life cycle approach, are as follows:

CarbonNeutral Company (2000) *CO₂ Emissions Assessment of Pet Shop Boys CD Album and Singles*

EMI Recorded Music (1998) *Ecobalance life cycle inventory analysis – comparison of CD packaging options*

PaperFoam (2008) *PaperFoam CD Trays*.

At a meeting hosted by Julie's Bicycle at Arup's 13 Fitzroy Street offices on 20th June, it was agreed that the calculated climate change impact arising from packaging that is currently commonly used, such as the jewel box, should be updated using the most recent data, together with other forms of packaging that could potentially provide an alternative to the jewel box.

The forms of CD packaging that were chosen, which includes cases and ancillary elements, are as follows:

CD Cases

- Jewel box with clear tray;
- Slimline jewel case;

- Boxed card package with sliding card tray;
- Digipack (card/plastic);
- Digipack (card);
- Card wallet;
- PVC wallet.

Ancillary Packaging Elements

- Jewel box inlay;
- Booklet (4 page);
- Booklet (12 page);
- Shrinkwrap.

A2.2 Carbon footprint update – base data

For each of the CD packaging elements listed above, the following data were sought from the reports listed above, together with other relevant information provided in telephone interviews:

- Mass of a unit of CD packaging;
- Material composition;
- Production of materials;
- Energy required to manufacture each CD packaging element.

Table 3 below provides a summary of the data and information obtained as a result of this process, which has formed the basis for this update. Figures are presented per unit of CD packaging, defined by the mass.

CD Packaging	Unit mass (g)	Assumed composition (%)	Energy to manufacture (kWh)	Notes
CD Cases				
Jewel box/clear tray	81.7	100% polystyrene	1.17 (elec) 0.24 (gas) 0.07 (oil)	1
Slimline jewel case	39.0	100% polystyrene	0.56 (elec) 0.11 (gas) 0.03 (oil)	2
Boxed card package with sliding card tray	30.0	100% card	0.04 (elec)	3
Digipack (card/plastic)	47.0	49% polystyrene 51% card	0.36 (elec) 0.07 (gas) 0.02 (oil)	4

Digipack (card)	48.0	100% card	0.07 (elec)	3
Card wallet	10.0	100% card	0.01 (elec)	3
PVC wallet	5.0	100% PVC	0.07 (elec) 0.01 (gas) Negl. (oil)	5
Ancillary Packaging Elements				
Jewel box inlay	3.4	100% card/paper	0.005 (elec)	3
Booklet (4 page)	10.9	100% paper	0.016 (elec)	6
Booklet (12 page)	32.8	100% paper	0.05 (elec)	6
Shrink wrap	0.6	100% LDPE	N/A	7

Table 3 - Key Data used to Update the Carbon Footprint of CD Packaging Elements

Notes

1. Split between electricity, gas and oil taken from ECCM report.
2. Same split of energy carriers as for jewel case, adjusted for mass on a linear basis.
3. Energy required for manufacture based on data provided by PaperFoam (personal communication) from an LCA study undertaken by the University of Utrecht. These figures are based on the card and glue elements only. We assume that all energy is derived from electricity (EU-25 average).
4. Mass of polystyrene and card elements based on Arup measurement.
5. Energy carriers assumed to be the same as for polystyrene, adjusted for mass on a linear basis.
6. Energy assumed to be the same as for card based products, adjusted for mass on a linear basis.
7. Manufacturing energy of the film is aggregated into data for material production, therefore it is not separated out here.

Greenhouse gas emissions factors used in the reviewed studies were checked, in comparison to recent greenhouse gas emissions factors. Where a material difference was found (greater than 5% difference), Arup has used more recently published greenhouse gas emissions factors. Where emissions of methane and/or nitrous oxide contribute more than 0.5% to the climate change impact, then their contribution has been included in this update.

Therefore, results are provided on a "carbon dioxide equivalent" (CO₂ e) basis.

Greenhouse gas emissions factors used by Arup are based on a life cycle approach and have been taken from the proprietary life cycle assessment (LCA) software tool of PE International GmbH – GaBi 4, for which Arup has a current licence.

Sources of data for emissions factors have mainly been derived from the following:

- Plastic materials: Association of Plastic Manufacturers in Europe (APME);
- Card/paper materials: BUWAL – used in reviewed studies and therefore not updated;
- Energy: European Life Cycle Database (ELCD) / PE International GmbH – based on 2002 - 2005 data and incorporating pre-combustion emissions as well as emissions at the point where energy is generated from fuels. Since the emissions factors we have

used to represent grid electricity generation are on a life cycle basis, they are higher than those used in the ECCM report, as illustrated in Table 4 for the UK.

ECCM (Defra; 2001) (kg CO ₂ /kWh)	Defra (2008) (kg CO ₂ /kWh)	GaBi 4 (kg CO ₂ e/kWh)
0.43 (Note 1)	0.54 (Note 2)	0.66 (Note 3)

Table 4 - Comparison of Grid Emissions Factors for the UK

Note 1: This emissions factor relates to carbon dioxide emissions from power stations only. It does not include emissions of other greenhouse gases or pre-combustion emissions (extraction and transport of offshore fossil fuels etc). It is used for corporate reporting purposes with a boundary that is the coastline of the UK.

Note 2: This is the latest Defra emissions factor which represents a three year rolling average emission for the UK National Grid, using the same boundaries as in Note 1.

Note 3: This is a life cycle emissions factor, which incorporates pre-combustion emissions and also includes methane and nitrous oxide emissions. The data have been put together by PE International GmbH and use IPCC global warming potentials (GWPs) which were updated in 2007 (methane = 25, nitrous oxide = 298).

A2.3 Boundaries

From review of the CarbonNeutral Company's *CO₂ Emissions Assessment of Pet Shop Boys CD Album and Singles (Appendix III)* report, the contribution of the stages in the life cycle of CD packaging that have been updated in this study are as summarised in Table 5.

Life Cycle Stage	Contribution (%)	Included / Excluded
<i>Material production (packaging)</i>	41.7	<i>Included</i> ⁷
<i>Manufacture of CD packaging</i>	9.5	<i>Included</i>
Material Production (CD)	8.7	Excluded – out of scope
Transport (factory to distribution centre)	14.0	Excluded
Distribution and marketing	18.8	Excluded – out of scope
Recording studios, business travel, offices	6.9	Excluded – out of scope

Table 5 - Contribution of Stages in the Life Cycle of CD Packaging

The results reported in this study are therefore on a “cradle to gate” basis, where the “gate” is defined as the manufacturing facility that produces the CD packaging. Downstream greenhouse gas emissions from this point are excluded.

A2.4 Carbon footprint update – sensitivity test

For the sensitivity test, we varied the following parameters:

⁷ Except production of glue in card based products which is estimated to be 10% by mass of the composition.

- *Energy required to produce jewel cases* – this is a thermoforming process, based on information provided in the ECCM report. It seems that an alternative less energy intensive injection moulding process can also be used. Therefore, to test the sensitivity of the comparison, we have calculated the greenhouse gas emissions if the energy requirements to manufacture the jewel cases were halved, as provided in Table 6 below.

Energy Source	Energy Requirement – Base Data (from ECCM) (kWh/case)	Assumed Energy Requirement using Injection Moulding (kWh/case)
Electricity	1.17	0.59
Gas	0.24	0.12
Oil	0.07	0.04

Table 6 - Energy Required to Produce Jewel Cases

- *Emissions factor used to represent production of card* – in our first estimate we used a figure based on production of card from wood pulp of 0.467 kg CO₂ / kg. However, to test the sensitivity of the comparisons we used a significantly higher factor for the emissions associated with use of card, that quoted in the ECCM report for “coated packaging paper” of 0.91 kg CO₂ / kg (based on BUWAL data).

Appendix B

**References &
Bibliography**

Appendix 2:
Consumer Research Study
into CD Packaging

Catherine Bottrill
and Vishnu Ganglani,
2008

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Executive Summary

In 2007 the Environmental Change Institute, Oxford University produced a report for Julie's Bicycle: First Step, UK Music Industry greenhouse Gas Emissions 2007 which identified that the UK recorded music sector produces at least 138,000 t CO₂e per annum – a quarter (26%) of the UK music industry's total 2007 greenhouse gas emissions. Of this, CD packaging accounted for an estimated 45,000 t CO₂e amounting to a third of the recorded music sector's emissions. An individual CD album creates approximately 1 kg CO₂e and a third of these emissions are attributable to the plastic jewel case (Bottrill et. al., 2008).

Julie's Bicycle set up an industry-wide initiative to explore low carbon CD packaging, led by a specially convened industry working group chaired by Tony Wadsworth.

The working group commissioned consultancy firm Arup to conduct a more in-depth analysis into the greenhouse gas (GHG) emissions of different CD packaging materials (see Appendix I). Arup's study identified that the differential between versions of card-based packaging and plastic jewel cases could produce an estimated 95% drop in CO₂ emissions and that a digipack format with plastic tray produces over 60% lower CO₂ emissions (Arup, 2008).

The Arup study identified that shifting to lower emissions packaging options could substantially reduce the music industry's carbon impact and demonstrate significant – and global – climate responsibility.

The most urgent priority identified by the Working Group was that a strategy to shift to card-based packaging required consumer input. Julie's Bicycle commissioned and modelled this research project which aimed to:

- 1) examine CD consumers' packaging preferences and purchasing choices;
- 2) identify their CD purchasing behaviour;
- 3) gather views on a music industry shift towards card-based CD packaging as industry standard.

The research involved the analysis of 319 consumer surveys completed by CD buyers at chain music specialist retailers, an independent music specialist retailer and a supermarket, in London and Bournemouth. The research focused on card-based packaging alternatives to the jewel case (card currently has the lowest emission profile and is closest to mass market uptake).

Emerging new alternative materials and packaging concepts should also be considered by the recorded music sector in the future.

Key findings

- Asked to state a preference between the same album title in a plastic jewel case or in a card wallet (Coldplay's Viva La Vida, EMI 2008) more than half of those surveyed (55%) preferred the card wallet version. The main reason CD buyers gave for favouring the card packaging was aesthetic (i.e. the look and feel) whereas the main reason for choosing the plastic jewel case was durability. This indicates a large proportion of CD buyers will accept a change in CD packaging material.
- Asked to state a preference from a range of four different card-based packaging options, half of those surveyed (50%) said they preferred the digipack with plastic tray over a 3-fold card wallet, 2-fold card wallet with CD accessed inside, or 2-fold card wallet with CD accessed outside. The great majority of CD buyers (73%) choosing the digipack with plastic tray felt it to be equal to, better, or much better than the plastic jewel case. CD buyers favoured the digipack because of its perceived durability and the ease of access to the CD.
- Anecdotally, CD buyers liked the rigid structure of the digipack. The fact that the tray was plastic was not material to their choice: the determining factors were durability and access to the disc.
- Heavy CD buyers (defined as purchasing more than 10 albums over the previous 12 months) as well as those expressing a concern for the environment were significantly more likely to state a preference for card-based packaging.
- Half of CD buyers (50%) thought CDs should only be sold in environmentally-friendly card-based packaging with a quarter of respondents (28%) disagreeing and a fifth (17%) not knowing.
- The majority of CD buyers (75%) agreed that it would be a positive step for the music industry to shift to environmentally-friendly card-based packing with only 13% disagreeing and 10% not knowing.
- A significant proportion (79%) of those CD buyers that stated a preference for the plastic jewel case format said that a change to card-packaging would not make a difference to their decision to buy or not to buy a CD.
- Almost half of CD buyers (47%) said an environmental accreditation label for packaging would give them a more positive view of the product. A fifth of respondents (19%) thought it maybe would and a third (33%) said it would not make a difference.

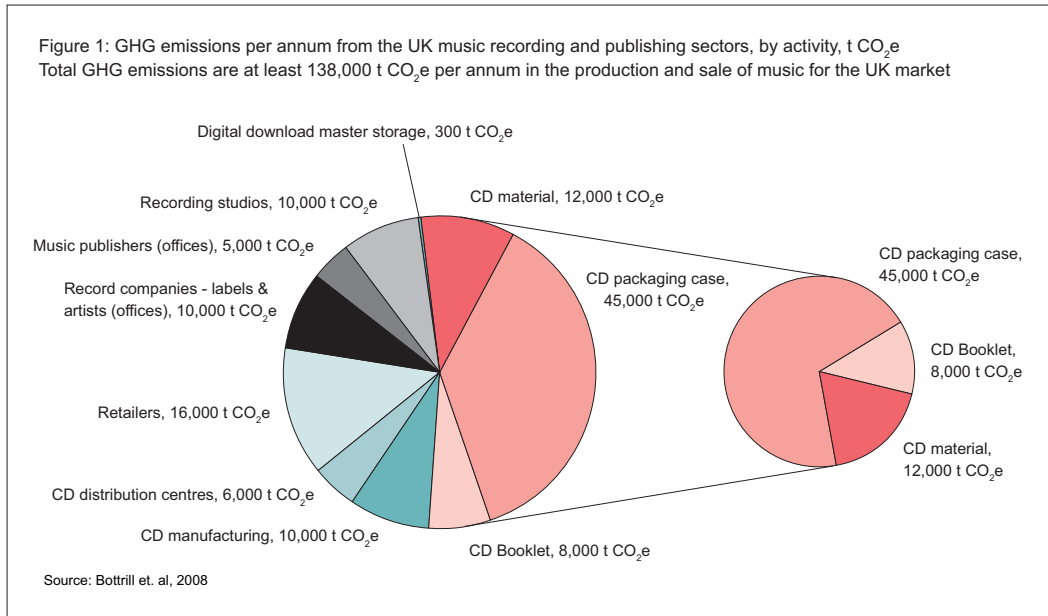
Conclusion

The consumer research findings show broad support for a wider adoption of environmentally-friendly card-based packaging. This support is likely to increase if the shift from plastic jewel case is underpinned by an environmental accreditation scheme to verify card-based CD packaging alternatives.

Section I: CD Packaging and Sales

I.1 CD packaging greenhouse gas emissions

Context: Julie's Bicycle First Step Report identified that plastic jewel cases for CDs account for at least a third (45,000 t CO₂e) of the recorded music sector's estimated 138,000 t CO₂e per annum (Figure 1).



An individual CD album creates approximately 1 kg CO₂e and a third of these emissions are attributable to plastic jewel case. Therefore, a priority for the industry is to identify and transition to CD packaging alternatives that will have a low emissions impact (Bottrill et al., 2008).

As a result Julie's Bicycle commissioned Arup, a leading environmental consultancy, to undertake a detailed analysis of the emissions saving potential from switching from selling CDs in a plastic jewel case to card-based packaging. This research concluded that a switch to a card wallet could reduce packaging emissions by 95% and a Digi-pack with a plastic tray would reduce packaged emissions by at least 60% (see Appendix 1, 2008).

With the environmental case clear the next steps were to understand what are the supply-chain and business issues for shifting the packaging format; and how will CD consumers respond to environmental alternatives to the plastic jewel case.

Research projects were undertaken to examine the key issues in each of these areas, thereby helping the recorded music sector to create a well-informed strategy for reducing packaging emissions. This report presents the findings of the consumer research into CD packaging.

I.2 Overview of annual CD sales

The music industry trends in CD album sales between September 2007 and 2008 from BPI statistics: over 131 million physical CD albums were sold in 2007.

Album sales are declining less rapidly than single sales.

By store type

Music specialist retailers sell the largest proportion CDs at 39% of which independent music specialist retailers account for 5%. The next largest proportion of sales at from grocers (22%) followed by internet music retailers (20%), general stores (13%) and mail order retailers (2%).

By age category

Approximately a fifth of CDs are sold in each of these age categories: 20-29 years old (23%), 30-39 years old (20%) and 40-49 years old (18%).

Over 10% of CDs are sold in each of these age categories: 12-19 years old (14%) and 50-59 years old (15%).

The smallest percentage of CDs are sold in age categories 60-69 years old (8%) and 70+ (3%).

By gender

A greater proportion of CDs by bought by males (60%) to females (40%).

Section 2: CD Consumer Research Study

2.1 Study aims and objectives

The objectives of the research were three-fold: 1) to examine CD consumers' packaging preferences and purchasing choices; 2) to identify their CD purchasing behaviour; and 3) to gather their views on a music industry shift towards card-based CD packaging as industry standard,

The study was particularly interested in the views of heavy-buying CD consumers, as they represent a commercially critical group.

The project focused on CD consumers' response to environmentally-friendly card-based CD packaging alternatives to the plastic jewel case. In addition, the industry already has some experience using card-based formats so this material is in the strongest and most commercially viable position for wide adoption in a reasonably short time frame.

This consumer research is confined to plastic and card in its current and most common formats. New material alternatives to the plastic jewel case or to the creation of new packaging concepts that are low in environmental impacts are encouraged but outside the scope of this study.

2.2 Methodology

The research used a structured closed question survey to collect attitudinal data (Appendix 2a: consumer survey template). The survey was administered face-to-face at the three main types of retailer types: music chain specialist, independent music specialist and supermarket. The survey was conducted at stores in two places – London and Bournemouth – to ensure findings were not biased because of location. The questionnaire was completed by 319 respondents giving us a good size sample from which to make reasonable inferences about the views and preferences of the UK CD buying population (Figure 2).

Figure 2: Number of surveys completed by store type and location

Store Type	Location		Total
	London	Bournemouth	
Chain music specialist	99	68	167
Independent music specialist	50	-	50
Supermarket	-	102	102
Total			319

2.3 Data Collection

The survey had two main focuses for data collection.

Part 1 involved gathering information from respondents about their stated preferences towards different CD packaging formats when shown a series of CD packaging samples. Each album sample used in the survey was by a well known artist to minimise negative response due to unfamiliarity. The respondents were asked to set aside personal music and design preferences in their assessment of the underlying packaging format.

Respondents were first shown Coldplay's Viva La Vida album in both a plastic jewel case and card-wallet format. Respondents were asked which they preferred and to give their reasons. The respondents were next asked to select their favourite card-based packaging option from a selection of four formats, including the Coldplay Viva La Vida album and asked to give their reasons. This 2-tiered approach to packaging preference aimed to provide greater insights into what CD consumers prefer in card-based CD packaging even if they initially selected the plastic jewel case versions.

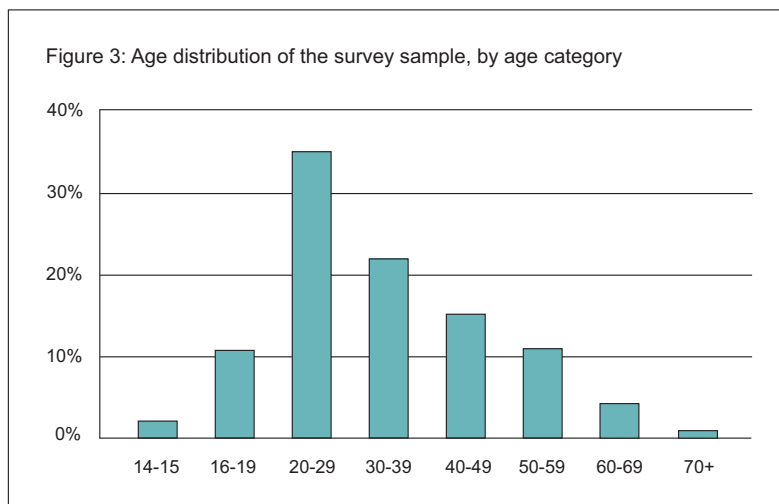
Part 2 of the survey was designed to collect information about respondents' attitudes to card-based CD packaging as industry standard on environmental grounds. In this context the survey also captured information about the impact of environmental concerns on purchase decision-making in general.

The survey also captured information on age, gender, CD purchasing behaviour and music taste.

The majority of the surveys were conducted on a Saturday, the highest sales day of the week. Interviewees approached people at random as they came in and out of the store. This avoided creating any slant in the findings towards people of a certain age or gender. The filter question for determining whether a respondent was eligible to complete the survey was that he or she must have bought at least 1 CD within the previous 12 months.

2.4 Data Analysis

A combination of descriptive and statistical tests were run to analyse the aggregated data from each of the store types and locations. All statistical tests were run using either a 95% or 90% significance level (i.e. $p = 0.05$ or $p = 0.10$ respectively) when testing the significance of a relationship between variables (e.g. packaging preference and store type). The standard error for the difference (12.3%) between card and plastic packaging was $\pm 5.7\%$ for our sample of 319 completed questionnaires. The statistical tests used for examining the strength of associations between data were Pearson's Chi-squared, Cramer V and Fisher's exact test. The appropriate statistical tables were referred to to assess the significance levels for each test.



Section 3: CD Consumer Survey Findings

3.1 Demographic

Of those surveyed almost two-thirds (60%) were male, which reflects the same gender bias as seen in the general CD buying population. The survey captured a reasonably good distribution of ages in the sample population (Figure 3). A third of respondents (35%) were aged between 20-39 years old and 22% were 30-39 years old. A further tenth (13%) of respondents were between 14-19 years old. A quarter (26%) of respondents were between 40-59 years old and 5% were 60 or older.

3.2 CD buying and music taste

For the purpose of this research we defined those respondents to the survey purchasing more than 10 CDs for themselves or as a gift to be heavy CD buyers¹. Therefore, we found that 56% of our sample to be heavy CD buyers and 44% to be light CD buyers. The greatest proportion of heavy CD buyers in our sample were those surveyed in the independent music specialist retailer (74%) followed by the chain music specialist retailer (56%), and the supermarket retailer (43%). If the threshold for defining a heavy CD buyer was shifted to 20 or more CDs then approximately a third (30-32%) of our sample recruited from independent and chain music specialists and 20% from the supermarket would constitute heavy buyers.

The proportion of heavy CD buyers in our sample is larger than the general CD buying population, where approximately 15-20% of CD consumers are heavy CD buyers². The reason for our sample having such a large proportion of heavy CD buyers is likely due to the fact that the stores where surveying took place were either flagship stores, the main high street music store or an iconic store each with a wide CD selection and likely to attract regular CD purchasers.

Respondents were asked where they mostly purchase CDs. A fifth (22%) buy their CDs primarily from a chain music specialist retailer, a sixth (15%) from a supermarket and a tenth from independent music specialist retailer (9%) or online retailer (11%).

Anecdotally, respondents at the independent specialist retailer who said they shopped at a mixture of retailers noted they not buy CDs from a supermarket but from chain music specialists or online retailers.

In addition, half (47%) of CD consumers surveyed purchased music via digital download.

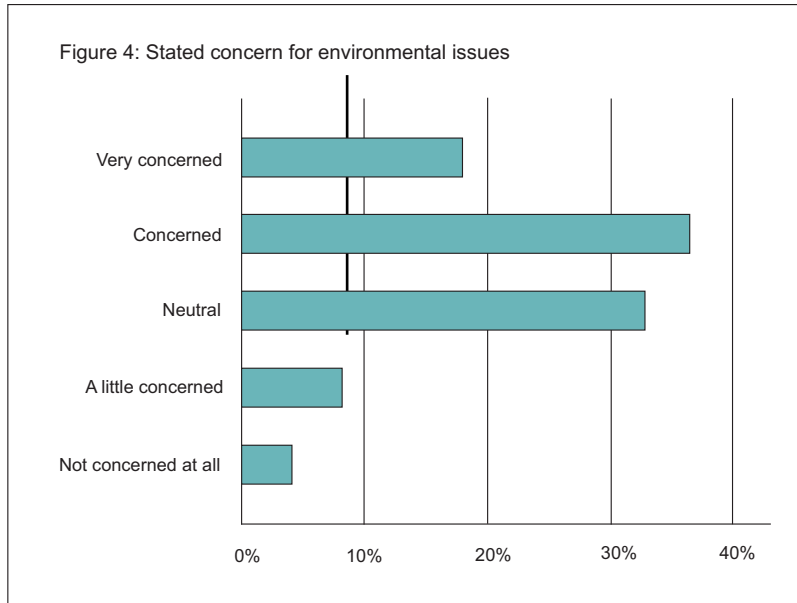
Our sample population represent a broad spectrum of different music tastes. This is useful for our analysis, as it means results are not skewed towards CD consumers that have a particular or narrow music taste. High selling music genres are well represented in the survey. For example almost half (47%) of the respondents listened to rock/pop music; a third (30%) listened to pop chart music; and over a third (37%) listened to indie; a quarter (25%) listened to dance music and in addition, approximately a fifth listened to classic (19%), jazz/blues (21%), R&B (20%), and metal (17%).

¹ TNS Audio Visual Trak Survey, BPI Statistical Handbook 2008

² TNS Audio Visual Trak Survey, BPI Statistical Handbook 2008

3.3 Environmental concern

Respondents were asked to state how concerned they were about environmental issues from a scale of 1 to 5 with 1 being not concerned at all to 5 being very concerned. Over half of respondents (55%) are concerned or very concerned about environmental issues (Figure 4).



3.4 Plastic jewel case vs. card wallet

When presented with the same album (Coldplay's Viva La Vida) more than half of respondents (54.9%) preferred the card wallet format to the plastic jewel case format (42.6%) (Figure 5). There were a small number of respondents who said they had no preference or did not know which format they most preferred.

The 12.3% difference between the card-based and plastic jewel case is found to be statistically significant at the 95% confidence interval (the standard error is 5.7%).

This is a good indication that the majority of CD consumers will view a shift to card-based packaging positively.

Figure 5: Preference for plastic jewel case vs. card wallet using Coldplay's Viva La Vida album as the sample

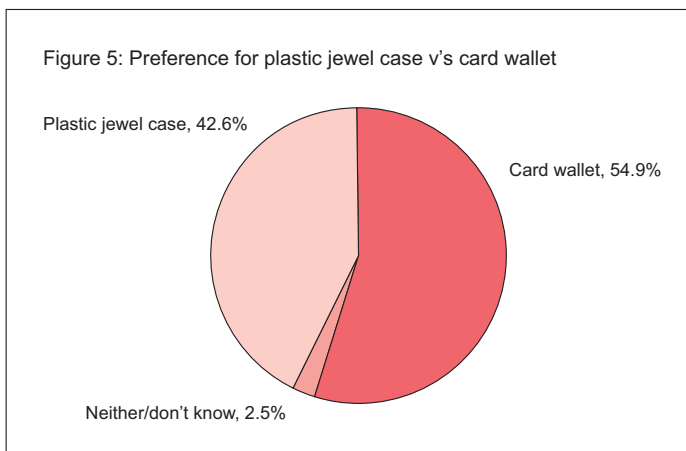
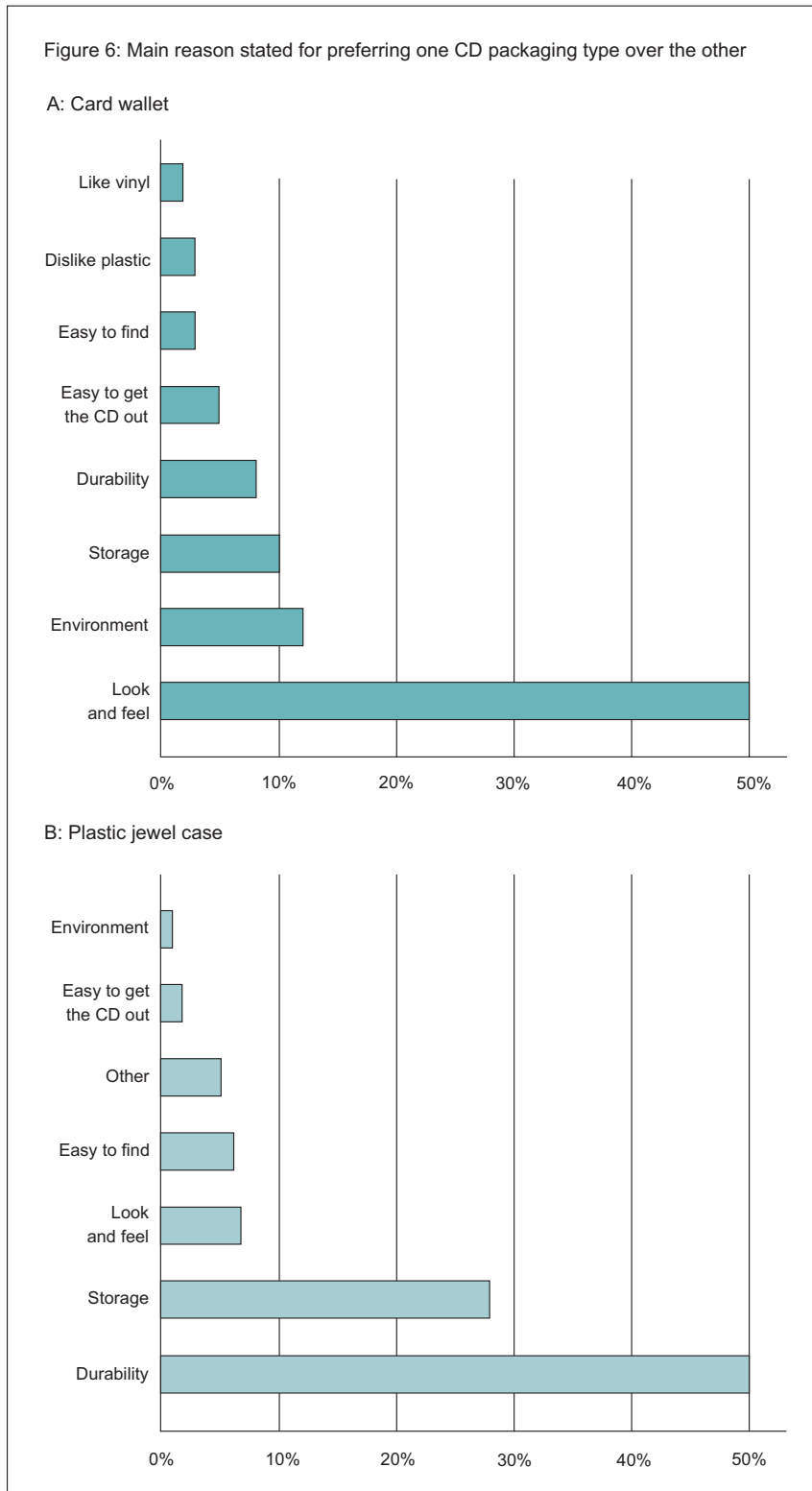


Figure 6: Plastic jewel case vs. card-based packaging



The most frequently given reasons for preferring the card wallet format were: the look and feel of packaging (50%); environmental concern (12%); and storage (10%) (Figures 6 and 7). The fact that over 10% of respondents indicated the environment as a key consideration without prompting or survey context is evidence that consumers are increasingly cognisant of environmental issues in their purchasing decisions.

Figure 7: Main reasons given for preferring the card wallet over the plastic jewel case

Reason	Percentage
Look & feel	50
Environment	12
Storage	10
Durability	8
Easy to get the CD out	5
Dislike of plastic	3
Easy to find	3
Like a vinyl	2

Main reasons given for preferring the plastic jewel case over the card wallet

Reason	Percentage
Durability	50
Storage	28
Easy to find	6
Easy to get the CD out	2
Environment	1
Look & feel	7
Other	6

Those that stated a preference for the plastic jewel case format stated their main reasons were: durability (50%), storage (28%) and easy to find (6%) (Figures 6 and 7). These consumers are concerned that the packaging protects the CD and is easily stored with their existing collections (eg on bespoke shelving, in cars).

When asked to identify which CD packaging option was more environmentally friendly the majority of people (87%) chose the card wallet. In contrast 2% of respondents identified the plastic jewel case as more environmentally friendly, while 5% thought the two packaging options had equal environmental impacts and 6% said they did not know.

3.5 Statistical tests run on CD packaging preferences & variables

3.5.1 Type of CD buyer

There was a significant association between CD packaging preference and heavy (more than 10 albums per year) or light CD buyers (Pearson Chi-Square statistic = 4.855 and Cramer's $V = 0.125$, $p = 0.05$). Of those respondents preferring the card-based packaging option 60% were heavy CD buyers and of those respondents preferring the plastic jewel case just 48% were heavy CD buyers. This suggests that heavy CD buyers, an important consumer base for the music industry, are willing and receptive to a shift away from plastic jewel cases.

3.5.2 Type of CD retailer

A significant association was found between where respondents primarily purchase their CDs and their CD packaging format preference (Fisher's test = 19.595 and Cramer $V = 0.242$, $p = 0.05$). Of the consumers that said they preferred the plastic jewel case a quarter (26%) bought their CDs primarily from chain music specialists; a tenth (13%) from supermarkets; a tenth (12%) from online retailers; and just 2% from an independent music retailer. However, the greatest proportion (47%) of those stating they preferred the plastic jewel over the card-based packaging format were those that shop at a mixture of music retailers.

A fifth (18%) those respondents that preferring the card-based packaging format were those primarily buying their CDs from chain music specialists; less than a fifth (15%) were from supermarkets; a tenth (11%) from independent retailers; and over a third (40%) were those purchasing CDs from a mixture of retailers.

3.5.3 Digital music purchasers

A weak but significant association was found between CD packaging preference and whether a respondent purchases digital music (Pearson Chi-Square = 3.461 and Cramer's V = 0.106, $p = 0.10$). Of our sample that purchased digital music over half (52%) preferred card-based packaging versus the plastic jewel case format (41%).

3.5.4 Environmental concern

A weak but significant association was found between CD packaging preference and the environmental concern of respondents (Pearson Chi-Square = 7.914 and Cramer's V = 0.161, $p = 0.10$). Almost two-thirds (59%) of those preferring card-based packaging format were concerned or very much concerned compared to less than half (48%) of those preferring the plastic jewel case format.

No significant association was found between respondents' stated environmental concern and whether the respondent was a heavy or light CD buyer (Pearson Chi-Square statistic = 2.343 and Cramer's V = 0.086, $p = 0.05$).

3.5.5 Age

There was not found to be any significant association between the age of the respondent and their CD packaging preference for the plastic jewel case format or the card-based packaging format (Pearson Chi-Square 10.004 and Cramer's V 0.180, $p = 0.05$).

3.5.6 Gender

There was not found to be any significant association between the gender of the respondent and their CD packaging preference for the plastic jewel case format or the card-based packaging format (Pearson Chi-Square 2.66, and Cramer's V 0.089, $p = 0.05$).

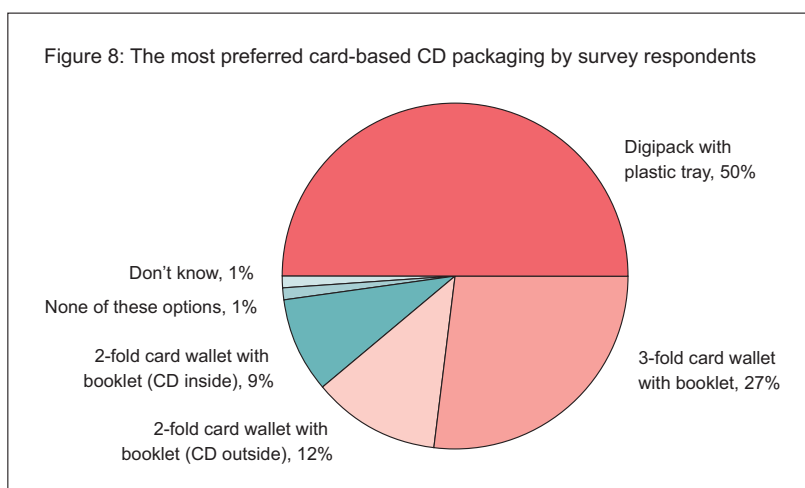
3.6 Card vs. card-based packaging preferences

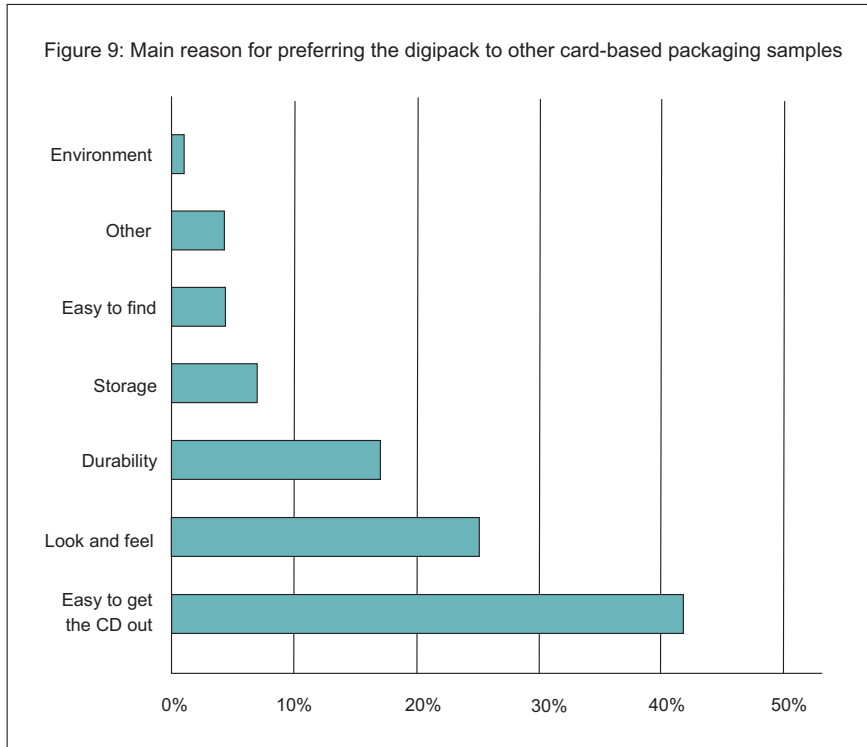
The card-based packaging most preferred from a sample of four formats was the digipack with a plastic tray (50%) followed by the 3-fold card wallet (Figure 8). The reasons most frequently given for were ease of access to the CD (42%) and the look and feel (25%). The durability of packaging was also seen as important (17%) (Figure 9).

Of the respondents preferring the digipack format, two-thirds (62.4%) were male and a third were female (38%). Consumers preferring the digipack format were split fairly evenly between heavy and light CD buyers.

Furthermore of respondents preferring the digipack, the majority (73%) considered the digipack format to be equal to (31%), better (31%) or much better (11%) than the plastic jewel case format.

Interestingly, the digipack format is the environmentally-friendly packaging sample that most closely resembles the plastic jewel case in design concept. Anecdotally, respondents said they would have chosen the digipack format as their most preferred even if fitted with a cardboard tray rather than the plastic tray. It was the rigid and robust structure that appealed to them rather than the use of the plastic tray material. The project was not able to source a good sample of the digipack format with cardboard tray, as there is a very limited range currently available. This suggests there is scope to expand the range of card-based CD packaging to both match the expectations and preferences of consumers as well as achieve a lower environmental impact.





For the second most preferred card-based packaging format – the 3-fold card wallet – more than half (58%) were male and more than half (56%) were heavy buyers. Nearly everyone favouring this option (89%) thought the packaging was equal to, better, or much better than the plastic jewel case format.

3.7 Consumer attitudes to environmental-friendly card-based packaging

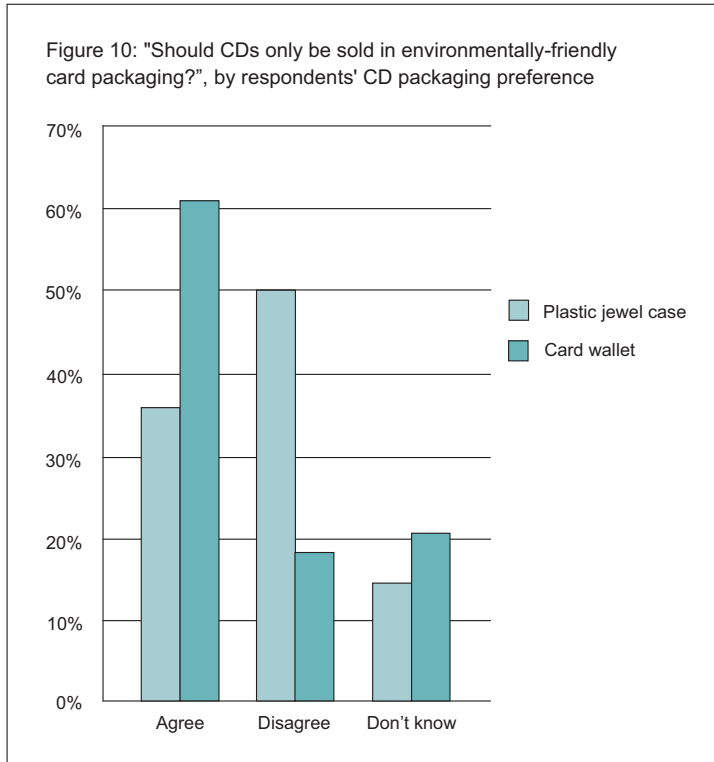
Respondents were asked a series of attitudinal questions to identify what they would think if the music industry shifted to environmentally-friendly card based packaging and whether they thought this would affect their decision to buy CDs.

There is a significant association between CD packaging preference and the attitude of the respondent to the statement:

“Should CDs only be sold in environmentally friendly card packaging?”

Overall half of respondents (50%) agreed CDs should only be sold in environmentally friendly card packaging with a third (31%) disagreeing and a fifth (18%) not knowing.

However, there was found to be a difference in respondents’ opinion depending upon their stated CD packaging preference. Of those respondents that preferred the plastic jewel case format a third (36.3%) agreed, half disagreed (49.6%), and 14.1% did not know. Of those respondents that preferred the card-based packaging format almost two-thirds (61%) agreed, a fifth (18%) disagreed and a further fifth (21%) did not know (Figure 10). (Pearson Chi-Square statistic = 34.436, and Cramer’s V = 0.335, $p = 0.05$).

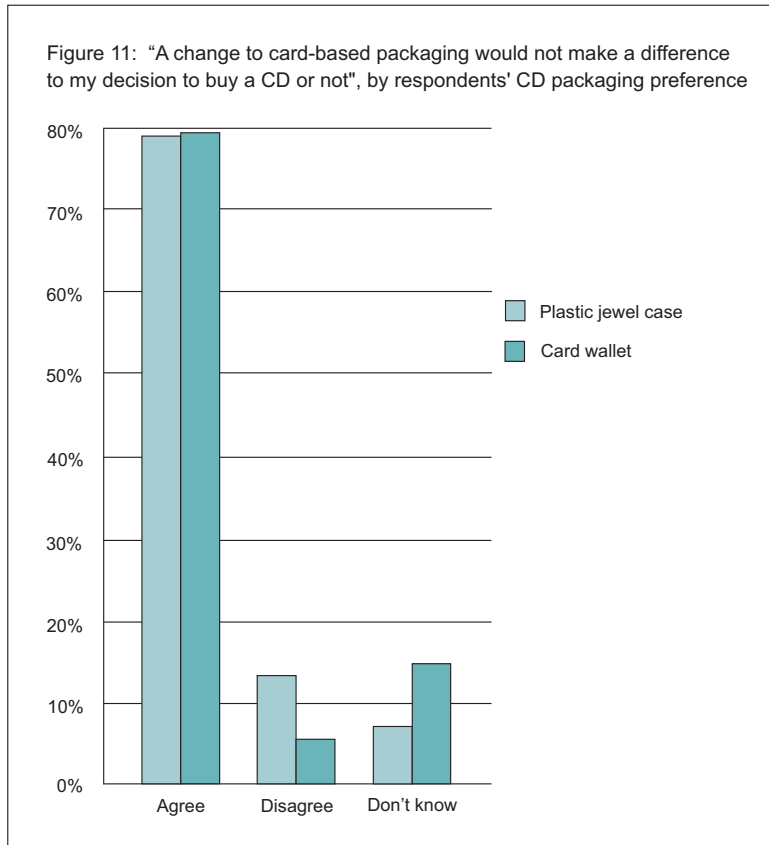


To the statement: "A change to card-based packaging would not make a difference to my decision to buy a CD or not."

Of those respondents that preferred the plastic jewel case the great majority (79.1%) agreed that changing to a card-based packaging format would not affect their decision to buy a CD (Figure 11). A small proportion (13.4%) disagreed with the statement – indicating that card-based packaging may deter them. A further 7.5% did not know whether card-based packaging would affect their decision to buy a CD. For those respondents who stated they preferred the card-based packaging, the majority (79.5%) agreed with the statement, with 5.1% disagreeing and 15.4% not knowing.

These findings are a strong indication that even those preferring the plastic jewel case format would not be deterred from buying a CD if it was only available in a card-based packaging format. This is because while the packaged product is the means to deliver and promote the music, the content is of primary importance to the consumer. In addition, anecdotally, a number of respondents volunteered that a CD in attractive card-based packaging could be a tipping point towards buying the CD.

Figure 11: "A change to card-based packaging would not make a difference to my decision to buy a CD or not", by respondents' CD packaging preference

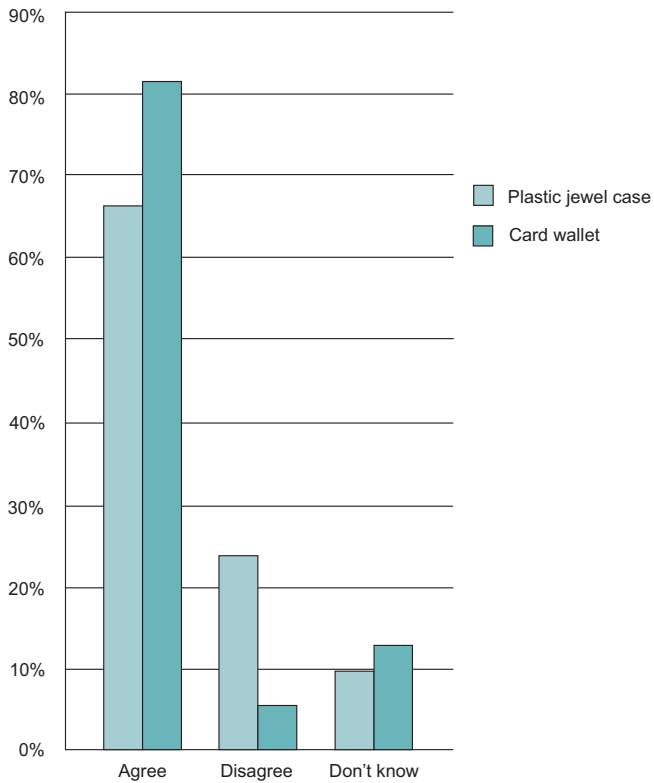


To the statement: "I think it would be a positive step for the music industry to use environmentally friendly card packaging for CDs."

Overall three-quarters of respondents (75%) thought it would be a positive step for the music industry to use environmentally friendly card packaging with just 14% disagreeing and 11% not knowing.

We also examined respondents' opinions based on their stated CD packaging preference. Of respondents preferring the plastic jewel case format two-thirds (66.4%) agreed that a move towards card-based packaging would be a positive move whereas a quarter (23.9%) disagreed and 9.7% did not know (Figure 12). An even greater proportion (81.6%) of those that preferred the card-based packaging option thought it would be a positive move for the industry to shift, with only 5.7% who disagreed and 12.8% who did not know. Therefore, we find a significant association between consumers' attitudes towards an industry shift and their CD packaging preference (Pearson Chi-Square = 21.160, and Cramer's V = 0.262, $p = 0.05$). However, the findings also show that consumers preferring plastic jewel case format would be supportive and receptive to changes in packaging on environmental grounds.

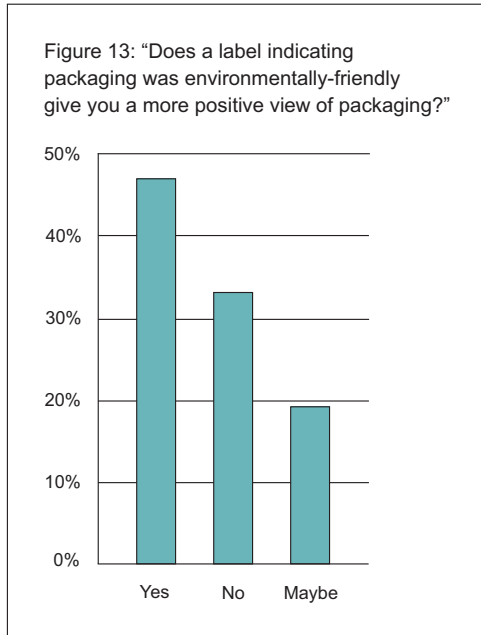
Figure 12: "I think it would be a positive step for the music industry to use environmentally-friendly card packaging for CDs", by respondents' CD packaging preference



To the question: "Does a label indicating packaging was environmentally-friendly give you a more positive view of packaging?"

Almost half the sample surveyed (47%) would have a more positive view of card-based packaging if there was an explanatory label and a further fifth (19%) thought a label would give them a more positive view of the product (Figure 13). Anecdotally, respondents mentioned preferring the label to be on the back of the package, and not in sticker format.

Heavy CD buyers (55% to 45% of light CD buyers) and women (53% to 47% of men) are more likely to hold a positive view of CD packaging with a label indicating it was environmentally friendly.



Of these respondents, approximately 3% of the respondents were in the age group 14-15, approximately 8% were in the age group 16-19, approximately 41% were in the age group 20-29, approximately 21% were in the age group 30-39, approximately 15% were in the age group 40-49, 9% were in the age group 50-59, and approximately 2% were in the age group 60-69.

Conclusions

The findings of the consumer research into CD packaging shows there to be strong support for a wider adoption of environmentally-friendly card-based packaging. This support is likely to increase if the shift away from plastic jewel case is underpinned by an effective communication campaign and accompanied by an environmental accreditation scheme for CD packaging.

References

Owen A, Roberts S, Dowdell D. (2008): Reducing the Impacts of CD Packaging 2008. Ove Arup.

Bottrill, C., Lye, G., Boykoff, M., Liverman, D. (2008). Julie's Bicycle First Step: UK Music Industry Greenhouse Gas Emissions for 2007. Environmental Change Institute, Oxford University, Oxford.

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Appendix 2A: Consumer Survey Form

SURVEY CODE (location and store type) _____ Date and time _____ Number _____

FILTER QUESTION: Have you bought a CD in the last 12 months? Yes (CONT.) No (STOP)

1) Which of 1 of these 2 CD packaging cases do you **MOST** prefer?

Please ignore whether or not you like the artist and the graphics.

- a. Plastic jewel case with booklet
- b. 2-fold card wallet with booklet (CD accessed outside)
- c. Neither example
- d. I don't know

2) What are your **MAIN REASONS** for preferring this CD packaging case? Unprompted

- _____ Durability
- _____ Storage
- _____ Easy to find
- _____ Easy to get CD out
- _____ Environment
- _____ Look and Feel
- _____ Other (please specify): _____
- _____ I don't know

3) Which one do you think is **MORE** environmentally-friendly?

- a. Plastic jewel case
- b. 2-fold card wallet
- c. They have about equal impact
- d. I don't know

4) Now, which one of these 4 card-based CD packaging cases do you **MOST** prefer?

Please ignore whether or not you like the artist and graphics.

- a. 2-fold card wallet with booklet (CD accessed outside)
- b. 2-fold card wallet with booklet (CD accessed inside)
- c. 3-fold card wallet with booklet
- d. digi pack with plastic tray
- e. None of these options
- f. I don't know

5) What are your **MAIN REASONS** for preferring this card-based CD packaging case? Unprompted

- _____ Durability
- _____ Storage
- _____ Easy to find
- _____ Easy to get CD out
- _____ Environment
- _____ Look and Feel
- _____ Other (please specify): _____
- _____ I don't know

6) Out of 5 how do you **RANK** the overall quality of the card-based CD packaging case you selected in comparison to the plastic CD case? (1 = much worst to 5 = much better, or don't know) _____

7) Would a label indicating the CD packaging was environmentally-friendly give you a more positive view of the packaging?

- a. No

- b. Maybe
- c. Yes
- d. I don't know

8) **To these statements do you - agree, disagree, or don't know:**

- _____ CDs should be only be sold in environmentally friendly card-based packaging.
- _____ I think it would be a positive step for the music industry to use environmentally friendly card- based packaging for CDs.
- _____ A change to card-based packaging would not make a difference to my decision to buy a CD or not.

9) **Out of 5 how concerned are you about the environment?**

(1 = not concerned to 5 = very concerned or don't know) _____

10) **If a product was environmentally-friendly how would it influence your spending? (prompt)**

- a. It would make no difference
- b. I would choose it if it cost the same
- c. I would sometimes choose it even if it cost more
- d. I would always choose it even if it cost more
- e. I don't know

11) **How many CDs have you bought in the last 12 months? _____**

12) **How many of those were bought as gifts? _____**

13) **Where do you MOSTLY buy CDs from? (prompt)**

- a. Chain music specialist retailers
- b. Supermarkets
- c. Independent music specialist retailers
- d. Online retailers
- e. A mixture of retailers
- f. Other (please specify): _____

14) **Did you buy a CD from a supermarket in the last 12 months? Yes No**

15) **Do you buy digital music? Yes No**

16) **How would you describe your music taste? (show list)**

- | | |
|-------------------|---------------------------------------|
| a. Rock/pop rock | j. Dance (Drum & Bass, Techno, House) |
| b.. Pop (Chart) | k. Jazz/Blues |
| c. Classic rock | l. Country/Folk/Oldies |
| d. Indie | m. Classical |
| e. Easy Listening | n. Soul |
| f. R&B/Urban | o. Chill-out |
| g. Reggae | p. World |
| h. Rock & Roll | q. Other (please specify): _____ |
| i. Heavy Metal | |

17) **Gender**

- a. Male

b. Female

18) Age - Which age bracket do you fall into? (*show list*)

- a. 14-16 (*must give explanatory note after the survey*)
- b. 16-19
- c. 20-29
- d. 30-39
- e. 40-49
- f. 50-59
- g. 60-69
- h. 70+

Appendix 3:
Manufacturing
Packaging Survey

Graham Crawshaw 2008

Manufacturing Packaging Survey

This survey was designed and analysed by Graham Crawshaw with support from the Julie's Bicycle team.

1.0 Background

Julie's Bicycle (JB) launched a survey of CD packaging suppliers, printers and brokers in early November 2008. The survey sought to:

- 1. identify the range of 'environmentally friendly', lower carbon products and processes currently in the market**
- 2. provide an opportunity for all suppliers to present information about their products and environmental credentials to the JB CD Packaging project within a consistent, comparable framework**
- 3. build up a picture of market capacity for a greater shift to card based packaging**
- 4. identify tolerance levels for some form of packaging certification**

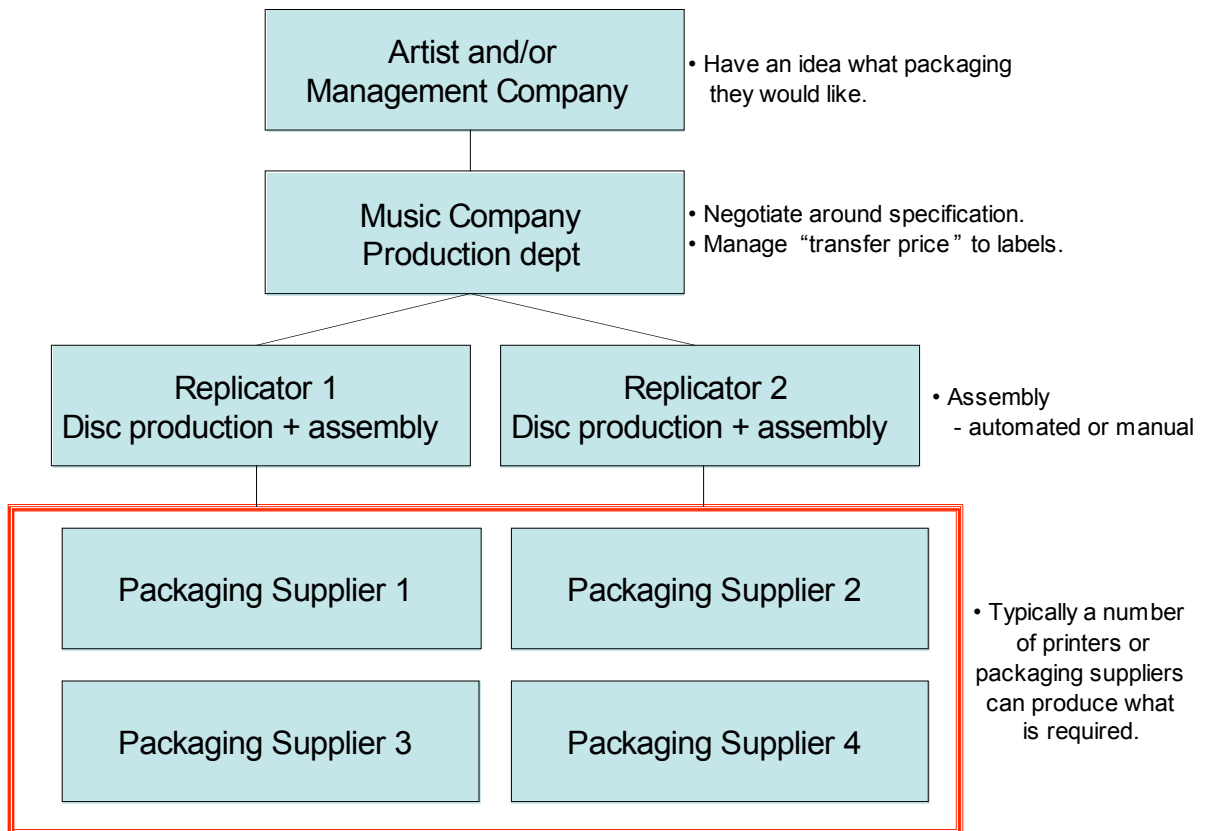
1.1 Relationship between Music company, Replicator and Packaging Supplier

Typically a Music Company has a contractual relationship with a Compact Disc Replicator. This Replicator will be responsible for manufacturing and collating compact discs (and other formats) into packaging that the Replicator contracts for. It is common for the Music Company to stipulate which Packaging Supplier the packaging should be purchased from. Sometimes the Packaging Supplier will sell directly to the Music Company but regardless of contractual relationship the Packaging Supplier will have influence with the Music Company.

The following chart indicates how the relationships work.

1. The Artist or Management Company will propose packaging ideas for the release.
2. The Artist's Management Company will negotiate with the Music Company around the specification and a trade off will be agreed. Sometimes, if more expensive packaging is desired, then the Artist will agree to take a reduced royalty payment on the album, called a Packaging Deduction.
3. Internally at the Music Company the Marketing department will agree a price for the packaging with the Production department. At times this price may not bear a direct relationship to the purchase price of the packaging due to internal adjustments around the 'transfer price'. These adjustments balance out the cost of producing an initial (high volume) quantity with future orders that typically decline in quantity over time.
4. The Music Company will be contracted with a CD Replicator (typically one organisation per continent). The Replicator will be equipped to collate the packaging selected by the Music Company either manually or with dedicated automatic packaging equipment. The former is more expensive as it is labour intensive. The latter is cheaper but requires capital outlay.

5. The Replicator will contract with a packaging company – this may be specified by the Music Company or the Replicator may be free to tender the work. This may involve more than one supplier.



For the purposes of assessing whether Packaging has sound environmental credentials it is necessary to get this information from the Packaging Supplier rather than from the Replicator. In assessing a CD package’s impact it is assumed that the impact of the Replicator’s producing and collating a compact disc is consistent whichever manufacturer is contracted. The variable impacts are associated with the type of Packaging used.

2.0 The Survey Questionnaire

Alongside general company and operations profiling, the questionnaire sought to establish the supplier’s current status in terms of environmental management and lower-carbon packaging development. (Appendix 3A)

The questionnaire was launched within an article in Music Week¹. This gave maximum awareness to the general supplier base to the music industry. Those suppliers that had already contacted JB were directed to complete the questionnaire. Organisations that make up the JB CD Packaging Working Group were asked to prompt their suppliers to completing the questionnaire via their Production teams. The JB website also carried the link to the on-line survey.

¹ November 3, 2008

2.1 Respondents

The suppliers who completed the Packaging Survey are listed at the end of this report. The CD Packaging Working Group estimates that these 11 packaging suppliers provide circa 85% of the music industry packaging sold in the UK, (excluding plastic jewel boxes but including their paper inserts).

9 of the 11 suppliers produce printed paper, carton or board packaging; the other 2 respondents are brokers who purchase through third parties.

2.2 Survey Responses

A total of 11 suppliers responded to the survey. The anonymised range of responses is detailed below:

1. All respondents sell packaging within Europe including the UK. Over 40% sell to the US and over 20% exports to South East Asia, Japan and Australia.
2. Annual turnover in sales of entertainment industry packaging ranged from 2 suppliers exceeding £21m, 1 exceeding £11m, 1 exceeding £5m to 5 suppliers with turnover of less than £5m.
3. When asked whether they have already achieved any environmental accreditation,
 - a. 4 already have ISO14001 (the International environmental standard), 1 is working towards this accreditation.
 - b. 1 company has already completed a full life cycle analysis (LCA) of their product. 1 is currently working toward a full life cycle analysis of their product.
 - c. 7 either have or are working towards the Forestry Stewardship Council (FSC) accreditation.
4. In addition 3 suppliers have also signed up to a number of voluntary environmental and/or ethical agreements.
5. Almost all suppliers are addressing carbon measurement and are working on initiatives to reduce their carbon footprint (e.g. foot printing of operations and products; using renewable energy; reducing business travel; reducing supply chain environmental impacts). A good number are also working with their suppliers to achieve the same. One supplier noted that “it is an essential part of our whole business idea to sell licenses to packaging companies that are located closer to the replicators, and to sell through local replicators, instead of producing packages and shipping them all over the world.”
6. All suppliers responded that they were looking at the elimination of harmful substances, pollution and waste (e.g. blacklisting toxic materials; stopping emissions to local water courses; reengineering processes for zero waste) and working towards improvement in this area. Conversion to 100% vegetable inks and reduced use of chemicals is common across all printers.

7. All suppliers responded that they were working towards product weight reduction. Using lighter trays was provided as an example of this.
8. All suppliers expressed an interest in a certification system, specifically for CD packaging. One respondent additionally noted that this certification system should extend to media-packaging (DVD, Blu-ray) in general.
9. When asked to identify their packaging formats that they consider environmentally friendly suppliers identified the following trade marked products: Repak, Flippak, Sunlyte disc packs, CD JakeBox, DVD JakeBox, Discbox Slider, SlidePac, DVDPac, BluRayPac, Ekoline. Other generic responses identified rigid presentation packaging, recycled trays and various light weight digipacks.
10. Suppliers were asked to compare these environmentally friendly products against the industry standard jewel box, tray, book and inlay in terms of cost, materials, weight, carbon emissions and lead time.
 - a. Cost – a wide range of responses were given but the suppliers stated premiums reduced as quantities increased. Production quantities below 5,000 units remain prohibitively expensive. Most carton or board products were typically priced around the existing prices for digipacks.
 - b. Materials – all products (with exception of digipack) highlighted the elimination of plastic trays. Most board had a high recycled content with other environmental credentials.
 - c. Weight - the environmentally friendly products saw a typical saving of 50% of the weight of a jewel box, tray, book and inlay. Suppliers highlighted the reduced cost of transport; another advantage of a lighter product. One supplier noted that a barrier to reducing product weight “is that some market segments, especially the games industry, *demand* a heavier package, since they consider that added weight = added value.”
 - d. Carbon emissions – were reported as a 30% to 80% reduction depending on which package was selected. Work has yet to be done to accurately measure emissions from most types of packaging.
 - e. Lead time – all suppliers highlighted that the lead time for alternative packaging was longer.
11. All suppliers source their material from within Europe.
12. Many suppliers use a high percentage of post consumer waste. Some trays are made from recycled bottle containers. One supplier uses Swedish sourced board which originates from sustainably produced trees harvested close to paper mills. In this instance the production of card from virgin board is therefore deemed lower emissions than using waste material as the transport and processing impacts are much less.
13. Can the packaging format(s) be auto-assembled at the replicators? A question on whether the environmentally friendly packaging can be auto-assembled at the replicators produced a mixed response from suppliers.

Information indicated that more packaging is capable of being automatically assembled by the replicator.

14. When asked if they had any additional comments to make suppliers typically summarised their previous responses. One supplier concluded that “it would be great if we could encourage an industry standard product that could then lead to reduced manufacturing costs, thus making it even more attractive to the customer.”

Conclusions

- The manufacturing industry is preparing for an increasingly regulated environment that puts carbon reductions as a priority. In this context the manufacturing industry is, in the main, prepared to, or already committed to carbon reduction.
- The manufacturing industry would in principle adopt an industry standard product to signal climate responsibility specifically on CD packaging.
- The manufacturing industry will commit to identifying market opportunities for card-based packaging.

The following suppliers completed the questionnaire (listed in alphabetical order):

AGI Media – UK
Breed Media Ltd – UK
JakeBox – Sweden
Key Production – UK
PaperFoam Ltd – UK
PaperFoam b.v. – Holland
Pozzoli spa – Italy
Shorewood Packaging Europe – UK
St Ives – UK
The London Fancy Box Company Ltd. – UK
Topac MultimediaPrint GmbH – Germany

Appendix 3A: CD Packaging Survey Form

Julie's Bicycle CD Packaging Survey

1. Introduction

Julie's Bicycle is doing a study on the carbon emissions profiles of different types of CD packaging.

The study needs to identify the range of manufacturing processes and what has been done that is innovatory and takes environmental impacts into account. Julie's Bicycle would like to make certain that all music industry printers / packaging suppliers have the opportunity to present information about their products rather than rely on the information we have received to date. To do this in a structured way we have developed a questionnaire that enables suppliers to tell us about their products and the environmental credentials that are appropriate.

All responses will be strictly confidential. All information will be anonymised and aggregated.

If you have any questions please email: info@juliesbicycle.com

1. Contact details

Name:	<input type="text"/>
Company:	<input type="text"/>
Address:	<input type="text"/>
Address 2:	<input type="text"/>
City/Town:	<input type="text"/>
State:	<input type="text"/>
ZIP/Postal Code:	<input type="text"/>
Country:	<input type="text"/>
Email Address:	<input type="text"/>
Phone Number:	<input type="text"/>

2. General

2. Which countries does your company sell to?

- UK
- Europe
- US

Other (please specify)

3. What is your turnover for producing packaging for the entertainment industry?

- Under £1m
- £1m - £4m
- £5m - £10m
- £11m - £20m
- £21m+

4. In which countries do you manufacture?

Julie's Bicycle CD Packaging Survey

5. Which countries/territories do you supply to?

6. Do you already have any environmental accreditations?

- BS8900
- EMAS
- ISO 14001
- LCA

Other (please specify)

7. When were these accreditations gained?

	DD	MM	YYYY
BS8900	<input type="text"/>	<input type="text"/>	<input type="text"/>
EMAS	<input type="text"/>	<input type="text"/>	<input type="text"/>
ISO 14001	<input type="text"/>	<input type="text"/>	<input type="text"/>
LCA	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other	<input type="text"/>	<input type="text"/>	<input type="text"/>

8. Are you working on achieving any environmental accreditations?

- BS8900
- EMAS
- ISO 14001
- LCA

Other (please specify)

9. When do you expect to be accredited?

	DD	MM	YYYY
BS8900	<input type="text"/>	<input type="text"/>	<input type="text"/>
EMAS	<input type="text"/>	<input type="text"/>	<input type="text"/>
ISO14001	<input type="text"/>	<input type="text"/>	<input type="text"/>
LCA	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other	<input type="text"/>	<input type="text"/>	<input type="text"/>

10. Have you signed up to any environmental and/or ethical voluntary agreements?

11. If yes, which and when?

Julie's Bicycle CD Packaging Survey

12. Is your company addressing measurement and reduction of carbon or ecological footprint (eg footprinting of operations and products; using renewable energy; reducing business travel; reducing supply chain environmental impacts)?

13. Is your company addressing the elimination of harmful substances, pollution and waste (eg blacklisting toxic materials; stopping emissions to local water courses; reengineering processes for zero waste)?

14. Is your company addressing product weight reduction?

15. Would you be interested in a certification system specifically for CD packaging?

3. Packaging

16. Do you offer packaging formats that you consider environmentally friendly? If yes please identify each format. If No, please go to question 20

Format 1

Format 2

Format 3

Format 4

17. How do these products compare against the industry standard jewel box, tray, book and inlay?

Cost

Materials

Weight

Carbon emissions

Lead time

18. Where are materials sourced?

19. Is any of the material post consumer or post industrial waste? (please specify which and in what proportions)

Julie's Bicycle CD Packaging Survey

20. Can the packaging format(s) be auto-assembled at the replicators?

21. Do you have any other comments you would like to add?

Thank you for completing this survey. If you have any comments or feedback please email info@juliesbicycle.com



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JULIE'S BICYCLE * ** *
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28 Berners Street London W1T 3AB
p: 020 7436 6112 e: info@juliesbicycle.com
www.juliesbicycle.com