Research on EU product label options

Final report

Study delivered by Ipsos MORI, London Economics and AEA for the European Commission

26th October 2012

Key information

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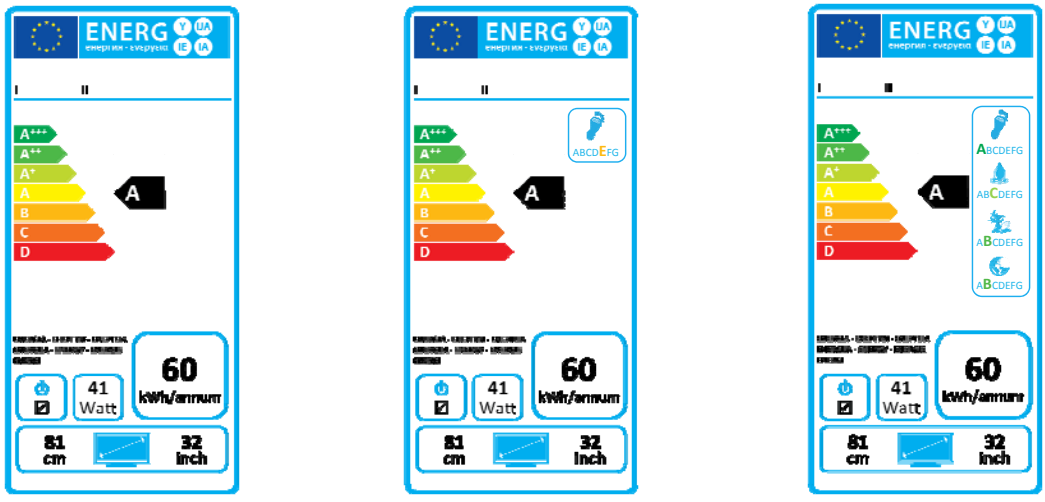
Executive summary

Research background and objectives

Ipsos MORI, London Economics and AEA were commissioned to conduct this research by the European Commission Directorate-General for Energy. The purpose of the study was to investigate the possibility of creating a product label which provides consumers with information about the environmental lifecycle performance of the product. This information may be added to the current Energy Label which already displays the energy efficiency rating of the product as well as other product specific characteristics (such as spin speed, noise level and capacity on a washing machine). The research has tested two options for a new label:

1. **Proposed Energy and Environmental Label** - the current Energy Label plus four additional environmental lifecycle indicators (carbon footprint, water footprint, resource depletion and water eco-toxicity)
2. **Proposed Energy and Carbon Footprint Label** - the current Energy Label plus only the lifecycle carbon footprint indicator.

These label designs, and the current Energy Label, which were tested during this research are shown below in Figure 1:



a) Current Energy Label

b) Proposed Energy and Carbon Footprint Label

c) Proposed Energy and Environmental Label

Figure 1: Three product label designs tested during study (based on television labels)

The symbols included on the new label designs are as follows:

Carbon footprint: The contribution to climate change made by this product throughout its life.*This is based on the total greenhouse gases released from the extraction of raw materials to manufacture the product, to when it is used by consumers, to when it is disposed of.*

Water footprint: The amount of water used throughout the product's life. *For example the water used during production of steel used to manufacture a washing machine*

Water eco-toxicity: The poisonous effects of the product throughout its life on species living in rivers and seas and on the quality of fresh water. *For example toxic substances released when the product is disposed that affects the health of plants and animals in rivers.*

Resource depletion: The rate at which this product leads to the depletion of natural resources faster than they are naturally replaced. *For example the use of rare metals in the manufacture a smart phone.*

The ultimate aim of the study was to establish whether either of these two new labels would be likely to encourage consumers to purchase more environmentally friendly products and how much they would be willing to pay for products with different environmental credentials.

The study consisted of three phases:

- Phase 1: A review of existing studies, schemes and information in order to inform the creation and testing of environmental impact symbols to be included on the proposed Energy and Environmental Label or the proposed Energy and Carbon Footprint Label.
- Phase 2: Qualitative discussion groups with consumers in three markets to test reactions to draft label designs and to test levels of understanding of the proposed new symbols and rating scale. These findings, along with the

findings from Phase 1, informed the design of the final label to be used in the online experiment in Phase 3.

- Phase 3: Quantitative survey and two behavioural experiments, a bidding experiment and a choice experiment, among 6,000 consumers in nine markets to test consumer preferences between, and willingness to pay for, products with different labels and different environmental ratings. The products tested through the experiment were washing machines, televisions and light bulbs.

This report draws together the findings of all three phases of this study. It is first of all important to consider the findings from Phase 1 which reviewed the methodologies available to underpin the production of an Energy and Carbon Footprint Label or an Energy and Environmental Label.

Key findings from Phase 1 – What is the possibility of creating a new product label incorporating environmental indicators?

Overall, the Phase 1 review has demonstrated that, with further work, robust methodologies could exist to serve the Commission's needs. The Phase 1 review of existing labels and methodologies for measuring the environmental performance of products concluded that, of the four new indicators being considered, carbon footprinting is the most mature. Indeed, it will soon be underpinned by an ISO standard which is an important development and essential to rigorous product performance labelling. Water footprinting is also to benefit from an ISO standard in the near future. However, an ISO standard is not a pre requisite for a robust methodology. Indeed an ISO standard provides a degree of flexibility to the users. In the context of a mandatory label, ideally user flexibility for applying the methodology would be as limited as possible.

The Phase 1 review concluded that the current methodologies for resource depletion and water eco-toxicity require more development however, before such indicators could become a requirement of an EU wide labelling scheme. A number of individual methodologies do exist that could be used or further developed by the European

Commission to support the introduction of either an Energy and Carbon Footprint Label or Energy and Environmental Label.

The issue of enforceability could not be investigated by this study due to a lack of information. There is a need for further work to be completed to gain a better understanding of how the whole life cycle assessment of a product's impact will be verified should an Energy and Carbon Footprint Label or an Energy and Environmental Label be implemented. Verification would most likely have to rely on auditing, paper trail checking and standardising reporting.

An alternative approach would be to adopt a multi criteria method capable of determining all four indicators. This would mean further development of methodologies such as the BP X30 323 or the Product Environmental Footprint. Work being carried out by the French Government on a nationwide product labelling experiment should be evaluated further by the Commission to draw out and understand the key findings and lessons learned from those participating in the experiment.

There are a number of additional considerations for the Commission in trying to introduce new environmental product labels. There will be a requirement to:

- **Review and establish the availability of test methods and standards for use in a scheme.** The review completed here showed a lack of test methods and standards and thus new ones would need to be devised. The Energy Label is a mandatory requirement and as such the standard and test method needs to be available for manufacturers to use to verify (through paper trail checking) compliance with the label's requirements. In short, everyone needs to be working to and with the same standard.
- **Make tools available to support manufacturers in reporting against product indicators.** Generating a carbon footprint or other indicator requires investment (financial and man power). So as not to burden businesses there will be a requirement to develop generic tools, such as databases and software. A similar

approach was adopted by the French Government which is generating a nationwide database.

- **Converge with existing methods.** Environmental indicators are a flourishing field and numerous initiatives are being developed around the world. The Commission would benefit from ensuring that businesses are not burdened by having to comply with numerous schemes setting different requirements for their products.

Key findings from Phase 2 and Phase 3 – What impact could a new environmental label have on consumer attitudes and behaviours?

The rest of this summary concludes that there is evidence from this study to suggest that a new Energy Label incorporating other environmental performance symbols could have a positive impact on consumer purchasing behaviour. The extent to which this is likely to be reflected in the real world is also discussed, along with recommendations for ways to increase the likely impact of a new label. These key findings are structured under five key policy questions which inform recital 23 of Directive 2010/30/EU.

<u>Policy question 1:</u> Performance of alternative label frames and combinations in terms of encouraging consumers to purchase environmentally preferable products

- Overall, in the Phase 3 experiment respondents submitted higher bids and demonstrated a higher willingness to pay for more environmentally preferable products affixed with the proposed new labels. Both the proposed Energy and Carbon Footprint Label and the Energy and Environmental Label encouraged respondents to be willing to pay more for products than when they were only shown the current Energy Label. However, it should be noted that the experiment held all other characteristics of the products constant. For example, all the washing machines shown to respondents, whilst differing in environmental lifecycle performance, offered the same private benefits in terms of noise level, spin speed and capacity. The Phase 2 qualitative discussions revealed that many participants placed greater importance on the latter product attributes when

making purchasing decisions. **This suggests that the proposed labels would encourage consumers to purchase more environmentally preferable, and often more expensive, products, although, whether this holds true as other product characteristics change has not been tested.**

- A comparison of bids and willingness to pay between the proposed Energy and Carbon Footprint Label and the proposed Energy and Environmental Label does not indicate that adding three further environmental parameters on the Energy and Environmental Label increased willingness to pay. It is worth noting that Phase 1 provided evidence that the carbon footprint can represent a good indicator of the overall environmental impact for specific product categories, mainly those considered as highly energy intensive and simple in terms of emission sources (no land use change, no biogenic emission, etc.). This conclusion appears to support an approach of just presenting the carbon footprint on the product label. Although, the methodology used to measure the carbon footprint needs to be considered carefully to ensure it is encompassing the wider environmental impact. **Observations from the experiment provide no indication that the additional information on the Energy and Environmental Label would necessarily change behaviour to a greater extent than the Energy and Carbon Footprint Label.**

- The use of the seven point rating scale (using letters from A to G as shown in Figure 2 below) for the new environmental symbols did lead respondents to submit higher bids for more environmentally friendly products, with the exception of light bulbs. Improved ratings on any of the new environmental symbols did also increase the probability that the better performing product was chosen by respondents. However no one symbol had a greater influence on behaviour than the others. It is important to note that this was the only rating scale tested in the Phase 3 experiment. It was identified as the most likely to be effective during Phase 2 which explored levels of consumer understanding of three alternative scales (letter rating, start rating, droplet rating).The Phase 3 survey confirmed that

the letter rating scale was well understood with three quarters (75%) of respondents interpreting it correctly. **The use of a seven point scale using letters is an effective means of communicating different performance ratings to consumers in the experiment.**

Figure 2: Seven point rating scale tested in new label designs

Policy question 2: Consumers' understanding of alternative label frames and the impact of this on their purchasing behaviour and willingness to pay

- The Phase 2 discussion groups explored levels of understanding of the four new lifecycle symbols which could be added to the current Energy Label. Overall, there was a relatively poor level of understanding among Phase 2 participants aside from the carbon footprint symbol which was the most widely recognised. A common assumption, made by the majority of Phase 2 participants and the Phase 3 respondents, was that the symbols represented the environmental impact of the product whilst it was *in use*. The concept of consumers being provided with information about the environmental impact of a product throughout its *lifecycle* was unfamiliar. This led to some confusion about the meaning of the labels. For instance, a few participants did not understand why a symbol depicting water footprint would be displayed on the label for a light bulb.

- The Phase 3 experiment analysis shows that respondents' understanding of the symbols included on the proposed new labels is important. The analysis investigated whether consumers' who correctly identified the definition of the new lifecycle performance symbols displayed different behaviour in their product choices and bids. With the proposed Energy and Environmental Label the difference between bids for "good" and "bad" products increased as respondents' understanding increased. Further, respondents were more likely to choose the better performing product if they had a higher level of understanding of the label

and this was true for both the proposed Energy and Carbon Footprint Label and the proposed Energy and Environmental Label. **If consumers understand the meaning of the environmental lifecycle symbols they are more likely to choose better performing products and to be willing to pay more for them.**

- The likely impact of an education campaign explaining the meaning of the symbols and ratings included on the new label design was tested during the Phase 3 experiment. This was done by exposing only half of respondents to explanatory information and analysing the effect this had on their understanding of the labels and their bids and willingness to pay. The education campaign was found to be effective at improving levels of understanding of the symbols and rating scales. Respondents exposed to the education campaign were also more likely to choose the better performing products and to bid less for poorly performing products than respondents who were not shown the information. However, the education campaign on its own did not result in respondents bidding more for better performing products. Half of the respondents exposed to the education campaign were also shown a prompt asking them to pay particular attention to the new environmental symbols when making their product choices and bids. There is no evidence from the experiment that this education “plus nudge” campaign influenced behaviour more than a campaign that simply explains the new symbols. **An education campaign that clearly explains the label is effective at improving consumer understanding of the proposed labels. It is therefore likely to push consumers towards making more environmental product choices as higher levels of understanding, as discussed above, are linked to purchases of more environmentally products at higher prices.**

Differences in impact of new product labels on behaviour across different household products

- The Phase 3 experiment tested purchasing decisions for three household products: washing machines, televisions and light bulbs. The policy observations set out above hold for both televisions and washing machines, however the observations for light bulbs are not as clear. While the Phase 3 respondents were more likely to choose the more environmentally friendly light bulb in all the situations described above (i.e. if presented with either or the new label designs rather than the current Energy Label or if exposed to the education campaign), they were no more likely to increase their bids for better performing light bulbs. This may be a reflection of the lower monetary stakes for light bulbs in the incentivised bidding experiment[1]. Respondents were given lower rewards for winning light bulbs compared to winning washing machines or televisions. This reflects a real purchasing environment where light bulbs are low cost items bought more frequently than washing machines and televisions. The Phase 2 discussion groups also uncovered a lack of willingness among consumers to consider the environmental impact of a light bulb, or even its energy efficiency, when deciding which light bulb to buy. Many Phase 2 participants said they always bought the cheapest available. This was reflected in the Phase 3 experiment where respondents did not bid more for better performing light bulbs. **Overall the labels are effective across all products tested, but we may expect the use of labels to have a greater impact on behaviour for products that represent a larger proportion of a household budget and are longer-term investments.**

Policy question 3: The main behavioural drivers of consumers' understanding and purchasing behaviours

[1] In the bidding experiment respondents made monetary offers (bids) on washing machines, televisions and light bulbs. The products were displayed next to a product label which was either the current Energy Label, the proposed Energy and Environmental Label or the proposed Energy and Carbon Footprint Label. Respondents 'won' the product if they bid a higher value than the sale price of the product (the sale price range was revealed to respondents but not the exact sale price). Respondents received 'points' which could be exchanged for shopping vouchers for products they 'won'.

- The Phase 2 discussion groups concluded that consumers would tend to focus on the product performance measures which are already displayed on existing product labels (for instance, screen size for televisions or per cycle water use for washing machines). These product characteristics very clearly represent private gains as they directly impact the user of the product in terms of product experience and the cost of running the product. Although, many of the consumers involved in this study, in both Phase 2 and Phase 3, interpreted the new symbols as also depicting 'in use' impacts, only one of these was linked to a private gain. This was the water footprint which was linked by some Phase 2 participants to their household water bill. Overall, therefore, the focus of attention for many consumers is likely to be on the product characteristics displayed at the bottom of the label rather than the new symbols being added to the right hand side of the label. In the Phase 3 experiment these the product characteristic symbols were held constant and it was found that the addition of the carbon footprint symbol did affect product choices and willingness to pay. However, increasing the number of additional symbols to the four environmental symbols did not increase willingness to pay further. **Consumers' choices can be affected by adding a carbon footprint symbol to the current Energy Label, however a key driver of purchasing decisions is still likely to be the product performance characteristics.**

- The Phase 3 experiment revealed that there are relatively few other consistent drivers of consumer purchasing decisions. It was hypothesised that respondents with pro-environmental attitudes would be willing to pay more for environmentally friendly products. However, the experiment did not provide strong evidence for this. It was also hypothesised that respondents from markets with an extensive history of environmental product labelling would choose, and be willing to pay more for, environmentally friendly products. However, again there was no evidence for this in the experiment. **Consumers' willingness to pay does not appear to be strongly linked to environmental attitudes or their prior exposure to product labelling.**

Policy question 4: Policy remedies available to the Commission to improve consumers' understanding of labels and willingness to pay for environmentally preferable goods

- The education campaign (explained under Policy question 1) increased the likelihood that respondents chose the more environmentally preferable good. The experiment analysis also revealed that as respondents' understanding of the symbols on the new labels increased, the difference between the amounts they bid for a good product and a bad product increased, and the likelihood that they chose the more environmentally preferable good increased. These observations suggest that the education campaign is important and, while this study did not specifically test alternative education campaigns, how information is presented and communicated to consumers will be important in determining the extent to which it affects consumer behaviour. The indications from this research are that it will be essential for any explanatory information to include a clear definition of the rating scale and the symbols, and, in particular, to emphasise that the symbols measure impact across the full product lifecycle. Further investigation into the most powerful design, channel and content for an education campaign around the new labels is advised. **An education campaign which explains the meaning of the new symbols included on an environmental label is likely to increase consumer understanding of this label, as well as their product choices.**

- The additional information included on the proposed Energy and Environmental Label did not lead to an increase in bids or willingness to pay compared to the proposed Energy and Carbon Footprint label. This suggests that further consideration should be taken before labels with multiple environmental symbols are introduced. In particular the additional cost to producers of these additional measures should be weighed against potential benefits. **A revised product label containing only the carbon footprint symbol is likely to have as great an**

effect on consumer behaviour as a revised label with more environmental symbols.

Policy question 5: How policy remedies available to the Commission interact with Member State labelling schemes in terms of consumer behaviour

- The Phase 1 review found many different approaches to product labelling already exist across European markets. The differences are in both how, and which, environmental impacts are measured, but also in how they are presented via labels to consumers. Different European markets place varying emphasis on different types of environmental impact and choose to relay these to consumers in different ways. In addition many Member States run national campaigns focused on topics such as saving water. For instance, markets such as Italy, Spain, Greece and Portugal have the strongest history of providing consumers with information about water use. However, this has focused on promoting household water efficiency rather than products with low water use across the full lifecycle. Of the four environmental indicators being considered, the carbon footprint is the most universally recognised in terms of methodology and presentation. **A key challenge for the Commission in introducing the proposed Energy and Environmental Label or the proposed Energy and Carbon Footprint Label will be to synchronise these with what is already being used. This is critical not only to reduce the burden placed on manufacturers in terms of the administrative and compliance costs they would incur, but also to prevent confusion among consumers.**

- The Phase 3 experiment tested whether a long history of product labelling was linked to higher levels of understanding of the proposed label designs. This relationship was found to not be straightforward. Germany and Norway are two markets which extensively use environmental product labels. Both have well known and recognised national ecolabel schemes for example (Blue Angel and Nordic Swan respectively). However, respondents from these

markets were found to be no more likely, and in some cases significantly less likely, to understand the individual indicator symbols included on the proposed labels. This could be because the labels currently used in Germany and Norway focus on one overall eco-rating which combines all aspects of a product's environmental performance. Indeed the labels themselves, which have existed for nearly 20 years, have been marketed to consumers for their simplicity. Consumers only have to look for the label to identify an environmentally preferable product. They are not required to interpret data or indicators. These respondents were therefore no more likely to understand the component symbols of water eco-toxicity or water footprint than respondents from markets with far less exposure to labelling. This is an example of the challenge faced by the Commission, which may be greater in markets with an established history of labelling rather than markets where labelling is relatively new. **An active communication campaign will be needed, especially in markets with an established history of product labelling.**

- A key European market to work closely with will be France where a national labelling experiment involving over 160 key manufacturers and retailers is currently being analysed. The results are expected in early 2013 followed by a consultation on which product labels to implement nation-wide. **It will be essential for the Commission to learn from the results of the French national experiment and to ensure that any new label designs are synchronised.**

1. Research Overview

1. Research Overview

Ipsos MORI, London Economics and AEA were commissioned to conduct this research by European Commission Directorate-General for Energy. The purpose of the research was to inform DG Energy of the possibilities to improve the energy and environmental performance of products. One crucial part of this was examining the verifiability of the carbon footprint of products, and also the products' environmental impact during their life cycle.

The research examined the effectiveness of a label which identifies the carbon footprint of energy related products and also features other environmental lifecycle parameters (water footprint, resource depletion and eco-toxicity). It also examined consumers' understanding of the various elements of a new environmental lifecycle label and ran behavioural tests in simulated purchase situations to measure consumers' willingness to pay for products with different levels of impact on the environment.

1.1 Research Background

The current Energy Label is well-known for transforming the market through the uptake of more efficient energy-related products. Such transformation has been achieved by having a compulsory label that provides consumers with meaningful, credible, comparable and easy to understand information which brings directly measurable financial gains to consumers.

Currently, energy labels are adopted by the European Commission on a product by product basis and show the ranking of products according to their energy efficiency/consumption on an A to G scale (A - green - being the most energy efficient and G – red - the least). Energy labels are mandatory for all appliances covered by the Energy Labelling Directive placed on the EU market and have to be clearly displayed on each appliance shown at the point of sale. The current Energy Label has been in place for more than 20 years (implemented by the initial Directive 92/75/EEC, now replaced by Directive 2010/30/EU) in the case of refrigerators, dishwashers and washing machines, and has helped improve energy efficiency

within these product groups. Today, 90% of these appliances placed on the EU market reach class A and above. This shift in the market and improvement in technologies prompted a review of the label and the introduction of new categories (A+ to A+++).

The current Energy Label provides clear and comparable information for consumers on the energy efficiency of products. It does this through:

- Its standardised design incorporating a classification from A to G where A is most energy efficient (there are additional classes of A+ and A++ for some products), and a colour scale from green to red where green is most energy efficient;
- Providing a value for the energy consumption of the product based on a specific EU-defined standard. For example, in the case of washing machines, energy consumption is calculated as the number of kilowatt hours used during a 60^{o}C cotton cycle for a typical 6kg load; and through
- Providing additional product specific information including, for example for washing machines - capacity, water consumption, washing and drying performance and noise levels.

In addition to the EU scheme, there are a number of national schemes which are based upon lifecycle analysis principles contained in the ISO suite of standards, such as ISO 14040. Each of the schemes is built upon a specified methodology developed by government bodies and stakeholders in the country of origin and each scheme adopts a specific labelling format. A number of schemes are reviewed briefly below to illustrate the breadth of schemes and their underlying approaches.

In the United Kingdom, the Carbon Reduction Label, which is a voluntary label, is becoming increasingly prominent. The label is managed by the Carbon Trust, a government funded, not-for-profit UK organisation. In October 2010 the total annual retail value of consumer goods bearing the label totalled £2 billion and 9 out of 10 UK households had purchased a labelled product in the last year[2]. The label is underpinned by the Publicly Available Specification 2050 methodology (PAS 2050). The Carbon Reduction Label has also experienced global

2 Factors influencing the penetration of energy efficient electrical appliances into national markets in Europe, Defra Market transformation Programme, June 2009

uptake, with thousands of products bearing the label worldwide. The Carbon Trust has been active in engaging in partnerships with organisations in countries such as Korea and Australia, in order to promote use of PAS 2050 and the Carbon Reduction Label.

The Japanese Carbon Footprint of Products scheme is in an advanced stage of development, and taking part is on a voluntary basis. A three year pilot project was undertaken by METI in 2009, and 94 different PCF labels were authorised in 2009. The methodology behind the scheme, TS Q0010 (TS=technical specification), was revised in July 2010 on the basis of feedback from the pilot project. The Japan Industrial Standard, JIS, will be released following the publication of ISO 14067. The scheme is designed to rely heavily on product category rules, which are specific rules and assumptions for PCF for a particular product or group of products, within an established methodology. The label pictured above has been chosen to represent the scheme – the motif is a kitchen scale.

France is running a national voluntary environmental labelling scheme experiment underpinned by the National Law “Le Grenelle de l’Environnement 1” for a minimum of a 12 month period from July 2011. Following the evaluation of the national experiment, the French Parliament will review the practicality of implementing a mandatory environmental label for products. The label developed by the participating manufacturers and retailers has to respect the principles of BP X30-323 methodology, developed by ADEME3 especially for the purpose of the French labelling scheme. Unlike the other schemes, it will be a multi-criteria labelling scheme, with labels illustrating other environmental characteristics such as their water footprint or resource depletion. Industry was involved in developing product category rules. During the national experiment, 168 companies had some leeway in experimenting with different label formats, and on the basis of the evaluation of this experience. A final label format will be chosen at some point in the future should the French Parliament vote for a mandatory label to be implemented.

3 ADEME: French Environment and Energy management Agency

1.2 Policy context

At the Commission level there are a number of keys policies that are driving this agenda. The first is the Sustainable Consumption and Production Action Plan[4]. This included:

- A proposal to examine, the addition of other relevant environmental information parameters such as emissions and resource-use over the course of a product's life cycle; however, it emphasised that *energy labelling must remain simple, concise and efficient*;
- The potential to introduce carbon footprint of products in the existing EU environmental labelling instruments such as the Eco-label and energy labelling; and
- The potential to take into account Member States' experience, to start working as soon as possible on common voluntary methodologies facilitating the future establishment of carbon audits for organisations and the calculation of the carbon footprint of products.

Two key steps have been taken towards achieving the above. These are:

- The European Commission study on Product Carbon Footprint methods[5] that involved analysing existing methodologies and initiatives and how they might relate to future policies; and
- The work being carried out by the Commission JRC IES draft Product Environmental Footprint (EF) Guide[6] was published for consultation in spring 2012.

The Single Market Act[7] includes a specific objective on environmental footprint: Proposal No 10. Before the end of 2012, the Commission will look into the feasibility of an initiative on the Ecological Footprint of Products to address the issue of product environmental impact, including carbon emissions.

[4] http://register.consilium.europa.eu/pdf/en/08/st16/st16914.en08.pdf

[5] Product Carbon Footprinting – a study on methodologies and initiatives, July 2012, for European Commission DG Environment, Ernst & Yound and Quantis

[6] http://ec.europa.eu/environment/eussd/product_footprint.htm

[7] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0206:FIN:EN:PDF

Following the conclusion on the "Sustainable materials management and sustainable production and consumption"[8] (December 2010), The European Council's invited the Commission to "develop a **common** methodology on the quantitative assessment of environmental impacts of products, throughout their life-cycle, in order to support the assessment and labelling of products".

The Resource Efficiency Roadmap[9] further strengthens and defines the future role of an environmental footprint methodology by explaining that the Commission will:

- Establish a common methodological approach to enable Member States and the private sector to assess, display and benchmark the environmental performance of products, services and companies based on a comprehensive assessment of environmental impacts over the life-cycle ('environmental footprint') (in 2012);
- Ensure better understanding of consumer behaviour and provide better information on the environmental footprints of products, including preventing the use of misleading claims, and refining eco-labelling schemes (in 2012).

The aim of the project was not to explore how the information displayed on the current Energy Label could be amended (i.e. should the scale be changed- from currently a letter scale, to a number scale for example) or the methodology behind determining the energy rating for a particular product. This has in part been done and the findings can be found in the report "Study on different options for communicating environmental information for products" produced for the Commission (DG Environment)[10].

[8] http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/envir/118642.pdf

[9] http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm

[10] Study on different options for communicating environmental information for products, Draft final report European Commission – DG Environment 23 December 2011

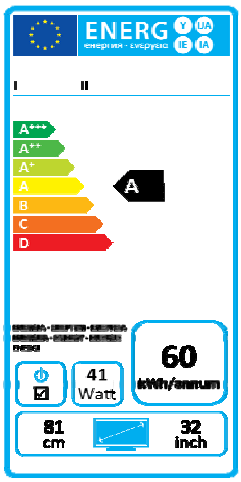
1.3 Research Objectives

This project aimed to understand how feasible it would be to upgrade the current Energy Label to include performance ratings for the carbon footprint, water footprint, resource efficiency and environmental toxicity of the product. The other key question to be answered by the study was whether consumers would pay more for a product which was better for the environment but that would not, necessarily, result in direct financial gains for them.

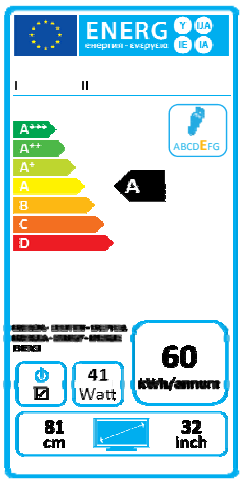
The research has tested two options for a new label:

1. **Proposed Energy and Environmental Label** - the current Energy Label plus four additional environmental indicators (carbon footprint, water footprint, resource depletion and water eco-toxicity)
2. **Proposed Energy and Carbon Footprint Label** - the current Energy Label plus only the carbon footprint indicator.

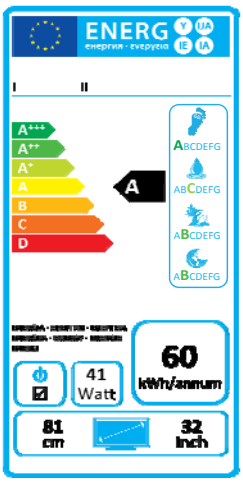
These label designs, and the current Energy Label, which were tested during this research are shown below.



a) Current Energy Label



b) Proposed Energy and Carbon Footprint Label



c) Proposed Energy and Environmental Label

The following terminology is used to refer to these label designs throughout the report:

Current Energy Label - the EU Energy Label currently in use which presents information on energy efficiency and other product specific characteristics.

Proposed Energy and Environmental Label - the EU Energy Label currently in use plus four additional environmental indicators (carbon footprint, water footprint, resource depletion and water eco-toxicity).

Proposed Energy and Carbon Footprint Label - the EU Energy Label currently in use plus a carbon footprint indicator.

The symbols included on the new label designs are as follows:

Carbon footprint: The contribution to climate change made by this product throughout its life.*This is based on the total greenhouse gases released from the extraction of raw materials to manufacture the product, to when it is used by consumers, to when it is disposed of.*

Water footprint: The amount of water used throughout the product's life. *For example the water used during production of steel used to manufacture a washing machine.*

Water eco-toxicity: The poisonous effects of the product throughout its life on species living in rivers and seas and on the quality of fresh water. *For example toxic substances released when the product is disposed that affect the health of plants and animals in rivers.*

Resource depletion: The rate at which this product leads to the depletion of natural resources faster than they are naturally replaced. *For example the use of rare metals in the manufacture a smart phone.*

The overarching objectives of the research were to:

- Review existing studies, schemes and information in order to inform the creation and testing of environmental impact symbols to be included on a proposed Energy and Environmental Label;

- Examine the possibility and appropriateness of replacing the current Energy Label with a label showing either all environmental parameters throughout the life cycle of a product or just the carbon footprint of a product throughout its lifecycle;
- Test consumers' understanding of alternative ways to present energy, environmental and carbon footprint information on product labels.
- Elicit consumers' willingness to pay for environmentally friendly goods with labels, and across different label frames through a simulated purchase experiment;
- Explore the level of need and consumer appetite, for an education campaign about a proposed Energy and Environmental Label and test the likely impact of the education campaign on consumer understanding of the labels;
- Analyse results and provide policy recommendations.

1.4 Research Method

This study involved three main phases:

Phase 1 – Review of current Energy Labels and analysis of product carbon and environmental footprinting: Collection and analysis of qualitative and quantitative data from existing official reports and public opinion surveys, studies and other resources that provided evidence regarding the main behavioural traits and external factors influencing individual decision-making in relation to the proposed both Energy and Environmental Labels and Energy and Carbon Footprint Labels and consumers' willingness to pay for non-financial benefits. More detailed information about the objectives for Phase 1, and the findings from the review, is provided in Chapter 2 of this report.

Phase 2 – Qualitative research across three markets: Six discussions groups were conducted in Great Britain, Poland and Italy with a broad range of consumers. The purpose of these groups was to test consumer reactions to draft label designs and to test levels of understanding of the proposed new symbols and rating scale. These

findings, along with the findings from Phase 1, informed the design of the final label to be used in the online experiment in Phase 3. The findings from Phase 2 are provided in Chapter 3 of this report.

Phase 3 – Design, testing & implementation of behavioural experiments: An online behavioural experiment was conducted across nine European markets with over 6,400 consumers. The data from the experiment was weighted back to the known profile of the population in each market (by age, gender and work status) to ensure the findings were nationally representative. Table 1 below shows the number of consumers who participated in the experiment in each of the markets.

Table 1: Markets participating in Phase 3 online behavioural experiment

European Market	Sample Size
United Kingdom	884
France	925
Germany	926
Italy	898
Norway	525
Poland	508
Romania	502
Spain	737
Estonia	504

The Phase 3 experiment elicited consumers' willingness to pay for three different product types which were presented alongside the proposed Energy and Environmental Label. It revealed whether consumers' were willing to pay more for products with a better environmental performance and whether this was affected by the inclusion of the proposed Energy and Environmental Label, the proposed Energy and Carbon Footprint Label or the current Energy Label. Each respondent also completed a short online questionnaire which explored their interpretation and understanding of the labels. The experiment design is explained in full in Chapter 4 and the analysis and results are presented in Chapter 5.

1.5 Research Outcomes

The outcome of Phases 1 and 2 were to provide an objective review and assessment of the methodologies that could be applied to a mandatory label such as the proposed Energy and Environmental label to provide consumers with wider environmental information than just the current Energy Label.

The outcome of Phase 3 was data that informed recital 23 of Directive 2010/30/EU, and specifically included:

- Performance of alternative label frames and combinations in terms of encouraging consumers to purchase environmentally preferable products;
- Consumers' understanding of alternative label frames and combinations across the same product (e.g. the same light bulb or white good), and across alternative products (e.g. light bulbs or white goods with different features and different environmental performance characteristics);
- The main behavioural drivers of consumers' understanding and purchasing behaviours.

1.6 Report structure

The main body of this report is split into five chapters:

Chapter 2 – Phase 1: Review of existing methodologies and research. This chapter evaluates the methodologies that exist to measure the carbon footprint, water footprint, eco-toxicity and resource depletion of products. It also reviews evidence about current levels of consumer awareness and understanding of different product label designs.

Chapter 3 – Phase 2: Qualitative research with consumers. This chapter presents findings from the six discussion groups which were held with consumers to test their understanding of the product label designs proposed for testing in Phase 3.

Chapter 4 – Phase 3: Survey and Experiment Design. This chapter presents the final design for Phase 3 and the rationale for the approach taken.

Chapter 5 – Discussion of results. This chapter presents the main conclusions from the study. It discusses consumer understanding of the new label designs and the extent to which they affect consumers' product choices and willingness to pay for more environmentally friendly products. This chapter draws on findings from both Phase 2 and Phase 3.

Chapter 6 – Limitations to the research. This chapter discusses the limitations to the research and the other factors which could drive consumer purchasing decisions which have not been measured by this study.

2. Phase 1: Review of existing methodologies and research

2. Phase 1: Review of existing methodologies and research

2.1 Phase 1 Objectives

2.1.1 Original objectives

The objectives for Phase 1 of the study were altered at the inception meeting. The original objectives were to:

1) Study the conclusions of previous and on-going Commission research into the environmental footprint of energy-related products (which focuses on the identification, analysis and comparison of the existing leading methodologies and initiatives in the European Union and globally)
2) Undertake a wider, comprehensive literature review of available studies and methodologies on the subject not analysed by the previously mentioned study.
3) Use the information gathered to carry out an assessment, involving all product partners, of the possibility and appropriateness of replacing the current Energy Label with a label displaying either:
    - all environmental parameters of a product throughout its lifecycle; or
    - the carbon footprint of a product throughout its lifecycle.

2.1.2 Updated objectives for Phase 1

The initial objectives of Phase 1 were updated following the commission of the study. It was decided that the focus should be testing a set of separate environmental indicators. This was felt to be more informative than a label presenting an overall environmental scoring.

This change of direction required the team to work closely with the Commission to establish a common understanding of each indicator, agree a definitive definition to be used to inform the methodology review and be used in Phase 3.

The four indicators the Commission asked the study to assess were:

- Carbon Footprint
- Water
- Eco-toxicity
- Life cycle resource efficiency

For the project team to identify existing methodologies or those under development, there was a need to clearly define what each category covered. The following were the initial definitions and logos to be used:

Figure 3: Carbon Footprint symbol

Carbon Footprint

Definition – the total greenhouse gases released throughout the product's life from manufacture and use to disposal.

Greenhouse gases are responsible for climate change.

Purpose of the logo: To inform consumers about the product's contribution to Climate change

Figure 4: Water Footprint symbol

Water use across the life cycle of the product

Definition - the amount of water used throughout the product's life from manufacture and use to disposal.

Purpose of the logo: Help consumers choose products that use less water

Figure 5: Eco-toxicity symbol

Eco-toxicity

Definition – the effect of the product on the environment and living things throughout its life from manufacture and use to disposal

Purpose of the logo: To inform consumers of the how harmful the product is to the environment.

Figure 6: Life Cycle Resource Efficiency symbol

Life cycle resource efficiency

Definition - how efficiently resources such as water, energy and raw materials are used in the making, use and disposal of the product.

Purpose of the logo: To inform consumers about how much resources are used by a product and to help them to identify products that use less resources (per product).

In parallel to the methodology review taking place, Phase 2 (qualitative research in three different countries) was completed. The results highlighted a lack of understanding by consumers of the logo for eco-toxicity and life cycle resource efficiency (see Chapter 3 which reports the findings from Phase 2).

This, combined with a high level review of the final draft of the "Product Environmental Footprinting (PEF)" methodology being developed by DG Environment, offered a window of opportunity to refocus the criteria definitions. The PEF methodology (see later for a detailed review) presents a synergy with the methodologies that could be used to calculate the indicator for each of the proposed indicators within this project. It was agreed that there was a need to homogenise this study with that of DG Environment so that manufacturers later on are not unduly faced with having to use different methodologies for similar environmental labelling exercise. In addition the PEF methodology has been developed through consultation and is based on pre-existing peer reviewed work in terms of the assessment method to be used for specific impacts.

It was proposed that, in line with PEF, the eco-toxicity indicator should focus on aquatic and freshwater ecosystems rather than the whole ecosystem, and that life cycle resource efficiency should be reworded as resource depletion.

The following definitions and logos were agreed as the final ones to take forward.

Water Eco-toxicity

Parameters of indicator: Focus on methodologies that can quantitatively assess the risks posed by chemicals to the environment i.e. that can compile and generate data on the level of pollution that is released to the aquatic ecosystem and the impact on fresh water. This is mainly looking at chemical and heavy metals releases, reduction in biodiversity of the aquatic ecosystem, and fresh water quality.

Figure 7: Water eco-toxicity symbol

Symbol: This new definition meant that a new logo was also required. The project team proposed and agreed with the Commission use of a new logo (see aside).

Consumer definition: The poisonous effects on the aquatic world and the quality of fresh water throughout the life of the product i.e. from the extraction of resources to manufacture the product to using the product and disposing of it. For example, the release of toxic substances during the manufacture of the product that affect the health of plants and animals in rivers.

Resource depletion

Parameters of indicator: Focus on methodologies that can quantify the impact of removal, and use, of natural resources from the environment. This results in a decrease in the availability of the total resource stock as non-renewable (usually abiotic i.e. non-living) resources are finite.

Figure 8: Resource depletion symbol

Symbol: The confusion created by the original logo, which was most commonly associated with oil and pollution by consumers (see section 3.3.4 for discussion of Phase 2 findings), meant that a new logo was also required. The project team proposed and agreed with the Commission use of a new logo (see aside).

Consumer definition: The use of raw materials in the manufacture of the product at a faster rate than they are naturally replaced. For example, the use of rare metals in the manufacture of a smart phones.

2.2 Phase 2 Methodology

The aims of this task were to review existing environmental labelling schemes, and to identify, review and evaluate successful approaches to calculate:

- carbon footprint,
- water footprint,
- resource depletion,
- water eco-toxicology, and

- using a structured, formal review process designed to extract information that characterises individual schemes.

The potential four new environmental indicators will display the whole life cycle impact of the product for each indicator, however the rating for energy will remain as it is currently displayed.

At the onset of this methodology review, it was obvious a lot of work was being conducted to grasp a European wide understanding of what is happening in this very buoyant field of environmental product labelling. Phase 1 started with a review of key documents in the field of product environmental labelling (be it carbon footprint, ecological footprint or others) in terms of the observations, conclusions and recommendations made by their authors. Key studies were identified based on:

- Date of publication,
- Who commissioned the work,
- Focus on product labelling and methodologies
- Level of analysis provided

The studies identified as the most relevant for this project were:

- **Product Carbon Footprinting – a study of methodologies and initiatives (July 2010) completed by Ernst & Young and Quantis**. The study focused on the identification, analysis and comparison of existing methodologies and initiatives worldwide that are suitable for use in future policy development. In all, the project identified 62 methodologies and initiatives for calculating carbon impact (it is worth noting that some of the methodologies studied were multi criteria ones and so covered more than just carbon footprint), 11 of these were examined by the study authors in more detail because of their particular relevance to informing EU policy.
- **Analysis of Existing Environmental Footprint Methodologies for Products and Organizations: Recommendations, Rationale, and Alignment, European Commission JRC IES, 2011**. This study built on the findings from the report by Ernst & Young and Quantis mentioned above, with a wider scope to identify and review key methodologies and standards that

are aimed at calculating environmental footprint of products and organisations rather than just carbon footprint. It retained just seven of the methodologies identified by the Ernst & Young and Quantis study.

- **Product Environmental Footprint Guide (draft out for consultation), European Commission JRC IES, 2012**. Development of a guide on how to calculate Environmental Footprint (EF) and development of product category specific methodological requirements for use in Product Environmental Footprint Category Rules (PFCRs). This report presents the requirements to calculate a product's EF and outlines the underlying methodologies that should be used to carry out the assessment. Environmental Footprint is a multi-criteria analysis methodology.

The above studies, all sponsored and reviewed by the European Commission, are considered to be reliable.

A review of these studies identified the use of common methodologies. Building on this, the review searched for other methods (or updated versions of previously reviewed methodologies) not involved in the Commission's previous studies to ensure it adequately covered all four indicators.

Methodologies that have been short listed by the Ernst & Young and Quantis[11] survey and the follow up work by the Commission JRC IES[12] have been the starting point of this review so as not to repeat previous work. Seven methodologies were assessed as the most robust approaches. These are also the approaches used to developed the up and coming Product Environmental Footprint guide (by DG Environment):

- ISO 14044: Environmental management -- Life cycle assessment - Requirements and guidelines
- ISO 14067: Carbon footprint of product
- ILCD: International Reference Life Cycle Data System

[11] Product Carbon Footprinting – a study on methodologies and initiatives, July 2012, for European Commission DG Environment, Ernst & Yound and Quantis

[12] Analysis of Existing Environmental Footprint Methodologies for Products and organisations: Recommendation, Rationales and Alignment, the European Commission HRC IES, December 2010

- Product and Supply Chain Standards Greenhouse Gas Protocol, (WRI/WBCSD[13]),
- Product Carbon Footprint (PAS 2050)

The studies did not just identify indicator specific methods, they acknowledged that life cycle thinking is at the core of most methodologies aimed at product environmental scoring. Additional whole life cycle methodologies were identified that could inform a number of indicators. Such methodologies are:

- Ecological footprint
- BPX 30-323 Environmental Footprint methodology

The initial review resulted in a shortlist of methodologies deemed reliable and fitting the work's scope.

2.3 Minimum requirement of methodologies

This study is concerned with how to expand the information currently presented by the Energy Label to include lifecycle environmental impacts. The current Energy Label, which mandates the label's use to inform consumers, currently works in parallel with the Ecodesign Directive which implements mandatory minimum energy efficiency requirements.

The Ernst & Young and Quantis study developed a number of policy scenarios to assess the differing methodological requirements that would apply to the development a specific carbon indicator. This would be included on a label based on a lifecycle approach rather than representing only the 'in use' phase. These were summarised as follows:

- a precise and transparent definition of the LCA calculation rules that reaches a consensus among the stakeholders,
- a sufficient level of data collection requirements to ensure robust results that allow scientifically sound comparisons,

[13] WBCSD - World Business Council on Sustainable Development WRI - World Resource Institute

- a data management system that could provide default values for all users affected by a mandatory scheme.

Application of the above criteria would ensure that the methodology, used to calculate non-carbon environmental indicators, is as robust and diligent as the methodological requirements of the current Energy Label.

2.4 Review of methodologies

This section presents a review of environmental labelling approaches to inform the Commission's expansion of the current Energy Label to include additional environmental lifecycle information.

Key observations

Overall, the Phase 1 review has demonstrated that, with further work, robust methodologies could exist to serve the Commission's needs. The Phase 1 review of existing labels and methodologies for measuring the environmental performance of products concluded that, of the four new indicators being considered, carbon footprinting is the most mature. Indeed, it will soon be underpinned by an ISO standard which is an important development and essential to rigorous product performance labelling. Water footprinting is also to benefit from an ISO standard in the near future.

The Phase 1 review concluded that the current methodologies for resource depletion and water eco-toxicity require more development however, before such indicators could become a requirement of an EU wide labelling scheme. A number of individual methodologies do exist that could be used or further developed by the European Commission to support the introduction of either an Energy and Carbon Footprint Label or Energy and Environmental Label.

2.4.1 Carbon footprint methodologies review

Carbon footprint is the most established and widely used environmental indicator presently in use, yet the first comprehensive carbon footprint label was only launched in 2008. Since then a lot has happened in this field and a number of reliable methodologies and initiatives have been launched.

Today, there are many different methodologies (some still in development phase) for the 'carbon footprinting' of products in a number of EU countries and in other countries around the world. Some of these initiatives aim to develop labelling schemes focused on life cycle carbon emissions, while others focus on companies' benefits from undertaking carbon analysis of their products. These methodologies and initiatives are broad in scope and fast evolving, which has led firms, public bodies and other structures to develop their own methodologies to support their specific needs. These methodologies can be quite different in terms of their approaches, such as the system boundaries they apply, how allocations are managed and how end of life is treated. Within all this, the European Commission has an important role to play because it is at the appropriate decision-making level to develop an EU-wide method.

This section summarises what are considered the most robust methodologies identified from the literature. Together they are the most helpful for informing how a carbon footprint could be added to the current energy label.

The first step of the review concentrated on reviewing and comparing the findings from the most recently published studies to gain an understanding of the diverse carbon footprint methodologies in use and to establish what they cover, their reliability, and application. The methodologies identified were:

- ISO 14044: Environmental management -- Life cycle assessment - Requirements and guidelines
- ISO 14067: carbon footprint of product (2012)
- Product Environmental Footprint, (draft 2012)
- ILCD: International Reference Life Cycle Data System
- Ecological footprint Standard 2009
- Product and Supply Chain Standards Greenhouse Gas Protocol, (WRI/WBCSD), 2011
- BPX 30-32 methodology for environmental footprint
- PAS 2050 for Product Carbon footprint, 2011

A summary of each is presented in Table 2 below. A detailed review of each scheme can be found in Appendix 1.1.1 of this report.

Table 2: Short list of Carbon footprint methodologies

Name		Short description
ISO 14044: Environmental Management -- Life Cycle Assessment - Requirements and Guidelines	Global	ISO 14044:2006 specifies requirements and provides guidelines for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, relationship between the LCA phases, and conditions for use of value choices and optional elements. ISO 14044:2006 covers life cycle assessment (LCA) studies and life cycle inventory (LCI) studies. This is a multi-criteria methodology
ISO 14067: carbon footprint of product (2012)	Global	ISO 14067 defines the Carbon Footprint of a Product (CFP) as a parameter ("indicator result") which is calculated from the greenhouse gas emissions of a product during its full life cycle, including raw material acquisition, production, use and end-of-life operations. With this understanding, the standard is based on the LCA methodology as specified in ISO 14044. ISO 14067 is an international standard aimed at measuring the carbon footprint for the lifecycle of products. It is used to calculate the greenhouse gas emissions from companies and their activities. It specifies principles and requirements for studies to quantify the carbon footprint of a product (CFP), based on life cycle assessment (LCA) specified in ISO 14040 and ISO 14044. Requirements and guidance for the assessment of a partial carbon footprint (partial CF) are also provided. ISO 14067 is applicable to CFP studies and partial CF studies with or without the intention to be publicly available. This International Standard provides for the adoption of product category rules (PCR), where they have been developed in accordance with ISO 14025 and are consistent with ISO 14067. This is a singular criteria methodology focused on carbon.

Name		Short description
Product Environmental Footprint,	Europe	The Commission's JRC IES and other European Commission services have developed a harmonised methodology for the calculation of the Environmental Footprint of Products (EFP) (including carbon footprint), this is still at the draft stage, but is out for stakeholder consultation. The purpose of EFP impact assessment is to group and aggregate the collected inventory data (Resource Use and Emissions Profile) according to the respective contributions to impact category. This subsequently provides the necessary basis for interpretation of the footprint results relative to the goals of the footprint study. The methodology has been developed building on the International Reference Life Cycle Data System (ILCD) Handbook as well as other existing methodological standards and guidance documents (ISO 14040-44, PAS 2050, BP X30, WRI/WBCSD GHG protocol, Sustainability Consortium, ISO 14025, Ecological Footprint, etc). The technical guide developed by JRC IES is tested using a limited number of pilot studies (10) representative of a wide variety of goods and services including: agriculture, retail, construction, chemicals, ICT, food, manufacturing (footwear, televisions, paper). This is a multi-criteria methodology covering carbon, water, resource depletion and water eco-toxicity.

Name		Short description
ILCD: International Reference Life Cycle Data System This is a tool rather than a methodology	Global	The International Reference Life Cycle Data System (ILCD) has been established to help ensure consistent and reproducible life cycle data and robust impact assessments. This system consists primarily of the ILCD Handbook and the ILCD Data Network. It provides a series of technical guidance documents developed through peer review and consultation and is in line with ISO 14040 and 14044. The ILCD Handbook provides detailed provisions for product (situation A and situation B) and corporate analysis (situation C). It is linked to established National LCA Database projects in all parts of the world, and with the World Business Council for Sustainable Development (WBCSD) and the United Nations Environment Programme (UNEP). This is a multi-criteria methodology including all the impacts covered by this study: carbon, water, resource depletion and water eco-toxicity.

Name		Short description
Ecological footprint Standard 2009	Global	Ecological Footprint Standards 2009 was developed by Global Footprint Network and is currently working on 2012 Standards update process. They aim to ensure that assessments are conducted and communicated in a way that is accurate and transparent, by providing standards and guidelines on such issues as use of source data, derivation of conversion factors, establishment of study boundaries, and communication of findings. The Standards are applicable to all Footprint studies, including sub-national populations, products, and organisations. The Standards have been developed through a consensus, committee-based process by a Standards Committee drawn from representatives of academia, government, NGOs, and consulting firms. As a Community Affiliate of the ISEAL Alliance, Global Footprint Network developed a standard-setting process aimed to comply with the ISEAL Standard-Setting Code of Ethics and Good Practice. The Ecological Footprint shows how carbon emissions compare and interacts with other elements of human demand, such as pressure on food sources, the quantity of living resources required to make goods, and the amount of land taken over. The standard has been developed by Global Footprint Network. The EF provides measure of the extent to which human activities exceed bio-capacity. This is a multi-criteria methodology including all the impacts covered by this study: carbon, water, resource depletion and water eco-toxicity.

Name		Short description
Product and Supply Chain Standards Greenhouse Gas Protocol, (WRI/WBCSD[14]), 2011	Global	The primary purpose of this standard is to support public disclosure of product life cycle GHG emissions to help users reduce these emissions by making informed choices about the products they design, manufacture, sell, purchase or use. The standard supports various business objectives e.g. identifying emission reduction opportunity along the product's supply chain, tracking improvements over time, understanding risk from life cycle GHG emissions in products, etc. The GHG Protocol Corporate Standard provides standards and guidance for companies and other types of organizations preparing a GHG emissions inventory. It covers the accounting and reporting of the six greenhouse gases covered by the Kyoto Protocol—carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). The Corporate Value Chain (Scope 3) and Product Life Cycle Accounting and Reporting Standards were published in October of 2011. These new standards include requirements and guidelines on both product life cycle accounting and calculation and reporting of corporate "Scope 3" emissions – i.e. corporations' indirect emissions, other than those already counted under "Scope 2" emissions from the generation of purchased energy. These two new standards are based on the life cycle approach. The Scope 3 standard is a supplement to the Corporate Standard, while the Product Standard builds upon the ISO 14040 series of standards. The Greenhouse Gas Protocol Initiative is a multi-stakeholder partnership of businesses, non-governmental organizations (NGOs), governments, and others convened by the World Resources Institute (WRI), a U.S.-based environmental NGO, and the World Business Council for Sustainable Development (WBCSD), a Geneva-based coalition of nearly 200 international companies. The process is headed by a Steering Committee (25 members). Development of the latest standards, over a three year period involved: • 2,300 participants were involved from 55 countries; • 112 members formed technical working groups to draft the standards, and; • 38 companies from various industries road tested the standards in 2010. The new standards provide a methodology that can be used to account for and report emissions from companies of all sectors, globally. This is a singular criteria methodology focused on carbon.

[14] WBCSD - World Business Council on Sustainable Development

WRI - World Resource Institute

Name		Short description
French Environmental Footprint (BPX 30-323)	France	BPX 30-323 has been developed as part of a French law "Le Grenelle 1" and lays the framework and general methodology for French environmental product labelling. The methodology has been developed as an environmental footprint one, and covers carbon impact, water, resources depletion and human toxicity. Beyond requiring an environmental footprint for each product category, BPX 30-323 provides general guidelines for product-specific communication and is in line with ISO 14040/44. France conducted a nationwide pilot that started in July 2011, participating companies had to agree to be involved for a minimum of 12 months. The pilot covers the quantification of environmental impacts and the communication of environmental footprints to the consumer. In parallel, ADEME has initiated the development of a public database to provide generic data that will enable the calculation of these indicators. BPX 30-323 was developed with over 300 organisations representing all the various relevant stakeholders, sectors, and NGOs gathered in the ADEME (Agency for Environment and Energy Management) / AFNOR (French Association of Normalization) platform. As BPX 30-323 is in line with ISO 14040 and ISO 14044 it can evolve following international or European community normative evolution. BPX 30-323 gives general principles for the environmental communication of products. The environmental communication includes indicators limited (a maximum of three can be displayed on the product) and specific to a category of product. These indicators take into account the main relevant impacts generated by the product. The leading objective is the development of multi criteria environmental performance data (carbon + other impacts) for products that can be used to consumers in their purchasing decisions. So the methodology: • must allow comparisons between products from the same category (or between products from different categories if relevant), in the same purchasing place or in different purchasing places; • must lead to a standardization of labelling practices with two objectives: cost and consideration of scientific knowledge; and, • must include at least CO_2 and other relevant impacts. The objective includes the development of product category rules besides the general guidelines. All consumer products (goods and services) are targeted. This is a multi-criteria methodology including all the impacts covered by this study: carbon, water, resource depletion and water eco-toxicity.

Name		Short description
PAS 2050,	Global	The Carbon Trust in the UK developed PAS 2050 is a Publicly Available Specification for the assessment of the life cycle greenhouse gas emissions of goods and services. It was first published in 2008 and then updated in 2011. Originally developed through a consensus building process involving technical knowledge/expertise from a wide group of international stakeholders and over 1,000 stakeholders consulted over two rounds of consultation. It was overseen by an independent Steering Group of experts, representing academia, NGO, Government, industry, etc. It was also supported by working groups of experts, market research and pilots with companies. The PAS 2050specifies requirements for the assessment of the life-cycle GHG emissions associated with the life cycle of goods and services ("products"), based on life cycle assessment techniques and principles (i.e. ISO14040/44). Requirements are specified for identifying the system boundary, the sources of GHG emissions that fall inside the system boundary, the data requirements for carrying out the analysis, and the calculation of the results. It includes the six GHGs identified under the Kyoto protocol and covers the whole life cycle of products, including the use phase and emissions from direct land-use changes that have taken place over the past 20 years. This is a singular criteria methodology focused on carbon.

2.4.2 Key conclusions from the literature review on carbon footprint labelling

Key conclusions drawn by the Ernst & Young and Quantis study on carbon footprint labelling were as follows:

- Current systems are not mature yet, and, each methodology has its own strengths and weaknesses. A key aspect for a methodology to underpin a mandatory label is that it required setting clear rules which in turn limits its flexibility on how it can be applied. This is critical to ensure that all products are assessed with the same rigorous approach. This may be overcome to some extent by way of an increase in detailed calculation rules which could be obtained through the development of Product Category Rule (PCR)-like documents (PCRs or sectorial methodologies for example).
- Current methodologies still lack precision on some critical aspects: for example, scenarios to be used for the use phase / end-of-life phase, cut-off criteria and land use. Specific work should be undertaken on these subjects in order to provide users with an accepted framework.
- Future European schemes will have to consider consistency with existing international initiatives aiming to homogenise PCF methodologies (Product GhG Protocol, ISO 14067) and to take into account experience from their more mature predecessors (such as PAS 2050).
- The ISO standard alone will not guarantee that a methodology is fit for a mandatory label. Indeed the ISO standard provides a level of flexibility to the user (in terms of interpretation or choices made by the user). Thus in order to be applicable within the context of mandatory labelling, changes to it would have to be made by policymakers.

Since the completion of the above study, the Commission has released a Product Environmental Footprint Guide (still in draft format) which provides a robust framework of how to establish an Environmental Footprint. The guide also introduces the need for Product Environmental Footprint Category Rules (PFCRs). PFCRs have an important role to play as their aims are to provide detailed technical guidance on how to complete a PEF study for a specific product. The PFCRs concentrate on

providing additional specification at a product level, thus increasing the reproducibility, consistency and relevance of product environmental studies. AFNOR (the French national office of standardisation), as part of the work within the BP X 3-323 methodology is also in the progress of implementing “sectorial standards”, to provide specific assessments for product categories covered. These standards complement the overall methodology and ensure comparability between products of the same category (food, textiles, furniture, etc.). AFNOR plays a key role in managing these sectorial standards as it also holds the certification role under the French Scheme.

A common conclusion arising from the literature review on carbon footprinting is that it is important to take into consideration all environmental impacts of products in a balanced way, and not just focus on carbon. However it was also found that there is an overall consensus that carbon footprint can represent a good indicator of the overall environmental impact for specific product categories, mainly those considered as highly energy intensive and simple in terms of emission sources (no land use change, no biogenic emission, etc.). This is very relevant to the potential addition of environmental indicators to the energy label. The Commission’s specification for this project was to consider maybe just adding carbon footprint to the label. This conclusion appears to support this approach in that overall a lower carbon footprint would also signal an overall lower environmental footprint.

However, in the case of some product groups, greenhouse gas emissions are not the most significant environmental aspect, and therefore other environmental impacts have to be taken into account to provide balanced life cycle information. Thus ideally the most appropriate methodology to calculate the carbon footprint as part of the energy label has to be one that offers the possibility of widening the environmental scope of the methodology to include environmental impacts other than climate change, as well as to ensure that the whole life cycle is considered in the analysis.

2.4.3 Water footprint methodologies

Within the context of this study, water footprint is defined as the amount of water used throughout the product’s life from manufacture and use to disposal. As for carbon footprint, water footprint can be calculated for a nation, a geographical area,

an organisation or at a product level. There are fewer comprehensive water footprint methodologies than ones for carbon. A number of recent initiatives have been taken in the fields of water labelling, certification and reporting, which are reviewed in this section.

Water footprint is an indicator that compiles the direct water use of a product, as well as its indirect water use. The Water Footprint Network defines it as the volume of freshwater used to produce the product, measured over the full supply chain. It is a multi-dimensional indicator, showing water consumption volumes by source and polluted volumes by type of pollution; all components of a total water footprint have to be specified geographically and temporally.[15] The Water Footprint Network (WFN) defines the volumetric Water Footprint (WF) as the virtual water content of a product; which is the total volume of freshwater used within all stages of the supply chain. The adjective 'virtual' reflects the fact that most of the water used to manufacture a product is not contained in or used by the product.

The real-water content of products is generally negligible if compared to the virtual-water content. For example, a litre of milk may contain nearly a litre of water but the whole supply chain consumed 1,000 litres of water including water to grow the grass and concentrates to feed the cow, drinking water, washing water, cleaning water, cooling water and processing water[16]. This is also true when comparing water consumption whilst a product is in-use and the amount of water used throughout the life cycle of a product. This is a key driver to why water footprint is gaining momentum, as a way to educate and inform consumers.

The European Water Partnership defines a comprehensive water footprint as one that should be split into three constituent elements[17]:

- **Blue water** = volume of surface and groundwater "consumed" as a result of the production of the product or service. It refers to consumption of blue

[15] The water footprint assessment manua : setting the global standard, **Arjen Hoekstra; Ashok K. Chapagain; Maite M. Aldaya ; Mesfin M. Mekonnen (World Bank) 2011**

[16] http://www.waterfootprint.org/?page=files/home

[17] Water Stewardship Programme of the European Water Partnership *http://www.ewp.eu*

water resources (surface and ground water) along the supply chain of a product. 'Consumption' refers to loss of water from the available ground-surface water body in a catchment area, which happens when water evaporates, returns to another catchment area or the sea or is incorporated into a product[16].

- **Grey water** = volume of polluted water associated with the production of goods and services, and is defined as the volume of freshwater that is required to assimilate the load of pollutants based on existing ambient water quality standards.
- **Green water =** volume of precipitation evaporated during the production process. Relevant to agricultural products and plant growth. It refers to the precipitation on land that does not runoff or recharge groundwater but is stored in the soil and evapo-transpires during growth.

It is worth noting that in the development of Product Environmental Footprint[18] methodology, water is considered an aspect of resource depletion (it distinguishes between resource depletion – aquatic and resource depletion mineral and fossil).

Looking at product labelling and water, it is observed that a number of labels are in place across Member States as well as worldwide. However labels are currently addressing the in-use water rather than the whole life cycle impact of a product on water resources. This section is not about reviewing water label for in-use but rather concentrates on the few methodologies that could be used to indicate a product's water life cycle impact.

Table 3 below presents the key methodologies identified as relevant for this study. An analysis of the different characteristics of each scheme is presented in Appendix 1.1.2 along with a long list of methodologies that have been identified with a short description.

[18] Product Environmental Footprint Guide, draft version for stakeholder consultation, the European Commission JRC IES, 2012.

Table 3: Short list of selected water footprint methodologies

Name		Name
French Environmental Footprint (BPX 30-323)	**France**	BPX 30-323 has been developed as part of a French law "Le Grenelle 1" and lays the framework and general methodology for French environmental product labelling. The methodology has been developed as an environmental footprint one, and covers carbon impact, water, resources depletion and human toxicity. Beyond requiring an environmental footprint for each product category, BPX 30-323 provides general guidelines for product-specific communication and is in line with ISO 14040/44. France conducted a nationwide pilot that started in July 2011, participating companies had to agree to be involved for a minimum of 12 months. The pilot covers the quantification of environmental impacts and the communication of environmental footprints to the consumer. In parallel, ADEME has initiated the development of a public database to provide generic data that will enable the calculation of these indicators. BPX 30-323 was developed with over 300 organisations representing all the various relevant stakeholders, sectors, and NGOs gathered in the ADEME (Agency for Environment and Energy Management) / AFNOR (French Association of Normalization) platform. As BPX 30-323 is in line with ISO 14040 and ISO 14044 it can evolve following international or European community normative evolution. BPX 30-323 gives general principles for the environmental communication of products. The environmental communication includes indicators limited (a maximum of three can be displayed on the product) and specific to a category of product. These indicators take into account the main relevant impacts generated by the product. The leading objective is the development of multicriteria environmental performance data (carbon + other impacts) for products that can be used to consumers in their purchasing decisions. So the methodology: • must allow comparisons between products from the same category (or between products from different categories if relevant), in the same purchasing place or in different purchasing places; • must lead to a standardization of labelling practices with two objectives: cost and consideration of scientific knowledge; and, • must include at least CO_2 and other relevant impacts. The objective includes the development of product category rules besides the general guidelines. All consumer products (goods and services) are targeted. This is a multi-criteria methodology including all the impacts covered by this study: carbon, water, resource depletion and water eco-toxicity.
Product Environmental Footprint, European Commission Current draft released 2012	Global	The Commission's JRC IES and other European Commission services have developed a harmonised methodology for the calculation of the environmental footprint of products (including carbon footprint), this is still at the draft stage, but is out for stakeholder consultation. The purpose of environmental footprint impact assessment is to group and aggregate the collected inventory data (Resource Use and Emissions Profile) according to the respective contributions to impact category. This subsequently provides the necessary basis for interpretation of the footprint results relative to the goals of the footprint study. The methodology has been developed building on the International Reference Life Cycle Data System (ILCD) Handbook as well as other existing methodological standards and guidance documents (ISO 14040-44, PAS 2050, BP X30, WRI/WBCSD GHG protocol, Sustainability Consortium, ISO 14025, Ecological Footprint, etc). The technical guide developed by JRC IES is tested using a limited number of pilot studies (10) representative of a wide variety of goods and services including: agriculture, retail, construction, chemicals, ICT, food, manufacturing (footwear, televisions, paper).

		This is a multi-criteria methodology including all the impacts covered by this study: carbon, water, resource depletion and water eco-toxicity.
Sustainability Consortium	EU	The Sustainability Consortium is a project originally launched by a group of consumer goods companies, including Wal-Mart, with the objective of establishing a scientifically grounded system for characterizing the environmental and social impacts associated with the production of consumer goods. Wal-Mart initiated the project with its own suppliers but the objective is to create a global framework. Thus, a consortium has been created and is administered by Arizona State University and the University of Arkansas. It is a voluntary and private standard development with the support of: • 60 companies (including 6 retailers plus L'Oréal, BASF, HP, Dell, Unilever, KPMG, Intel, 3M, Toshiba) • NGO: WWF, BSR, and GS1 The consortium's method assesses suppliers on 4 subjects: • Energy and Climate • Natural resources (including water) • Material efficiency • People and Community It is a first attempt to assess supplier engagement on sustainability. The sustainability consortium goal is to "develop transparent methodologies, tools and strategies to drive a new generation of products and supply networks that address environmental, social and economic imperatives." This is a multi-criteria methodology including all the impacts covered by this study: carbon, water, and resource depletion.
Water Footprint Index ISO 14046	Global	Preliminary Work Item, ISO 14046, Water footprint – Requirements and guidelines, being developed to complement existing LCA standards and work on carbon footprint metrics by ISO technical committee ISO/TC 207. It will take into account the ISO 14064 on the accounting and verification of greenhouse gases This methodology addresses only water impacts.

Water Impact Index	Global	The Water Impact is developed by Veolia Environment Research & Innovation in the USA. The Water Impact Index was the first indicator to integrate in one single metric all the key water aspects, namely water volume, as well as the level of water stress and the quality of water withdrawn and discharged. It measures the impact of activities on a local water resource. The online application allows assessing two equivalent technical solutions. It also enables identification of water hotspots in the value chain and can provide information on the main environmental improvement leverages. The tool is designed for those with some degree of operational understanding of water and wastewater systems, and requires an understanding of a variety of factors including water chemistry and the energy-water nexus. It can be used to analyse both municipal and industrial systems. •The results of the calculation can be used in conjunction with a traditional cost analysis to determine the best Return On Investment in terms of areas in which impact on local water resources can be minimized – and may lead to cost savings. This is methodology addresses only water impacts.

2.4.4 Key conclusions from the literature review on water footprint labelling

The main conclusions from the literature review were:

- The process of considering a water footprint and prioritising improvements is more complex than carbon footprinting as when water is returned to the environment, it may not be returned in the same state (i.e. water quality may vary), or it may be extracted when/where supply is scarce which makes it difficult to categorise the severity of the impacts linked to water extraction. This in turn makes comparisons difficult due to the complexities that arise from global supply chains and water scarcity.
- The big issue when looking at sustainability of water use is the global nature of supply chains and operations as there are varying degrees of water scarcity both globally and on a local level. These variations are evident geographically and seasonally.
- There is a close link between water and energy, which will be a key theme of future water strategies, particularly where water efficiency also results in energy savings[19].

Water labelling for products has been used for a number of years now and across the world to varying degree of success. These labels focus on informing consumers at the point of purchase about a product's water consumption when *in use***.** Several initiatives exist that promote specific products, sometimes through financial incentives because a product has achieved a high performance level, in a similar way to the energy label, or example the Water Technology Lost in the UK or the Australian WELS water rating (which is similar to the EU Energy label). However these labels do not take into consideration the water impact a product has throughout its life cycle.

Water footprinting, as mentioned earlier, is much more complex than carbon footprinting due to the fact that water is returned to the environment but often with its properties altered for example, containing pollutants. In addition the concept of water footprinting needs to consider spatial impacts that can be covered regions across the

[19] Thematic Issue: Managing water demand, reuse and recycling, Science for Environment Policy, European Commission May 2012

globe. Thus establishing a definite methodology of how to best conduct a water footprint is a challenge. Further collecting and disseminating meaningful water-related information is a complicated and difficult undertaking. While corporate water accounting methods and tools have been under development for the past decade, there is still near universal agreement that current methods—though a good start—are inadequate and need to be refined.[20]

The key achievement in this area is the development of the ISO 14046: Water Footprint Standard (still in draft format) which is based on an LCA approach as per ISO 14067: Carbon Footprint Standard. But, as mentioned earlier, the ISO standard alone will not guarantee that a methodology is fit for a mandatory label. Indeed the ISO standard provides a level of flexibility to the user (in terms of interpretation or choices made by the user). Thus in order to be applicable within the context of mandatory labelling, changes to it would have to be made by policymakers.

2.4.5 Resource depletion

Within the context of this study resource depletion is defined as the impact of removal, and use, of natural resources from the environment. This results in a decrease in resource availability of the total resource stock as non-renewable (usually abiotic i.e. non-living) resources are finite. Minimising the quantity of resources required to manufacture similar product, or increase the use of recycled materials will result in reduced resource depletion.

Only a few methodologies cover this specific indicator as identified in Table 4 below. A more detailed analysis is presented in Appendix 1.1.3 along with a list of existing methodologies, tools and initiatives.

[20] CORPORATE WATER ACCOUNTING - An Analysis of Methods and Tools for Measuring Water Use and Its Impacts, UNEP, the Global Compact and the CEO Water Mandate, 2010

Table 4: Short list of resource depletion methodologies

Name		Short Description
French Environmental Footprint (BPX 30-323)	France	BPX 30-323 has been developed as part of a French law "Le Grenelle 1" and lays the framework and general methodology for French environmental product labelling. The methodology has been developed as an environmental footprint one, and covers carbon impact, water, resources depletion and human toxicity. Beyond requiring an environmental footprint for each product category, BPX 30-323 provides general guidelines for product-specific communication and is in line with ISO 14040/44. France conducted a nationwide pilot that started in July 2011, participating companies had to agree to be involved for a minimum of 12 months. The pilot covers the quantification of environmental impacts and the communication of environmental footprints to the consumer. In parallel, ADEME has initiated the development of a public database to provide generic data that will enable the calculation of these indicators. BPX 30-323 was developed with over 300 organisations representing all the various relevant stakeholders, sectors, and NGOs gathered in the ADEME (Agency for Environment and Energy Management) / AFNOR (French Association of Normalization) platform. As BPX 30-323 is in line with ISO 14040 and ISO 14044 it can evolve following international or European community normative evolution. BPX 30-323 gives general principles for the environmental communication of products. The environmental communication includes indicators limited (a maximum of three can be displayed on the product) and specific to a category of product. These indicators take into account the main relevant impacts generated by the product. The leading objective is the development of multicriteria environmental performance data (carbon + other impacts) for products that can be used to consumers in their purchasing decisions. So the methodology: o must allow comparisons between products from the same category (or between products from different categories if relevant), in the same purchasing place or in different purchasing places; o must lead to a standardization of labelling practices with two objectives: cost and consideration of scientific knowledge; and, o must include at least CO2 and other relevant impacts. The objective includes the development of product category rules besides the general guidelines. All consumer products (goods and services) are targeted. This is a multi-criteria methodology including all the impacts covered by this study: carbon, water, resource depletion and water eco-toxicity.

ILCD: International Reference Life Cycle Data System This is a tool rather than a methodology	Global	The International Reference Life Cycle Data System (ILCD) has been established to help ensure consistent and reproducible life cycle data and robust impact assessments. This system consists primarily of the ILCD Handbook and the ILCD Data Network. It provides a series of technical guidance documents developed through peer review and consultation and is in line with the ISO 14040 and 14044. The ILCD Handbook provides detailed provisions for product (situation A and situation B) and corporate analysis (situation C). It is linked to established National LCA Database projects in all parts of the world, and with the World Business Council for Sustainable Development (WBCSD) and the United Nations Environment Programme (UNEP). This is a multi-criteria methodology including all the impacts covered by this study: carbon, water, resource depletion and water eco-toxicity.
O2 Eco-Rating Developed by O2 mobile operator	UK	O2 invested in this project to develop a simple and transparent rating system that evaluates the sustainability credentials of mobile phone handsets and rewards innovation by implementing an Eco rating. The ultimate goal of this work is to enable O2's customers to evaluate phones' sustainability credentials along with their other features. It expects that consumers' interest in this aspect of their mobile phones will in turn encourage manufacturers to take a leadership role in driving forward sustainability. The ratings are established based on a supplier questionnaire that has been developed by O2. The questions posed concern: • Policy, • Management systems, • Supply chain requirements, • Supplier management, • Communications, • Social inclusion and community, • Climate change and energy, • Resource use • Handset obsolescence and waste kit, • External recognition This is a multi-criteria methodology including carbon and resource depletion. .

Product Environmental Footprint, Developed by the European Commission	Europe	The Commission's JRC IES and other European Commission services have developed a harmonised methodology for calculation of the environmental footprint of products (including carbon footprint), this is still at the draft stage, but is out for stakeholder consultation. The purpose of environmental footprint impact assessment is to group and aggregate the collected inventory data (Resource Use and Emissions Profile) according to the respective contributions to impact category. This subsequently provides the necessary basis for interpretation of the footprint results relative to the goals of the footprint study. The methodology has been developed building on the International Reference Life Cycle Data System (ILCD) Handbook as well as other existing methodological standards and guidance documents (ISO 14040-44, PAS 2050, BP X30, WRI/WBCSD GHG protocol, Sustainability Consortium, ISO 14025, Ecological Footprint, etc). The technical guide developed by JRC IES is tested using a limited number of pilot studies (10) representative of a wide variety of goods and services including: agriculture, retail, construction, chemicals, ICT, food, manufacturing (footwear, televisions, paper). The current draft document also provides guidance on how to create product category-specific methodological requirements for use in Product Environmental Footprint Category Rules (PFCRs). This is a multi-criteria methodology including all the impacts covered by this study: carbon, water, resource depletion and water eco-toxicity.
Vodafone Eco rating	EU	Vodafone as developed an Eco rating focusing on rating mobile phone handsets only. The score is based on answers to 162 questions about the environmental and social impacts of the mobile phone. These cover: • The impacts of the phone throughout its life, from mining of raw materials to produce components, to production of the phone by manufacturers, use by consumers and disposal when the phone comes to the end of its life. • How committed the manufacturer is to managing its own environmental and social impacts. Vodafone plans to make these questions more difficult over time to encourage manufacturers to design phones that are better for the environment and society. The Eco-rating was launched in the Netherlands in 2011 and will be introduced to other European markets in 2012. This is a multi-criteria methodology including all the impacts covered by this study: carbon, water, resource depletion and water eco-toxicity.

Sustainability consortium Developed by Wal-Mart	USA	The Sustainability Consortium is a project originally launched by a group of consumer goods companies, including Wal-Mart, with the objective of establishing a scientifically grounded system for characterizing the environmental and social impacts associated with the production of consumer goods. Wal-Mart initiated the project with its own suppliers but the objective is to create a global framework. Thus, a consortium has been created and is administered by Arizona State University and the University of Arkansas. It is a voluntary and private standard development with the support of: • 60 companies (including 6 retailers plus L'Oréal, BASF, HP, Dell, Unilever, KPMG, Intel, 3M, Toshiba) • NGO: WWF, BSR, and GS1 The consortium's method assesses suppliers on 4 subjects: • Energy and Climate • Natural resources (including water) • Material efficiency • People and Community It is a first attempt to assess supplier engagement on sustainability. The sustainability consortium goal is to "develop transparent methodologies, tools and strategies to drive a new generation of products and supply networks that address environmental, social and economic imperatives." This is a multi-criteria methodology including all the impacts covered by this study: carbon, water and resource depletion.

2.4.6 Key conclusions from the literature review on resource depletion tools

The main conclusions from the literature review were:

- Methodologies are developed by private corporation such as large manufacturers to support their brand sustainability claims,
- The methodologies embrace a life cycle approach, as the results are often used to improve eco design as the conception stage or improve end of life management.

The key methodologies that can be highlighted are the French environmental footprint (BP X30 323) and the draft Environmental Footprint of Product by the European Commission.

2.4.7 Water eco-toxicity

Within the context of this study, water eco-toxicity concerns the risks posed by chemicals to the aquatic ecosystem and the impact on fresh water. This includes consideration of chemical and heavy metal releases, and biodiversity and fresh water impacts.

The review sought to identify methods that quantitatively assess chemical risks to the aquatic environment i.e. methods that compile and generate data on the level of pollution that is released to the aquatic ecosystem and the impact on fresh water.

It is worth noting that the chemical content of a product is strictly governed by regulation and covered under REACH, which is not within the remit of this project. The tools reviewed here provide a framework to identify and quantify chemicals within a product/ process that are released to water and what impact it has on the aquatic environment.

Table 5 below summarises each methodology. A more detailed review is presented in Appendix 1.1.4. Unlike water footprint and resource depletion methodologies there is no long list of existing methodologies for water eco-toxicity.

Table 5: List of Water Eco-toxicity methodologies

Name	Country	Name
French Environmental Footprint (BPX 30-323)	France	BPX 30-323 has been developed as part of a French law “Le Grenelle 1” and lays the framework and general methodology for French environmental product labelling. The methodology has been developed as an environmental footprint one, and covers carbon impact, water, resources depletion and human toxicity. Beyond requiring an environmental footprint for each product category, BPX 30-323 provides general guidelines for product-specific communication and is in line with ISO 14040/44. France conducted a nationwide pilot that started in July 2011, participating companies had to agree to be involved for a minimum of 12 months. The pilot covers the quantification of environmental impacts and the communication of environmental footprints to the consumer. In parallel, ADEME has initiated the development of a public database to provide generic data that will enable the calculation of these indicators. BPX 30-323 was developed with over 300 organisations representing all the various relevant stakeholders, sectors, and NGOs gathered in the ADEME (Agency for Environment and Energy Management) / AFNOR (French Association of Normalization) platform. As BPX 30-323 is in line with ISO 14040 and ISO 14044 it can evolve following international or European community normative evolution. BPX 30-323 gives general principles for the environmental communication of products. The environmental communication includes indicators limited (a maximum of three can be displayed on the product) and specific to a category of product. These indicators take into account the main relevant impacts generated by the product. The leading objective is the development of multicriteria environmental performance data (carbon + other impacts) for products that can be used to consumers in their purchasing decisions. So the methodology: • must allow comparisons between products from the same category (or between products from different

		categories if relevant), in the same purchasing place or in different purchasing places; • must lead to a standardization of labelling practices with two objectives: cost and consideration of scientific knowledge; and, • must include at least CO_2 and other relevant impacts. The objective includes the development of product category rules besides the general guidelines. All consumer products (goods and services) are targeted.
Product Environmental Footprint, European Commission Current draft released 2012	Global	The Commission's JRC IES and other European Commission services have developed a harmonised methodology for the calculation of the environmental footprint of products (including carbon footprint), this is still at the draft stage, but is out for stakeholder consultation. The purpose of environmental footprint impact assessment is to group and aggregate the collected inventory data (Resource Use and Emissions Profile) according to the respective contributions to impact category. This subsequently provides the necessary basis for interpretation of the footprint results relative to the goals of the footprint study. The methodology has been developed building on the International Reference Life Cycle Data System (ILCD) Handbook as well as other existing methodological standards and guidance documents (ISO 14040-44, PAS 2050, BP X30, WRI/WBCSD GHG protocol, Sustainability Consortium, ISO 14025, Ecological Footprint, etc). The technical guide developed by JRC IES is tested using a limited number of pilot studies (10) representative of a wide variety of goods and services including: agriculture, retail, construction, chemicals, ICT, food, manufacturing (footwear, televisions, paper).
Usetox model		This a characterisation methodology of human and Eco-toxicity impacts in Life Cycle Impact Assessment and for comparative assessment and ranking of chemicals according to their inherent hazard characteristics. It was developed by a team of researchers from the Task Force on Toxic Impacts under the UNEP-SETAC Life Cycle Initiative.
Swiss Ecoscarcity model (Swiss Ecopoints method)		Developed for Switzerland but now includes some other countries and allows comparative weighting and aggregation of environmental impacts by factors (emissions into air, water and top-soil/groundwater and energy resources), based on annual actual flows and the annual flow considered as critical in a defined area. Current flows are published and taken from the newest available data, and critical flows are from scientifically supported goals of the Swiss environmental policy. The method

		is based on the assumption that an established environmental policy framework can be used as reference for improving individual products and processes. Damages to ecosystem quality are considered in the target setting process of the general environmental policy; this general environmental policy in turn is then the basis for the 'critical flows'. An implicit weighting takes place in accepting the various goals of the environmental policy. The ecopoints method contains common characterization/classification approaches (for climate change, ozone depletion, acidification). Other interventions are assessed individually (e.g. various heavy metals) or as a group (e.g. NM-VOC, or pesticides).Applicable to standard environmental assessments, with specific products or processes or company EMS that use (ISO 14001) supported by such a weighting method

2.4.8 Key conclusions from the literature review on water eco-toxicity labelling

The literature review identified little information on initiatives aimed at labelling products or processes regarding water eco-toxicity impacts. On the other hand, this indicator benefits from LCA methodologies in terms of characterisation methods so as to be able to express the level of pollution as a possible indicator.

The French product labelling initiative currently underway includes a number of products bearing an indicator or an overall eco score including water eco-toxicity. The products more likely to bear such indicators were water related products such as detergent, shampoos, washing machine or dishwasher.

2.5 Conclusions from the Phase 1 review of existing methodologies

The above section presented a summary of methodologies, initiatives and tools that are available or in development. Any of these potentially could be considered further by the Commission if it wishes to evolve the Energy Label to become either an Energy and Carbon Footprint Label or Energy and Environmental Label.
Of the four indicators being considered, carbon footprinting is the most mature. Soon it will be underpinned by an ISO standard. Water footprinting is also to benefit from an ISO standard in the near future. These are important developments and are essential to underpinning product performance labelling in terms of the rigour and confidence they instil. Though as mention before, ISO standard is not a pre requisite for a robust methodology.

The issue of enforceability of the methodologies and labels reviewed could not be addressed in detail within this project due to a lack of information available. Market surveillance authorities are currently responsible for product testing for in use parameters. Yet how whole life cycle assessment of the products' impact will be verified is unclear should an Energy and Carbon Footprint Label or an Energy and Environmental Label be implemented. Verification will most likely have to rely on auditing, paper trail checking and standardising reporting. Some of the methodologies reviewed have implemented independent certification bodies this is

the case of PAS2050 for example. However, most methodologies currently rely on the transparency principle whereby system boundaries, assumption, data sources, emissions factors, assessment limitations are accessible. Again, it will be interesting to review how France might approach this issue should the French parliament vote to implement a mandatory environmental labelling of products following the national experiment.

Considering the resource depletion and water eco-toxicity indicators, it is acknowledged that methodologies reviewed in this report for both indicators are likely to be widely used by industry within the tools they use when completing life cycle assessment of their product. However the outputs are kept internal and rarely publically communicated.

Table 6 presents a high level review of the status of the methodologies available for each indicator. . It should be noted that the judgement presented here consider how well methodologies are developed in the field of that indicators rather than scoring each individual methodology. The judgements would change dramatically based on specific methodology reviewed (for example the ISO 1067 for carbon footprint has been in development for 5 years, has undergone a number of consultation and yet is still not finalised).

Table 6: Level of methods' suitability for each indicator [21]

	Indicators			
	Carbon Footprint	Water Footprint	Resource depletion	Water Eco-Toxicity
Life cycle approach				
Reliability				
Robustness				
Maturity				
Degree of uptake				
Credibility				
Communication				
Enforceability				

Overall this review shows that a number of individual methodologies exist that could be used or further developed by the Commission to support the introduction of either an Energy and Carbon Footprint Label or Energy and Environmental Label.

An alternative approach would be to adopt a multi criteria method capable of determining all four indicators. This would mean further development of methodologies such as the BP X30 323 or the Product Environmental Footprint. Work being carried out by the French Government on a nationwide product labelling experiment should be evaluated further by the Commission to draw out and understand the key findings and lessons learnt from those participating in the experiment.

[21] **Definitions:**

Life cycle approach	Do the methodologies consider the entire life cycle?
Reliability:	Are the methodologies currently available being applied to a range of product types?
Robustness:	Have the methods been reviewed and critiqued?
Maturity:	How long have the methodologies been in used? This aspect considers the length of time that has been available for testing and further development reflecting market use.)
Degree of uptake:	Is the methodology widely used by different market sectors and communicated?
Credibility:	Considers who devised the methodology. If for example, the methodology is an International standard it is considered highly credible. At the other extreme might be a method devised by a student.
Communication:	Methodologies enable presentation of findings as an indicator/label rather than a report
Enforceability	Ease of methodology to be verified by a third party in the context of a mandatory label

Green: methodologies are available and strong
Orange: Some methodologies are robust enough, but most still require further development
Red: No clear methodologies available, further development required.

There are a number of additional considerations for the Commission in trying to introduce new environmental product labels. There will be a requirement to:

- **Review and establish the availability of test methods and standards for use in a scheme.** The review completed here showed a lack of test methods and standards and thus new ones would need to be devised. The Energy Label is a mandatory requirement and as such the standard and test method needs to be available for manufacturers to use to verify (through paper trail checking) compliance with the label's requirements. In short, everyone needs to be working to and with the same standard.
- **Make tools available to support manufacturers in reporting against product indicators.** Generating a carbon footprint or other indicator requires investment (financial and man power). So as not to burden businesses there will be a requirement to develop generic tools, such as databases and software. A similar approach was adopted by the French Government which is generating a nationwide database.
- **Converge with existing methods.** Environmental indicators are a flourishing field and numerous initiatives are being developed around the world. The Commission would benefit from ensuring that businesses are not burdened by having to comply with numerous schemes setting different requirements for their products.

2.6 Information on the national and international trade issues which may influence or be affected by a new EU product labelling scheme.

This section presents a high level review of the implications of expanding the current mandatory Energy Label to include other environmental indicators. This is not meant to be a legal brief, but rather to identify potential national and international trade agreements that the updated label will have to comply with. The review concentrates on requirements for mandatory labels only. The main trade agreement that an "upgraded Energy Label" will need to comply with is that of the World Trade Organisation (WTO). The WTO's primary aim is to maintain fair and equitable trade between its Members via the WTO's "Principles of the Trading System"[22], states five primary principles for governing the legality of international trade policies:

1) **Non-Discrimination:** WTO Members must apply the same conditions to trade with all other WTO Members and may not grant special favour to or impose special restrictions on trade with any other Member. All locally-produced goods should be treated equally to imported goods.
2) **Reciprocity:** Nations may negotiate for better access to foreign markets, but must award equal access to their own markets in return.
3) **Binding and Enforceable Commitments:** Tariff commitments made in multilateral negotiations are binding and can only be changed through further negotiation with its trading partners. Changing of agreements could result in one side having to compensate the other for loss of trade, and any disputes are handled directly by the WTO.
4) **Transparency:** All Members must openly publish their trade regulations, allow other Members to review any administrative decisions made, respond to other Members' requests for information and notify the WTO immediately of any changes made to trade policies.
5) **Safety Valves:** Member governments may occasionally restrict trade under very specific circumstances. Provisions for this include allowing use of trade for non-economic purposes, ensuring "fair competition" and permitting intervention in trade for economic purposes.

[22] http://www.wto.org/english/thewto_e/whatis_e/tif_e/fact2_e.htm

There are two WTO specific agreements that need to be carefully considered to ensure that a revised EU Energy Label is not infringing either. The agreements are:

- **The Agreement on Technical Barriers to Trade**[23] ensures that regulations, standards, testing and certification procedures do not create unnecessary obstacles, while also providing members with the right to implement measures to achieve legitimate policy objectives, such as the protection of human health and safety, or the environment. Within this:
    - A technical regulation is defined as "a document which lays down product characteristics or their related processes and production methods, including the applicable administrative provisions, with which compliance is mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method".
    - A standard is defined as "a document approved by a recognised body that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method".
- **The General Agreement on Tariffs and Trade**[24] (GATT) agreement contains general rules on trade in goods, Article III:4 covers "all laws, regulations and requirements affecting their internal sale, offering for sale, purchase, transportation, distribution or use." This broad definition includes environmental labelling schemes.

In 2012 the European Commission published a study on the "Different options for communicating environmental information for products"[25]. The report includes a review on the World Trade Organisation Agreements, including what the recent landmark WTO ruling on "safe Tuna" labelling mean for other product labelling

[23] http://www.wto.org/english/res_e/booksp_e/analytic_index_e/tbt_01_e.htm

[24] http://www.wto.org/english/res_e/booksp_e/analytic_index_e/gatt1994_e.htm

[25] Study on different options for communicating environmental information for products, European Commission DG Environment, 6 February 2012

initiatives and literature. The work's recommendations relevant to the present study are:

- Legislation on environmental labelling must not be a discriminator between imported and domestic products.
- The EU's legislation should clearly refer to the environmental objectives of the measure and, optimally, define a certain level of protection sought. It should avoid any reference or statement implying that environmental information rules serve the protection of the internal market.
- The EU should have sound arguments for why the environmental labelling rules chosen are the least trade-restrictive measures conceivable for the objective it pursues.
- The EU must take into account respective ISO standards on environmental labelling.

The study also identified factors that are in principle unlikely to affect the WTO compatibility of a label. These include

- Its design;
- Which and what types of Process and Product Method (PPM)-related environmental information are included in the label (e.g. CO2 emissions and information on other air pollution or only information on one of them), as long as for each type of information, the above conditions (i.e., non-discrimination, proportionality) are met;
- Whether third party verification is used. As long as verification is non-discriminatory and proportional and that verifiers outside the EU are accepted, then this requirement is acceptable;
- Whether the label is voluntary or mandatory (depending on the details of the labelling scheme and the proportionality test); and
- Whether the Commission proposes a directive or a regulation; the substance and procedural rules contained in the legislation are the key WTO issues.

The current procedure for developing a product specific Energy Label includes consultation with WTO concerning technical barriers to trade. The existing procedures ought to provide an appropriate safety net for ensuring a revision to the Energy Label complies with WTO rules.

2.7 Consumer awareness and understanding of energy, carbon and eco- labels for energy using and energy related products

There are a wide range of energy and other environmental product labels presently in use globally. Many have been designed without research to test their effectiveness[26] with consumers despite the fact that they are a vehicle for conveying information to consumers about the energy (or other environmental) performance of products. To be effective as an instrument to change behaviour and transform markets they must provide information in a way that positively influences consumer purchase decisions. There is a growing realisation that label design should be informed by research focused on the primary end-user - the consumer. There is a need to understand what impact labels are having on consumer purchasing decision making and their overall behaviour. This section reviews the international body evidence for insight into an ideal product label design.

The review focused on understanding:

1. Consumer buying habits
2. Consumer awareness of environmental labels
3. Who uses environmental labels?
4. Who do consumers trust?

The section below presents the key findings from the literature review, the details of which can be found in Appendix 1.3.

Key observations

International research into labels to date has demonstrated that the design of the label is crucial in its success. Using comparative scales to compare the performance of similar appliances is better understood, and more motivating, than those that present technical information only.

Price is commonly the most important criteria to consumers, with energy efficiency a lower priority than other product features. Historically, take-up of low carbon products has tended to happen where there are other, more direct, consumer benefits (e.g. saving

[26] A multi-country comparative evaluation of labelling research, Christine Egan & Paul Waide presented at ECEEE 2005 SUMMER STUDY – WHAT WORKS & WHO DELIVERS?,

money or hassle) and where the take-up involves minimal individual effort.

Product labelling can very successful in driving market changes. The current Energy label has been an undeniable market transformation success and much of the credit must be attributed to its design. European consumers trust the Energy Label and they also, to a large degree, take the label into account when they buy electrical household appliances.

Wider consumer education and retailer training may be required to ensure new labels are widely understood and used by consumers.

International research into energy information labels conducted to date has demonstrated the following general (i.e. universally applicable) findings:

2.7.1 General points

- Label design by committee or policy and technical stakeholders rarely matches the needs of consumers as found in market research[27]. As consumers are the intended end-users, new energy labels should always be designed through consumer-based market research[28].
- Good label design is a necessary requirement. Having a good design, i.e. one which achieves high levels of: comprehension, motivation, appeal and credibility; does not of itself ensure that the labelling programme will be effective; however, the opposite is true (i.e. if the label design is poor the labelling programme will be ineffective)[29].
- Proposed revisions to energy labels should be tested for effectiveness with key stakeholders (most importantly consumers) prior to adoption. Existing labels that do not undertake such evaluation risk losing hard won marketing leverage and brand equity[30].

[27] A Multi-Country Comparative Evaluation of Labelling Research, C Egan (CLASP) and P Waide (IEA)

[28] Consumers and the EU Energy Label Report from a European comparative study, Lisbeth Berg, Eivind Stø & Pål Strandbakken, BARENERGY project, Deliverable D 23 (2009)

[29] Designing and Implementing a Labelling Programme, Peter du Pont, IIEC, Presentation at the CLASP Latin American Regional Workshop on Energy Efficiency Standards and Labelling, 2000

[30] Consumer survey on the new format of the European Energy Label for televisions - Comparison of a "A-G closed" versus a "beyond A" scale format, Stefanie Heinzle and Rolf Wüstenhagen. University of St. Gallen, 2009

- Ensure consumers are given options not just information: always return to the question 'what do we actually want consumers to do?'
- The most appropriate design will depend upon local cultural factors and should be assessed by multi-method research. Often these cannot be foretold even by local policymakers as they lie outside of their expertise.
- Any label design will have some limitations in consumer comprehension with visual and latter based labels. These potential problems can and should be addressed over time through public education.
- Consumers often (but not always) express a preference for including operating costs on the label[31] [32]; however, no international labelling programme has resolved how to do this given that energy prices vary regionally and over time and given the high potential for confusion between operating costs and savings[33].
- Policy-makers should aim to achieve 70%+ scores for consumer: comprehension, appeal, credibility, and motivational response from the label. Higher comprehension rates are typically found in labels designed from first principles than those designed through an a priori policymaker decision. Recall of the relative efficiency of competing products when shopping should also be measured.
- Price is commonly the most important criteria with energy efficiency a lower priority than other product features. Historically, take-up of low carbon products has tended to happen where there are benefits (e.g. save individual money and hassle) and also involve minimal individual effort[34].
- The current Energy Label has been an undeniable market transformation success and much of the credit must be attributed to its design. European consumers trust the current Energy Label and they also, to a large degree, take the label into account when they buy electrical household appliances.

[31] Haodong Gu, Pamela Morrison and Chongxin Yu, 2009, Energy Labels: Formats and Impact on Consumption Behaviour

[32] Loads of green washing—can behavioural economics increase willingness-to-pay for efficient washing machines in the UK, Joe Bull, energy policy, November 2012 p 242-252

[33] A multi country comparative evaluation of labelling research, Christine Egan, 2005 study for ECEEE

[34] EU Energy Labelling, Global Research Report, Ipsos Marketing, December 2008

Market evaluations have shown a clear and strong evolution toward higher efficiency products since its introduction.

- Wider consumer education and retailer training may be required to ensure new labels are widely understood and used by consumers – especially amongst those segments that do not tend to recognise/understand/use labels regularly. Research from China[35], Tunisia and India proves that a well-designed label can be correctly interpreted by greater than 70% of the population, despite them never having seen the label design before. This should rise after a period of familiarity with the labelling scheme and especially if accompanied by a consumer awareness and retailer training campaign during its launch.

2.7.2 Label design

- Labels that present the efficiency of the appliance on a comparative scale compared to other similar appliances are more easily understood and motivating than those that present technical information only[36].
- Labels which present the comparative efficiency via discrete categories such as stars, letters or numbers are vastly more preferred and seem to be more effective than those which use a continuous scale[37] [38]. In part, this is because they are easier to remember when shopping for an appliance. In addition, the thresholds used in these labels can be highly motivating for both manufacturers and retailers.
- European consumers understand that A is the most energy efficient and want to retain this simple labelling. The "A-G closed" scale had a greater impact on consumer decisions than the “beyond A” scale[39].

[35] Does an energy efficiency label alter consumers’ purchasing decisions? A latent class approach based on a stated choice experiment in Shanghai, Junyi Shen, Tatsuyoshi Saijo, 2008

[36] A Multi-Country Comparative Evaluation of Labelling Research, C Egan (CLASP) and P Waide (IEA)

[37] Does an energy efficiency label alter consumers’ purchasing decisions? A latent class approach based on a stated choice experiment in Shanghai, Junyi Shen, Tatsuyoshi Saijo, 2008

[38] Developing a Comprehensive Energy Guide Label for Household Appliances through Consumers Research Survey R. Saidur, M. A. Sattar, A. Izudin and H. H. Masjuki, University of Malaya, 2006

[39] Consumer survey on the new format of the European Energy Label for televisions - Comparison of a "A-G closed" versus a "beyond A" scale format, Stefanie Heinzle and Rolf Wüstenhagen. University of St. Gallen, 2009

- Evidence of reduced running costs is key to getting more consumers to buy energy efficient products (such as the kWh used per period by a refrigerator, or the kWh per cycle used by a clothes washer).
- There can be strong connotations with colour and therefore it is helpful to exploit these to make the label more readily understandable and appealing.
- Consumers preferred less technical terminology such as “power” or “current” to represent electricity and “units per day” over “kWh per day” to discuss quantities[40].
- Overloading the label with excessive or poorly organised information is distracting and limits both comprehension and engagement with the label. Careful blocking of related information and appropriate choices of fonts are helpful to make it clear to consumers which elements are most important and which only need to be addressed if further information is required.
- Government endorsement can often bring credibility to a label.
- Consumer perceptions of which label is easiest to understand do not necessarily correlate with their actual levels of comprehension. There is a trade-off between accuracy and readability/comprehension which needs careful assessment[41].
- Be selective about what to communicate: don’t focus efforts on trying to put a label on everything.
- The adoption of a well-known energy label design, even if it is successfully applied elsewhere, cannot be assumed to be effective in a new locale and hence this should, as a minimum, be confirmed through research before considering its adoption.

[40] Disclosure of Energy Operating Cost Information: A Silver Bullet for Overcoming the Energy-Efficiency Gap? Stefanie Lena Heinzle, Journal of Consum Policy (2012) 35:43–64

[41] Designing and Implementing a Labelling Programme, Peter du Pont, IIEC, Presentation at the CLASP Latin American Regional Workshop on Energy Efficiency Standards and Labelling, 2000

2.7.3 Carbon labels

- Communicating carbon is difficult as carbon 'literacy' amongst consumers is low, and producers and retailers face overloading the consumer with too much information[42]. Generally, consumers:
    - do not engage with grams of CO_2;
    - do not understand carbon terminology; and
    - have higher awareness and understanding of simpler ecolabel schemes, such as the EU Energy label
- A 'best-in-class' approach or product sector banded approach that provides a 'traffic-light' or A-G rating system would be better.
- Carbon labels must provide relevant information in a simple, clear and engaging way. To be effective the carbon label format would need certain key attributes[43]:
    - be simple to understand and intuitive (i.e. need little interpretation);
    - provide context;
    - be noticeable/ distinctive - to cut through the 'noise' (ever increasing information on products); and,
    - be from a trusted voice and fit with other sustainability labels.

2.7.4 Consumers

- Consumers are confused over the terms used in some environmental labelling[44].
- Energy efficient appliances represent money-saving first and foremost and environmental benefits are secondary[45].
- Research indicates consumers want information about energy efficiency[46].

[42] Check-out carbon - the role of carbon labelling in delivering a low-carbon shopping basket, Tom Berry, Dan Crossley, Jemima Jewell, Forum for the Future, June 2008

[43] Carbon Labelling: Public Perceptions of the Debate, Dr Paul Upham, Dr Mercedes Bleda, The University of Manchester Sustainable Consumption Institute, 2009

[44] Ibid 1

[45] EU Energy Labelling, Global Research Report, Ipsos Marketing, December 2008

- Consumers don't want to spend time deciphering the meaning of energy labels and want clarity and simplicity in product labelling.
- Consumers, even those who have never been exposed to energy labels, generally think that comparative energy labelling is a good idea that would aid purchase decision making[47].
- Comprehension of labels is lower amongst more vulnerable groups in society (older, poorer, lower academic achievement etc)[48].
- People in the EU15 countries tended to be more aware of the meaning of environmental product labels (84% could provide one correct answer or more). Only 59% of respondents in NMS12 countries could do the same[48].
- Women consider environmental concerns like energy and water consumption significantly more when making their choice than men[49].
- Age plays a role in label use[49] [50]:
    - Older people (age 48+) are more likely to consider environmental issues when purchasing.
    - Respondents in the 31–37 year age grouping placed significantly less consideration on water consumption.
    - Respondents between 38 and 47 years of age placed less emphasis on brand/model.
    - Respondents in the oldest age quartile placed more consideration on user friendliness.
    - Those in the youngest quartile considered the design/colour/decoration aspect significantly more.

[46] Consumer understanding of green terms: a supplementary report on consumer responses to environmental labels - A report to the Department for Environment, Food and Rural Affairs. Fletcher, J. and Downing, P, Brook Lyndhurst & Icaro Consulting, for Defra, London, 2011

[47] Consumers and the EU Energy Label Report from a European comparative study, Lisbeth Berg, Eivind Stø & Pål Strandbakken, BARENERGY project, Deliverable D 23 (2009)

[48] SPECIAL EUROBAROMETER 342, Consumer empowerment, TNS Opinion & Social for Eurostat and the Directorate-General for Health and Consumers (DG SANCO) April 2011

[49] Who puts the most energy into energy conservation? A segmentation of energy consumers based on energy-related behavioural characteristics, Bernadette Sutterlin, Thomas A .Brunner, Michael Siegrist, 2011

- Respondents who were accompanied by family or friends seemed to be more predisposed to consider water and energy consumption, and to search for information regarding energy consumption and energy efficiency class, than respondents who were not accompanied[50].

Failure to follow these prescriptions would seem to seriously risk the integrity of the labelling programme and could risk minimising the energy saving and market transformation impact of the labelling scheme.

[50] Energy efficiency and appliance purchases in Europe: Consumer profiles and choice determinants, Rui Gaspar n, Dalila Antunes, 2011

3. Phase 2: Qualitative research with consumers

3. Phase 2: Qualitative research with consumers

3.1 Objectives and methodology for Phase 2

Ipsos MORI explored consumer understanding across a range of the proposed Energy and Environmental Label and Energy and Carbon Footprint Label designs through six qualitative discussion groups. There were held in Great Britain, Italy and Poland in March 2012. Each discussion group consisted of eight participants, and engaged a broad range of consumers aged 25 to 64 from different social grades and with varying environmental attitudes. All these consumers had recently purchased a washing machine, smart phone[51] and/or light bulb. Each of the six discussion groups lasted two hours. The topic guide used to direct the discussion is included in Appendix 2.1. This was translated by native speakers in Italy and Poland.

The objective for Phase 2 was to gain valuable insight about consumer understanding and preferences for:

1. The **rating scales** used to describe a product's performance against the environmental indicators e.g. stars, letters or droplets;
2. The **symbols** used to visually represent the environmental performance indicators e.g. carbon footprint symbol, water droplet symbol etc.; and
3. The **explanatory descriptions** which could be included in an education campaign about the new environmental symbols.

Assessing consumers' understanding and preferences for these two elements of the product labels was crucial to inform the design of the online behavioural experiment conducted in Phase 3 of the study. This chapter presents the findings from Phase 2 and the implications of these on the design of the labels used in Phase 3.

[51] Please note: the Phase 2 discussion groups discussed the environmental product labels in relation to washing machines, light bulbs and smart phones. It was post Phase 2 that the decision was taken to replace smart phones with TVs for the purposes of the main experiment conducted in Phase 3.

The Phase 2 workshops also uncovered insights into a number of other important areas relevant to this study:

- the main drivers of consumer purchasing behaviour, and how this differed in relation to different types of product;
- consumers' attitudes towards the principle of environmental product labelling and their level of interest in it;
- the sources of information consumers turned to when making purchasing decisions, and the sources of information they would anticipate using to find out more about the proposed Energy and Environmental Label and Energy and Carbon Footprint Label designs.

These three areas are not covered in this chapter which is focusing purely on the background to the final design of the Phase 3 experiment. They are reported in Chapter 5 to help explain and support the quantitative findings from the online behavioural experiment.

3.2 Consumer understanding of environmental performance rating scales

Participants in the Phase 2 qualitative discussion groups were shown mock-up product labels using three different types of rating scales. The three types of scale tested were:

- Star rating
- Letter rating
- Drop rating

The participants were asked to interpret each of the scales to describe what they thought they meant for the environmental performance of the product. They were also asked which of the three types of rating scale they would prefer to be used on product labels.

3.2.1 Consumer understanding and appeal of the star rating

Figure 9: Star rating

The star rating scale was popular across the Phase 2 participants due to its familiarity to them. They felt it closely resembled the type of scale used to rate the quality of hotels and restaurants.

Many participants identified the star scale as a useful way to rate the products as it was clear that the number of stars was out of a total possible of seven stars. This was considered an improvement on the drop rating scale (discussed in section 3.2.3) which did not provide any indication of the best or worst possible rating.

However, despite the star rating having appeal to consumers, it was not universally understood. In all three markets there were some participants who were unsure whether an increased number of stars indicated a better or worse performing product. For instance, some participants questioned whether seven stars under the carbon footprint symbol meant this product caused a lot of harm to the environment or no harm at all.

The use of different colours for different numbers of stars was felt to add to the confusion, rather than help clarify the meaning of the scale.

3.2.2 Consumer understanding of the letter rating

Figure 10: Letter rating

The letter rating was the best understood of the three scales across participants in all three markets. The participants identified the following positive aspects of the scale to aid their understanding of it:

- The scale had a clear frame of reference with the letters A-G clearly indicating the start and end of the scale;
- Participants felt it was clear that the bigger letter represented the rating for that specific symbol; and
- Participants found it intuitive that a rating of ‘A’ represents the

best performance rating a product could receive, and a rating of ‘G’ as the worst.

Some participants also liked this rating scale as the use of letters mirrored the energy efficiency rating scale also included on the product label. However, there was some confusion as to why the two scales were not made to match exactly. For instance, some participants found it confusing that there was no F or G on the energy efficiency scale. Overall, this did not reduce their understanding of it however.

While some participants liked the use of different coloured letters across the A-G scale, for others it was considered unnecessary. Overall, having only the applicable letter in coloured font was deemed to be preferable by Phase 2 participants. This design is displayed below:

3.2.3 Consumer understanding and appeal of the drop rating

The drop rating scale was the least popular scale across many Phase 2 participants. This was because it was felt to be the least clear. The problems identified by participants with this scale were:

- It is not clear to participants what the letter in the drop referred to. Some did not think this related to a position along a scale at all. In other cases participants thought that the letter could be an abbreviation for a word. For instance, a few thought the ‘E’ could stand for ‘efficient’, ‘economical’ or ‘ecological’, while ‘C’ could mean ‘chemicals’.
- It is not clear to participants where the scale begins or ends. Generally they assumed that a rating of ‘A’ was better than a rating of ‘B’; however they could not interpret a lower rating such as ‘E’ as there was no indication of how low the rating could go. A rating of ‘E’, for instance, could still be very good if the worse possible rating was ‘Z’.

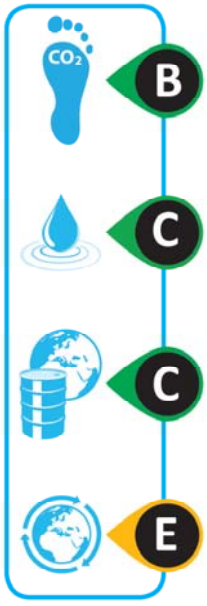


Figure 11: Drop rating

3.3 Consumer understanding of the environmental performance symbols

The Phase 2 participants were shown mock-ups of the proposed Energy and Environmental Label which included the four new environmental performance symbols.

Across the three markets, understanding of the four new symbols varied. Overall, the carbon footprint symbol was the most widely understood with the other three symbols interpreted correctly by relatively few participants. Levels of understanding of each of the symbols is set out below

Across all the markets the concept of an environmental impact being sustained *throughout the product lifecycle* was unfamiliar to participants. The majority immediately assumed that the symbols represented the performance of the product only when the product was being used by the consumer. This led to some confusion about the meaning of the labels. For instance, a few participants did not understand why a symbol depicting water footprint would be displayed on the label for a smart phone.

3.3.1 Consumer understanding of the carbon footprint symbol

The carbon footprint symbol was accurately interpreted by many participants in all three markets. Not all participants realised that this symbol related to the total greenhouse gas emissions (as opposed to just carbon dioxide emissions). However its meaning was broadly understood to relate to emissions into the atmosphere.

The Phase 2 participants from Great Britain were the most likely to refer to this symbol through the term ‘carbon footprint’. This term was less familiar among participants in Poland and Italy and, as a result, some were confused by the use of a footprint image. However, due to the written ‘CO2’ chemical symbol they still correctly described the meaning of this symbol.

Most participants were familiar with the concept of emissions and acknowledged them to be an important indicator of environmental performance.

As explained above, some participants did not find it intuitive that this symbol referred to the emissions emitted throughout the lifecycle of the product, from its manufacture to its use and its ultimate disposal. This led some to question why this symbol was shown on a label for a washing machine, smart phone or light bulb as those products were not believed to emit carbon dioxide when being used in the home. A few participants linked the emissions to the amount of energy used to operate the product, but none linked it to the product lifecycle.

3.3.2 Consumer understanding of the water symbol

Most Phase 2 participants identified this symbol as a water droplet and linked it to water use. However, again this was interpreted by nearly all participants as the water used whilst the product was operated within the home. No participants linked it to the water used throughout the product's lifecycle.

In the UK, one older respondent confused the symbol for a gas flame. This might have been due to similarities with the image used in advertising by the energy company British Gas.

Figure 12: Gas flame

In Poland there were a few respondents who did not know whether the symbol referred to water use, water pollution, or, in the case of smart phones, water resistance.

Again, there was a prevalent lack of understanding that the symbol related to the full product lifecycle. This led to confusion about the appearance of a water footprint symbol on packaging for light bulbs or smart phones.

During the Phase 2 discussion groups, the participants were asked if they could think of alternatives symbols to represent the definitions more clearly.

Figure 10: Letter rating

Some participants in Great Britain and Poland proposed that a running tap (similar to the water efficiency symbol on the washing machine label) might represent water usage better: However, it is possible that this could perpetuate misunderstanding of these symbols referring to the environmental impact across the full lifetime of the product rather than just when it is being used by the consumer.

3.3.3 Consumer understanding of the eco-toxicity symbol

This symbol was poorly understood across participants in all three markets. There were many different interpretations of it:

- The symbol was commonly thought to show an oil barrel which was associated with pollution by many participants;
- Others thought it illustrated the amount of fuel used by the product;
- A few participants in Poland interpreted it to show that the product would be detrimental to human health;
- A few other Polish participants thought it indicated that the product needed to be disposed of in special containers to avoid environmental pollution.

Participants were told that this symbol depicted the eco-toxicity of the product but this did not aid their understanding of it due to their unfamiliarity with this term.

Having been told the full definition of eco-toxicity, some respondents expressed reservations about buying a product with this symbol on the label as they believed the product may be harmful to themselves or family. It was interesting to note that this concern was raised more commonly than a concern about buying a product which would be detrimental to the environment. The latter was only raised by a small number of the Phase 2 participants.

Participants in all three markets proposed using a skull and crossbones symbol to represent eco-toxicity as this was immediately related to 'toxicity' for them. However, it is possible

Figure 14: Skull and crossbones

that this could lead to greater reluctance among consumers to purchase products with this symbol included on the label for the reasons discussed above.

3.3.4 Consumer understanding of the life cycle resource efficiency symbol

The meaning of this symbol was not well understood by the Phase 2 participants. There were many different interpretations of it:

Figure15: Mobius lool recycling symbol

- Some thought it was related to recycling due to the use of three arrows (similar to the Mobius loop recycling symbol);
- Participants in Italy came closest to the correct definition thinking it showed something to do with the general management of resources or the environmental sustainability of the product;
- A few participants in the UK interpreted it to mean the distance the product had travelled from the place of production to the place of sale;
- One participant interpreted it to indicate the availability of the product around the world.

Once the participants had been told the correct definition of the symbols, some thought it was best described as a summary symbol of the other three indicators.

The Phase 2 participants could not think of any better way of representing this environmental indicator.

3.4 Consumer understanding of explanatory descriptions of the new environmental symbols

A further objective for the Phase 2 discussion groups was to test participants understanding of textual descriptions of the four new environmental symbols. These were tested to explore the extent to which they helped participants to understand the new product label designs and, ultimately, whether they would encourage them to take more notice of the environmental ratings when making purchasing decisions. This was to inform the design of an education campaign which would be used during

the Phase 3 online experiment (see section 4.2 in Chapter 4 for details of the final information campaign design used). The explanations which were tested with the Phase 2 participants are shown below:

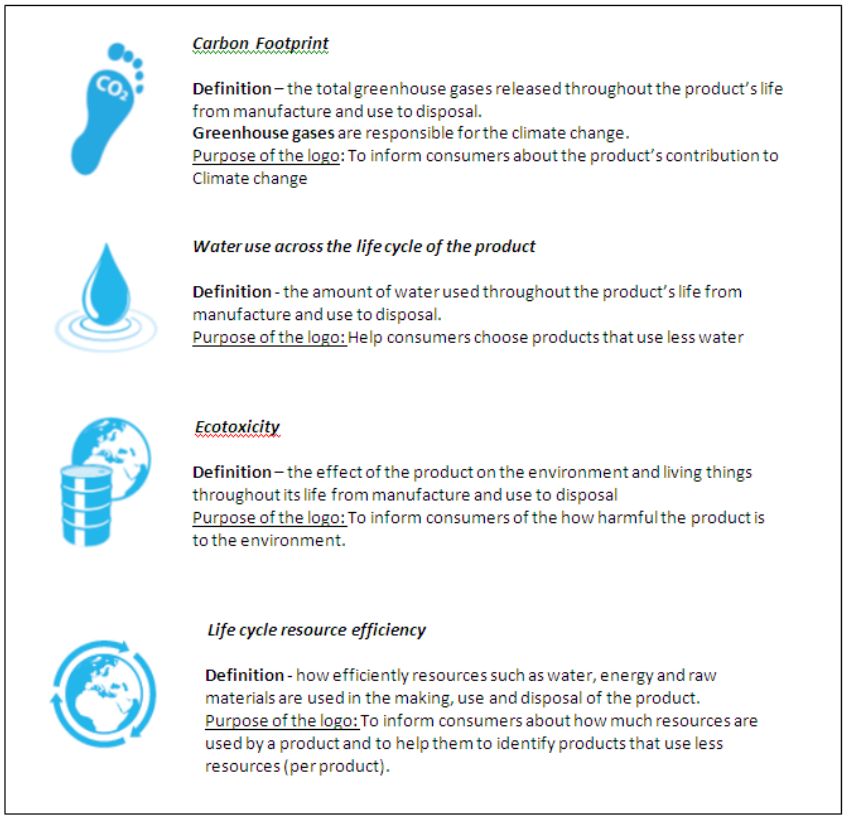


Figure 16: Definitions of new environmental symbols given to Phase 2 participants

Overall, the text explanations were favourably received by the Phase 2 participants. They were well understood and participants felt they helped them to understand the purpose of the new product label more fully. Phase 2 participants were not able to make any improvements to the suggested descriptions.

3.5 Implications of Phase 2 for the design of the Phase 3 survey and experiment

The findings discussed above are used to inform the design of the labels presented to consumers in the Phase 3 survey and experiment. The final section of this chapter sets out the recommendations passed on to the Commission at the end of Stage 2.

3.5.1 Recommendation for rating scale to use in label design

The recommendation made to the Commission at the end of Phase 2 was to take forward the letter rating into the Phase 3 survey and experiment. It was recommended that the letter scale was designed so that the respective rating was highlighted in the appropriate colour (matching the energy rating scale colours) and the other letters were all kept blue. The recommended rating scale is shown below:

In order to use either the star rating or the drop rating in the labels it was felt that additional information would be required to guarantee correct interpretation. Providing this additional information on the label, in addition to the product performance features, energy ratings and environmental symbols and ratings, could have created problems of cognitive limitations. This may have increased the likelihood of behavioural biases. It would be expected to decrease consumers' understanding of the labels and reduce the likelihood that consumer would take the ratings into account when purchasing goods. Frames that were clear upon first reading (i.e. the letter rating) and did not require additional information were more likely to effectively influence consumers' purchasing behaviour and willingness to pay. Based on the evidence from Phase 2, it was therefore recommended to take forward only the letter rating which was found to be universally understood.

3.5.2 Recommendation for symbols to use in label design

Based on the findings outlined above the recommendation made to the Commission was to use the original symbol designs for carbon footprint and water usage. However, it was suggested that there should be an investigation of alternative symbols for eco-toxicity and resource efficiency to improve their connection with consumers. These alternative symbols were presented in Chapter 2.

Water eco-toxicity Resource depletion

Although it was recommended that the water symbol included on the label remained the same as the one tested in Phase 2, it was recommended that two alternative designs were tested for understanding during the survey section of Phase 3. One of the symbols taken forward for further testing was the design suggested by Phase 2 participants (the tap and water droplet). The other was developed by the research team in response to the lack of understanding among Phase 2 participants that these symbols related to the product lifecycle. The design below was created for testing in Phase 3.

Alternative design 1
(Developed by Phase 2 participants)

Alternative design 2
(Developed by research team)

Figure 17: Alternative designs

Given the poor understanding of some of the environmental symbols uncovered in Phase 2 it was also recommended that the Phase 3 online survey included questions to ascertain respondents understanding. In particular, to measure the proportion of consumers who also interpreted the symbols to refer to direct use indicators rather than product lifecycle indicators. This was important so that the choices made during the willingness to pay experiment could be cross-analysed with the interpretation the consumer had for the symbol to see on what basis a certain bid on a product, or a choice between products, was being made. The questions developed to test this are included in Appendix 3.1.

4. Phase 3: Survey and Experiment design

4. Phase 3: Survey and Experiment design

4.1 Overview of the design of Phase 3

This chapter describes the behavioural experiment used to assess consumers' preferences and willingness-to-pay for washing machines, light bulbs and televisions affixed with different *environmental* labels at point of sale.

The experiment was conducted online among 6,409 consumers from nine European markets. The data from the experiment was weighted back to the known profile of the population in each market (by age, gender and work status) to ensure the findings were nationally representative. The table below shows the number of consumers who participated in the experiment in each of the markets.

Table 7: Sample size per country

Country	Sample Size
United Kingdom	884
France	925
Germany	926
Italy	898
Norway	525
Poland	508
Romania	502
Spain	737
Estonia	504

Three labels were tested in the experiment, the current Energy Label, the proposed Energy and Carbon Footprint Label, and a proposed Energy and Environmental Label as follows:

- The current Energy Label included an energy efficiency grade and product specific icons such as the noise level of a washing machine. This label provided the consumer with information about the energy consumption of the product when it is in use by a consumer. As such, this label stated information

on the *private good* provided by the product. For instance, a higher energy efficiency rating would have a direct benefit to the consumer in terms of lower energy costs. Energy use also has a *public good* element however as lower energy consumption has a benefit in terms of carbon impacts which flow to others beyond the direct consumer.

- The proposed Energy and Carbon Footprint Label added a carbon footprint symbol, rated on a seven letter scale from A to G, to the current Energy Label. The carbon footprint symbol provided information on the product's contribution to climate change throughout its life i.e. a *public good*.
- The proposed Energy and Environmental Label included the carbon footprint and three additional environmental measures. These were water use across the product lifecycle, water eco-toxicity and resource depletion. Each of these measures had a seven letter rating from A to G, and again represented a *public good* associated with the product's life.

In order to focus the experiment on the impact of introducing *additional* environmental performance information to the current Energy Label, the experiment design held energy efficiency and product specific icons constant for each product type. In the Phase 2 qualitative discussion groups it was found that the product specific icons were considered the more important elements of choice. Therefore, to ensure that the effect of adding additional environmental information could be isolated, all other information was held constant.[52] This element of the experiment design, and the relevant findings from the Phase 2 discussion groups, are discussed in further detail in Chapter 6.

The Phase 3 experiment consisted of three parts which are described in more detail in this chapter:

- A bidding exercise;
- A choice experiment; and
- A survey asking attitudinal and demographic questions.

[52] This was also a pragmatic choice to allow us to implement the experiment within the time-limit for the online experiment and survey.

4.1.1 Rationale for Phase 3 experiment design

Bidding exercises have been used by a number of researchers to assess the impact of labelling schemes on consumer behaviour. These studies included Gracia et. al., (2009) in which the authors evaluated consumers' willingness-to-pay for meat products with different types of animal welfare labels. In this study consumers' willingness-to-pay for products with an animal welfare label was higher than for products with no label irrespective of the information provided by the label. However, the results indicated that across different labels, willingness-to-pay was higher for less comprehensive labels in terms of animal welfare. The authors concluded that consumers used only a few items of information on the label in their choice, and they were therefore willing-to-pay a higher price for products with 'fewer words' even if the level of animal welfare conveyed by the label was lower. Noussair et. al., (2002) and (2004) evaluated consumers' willingness-to-pay for products with labels that indicated the good included ingredients with genetically modified organisms (GMO). The authors observed that labels which conveyed information using text were often not noticed by consumers; and, as such, the label did not impact upon consumers' valuation of the product. However, when consumers' attention was directed towards the label information, consumers did account for this information in their choices. The authors concluded that information presented in a standardised format that concisely transmitted information was an important element of labelling schemes. Bernard and Bernard (2009) used an experimental auction to investigate consumer preferences for milk labelled as organic, GMO free, antibiotic free, and conventional. Milk that is organic was also GMO free and antibiotic free, likewise GMO free was also antibiotic free. As such, the labels provided information on increasing 'absence' of 'additives' as compared to conventional milk. The authors observed that there was little difference in willingness-to-pay across organic, GMO free and antibiotic free, however this might be due to diminishing marginal valuations for increased attributes in the nature of the product as opposed to label presentation. Rousou and Lusk (2009) ran a bidding experiment with different information treatments to assess consumers' valuation of GMO food. The authors found that consumers were most willing to switch from non-GMO to GMO products when the positive public benefit effects of GMO were presented to them, namely reduced environmental impacts from reduced pesticide use. However, consumers tended to value the *private good* health benefits to a

greater extent when considering the price they would be willing-to-pay for the GMO product.

Choice experiments have also been used by a number of researchers to assess willingness-to-pay for products with different labels. Shen and Saijo (2009) implemented a choice experiment to assess consumer preferences for air conditioners and refrigerators with energy efficiency labels. The authors observed that consumers paid attention to the energy labels, but tended to take into account energy efficiency in their preferences for products which they used more frequently such as refrigerators as compared to air conditioners. Loueiroa and Umbergerb (2007) used a choice experiment to investigate the value consumers place on products carrying a food safety label approved by the US Department of Agriculture, and a label stating country of origin. The authors found that willingness-to-pay for the food safety label (a private good) was greater than the country-of-origin of label (that can contain information on both the private and public good element of the product). In a choice experiment with roses, Michaud and Llerena (2008) tested the effect of an environmental certification label which verified that the roses had been produced by growers that complied with organic practices, and a label that informed the consumer whether the rose, during production and transportation, was associated with high or low carbon emissions. Both of these attributes were public goods associated with consumption of a private good. However, consumers were willing-to-pay more for products associated with low carbon impacts than products associated with organic production systems. The authors concluded that the carbon information was more general and easier to understand than the certification label, which was associated with more complex production features. Further, consumers' general knowledge was most likely higher surrounding carbon issues. This pointed to the importance of consumers' prior knowledge about the information that labels convey.

4.2 Testing the impact of an education campaign through the Phase 3 experiment

To test the effect of prior knowledge on the impact of the new product labels being examined by this study, the experiment included a simulated "education campaign". This was based along the lines of the information currently available for the current Energy Label.

Three education scenarios were tested during the Phase 3 experiment:

1. A third of respondents saw no information on the meaning of the labels ("No Info" group)
2. A third of respondents saw an explanation of the current Energy Label and an explanation of either the proposed Energy and Environmental Label or the Energy and Carbon Footprint Label ("Explanation group").
3. A third of respondents saw these explanation screens and were also prompted to consider them when making their product choices and submitting bids. This 'nudge' could be considered to simulate an advertising or marketing campaign which encourages consumers to consider the environmental credentials of a product ("Explanation plus prompt group").

The education screens and prompt text are shown in Figures 18-20[53] below.

[53] Please note the terminology used in these images is the terminology shown to Phase 3 respondents. The term 'Current EU environmental label' was used to describe the current Energy Label and the term 'New EU environmental label' was used to describe both the proposed Energy and Environmental Label and the proposed Energy and Carbon Footprint Label. Each respondent was only shown one of the new label designs and so there was no need to distinguish between them in the terminology used.

Current EU environmental label

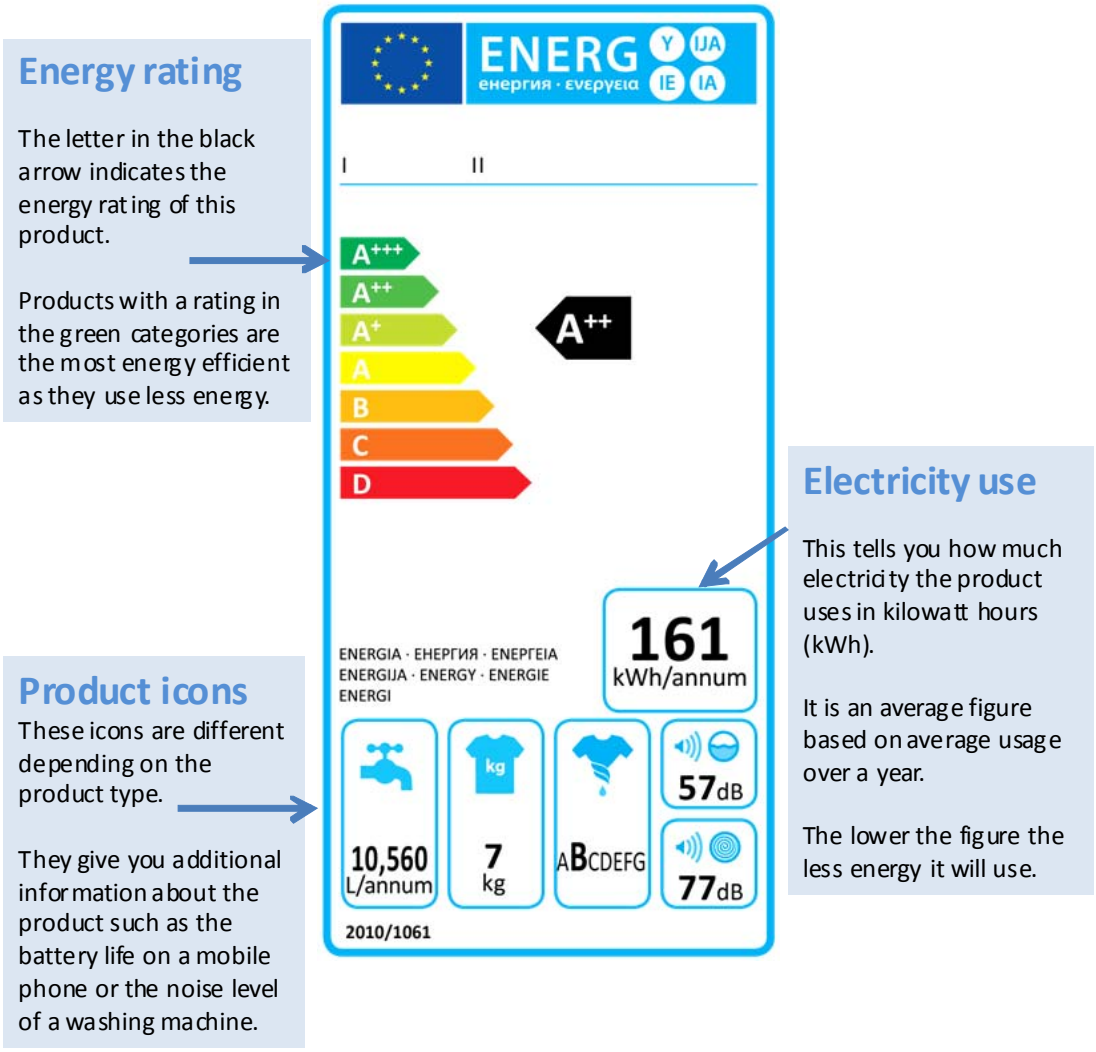
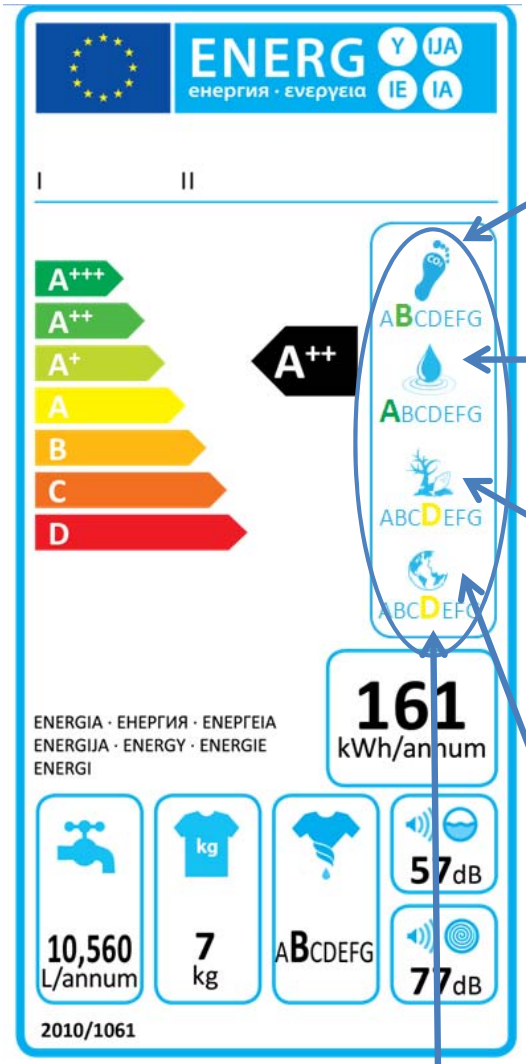


Figure 18: Education campaign shown to all respondents in "Explanation group" and "Explanation plus prompt group"

New EU environmental label



Carbon footprint

The contribution to climate change made by this product throughout its life.

This is based on the total greenhouse gases released from the extraction of raw materials to manufacture the product, to when it is used by consumers, to when it is disposed of.

Water use across product lifecycle

The amount of water used throughout the product's life.

For example the water used during production of steel used to manufacture a washing machine

Water eco toxicity

The poisonous effects of the product throughout its life on species living in rivers and seas and on the quality of fresh water.

For example toxic substances released when the product is disposed that affect the health of plants and animals in rivers.

Resource depletion

The rate at which this product leads to the depletion of natural resources faster than they are naturally replaced .

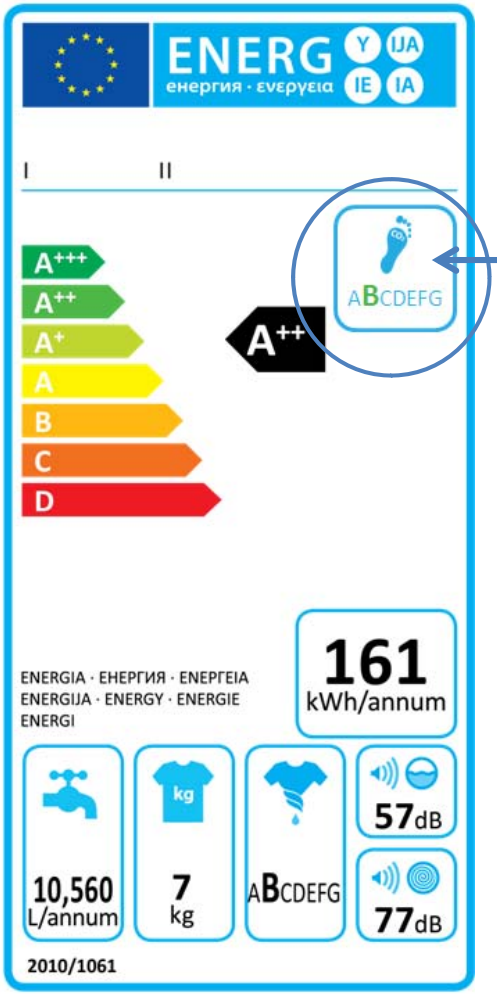
For example the use of rare metals in the manufacture a smart phone.

Ratings

Products are rated from A to G for their environmental performance.
A rating of **A** means the product is better for the environment/

Figure 19: Education campaign shown to respondents in "Explanation group" and "Explanation plus prompt group" who saw the proposed Energy and Environmental Label

New EU environmental label



Carbon footprint

The contribution to climate change made by this product throughout its life.

This is based on the total greenhouse gases released from the extraction of raw materials to manufacture the product, to when it is used by consumers, to when it is disposed of.

Products are rated from A to G for their carbon footprint. A rating of **A** means the product has a lower carbon footprint.

Figure 20: Education campaign shown to respondents in "Explanation group" and "Explanation plus prompt group" who saw the proposed Energy and Carbon Footprint Label

Respondents who were exposed to the "Explanation and Prompt" were shown the following text ahead of the bidding exercise and ahead of the choice experiment.

The products you will see are all identical apart from their **environmental ratings under the four new symbols**, which are shown on some products (but not all). We would like you to think about these different ratings when you decide how much to bid for each product.

The products you will see are all identical apart from their **environmental ratings under the four new symbols**, which are shown on some products (but not all). We would like you to think about these different ratings when you decide which product you would be most likely to buy.

4.3 The bidding exercise

The bidding exercise required Phase 3 respondents to make monetary offers (or bids) on each of the three products. It was not possible to 'sell' actual goods during the experiment under standard market research rules, and as such the experiment respondents received 'points' which could be translated into high street shopping vouchers.[54] In order to incentivise the experiment, in the absence of being able to provide respondents with the actual goods, it was necessary to give them *redemption values*. The redemption value was the amount for which they could redeem any products successfully secured in the experiment.

The bidding exercise operated in the following way:

- Respondents were shown a product with the respective label.
- They were informed of their redemption value and invited to make an offer for the product.
- Respondents 'won' the product if their offer price was greater than the sale price for the product.
- The sale price was randomly drawn from a pre-specified interval. Respondents were informed of this interval before they made their offer

[54] This feature is one of the main differences between this bidding exercise and the bidding exercises used in previous labelling work, e.g. Noussair et, al., 2002 and 2004.

but were not told the exact sale price of the particular product they were shown.[55]

- If a respondent successfully "won" a product in the experiment they earned their redemption value *minus* the sale price. This was converted into points which could be redeemed for high street shopping vouchers.

In this experiment, if a respondent *did not* take into account the environmental impacts of the product when deciding how much to bid then they would be expect to bid their redemption value, as this was the way to maximise their expected private benefit. However, if a respondent *did* take into account the environmental impacts and derived value from goods that are more environmentally friendly, then they would be willing to bid this 'environmental value' above their private benefits.

The respondent's behaviour was incentivised in this experiment as their earnings in the experiment were directly linked to the choices they made in the experiment. However, in order to incentivise both the private benefits (as done through the redemption values), and the public benefit (the improvement in environmental outcomes), a financial contribution to environmental improvements was introduced. This contribution was made when respondents 'won' more environmentally friendly products. It was important to incentivise both the private and public goods in this experiment to create a balanced incentive system (i.e. the public good would be hypothetical if it was not incentivised) potentially biasing respondents' choices towards the private benefit.

In cases where respondents accounted for the environmental impact of the products and bid above their redemption value for more environmentally friendly products, situations could arise where the respondent lost money. This would occur if they successfully won the good and the sale price was greater than their redemption value. In order to prevent respondents losing money, an *endowment* was included in the experiment. The endowment was given to each respondent before they made a

[55] The sale price is re-drawn for each new bid, and participants are told that the sale price will not remain the same across bidding opportunities.

bid on a product. The endowment then decreased in cases where the participant won the good and the sale price was greater than their redemption value. The endowment also performed another important function in the experiment: it prevented participants from having an incentive to bid very high (above their redemption value) since they had nothing further to lose in private terms by increasing their bid beyond their valuation. It also reinforced more strongly that they gave up some of their earnings in order to generate environmental benefits through their decisions. This could be considered analogous to 'paying more' for a good which was environmentally friendly.

4.3.1 The bidding process

At the beginning of the bidding exercise respondents were shown an instruction screen which informed them about how the bidding exercise would work. The text of the instructions given to respondents is shown below:

This section of the survey will ask you to complete an exercise that is different to standard survey questions. It is essential that you read the instructions carefully to understand how to complete the exercise.

You are now going to be shown a range of washing machines, televisions and light bulbs. You will be asked how much you would be prepared to offer for each product if it was on sale at an auction. This will be your 'bid'.

This is a hypothetical auction so you will not receive real products or pay with real money. You are also not bidding against other people. However, you can earn up to 300 additional Ipsos points depending on the bids you make. This is in addition to the 150 points you will receive for taking part in this survey.

Please read the following instructions carefully.

- You will be given a small amount of 'money' at the start of each bid. This will be called an endowment. The bids you make will determine how much of this endowment you receive in Ipsos points at the end of the exercise.

- You will be told the re-sale value of the product i.e. how much you could get for the product if you re-sold it.
- You will be asked to state how much you would offer for the product (your 'bid'). You are free to bid any amount.
- You will not be told the exact sale price of the product before you make your bid, but you will be told the price range for the product.
- If the amount you bid for the product is above the actual sale price, you will 'win' the product.
- If the amount you bid is below the sale price you will not win the product.
- For each product that you win, you may receive additional Ipsos points. The number of points you win will be calculated from the difference between the re-sale price and the sale price of the product plus your endowment money.
- If you win a product with a higher sale price than its re-sale value, you will lose money from your endowment. During this exercise you may lose some or all of the endowment but you will always receive 150 Ipsos points for taking part in the survey.
- If you win products that are environmentally friendly then Ipsos MORI will make a financial donation to a fund designed to protect the environment. The more environmentally friendly the product is, the greater the donation we will make.

Here are a few examples to show you how it works.

Example 1: You win the product and win additional Ipsos points

- You are given an endowment of £17. You are told that the re-sale value of a washing machine is £340. You are told the sale price range is between £323 and £357.
- You decide to bid £330.
- The sale price for the washing machine is actually £325.
- You win the product as you were willing to offer more for the washing machine than the sale price. For this bid you would win £32 (re-sale price of £340 minus sale price of £325 plus £17 endowment). This is converted into 74 additional Ipsos points.

Example 2: You win the product but lose some of your endowment

- You are given an endowment of £17. You are told that the re-sale value of a washing machine is £340. You are told the sale price range is between £323 and £357.
- You decide to bid £350.
- The sale price for the washing machine is actually £345.
- You win the product as you were willing to offer more for the washing machine than the sale price. For this bid you lose £5 from your endowment (re-sale price of £340 minus sale price of £345). You are left with £12 from your endowment. This is converted into 28 additional Ipsos points. The product you won was environmentally friendly so a financial donation is made by Ipsos MORI to a fund designed to protect the environment.

Example 3: You do not win the product and do not win any additional Ipsos points

- You are given an endowment of £17. You are told that the re-sale value of a washing machine is £340. You are told the sale price range is between £323 and £357.
- You decide to bid £335.
- The sale price for the washing machine is actually £340.
- You do not win the product as you were not willing to offer more for the washing machine than the sale price.

Each respondent made three separate bids for each of the three products. That meant in total each respondent made nine bids. In order to ensure respondents could complete the experiment within the time allotted, and to ensure respondent fatigue was avoided, the respondents were divided into two groups. [56]

- Group 1 made bids on products carrying either the proposed Energy and Environmental Label (Information screen 2) or the current Energy Label (Information screen 1).

[56] The allocation of respondents to a group is random with approximately 60% allocated to group 1 and 40% allocated to group 2.

- Group 2 made bids on products carrying either the proposed Energy and Carbon Footprint Label (Information screen 3) or the current Energy Label (Information screen 1).

For Group 1, there were a maximum of 2,401 different label combinations (4 icons each with 7 different ratings). To ensure there were a sufficient number of observations for analysis, it was not feasible to include all 2,401 different combinations in the experiment. It was therefore necessary to narrow the set of combinations to a manageable size. Consequently, the following stylised label combinations in the experiment were implemented.[57]

Table 8: Label rating combinations in Phase 3 experiment

	Rating Combination for the full environmental label											Current Energy Label
	1	2	3	4	5	6	7	8	9	10	11	12*
Washing machines												
CO2	B	A	G	B	B	B	B	B	B	A	A	-
H2O	B	B	B	A	G	B	B	B	B	A	A	-
ECO	D	D	D	D	D	A	G	D	D	C	B	-
RES	D	D	D	D	D	D	D	A	G	C	B	-
Televisions:												
CO2	C	A	G	C	C	C	C	C	C	B	A	-
H2O	C	C	C	A	G	C	C	C	C	B	A	-
ECO	B	B	B	B	B	A	G	B	B	A	A	-
RES	B	B	B	B	B	B	B	A	G	A	A	-
Light bulbs (Halogen energy saving):												
CO2	C	A	G	C	C	C	C	C	C	B	A	-
H2O	B	B	B	A	G	B	B	B	B	A	A	-
ECO	C	C	C	C	C	A	G	C	C	B	A	-
RES	C	C	C	C	C	C	C	A	G	B	A	-

[57] Rating combinations are randomly drawn from combinations 1 to 12, with the restriction that each individual combination appears an equal number of times for respondents in each country.

Note: The current Energy Label (combination 12) presents only energy efficiency information and the product specific icons.

These rating combinations could be summarised as follows:

Combination 1: Median ratings among the fictitious washing machines and televisions provided by AEA, and the ratings for the fictitious energy saving halogen light bulb provided by AEA (these ratings for the light bulb were used rather than the median ratings since the web-sweep indicated that actual prices in the market varied significantly across the different types of light bulb).

Combinations 2-9: As per Combination 1, except that one of the ratings was altered to either the highest (A) or the lowest (G) possible rating.

Combination 10: From a baseline of Combination 1, ratings were improved by one level.

Combination 11: From a baseline of Combination 1, ratings were improved by two levels (where possible).

Combination 12: The current Energy Label.

Respondents in Group 2 made bids for products with either the current Energy Label (Information screen 1) or the proposed Energy and Carbon Footprint Label (Information screen 3). In this case there were eight possible label combinations (the carbon footprint icon with seven ratings plus the current Energy Label).[58]

As previously stated, in order to incentivise the public good component of the products a financial contribution to an environmental cause was introduced for goods that had a higher rating. To implement this feature, label combinations that were

[58] The energy rating is held constant across products in order to focus the experiment on consumer behaviour when additional environmental information is added to the energy label. This of course is not the case in the real world where products vary by products specific factors and energy rating.

'more' environmentally friendly than others were selected.[59] Rating combination 1 in the above table was the label that was used as the median product. Combinations 2,4,6,8,10 and 11 were more environmentally friendly and combinations 3,5,7 and 9 were less environmentally friendly.

4.3.2 Redemption values, endowments and sales prices

Phase 3 respondents submitted bids for the products and received 'points' instead of receiving the actual good.[60] The points could be exchanged for high street shopping vouchers. The points earned by respondents depended on their actual choices in the experiment. This was called induced values and is used in experiments when actual goods cannot be exchanged. The respondent's earnings were redemption value minus price paid for the good. The use of redemption values introduced the real life concept of *utility* derived from consuming a good: called *saliency* in behavioural experiment design.

Respondents were informed of their redemption values at the start of the bidding for each product type. These were fixed for each product throughout the exercise.

Sales prices were drawn from a uniform distribution where the minimum possible price was below the redemption value and the maximum possible price was above the redemption value. The maximum sales price was set at 5% above the redemption value and the minimum sales price at 5% below the redemption value for washing machines and televisions. This range was increased to 10% above and below for light bulbs.

In order to make the exercise seem 'realistic', redemption values and sales prices were selected such that they were similar to actual prices in the respondent's home country. These prices are shown in the table below.

[59] The environmental performance measures do not currently exist for products in the EU, as such we have created stylised label combinations and selected those combinations that are "better" in terms of environmental performance for the purpose of the experiment. We recognise some label combinations may not exist in the field if the measures were used, for example, it may not be reasonable that a product would have a high rating for water eco-toxicity but a low rating for resource depletion.

[60] Due to market research rules we are unable to sell actual products in the online experiment.

Table 9: Sales prices per country

	Washing machines (1,400 rpm, 7 kg)	Televisions (LED, 32 inch screen)	Light bulbs (Energy Saving Halogen)
UK (GBP)	340	350	1.70
Germany (EUR)	440	420	1.50
Italy (EUR)	420	400	3.60
France (EUR)	400	400	3.40
Spain (EUR)	400	400	2.80
Norway (NOK)	3,000	3,000	21.00
Poland (PLN)	1,700	1,750	12.00
Romania (LEU)	1,800	1,800	15.00
Estonia (EUR)	400	400	2.80

Source: London Economics' web sweep conducted during May 2012. Average prices across a set brands for each product available from range of online retailers for each Member State.

Redemption values were set at the average price for each Member State. Sales prices were randomly drawn from a uniform distribution with the following ranges, 10% above and below the average price for washing machines and televisions and 5% for light bulbs. Endowments were set at 5% of redemption values for washing machines and televisions and 10% for light bulbs.[61]

4.4 The choice experiment

In the choice experiment respondents were asked to make choices between hypothetical products for washing machines, televisions and light bulbs. The choice experiment was not incentivised, but instead asked respondents to consider being in a situation in which they were making a choice between two different variants of the same product. Products varied in terms of environmental ratings and prices.

[61] These values have been selected such that expected average earnings in the bidding exercise remain within the budget allocated for respondent payments.

As in the bidding exercise, respondents in the choice experiment were divided into two groups. Respondents in Group 1 made three choices for each of the three products (9 choices in total) carrying the proposed Energy and Environmental Label (Information screen 2) and the current Energy Label (Information screen 1). Respondents in Group 2 made choices between products with the proposed Energy and Carbon Footprint Label (Information screen 3) and the current Energy Label (Information Screen 1).

For Group 1 the following choice combinations were implemented and aligned with the rating combinations shown in the table above for the bidding exercise:

1. Rating combination 1 vs. 2 (median product vs. improved CO2)
2. Rating combination 1 vs. 4 (median product vs. improved H2O)
3. Rating combination 1 vs. 6 (median product vs. improved ECO)
4. Rating combination 1 vs. 8 (median product vs. improved RES)
5. Rating combination 1 vs.11 (median product vs. improved CO2, H2O, ECO & RES)
6. Rating combination 2 vs. 3 (very good CO2 vs. very poor CO2)
7. Rating combination 4 vs. 5 (very good H2O vs. very poor H2O)
8. Rating combination 6 vs. 7 (very good ECO vs. very poor ECO)
9. Rating combination 8 vs. 9 (very good RES vs. very poor RES)
10. Rating combination 11 vs. 12 (high ratings vs. current Energy Label)
11. Rating combination 1 vs. 12 (median product vs. current Energy Label)

These pairs were randomly allocated across respondents, such that each pair appeared an equal number of times for respondents in each country.

Prices for the different rating combinations were assigned as follows:

- The price of the product with the worse rating(s) would be fixed at the average price for the country as determined by our web sweep and shown in the table above.

- The price of the product with the better rating(s) was randomly assigned one of seven levels relative to the price of the other product: 1) same price; 2) 2.5% more expensive; 3) 5% more expensive; 4) 7.5% more expensive; 5) 10% more expensive; 6) 20% more expensive; and 7) 30% more expensive.

For pairs 10 and 11 it was not possible to identify which product had the better rating. Therefore we set the following:

- For pair 10, it was 'assumed' that combination 12 (i.e. the product with high ratings across-the-board) had better ratings.

- For pair 11, the product assigned the higher price was randomised (i.e. for some choices the product with the current Energy Label was more expensive whereas for the other choices the product with the proposed Energy and Environmental Label was more expensive).

The product rating combinations for Group 2 were set as the following.

- For washing machines and televisions:
    1. A vs. G
    2. A vs. B
    3. B vs. C
    4. A vs. C
    5. A vs. No rating (i.e. the current Energy Label)
    6. B vs. No rating (i.e. the current Energy Label)
- For light bulbs[62]:
    1. A vs. G
    2. A vs. C
    3. B vs. C
    4. C vs. D
    5. A vs. No rating (i.e. the current Energy Label)
    6. C vs. No rating (i.e. the current Energy Label)

[62] The pairs of ratings are slightly different for light bulbs since the CO2 rating for the fictitious light bulb from AEA is below that of the other two product types.

As for Group 1, these pairs were randomly allocated across respondents, such that each pair appears an equal number of times for respondents in each country. Prices were also assigned in the same way as for Group 1, and treating combination 5 and 6 as we did combinations 11 and 12.

4.5 Survey of respondents

The final element of Phase 3 was a survey which sought to understand the extent to which respondents had correctly interpreted the symbols. It also asked respondents attitudinal questions about their level of concern for the environment, climate change and resource depletion. The questions asked in Module 3 are included in Appendix 3.1.

4.6 References informing experiment design

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5. Discussion of results

5. Discussion of results

In this chapter we discuss the findings from Phase 3. The chapter brings together the results from both the bidding experiment and the choice experiment which were explained in Chapter 4. It also refers to the results from the survey questions asked at the end of the experiment and to the qualitative discussions from Phase 2 which add useful context to the findings. The discussion of findings is set out in six sub-sections:

5.1 Experiment analysis methodology

The bidding exercise was analysed by comparing the average bids submitted by different groups of respondents for different types of products. This revealed, for example, whether respondents who saw the proposed Energy and Environmental Label submitted different bids to those who saw the proposed Energy and Carbon Footprint Label or the current Energy Label.

The choice experiment was analysed by comparing choices made between pairs of products presented to respondents with different labels, environmental ratings and prices. This reveals how consumers' choices and willingness to pay changed when products with different labels were offered.

Methodology recap

Bidding exercise - respondents made monetary offers (bids) on washing machines, televisions and light bulbs. The products were displayed next to a product label which was either: the current Energy Label, the proposed Energy and Environmental Label or the proposed Energy and Carbon Footprint Label. Respondents 'won' the product if they bid a higher value than the sale price of the product (the sale price range was revealed to respondents but not the exact sale price). Respondents received 'points' which could be exchanged for shopping vouchers for products they 'won'.

Choice experiment – respondents were shown pairs of the same product and asked to select which version of the product they would choose to purchase. The products were shown next to either the current Energy Label, the proposed Energy and Environmental Label or the proposed Energy and Carbon Footprint Label. The two products presented at each choice were given different ratings for the new environmental symbols. They were also given different prices.

For a detailed methodology of the two components of the Phase 3 online behavioural experiment please refer to Chapter 4.

5.1.1 Dealing with outliers in the data

In the bidding exercise data there were a number of bids placed either above or below the sale price range provided for that product. Respondents had no incentive to bid above the maximum sale price as this did not increase their likelihood of winning the auction and could lead to a reduction in earnings if the product was won. Respondents also had no incentive to bid below the minimum sales price as this would result in them definitely not winning the product.

It is possible that some of these outlying bids may have been submitted intentionally in order to signal how much a particular product may be worth to the respondent.

However, the majority of these outlying bids were likely to be the result of respondent inputting error (e.g. accidentally adding another zero, omitting the decimal place, etc.) or a lack of understanding of the task.[63]

For light bulbs in particular, there were a number of bids that were significantly above or below the sale price bid. Two possible explanations are that:

- For light bulbs respondents had to enter bids involving decimal places (which may increase the scope for errors); and
- Light bulbs are a low priced product relative to washing machines and televisions, which may have led these respondents to put less thought into the light bulb task due to the lower stakes involved in the incentivised experiment.

These outliers influenced the mean estimate for bids in the experiment. Both the mean and median bids have therefore been considered in the key analysis of the impact of the different labels on average bids. A common 'rule-of-thumb' approach has been taken that excludes bids three or more standard deviations from the mean (for discussion, see Osborne and Overbay[64]). The rational for this approach is that it excludes only 1% of all observations from a normally distributed population.[65] However, for light bulbs, even when these outliers are excluded there were still a number of exceptionally high bids that disproportionately affected the average bid for this product.

For completeness, the analysis was also conducted on the full data set with no omitted bids. These observations are presented in Appendix 4.1. The key findings from the regressions did not change when the analysis was run using the full data set. However, some of the observations were not as strong when the outlying bids were retained.

[63] The presence of anomalous bids in controlled experiment data is not unusual and can arise due to respondents not understanding the task, manual input errors and subjects loosing focus or not 'playing' the task (Friedman.D and Sunder.S, 1994, Experimental methods a primer for economists, Cambridge University Press).

[64] Osborne, J. W. and Overbay, A. (2004), *"The power of outliers (and why researchers should always check for them)"*, Practical Assessment, Research & Evaluation, 9(6)

[65] All observations which were three or more standard deviations from the mean were dropped from the dataset. For washing machines 1.0% of all observations were therefore dropped, for TVs 0.6% and for light bulbs 6.6%.

5.1.2 Label combinations

Due to the large number of label combinations (2,401 different combinations for the proposed Energy and Environmental Label) it was necessary to reduce this number to a set that could be tested within the experiment. As explained in section 4.3.1, 11 stylised combinations of the proposed Energy and Environmental Label, seven combinations of the proposed Energy and Carbon Footprint Label and one variant of the current Energy Label were used.[66] These combinations were divided into 'more' environmentally friendly combinations and 'less' environmentally friendly combinations with one mid-range product for the proposed Energy and Environmental Label. These combination groups ("good" and "bad") were used in the analysis of behaviour in the bidding experiment.

In the choice experiment, 11 combinations of the proposed Energy and Environmental Label, 6 combinations of the proposed Energy and Carbon Footprint Label and one variant of the current Energy Label were used (see section 4.4). In the choice experiment these were also grouped into "better" and "worse" performing products.

Table 10 below explains again how the various combinations of the proposed Energy and Environmental Label were graded into "good" (indicated in green) or "bad" (indicated in red) for the environment. Combination 1 has no grading as it was the 'middle' rated product and combination 12 has no grading as it was the current Energy Label with no environmental indicators. Products with a carbon dioxide rating on the proposed Energy and Carbon Footprint Label of either A, B or C were tagged as "good" and those with a rating of D,E, F or G were "bad".

[66] In order to isolate the impact of the proposed Energy and Environmental Label and the proposed Energy and Carbon Footprint Label, the current Energy Label was held constant in the experiment.

Table 10.The different rating combinations for "good" and "bad" products

	Rating Combination											
	1	2	3	4	5	6	7	8	9	10	11	12
Washing machines												
CO2	B	A	G	B	B	B	B	B	B	A	A	-
H2O	B	B	B	A	G	B	B	B	B	A	A	-
ECO	D	D	D	D	D	A	G	D	D	C	B	-
RES	D	D	D	D	D	D	D	A	G	C	B	-
Televisions:												
CO2	C	A	G	C	C	C	C	C	C	B	A	-
H2O	C	C	C	A	G	C	C	C	C	B	A	-
ECO	B	B	B	B	B	A	G	B	B	A	A	-
RES	B	B	B	B	B	B	B	A	G	A	A	-
Light bulbs (Halogen energy saving):												
CO2	C	A	G	C	C	C	C	C	C	B	A	-
H2O	B	B	B	A	G	B	B	B	B	A	A	-
ECO	C	C	C	C	C	A	G	C	C	B	A	-
RES	C	C	C	C	C	C	C	A	G	B	A	-

5.2 Impact of environmental labelling on product choices and willingness to pay

This section discusses the impact the different labels had on bids, product choices and willingness to pay. The observations for the proposed Energy and Carbon Footprint Label are presented first, followed by the proposed Energy and Environmental Label. These two formats for the new label are then compared to assess which could be more effective in encouraging purchases of products with low environmental impact.

The box on the following page presents the key observations from this analysis:

Key observations

The environmental ratings included on the proposed Energy and Environmental Label and the proposed Energy and Carbon Footprint Label had a positive effect on product choices and willingness to pay for washing machines and televisions. Respondents made higher bids, on average, in the bidding experiment for environmentally "better" performing products and often demonstrated a willingness to pay a premium for such products in the choice experiment. For light bulbs, a similar conclusion was reached from the results of the choice experiment, although the results of the bidding experiment were less conclusive.

Both of the new label designs encouraged respondents to be willing to pay more for products than when they were only shown the current Energy Label.

Comparing the bids and choices made when the proposed Energy and Carbon Footprint Label was shown with the bids and choices made when the proposed Energy and Environmental Label was shown demonstrates that the additional information contained in the latter label did not increase respondents willingness to pay any further.

5.2.1 Impact of the proposed Energy and Carbon Footprint Label on product choices and willingness to pay

Analysis of bids and willingness to pay a price premium for more and less environmentally friendly products

The bidding experiment results show that average bids were higher for "good" televisions and washing machines carrying the proposed Energy and Carbon Footprint Label compared to average bids for "bad" ones (Table 11). For example, in the case of televisions, the difference between the mean bid for a "good" product and the mean bid for a "bad" product was €2.99 (an estimate that is statistically significant at 1%).

Table 11: Average bidding experiment bids under alternative labelling schemes

	Average bids for products under alternative labelling schemes and environmental standards						Differences in average bids across alternative labelling schemes and environmental standards[1]				
Labelling scheme	Proposed Energy and Carbon Footprint Label		Proposed Energy and Environmental Label			Current Energy Label	"good" product carrying Energy and Carbon Footprint Label vs. Product carrying current Energy Label	"good" product carrying Energy and Environmental Label vs. Product carrying current Energy Label	"good" product carrying Energy and Carbon Footprint Label vs. "bad" product carrying Energy and Carbon Footprint Label	"good" product carrying Energy and Environmental Label vs. "bad" product carrying Energy and Environmental Label	"good" product carrying Energy and Environmental Label vs. "good" product carrying Energy and Carbon Footprint Label
Environmental standard (Based on the new environmental characteristics only)	Bad	Good	Bad	Good	Mid-range	Not Applicable					
	(1)	(2)	(3)	(4)	(5)	(6)	(2)-(6)	(4)-(6)	(1)-(2)	(3)-(4)	(4)-(2)
Means											
Washing machines	415.85	420.49	415.53	418.90	417.74	416.74	3.75***	2.16***	4.64***	3.37***	-1.59***
Televisions	412.77	415.76	412.63	415.95	415.69	413.12	2.63***	2.82***	2.99***	3.31***	0.19***
Light bulbs	4.08	4.07	3.78	3.93	5.30	4.38	-0.31	-0.46	-0.01	0.15	-0.15
Medians											
Washing machines	408.08	413.12	408.08	412.64	411.10	408.97	4.15***	3.67***	5.04***	4.56***	-0.48***
Televisions	405.00	409.52	404.76	410.00	408.94	405.00	4.52***	5.00***	4.52***	5.24***	0.48
Light bulbs	2.85	2.89	2.83	2.89	2.90	2.85	0.05***	0.04***	0.05***	0.06***	0.00

Notes: Calculated across all respondents, excluding bids more than three standard deviations from the mean. 1. *** (**, *) implies significant at 1% (5%, 10%).

A comparison of average bids for televisions and washing machines that carried the proposed Energy and Carbon Footprint Label and had a “good” rating (column 2 in Table 11) with products that only carried the current Energy Label (column 6 in Table 11), shows that mean and median bids were higher for the former (and the difference is statistically significant). For example, for washing machines mean bids were €3.75 higher for products carrying the proposed Energy and Carbon Footprint Label and this is statistically significant at the 1% level.

The results of the bidding exercise for washing machines and televisions are supported by those of the choice experiment. A large share of respondents indicated they would pay a premium for the “better” product carrying the proposed Energy and Carbon Footprint Label. Here, the term “better product” refers to the product with a “better” carbon footprint rating from choice pairs 1 to 4 described in section 4.4. The premium that respondents would be willing to pay for “better” products is around 40% for a washing machine and 37% for a television. Among those who would pay a premium the *minimum* average premium they would pay is around €64 (Table 12).

However, the results are less conclusive for light bulbs. In the bidding experiment, the patterns described above only hold for the median bid, but not the mean bid. For example, the median bid for a “good” light bulb carrying the proposed Energy and Environmental Label was €0.04 higher than the median bid for light bulbs that only carried the current Energy Label, and this is statistically significant at the 1% level. There were a number of especially high bids for light bulbs that disproportionally affected the mean however. This was the case even with outliers excluded (i.e. bids more than three standard deviations from the mean). As previously stated, the lower stakes associated with light bulbs in the bidding experiment, and the need to input bids which included decimal points, may have led to more manual errors creating noise in the light bulb bid data. This has resulted in observations for the light bulbs not being as clear as those for the washing machines and televisions.

There is a much clearer pattern from the choice experiment for light bulbs than the bidding exercise however. The share who indicated they would pay a premium for

the “better” product was around 50%, with a *minimum* average premium (among those who would pay one) of about €0.47.

Table 12: Share of respondents willing to pay a premium for products carrying the proposed Energy and Carbon Footprint Label (average across all respondents)

Product category	Share willing to pay a premium for “better” product[1]	Minimum average premium they will pay[2]
Washing Machines	39.8%	€ 64.19
Televisions	36.8%	€ 64.00
Light bulbs	50.2%	€ 0.47

Notes: Figures are averages calculated across choice pairs 1 to 4. Results for subsets of pairs 1 to 4 and individual pairs are presented below. 1. Share among those offered the product at a premium. 2. This is a lower bound estimate since the premium that each individual is willing to pay is taken to be the minimum premium that we know they would pay based on the choices they made (they might be willing to pay more).

Analysis of the share of respondents that chose environmentally friendly products as the price premium increased

Figure 21 below shows the share of respondents who indicated they would choose the “better” product carrying the proposed Energy and Carbon Footprint Label at different price premiums, for washing machines, televisions and light bulbs. The figure shows a downward trend for all products, however, for light bulbs the share decreases less, compared to washing machines and televisions, as the price premium increases. This is likely to reflect the low price of a light bulb.

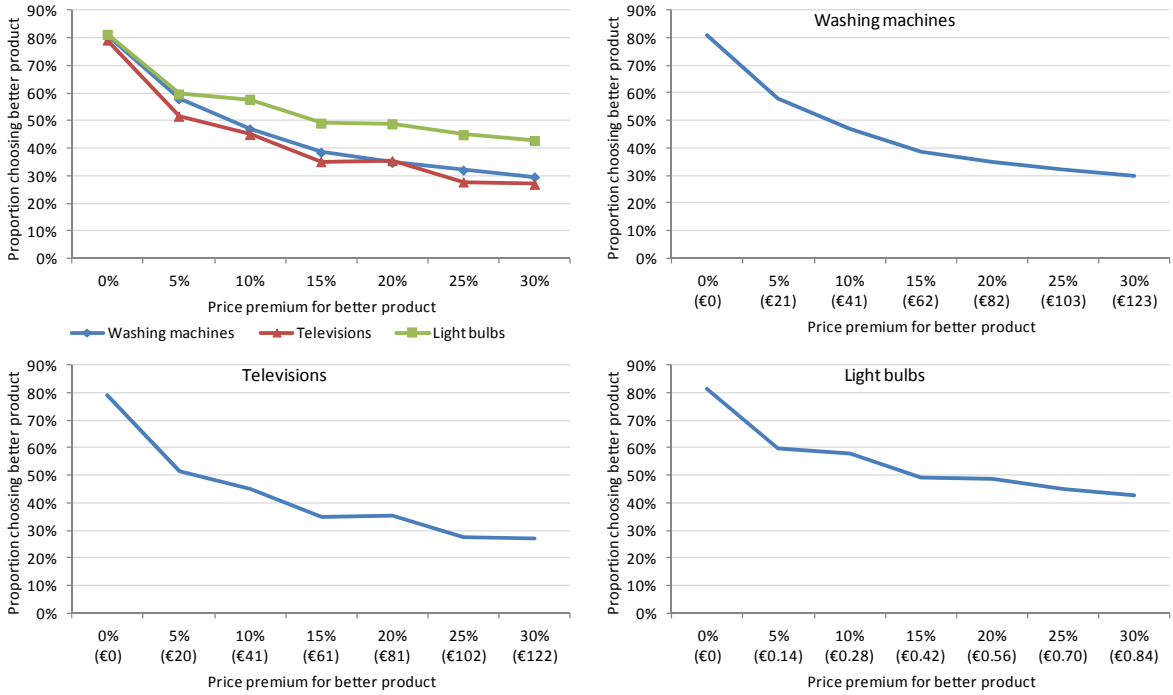


Figure 21: Share of respondents choosing the "better" product at different price premiums – proposed Energy and Carbon Footprint label (average across all respondents)

Analysis of choices for products displaying proposed Energy and Carbon Footprint Label and products displaying current Energy Label

Table 13 examines the choices made for choice pairs that include a product carrying the proposed Energy and Carbon Footprint Label and a product carrying the current Energy Label (i.e. choice pairs 5 and 6 in section 4.4). The main observation from the table is that consumers prefer products with the new environmental information shown on the proposed Energy and Carbon Footprint Label to products where this information is not shown at all (as with the current Energy Label), even if the carbon footprint rating is only mid-range.

For example, 37.1% of respondents were willing to pay a premium on a washing machine with an A-rating for carbon footprint compared to a washing machine with no information about its carbon footprint. The minimum average premium they were willing to pay was €60.61.

Table 13: Share of respondents willing to pay a premium for products carrying the proposed Energy and Carbon Footprint Label compared to same product with different label (average across all respondents)

Product category	Product offered at a premium to comparator	Comparator product	Share willing to pay a premium[1]	Min. average premium they will pay[2]
Washing Machines	Top-end[3] products (A-rated)	Products carrying EU label only	37.1%	€ 60.61
	Mid-range[4] product (B-rated)	Products carrying EU label only	36.1%	€ 58.56
	Products carrying EU label only[4]	Mid-range product (B-rated)	7.1%	€ 73.06
Televisions	Top-end[3] products (A-rated)	Products carrying EU label only	32.8%	€ 68.29
	Mid-range[4] product (B-rated)	Products carrying EU label only	34.2%	€ 63.78
	Products carrying EU label only[4]	Mid-range product (B-rated)	8.5%	€ 64.80
Light bulbs	Top-end[3] products (A-rated)	Products carrying EU label only	43.7%	€ 0.48
	Mid-range[4] product (B-rated)	Products carrying EU label only	39.1%	€ 0.46
	Products carrying EU label only[4]	Mid-range product (B-rated)	6.8%	€ 0.51

Notes: 1.Share among those offered the product at a premium. 2. This is a lower bound estimate since the premium that each individual is willing to pay is taken to be the minimum premium that we know they would pay based on the choices they made (they might be willing to pay more). 3. Choice experiment pair 5. 4. Choice experiment pair 6.

The Phase 2 discussion groups offered some evidence to help understand the varying impact of the proposed label designs on the different products. Phase 2 uncovered different decision making processes for different types of product, for example purchasing a light bulb as opposed to a washing machine. Light bulbs were seen by Phase 2 participants as a low involvement, essential, quick and cheap purchase. Many Phase 2 participants admitted that for these reasons they put very little thought into the particular light bulb they were buying. While nearly all the Phase 2 participants who had recently purchased a washing machine said they conducted research into the different options prior to making their purchase, none who had recently bought a light bulb had done any research. Many said they would always buy the cheapest regardless of other factors. When prompted to discuss the importance of energy efficiency or environmental ratings on light bulbs, many Phase 2 participants felt this was less important to them than other product characteristics

(namely the speed with which the light bulb illuminated a room and the quality and colour of the light emitted).

While many of the Phase 2 participants recalled seeing the energy efficiency rating on the side of washing machines, very few recalled this being printed on light bulb packaging. Many also said they would not expect to see it on this product. This supports the hypothesis made above that, during the Phase 3 experiment, respondents were likely to be paying less attention to the product label presented on screen and taking less care over the bids they made.

5.2.2 Impact of the proposed Energy and Environmental Label on product choices and willingness to pay

The impact of the proposed Energy and Environmental Label on product choices and willingness to pay was very similar to the impact of the proposed Energy and Carbon Footprint Label described above in section 5.2.1.

Analysis of bids and willingness to pay a price premium for more and less environmentally friendly products

The results of the bidding experiment show that average bids (mean and median) were higher for “good” televisions and washing machines carrying the proposed Energy and Environmental Label compared to average bids for “bad” ones (Table 11). For example, for televisions the difference between the mean bids for good versus bad products was €3.31 (an estimate that is statistically significant at 1%).

In addition, a comparison of the average bids for televisions and washing machines that carried the proposed Energy and Environmental Label and had a good rating (i.e. column 4 in Table 11) to products that only carried the current Energy Label (column 6 in Table 11), shows that mean and median bids were higher for the former (and the difference is statistically significant at 1%).

However, as with the Energy and Carbon Footprint Label, for lightbulbs the results of the bidding experiment are less conclusive.

The results of the choice experiment corroborate those of the bidding exercise for washing machines and televisions. A large share of respondents indicated they were willing to pay a premium for the "better" product (from an environmental perspective) carrying the proposed Energy and Environmental Label. Here, the term "better product" refers to the product with better environmental ratings from choice pairs 1 to 9 described in section 4.4. For washing machines and televisions, the share who indicated they would pay a premium (of between 5% and 30%) for the "better" product was around 39%.[67] Among those who would pay a premium, the *minimum* average premium they would pay for these products is around €65 (Table 14).[68]

As with the proposed Energy and Carbon Footprint Label, the results of the bidding experiment are less conclusive for light bulbs while the choice experiment results showed a much more distinct pattern. The share who indicated they would pay a premium for the "better" product was around 46% (slightly higher than for washing machines and televisions), and among those who would pay a premium, the *minimum* average premium that they would pay is around €0.46.

Note that the figures shown in Table 14 are averages calculated across choice pairs 1 to 9. Results for subsets of pairs 1 to 9 and individual pairs are presented in the table below.

Table 14: Share of respondents willing to pay a premium for "better" products carrying the proposed Energy and Environmental Label (average across all respondents)

Product category	Share willing to pay a premium for better product[1]	Minimum average premium they will pay[2]
Washing Machines	39.3%	€ 65.08
Televisions	39.1%	€ 65.29
Light bulbs	45.8%	€ 0.46

Notes: Figures are averages calculated across choice pairs 1 to 9. Results for subsets of pairs 1 to 9 and individual pairs are presented below. 1. Share among those offered the product at a premium. 2. This is a lower bound estimate since the premium that each individual is willing to pay is taken to be the minimum premium that we know they would pay based on the choices they made (they might be willing to pay more).

[67] Shares among those offered these products at a premium in the choice experiment.

[68] This is a lower bound estimate since the premium that each individual is willing to pay is taken to be the minimum premium that we know they would pay based on the choices they made (they might be willing to pay more).

Analysis of the share of respondents that chose the more environmentally friendly products as the price premium increased

Figure 22 below illustrates the share of respondents who indicated that they would choose the better product at different price premiums, for washing machines, televisions and light bulbs. As with the proposed Energy and Carbon Footprint Label, Figure 22 shows a similar downward trend for all products as price premium increases. For light bulbs the share decreased less, compared to televisions and washing machines, as the price premium increased.

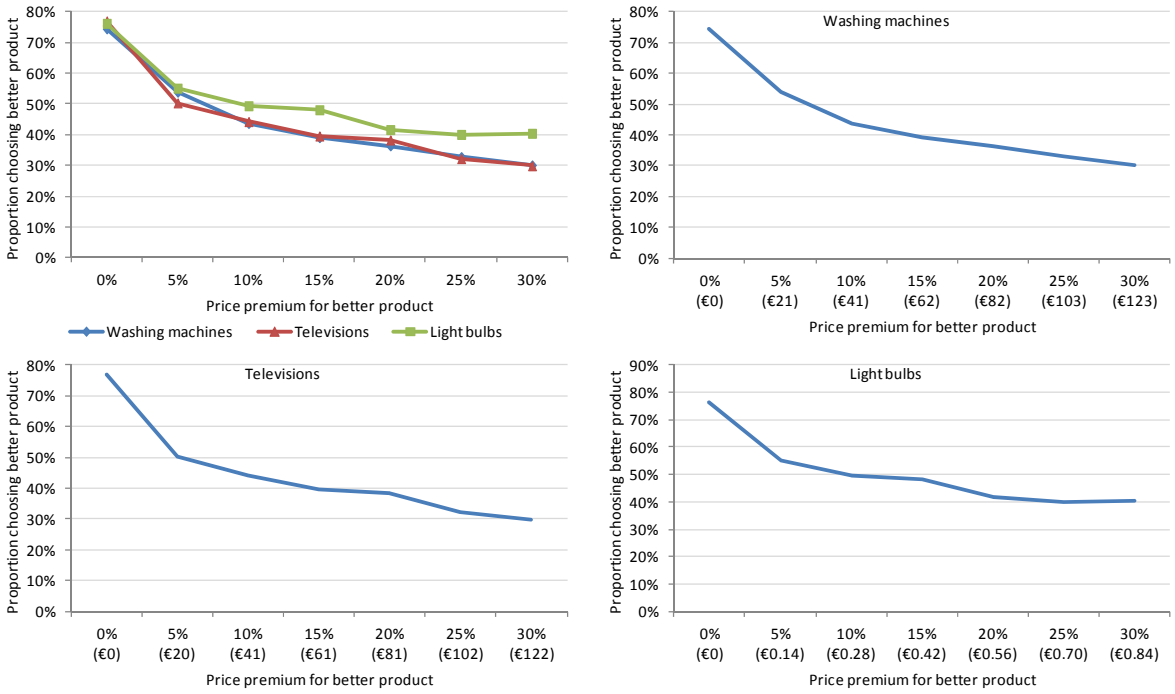


Figure 22: Share of respondents choosing the "better" product at different price premiums – proposed Energy and Environmental Label (average across all respondents)

Analysis of choices for products displaying proposed Energy and Environmental Label and products displaying current Energy Label

Table 15 examines the selections made for individual choice pairs and subsets of choice pairs that included the 'mid-range' product (i.e. pairs 1 to 5 and 11 described in section 4.3.1).

This includes the pair offering a choice between the mid-range product and a product which carried only the current Energy Label (i.e. pair 11). As above, Table 15

presents the share of respondents who indicated they were willing to pay a premium for the “better” product.

The main observations from Table 15 are:

- Many consumers (40-45%) were willing to pay a premium for a *very good* product (i.e. the product with high ratings across-the-board from pair 5), instead of the mid-range product.
- In general, consumers preferred products with the new environmental information shown on the proposed Energy and Environmental Label rather than products where this information was not shown at all (i.e. the current Energy Label) even if the ratings for the new information were only mid-range.

The latter point is shown by the high shares of respondents (around 32-46%) who were willing to pay a premium for the mid-range product rather than a product carrying the current Energy Label only. Far fewer (around 9-12%) would pay a premium for the product carrying the current Energy Label only (given the opposite choice).

Table 15 is shown on the following page:

Table 15: Share of respondents willing to pay a premium for products carrying the proposed Energy and Environmental Label (average across all respondents)

Product category	Product offered at a premium to comparator	Comparator product	Share willing to pay a premium[1]	Min. average premium they will pay[2]
Washing Machines	One rating improved[3]	Mid-range product	26.0%	€ 62.70
	All ratings improved[4]	Mid-range product	41.2%	€ 65.58
	Mid-range product[5]	Products carrying EU label only	38.2%	€ 70.89
	Products carrying EU label only[5]	Mid-range product	8.5%	€ 66.21
Televisions	One rating improved[3]	Mid-range product	30.5%	€ 64.96
	All ratings improved[4]	Mid-range product	44.1%	€ 64.87
	Mid-range product[5]	Products carrying EU label only	31.9%	€ 64.50
	Products carrying EU label only[5]	Mid-range product	11.7%	€ 59.38
Light bulbs	One rating improved[3]	Mid-range product	32.3%	€ 0.44
	All ratings improved[4]	Mid-range product	45.2%	€ 0.46
	Mid-range product[5]	Products carrying EU label only	45.6%	€ 0.47
	Products carrying EU label only[5]	Mid-range product	9.0%	€ 0.47

Notes: 1. Share among those offered the product at a premium. 2. This is a lower bound estimate since the premium that each individual is willing to pay is taken to be the minimum premium that we know they would pay based on the choices they made (they might be willing to pay more). 3. Choice experiment pairs 1 to 4. 4. Choice experiment pair 5. 5. Choice experiment pair 11.

5.2.3 A comparison of the impact of the proposed Energy and Carbon Footprint Label and the proposed Energy and Environmental Label on product choices and willingness to pay

Overall the proposed Energy and Carbon Footprint Label had a greater positive impact on respondents' product choices and willingness to pay than the proposed Energy and Environmental Label. The difference in impact was fairly small however as this section describes, and was not true for televisions.

In the bidding experiment, the mean bids for "good" washing machines carrying the proposed Energy and Environmental Label were €1.59 lower than for the proposed Energy and Carbon Footprint Label (Table 11). For televisions and light bulbs these differences were not statistically different from zero.

The choice experiment did not explicitly include a choice between two products where one carries the proposed Energy and Environmental Label and the other carries the proposed Energy and Carbon Footprint Label. However, a comparison of the results shown in Tables 12 and 14 shows the difference in the share of respondents choosing the "better" product at a price premium and minimum willingness to pay between these two labels.

For light bulbs, the share of respondents willing to pay a premium for the better product was slightly higher under the proposed Energy and Carbon Footprint Label than under the proposed Energy and Environmental Label (50.2% compared to 45.8%). For televisions this share was slightly higher for the proposed Energy and Environmental Label (39.1% for the proposed Energy and Environmental Label compared to 36.8% for the proposed Energy and Carbon Footprint Label). The minimum average willingness to pay was very similar under both labelling schemes for all products.

5.3 Impact on product choices and willingness to pay of improving individual environmental ratings on product labels

This section discusses the impact that a change in the individual ratings of each environmental symbol included on the product labels had on product choices and willingness to pay.

Methodology recap

The proposed Energy and Environmental Label used in the Phase 3 experiment included four environmental symbols: carbon footprint (CO2), water use (H20), water eco-toxicity (ECO), and resource depletion (RES). Each of these measures had seven possible ratings (A to G).

The proposed Energy and Carbon Footprint label used in the Phase 3 experiment included only the carbon footprint symbol (CO2).

Key observations

Improving the rating for any symbol included on the proposed Energy and Environmental label, or improving the rating of the carbon footprint symbol on the proposed Energy and Carbon Footprint Label, increased the average bid for washing machines and televisions in the bidding experiment. However, it did not increase the average bid for light bulbs.

In the choice experiment a rating improvement increased the likelihood that a respondent chose the higher rated product over the alternative for all washing machines, televisions and light bulbs.

The observations from both experiments did not indicate that any one environmental symbol was having a greater influence on product choices and willingness to pay than the others.

In order to examine the impact of individual ratings two regressions were conducted:

- A regression of bid values from the bidding experiment on ratings for each symbol; and
- A regression of product choice on the differences between the ratings of alternative products from the choice experiment.

The first regression equation for the bidding experiment is:

$$Bid = \alpha + \beta_1.CO2 + \beta_2.H2O + \beta_3.ECO + \beta_4.RES + \varepsilon$$

Where:

- *'Bid'* is the bid submitted.
- *'CO2'* is the CO2 rating of the product.
- *'H2O'* is the water usage rating of the product.
- *'ECO'* is the eco-toxicity rating of the product.
- *'RES'* is the resource depletion rating of the product.
- *'ε'* is the error term.

The second regression equation for the choice experiment is:

$$Choice = Logistic(\alpha + \beta_1.PricePremium + \beta_2.CO2\_Difference + \beta_3.H2O\_Difference + \beta_4.ECO\_Difference + \beta_5.RES\_Difference) + \varepsilon$$

Where:

- *'Choice'* indicates whether the respondent chose the "better" product (i.e. the more environmentally friendly product).[69]
- *'PricePremium'* is the additional cost of the "better" product (as a percentage).
- *'CO2_Difference'* is the difference between the CO2 rating given to the "better" product and the CO2 rating given to the other product in the choice.
- *'H2O_Difference'* is the difference between the water usage rating given to the "better" product and the water usage rating given to the other product in the choice.
- *'ECO_Difference'* is the difference between the eco-toxicity rating given to the "better" product and the eco-toxicity rating given to the other product in the choice.

[69] Since the dependent variable is binary we use a logistic regression.

- *'RES_Difference'* is the difference between the resource depletion rating given to the "better" product and the resource depletion rating given to the other product in the choice.
- *'ε'* is the error term.

5.3.1 Impact of improved ratings on products with the proposed Energy and Carbon Footprint Label

In the bidding experiment, for washing machines and televisions carrying the proposed Energy and Carbon Footprint Label, increasing the rating for the new carbon footprint symbol increased the average value of bids (Table 16). For example, improving the carbon footprint rating of a television by one level increased the average bid by around €0.94. However, for light bulbs the impact of increasing the rating was insignificant.

Table 16: Regression results: Effect of improving individual ratings by one level on the average bid submitted for products carrying the proposed Energy and Carbon Footprint Label (all respondents)

	Washing machines	Televisions	Light bulbs
CO2 rating	1.27***	0.94***	-0.07
Constant	413.16***	409.71***	4.36***

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 1% (5%, 10%).

The choice experiment confirmed that an improved carbon footprint rating made the product more desirable to respondents. Increasing the difference between the carbon footprint rating of the two products offered in the choice experiment increased the likelihood that the respondent chose the "better" product. This was true across washing machines, televisions and light bulbs (Table 17). For example, increasing the difference between the carbon footprint rating for two washing machines increased the likelihood that the respondent chose the "better" rated product by 3.3%.

Table 17: Logistic regression coefficients and marginal effects: Effect of differences in ratings on product choice (Proposed Energy and Carbon Footprint Label, all respondents)[1]

	Estimated coefficients and marginal effects:					
	Washing Machines		Televisions		Light bulbs	
Explanatory variable	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
PricePremium	-0.062***	-0.015***	-0.062***	-0.015***	-0.052***	-0.013***
CO2_Difference	0.132***	0.033***	0.125***	0.031***	0.130***	0.032***
Constant	0.520***	-	0.345***	-	0.699***	-

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. CO2_Difference is the differences in carbon footprint rating between the "better" product and the other product in the choice. 3. *** (**, *) implies significant at 1% (5%, 10%).

5.3.2 Impact of improved ratings on products with the proposed Energy and Environmental Label

In the bidding experiment, for washing machines and televisions carrying the proposed Energy and Environmental Label, increasing the rating for any symbol increased the value of bids on average (Table 18). These results are all statistically significant (at 1%), except for the effect of the resource depletion rating on bids for washing machines and the effect of the water usage rating on bids for televisions (neither of which are statistically significant).

A change in the rating for eco-toxicity had the largest impact on bids placed on washing machines and televisions. For example, improving the eco-toxicity rating of a television by one level increased the average bid by around €0.72. However, the difference between the effects of each of the four symbols was small, and not statistically different. Therefore the hypotheses that the estimated coefficients are, in fact, equal, cannot be rejected. For light bulbs, a change in the rating for any of the symbols had no impact on the bids made.

The choice experiment also backed up these findings for the proposed Energy and Environmental Label. Increasing the gap between the ratings of the two products presented in the choice experiment increased the likelihood that the respondent

chose the "better" product (Table 19).[70] In contrast to the results from the bidding experiment, this finding holds across all product categories. For example, increasing the difference between the carbon footprint ratings of two light bulbs that carry the proposed Energy and Environmental Label by one level increased the likelihood that the "better" product is chosen by an estimated 5.4% (see the relevant marginal effect in Table 19).

As with the bidding experiment, within each product category the differential impacts of changes to the ratings for the four symbols were not statistically different (e.g. for washing machines the lowest marginal effect was 0.057, which is not statistically different from the highest marginal effect of 0.064). However, looking across product categories, it appeared that the four ratings had greater impacts for washing machines and light bulbs (with marginal effects ranging from 0.057 to 0.064 and 0.049 to 0.057 respectively) than for televisions (with marginal effects ranging from 0.029 to 0.032).

Table 18: Regression results: Effect of improving individual ratings by one level on the average bid submitted for products carrying the proposed Energy and Environmental Label (all respondents)

	Washing machines	Televisions	Light bulbs
CO2 rating	0.503***	0.466***	-0.029
H2O rating	0.414***	0.235	0.054
ECO rating	0.767***	0.719***	-0.097
RES rating	0.288	0.481***	0.057
Constant	408.098***	403.598***	4.029***
Observations	10,459	10,520	9,895

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 1% (5%, 10%).

[70] This is shown by the positive and significant coefficients on all *'_Difference'* variables in Table 19.

Table 19: Logistic regression coefficients and marginal effects: Effect of differences in ratings on product choice (Full label, all respondents)[1]

	Estimated coefficients and marginal effects:					
	Washing Machines		Televisions		Light bulbs	
Explanatory variable	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
PricePremium	-0.056***	-0.014***	-0.058***	-0.014***	-0.043***	-0.011***
CO2_Difference	0.237***	0.058***	0.129***	0.032***	0.215***	0.054***
H2O_Difference	0.262***	0.064***	0.124***	0.030***	0.230***	0.057***
ECO_Difference	0.246***	0.060***	0.118***	0.029***	0.206***	0.052***
RES_Difference	0.233***	0.057***	0.125***	0.031***	0.195***	0.049***
Constant	-0.477***	-	0.124**	-	-0.262***	-

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. CO2_Difference, H2O_Difference, ECO_Difference and RES_Difference are the differences in ratings between the "better" product and the other product in the choice for CO2, water usage, eco-toxicity resource depletion respectively. 3. *** (**, *) implies significant at 1% (5%, 10%).

5.4 Consumer understanding of the labels and the impact of an education campaign on product choices and willingness to pay

Key observations

The Phase 3 survey confirmed the finding from the Phase 2 discussion groups that consumers are likely to misinterpret the new environmental symbols unless they are given clear explanatory information alongside the labels. Many of the Phase 2 participants and the Phase 3 respondents assumed these symbols represented the environmental impact of a product when it was in household use, rather than throughout its lifecycle (from the time of manufacture to the time of disposal).

Levels of understanding of the rating scale used to grade the environmental performance of the product against the four new symbols was relatively high. However, around a quarter of Phase 3 respondents either interpreted this incorrectly or said they did not know how to interpret it.

The Phase 3 respondents who were shown a simulated 'education campaign' which explained the meaning of each of the new symbols and the rating scale, prior to the experiment, had far higher levels of understanding of both.

The experiment analysis shows that respondents' understanding of the symbols included on the proposed new labels is important. The experiment analysis explicitly investigated whether consumers' with a correct understanding of the new lifecycle symbols made different purchase decisions and bids to those who did not understand the true meaning of the symbols. With the proposed Energy and Environmental Label the difference between bids for "good" and "bad" products increased as respondents' understanding increased. Further, respondents were more likely to choose the better performing product if they had a higher level of understanding of the label and this was true for both the proposed Energy and Carbon label and the proposed Energy and Environmental label. This supports the finding (shown in section 5.4.5 below) that an information campaign is important in influencing behaviour.

The relationship between consumer behaviour and being exposed to an education campaign was also tested directly. The analysis shows that exposure to information

about the labels had a positive impact, to some extent, on consumer purchasing behaviour. The choice experiment analysis indicates that the education campaign increased the likelihood that respondents chose the better performing product (for both the Energy and Carbon Footprint label and the Energy and Environmental Label). In addition, average bids among respondents who had seen the education campaign were lower for televisions and washing machines that were categorised as "bad" performing products in terms of the environmental measures (for both the Energy and Carbon Footprint Label and the Energy and Environmental Label). However, there is no evidence to suggest that exposure to the education campaign encouraged respondents to bids more for "good" products.

Some Phase 3 respondents were shown a prompt, encouraging them to consider the new environmental symbols when they made their product choices and bids, in addition to the explanatory information (an education campaign plus advertising 'nudge'). However, there is no evidence that this influenced respondents' behaviour further than just seeing the education campaign.

5.4.1 Consumer understanding of the four new environmental symbols

As discussed in Chapter 3, the Phase 2 discussion groups found a relatively low level of understanding of the four new environmental symbols. The Phase 3 survey provided further evidence that these symbols can be problematic for consumers to interpret correctly. A key misunderstanding identified by Phase 3 survey, and confirming the qualitative findings from Phase 2, was that these symbols do not only represent the environmental performance of the product when it is being used by the consumer but across the whole lifetime of the product. This confusion is evident in the chart below which shows the Phase 3 respondents' interpretation of the water footprint symbol.

Although the majority of respondents understood that this symbol depicted something related to water use (78%), most thought it related to the water used by the product when it is being used by the customer (50%). Just over a quarter of the survey

respondents correctly identified that the symbol depicted the amount of water used throughout the product's life (28%).

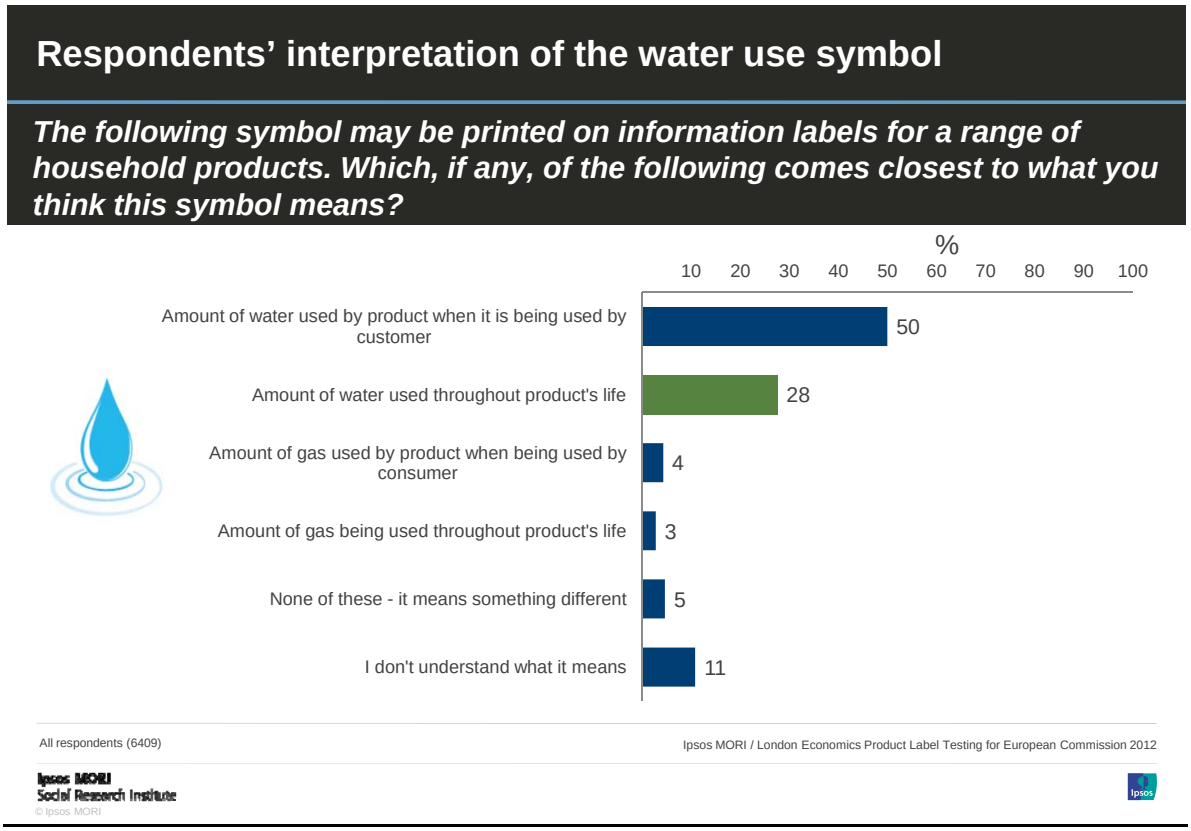


Figure 23: Respondents' interpretation of the water footprint symbol

Overall 54% of the Phase 3 survey respondents thought this symbol referred to an element of the product's performance while it was being used by the consumer, and 31% recognised it to refer to the performance across the product's lifecycle. This is perhaps unsurprising given this is a new concept for consumers who, on the whole, have only been exposed to labels which provide information about the performance of a product when being used e.g. energy efficiency, water use etc. In a study completed for the European Commission, focus groups findings emphasised that *"the concept of multi-criteria environmental impacts across product life cycle is unfamiliar. In general, the participants were unfamiliar with the idea that products can have environmental impacts across different impact categories over their entire life cycle"*[71].

[71] The BIO Intelligence Service (2011), Study on different options for communicating environmental information for products, Draft final report prepared for the European Commission – DG Environment

This BIO Intelligence Service study (2011) also showed that consumers have different expectations for different product groups. With regard to food and drink, and electronics, consumers expressed an understanding of certain impacts associated with these products. Understanding of environmental impact was closely entwined with nutritional and health concerns (in the case of food and drink) and energy use and the related cost (in the case of electronics). For household cleaning supplies, consumers expressed an understanding of the potential for harm associated with toxic or hazardous products. In the case of clothing, participants suggested a simplified label, like the EU Ecolabel, to indicate if the product is "environmentally-friendly" or not.

Consumer understanding of two alternative water footprint symbols

Chapter 3 presented two alternative symbols to depict water footprint and these were also tested at this stage in the Phase 3 survey. The chart below shows the proportion of respondents who correctly identified that the symbol illustrates the *"amount of water used throughout the product's life"* and indicates which of the three water symbols they were shown.

It shows that correct understanding of the water footprint symbol was highest when the standard water symbol plus the lifecycle arrows was shown. Approaching two in five (37%) respondents who saw this symbol identified the correct definition compared to 28% of those who saw the standard symbol. The alternative symbol designed by the Phase 2 participants themselves (which shows a tap with a water droplet) did not aid understanding, with 22% identifying the correct definition.

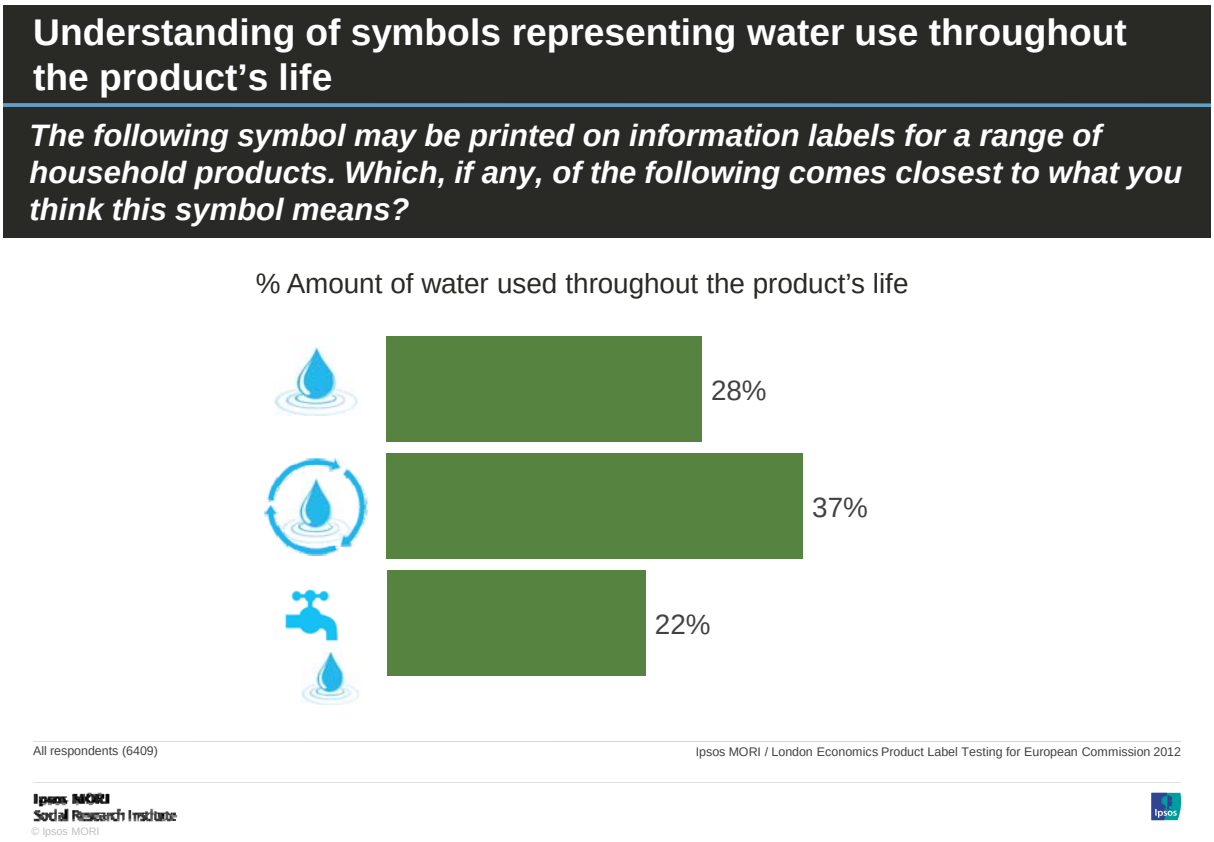


Figure 24: Understanding of symbols representing water use throughout the product's life

As hypothesised at Phase 2, the alternative symbol showing the tap and water droplet reinforced levels of misunderstanding that this relates to water use across the whole product lifecycle rather than just when it's being used by consumers. The chart at the top of the next page shows that more than three in five respondents (62%) thought the symbol depicted the *"amount of water used by the product when it's being used by the customer"* compared to 23% who recognised it to be the *"amount of water used throughout the product's life"*.

However, the alternative symbol created by adding the lifecycle arrows around the water droplet was more likely to be correctly interpreted as representing the water use over the full life of the product (37% compared to 19%).

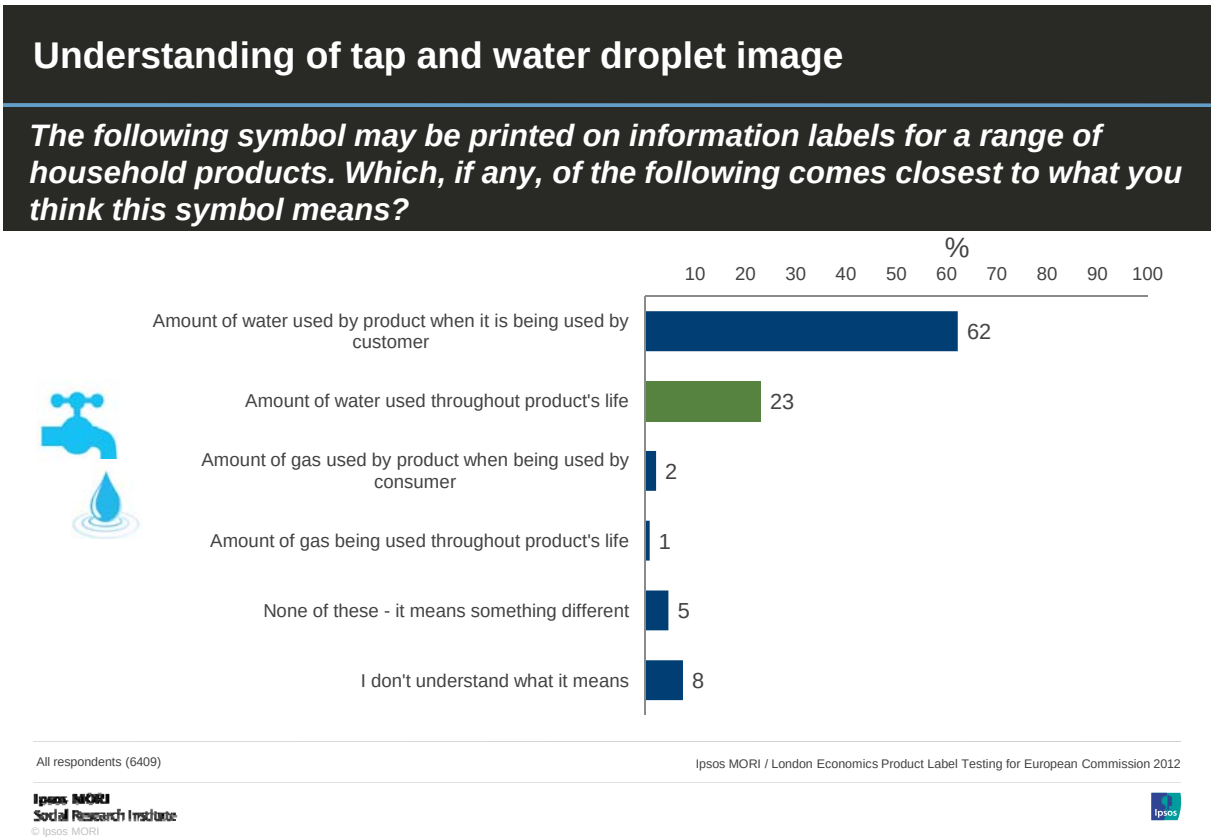


Figure 25: Understanding of tap and water droplet image

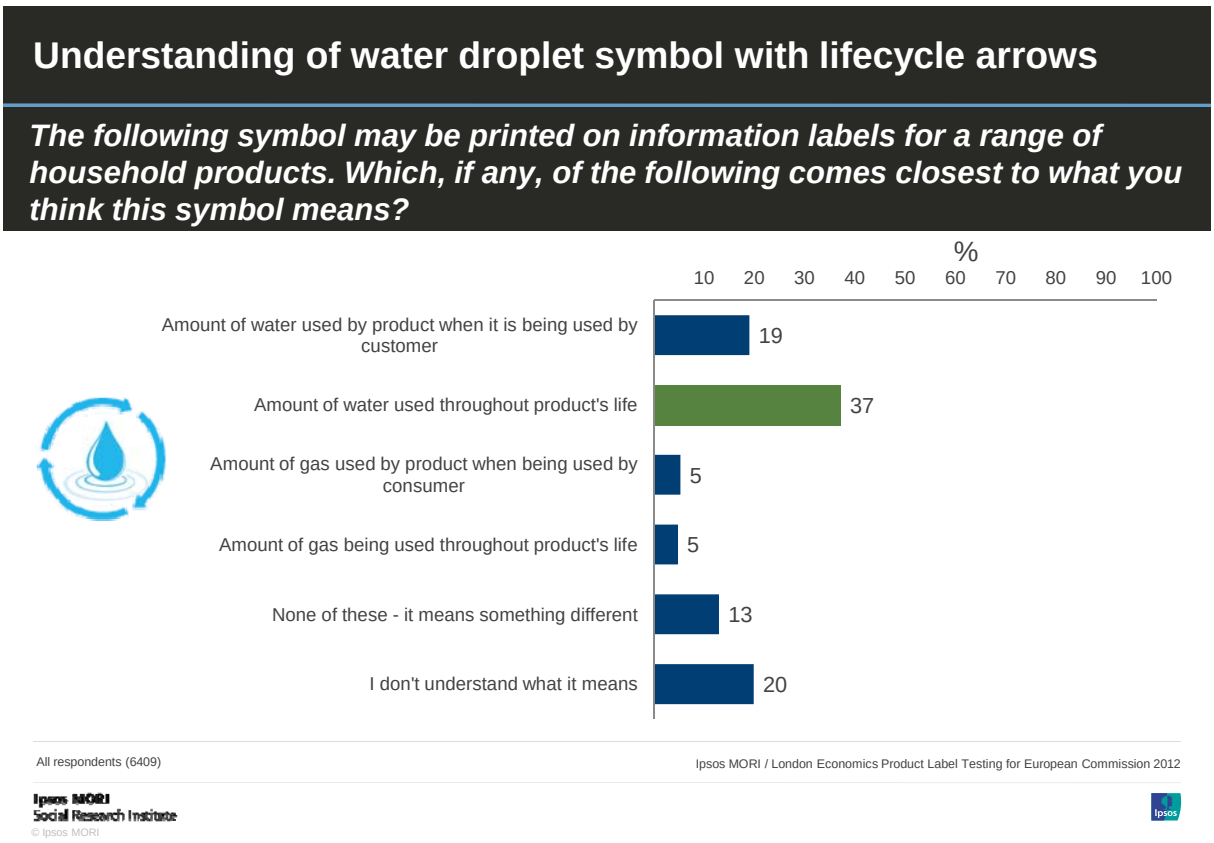


Figure 26: Understanding of water droplet symbol with lifecycle arrows

The other three new environmental symbols were also not fully understood by the Phase 3 survey respondents. The main misunderstanding of the carbon footprint symbol (shown in the chart below) was that respondents interpreted it to represent solely carbon dioxide emissions rather than total greenhouse gas emissions. This was also a common mistake made by the consumers involved in the Phase 2 qualitative discussion groups.

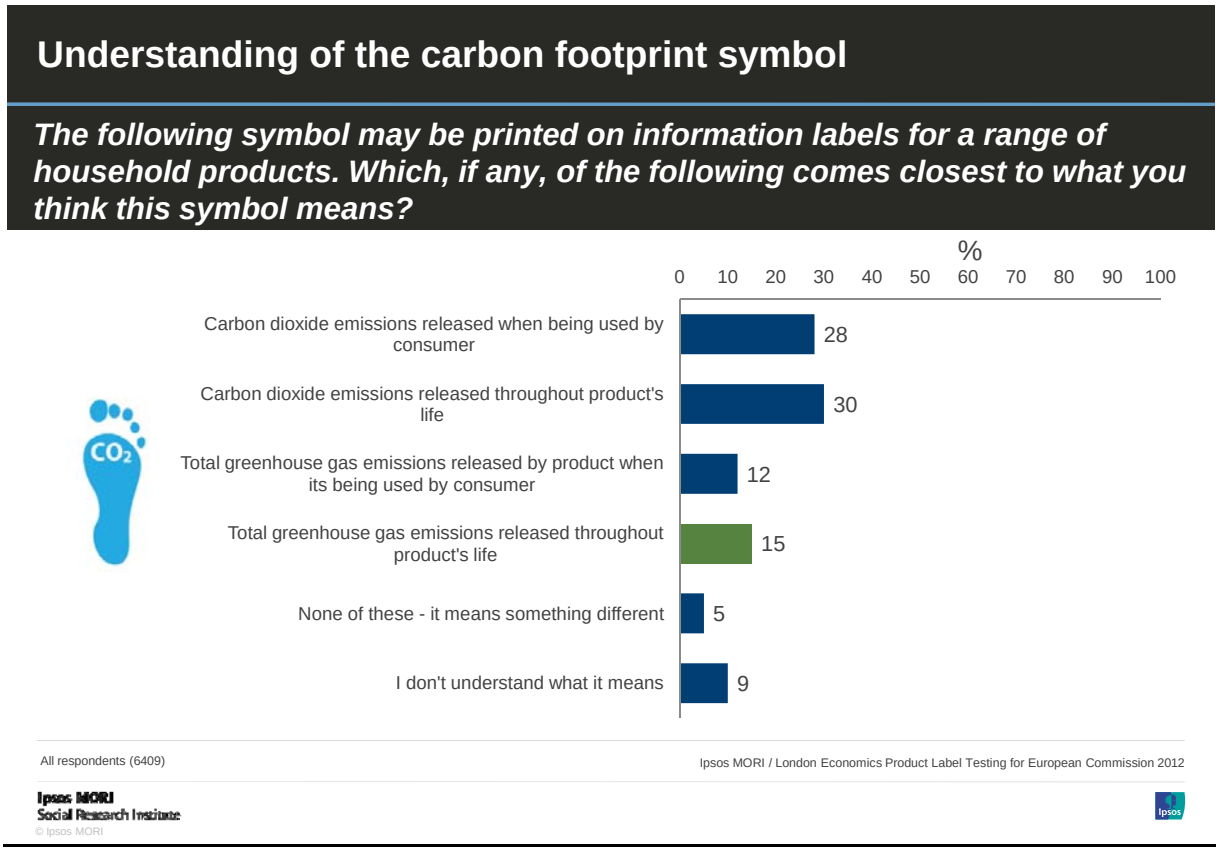


Figure 27: Understanding of the carbon footprint symbol

The chart below shows that the Phase 3 survey respondents made a variety of interpretations of the water eco-toxicity symbol. The most common interpretation, made by a third of respondents (35%), was the *"impact of the product on natural habitats*". Over a quarter (28%) correctly identified the definition to be the *"poisonous effects of the product throughout its life on life on species living in rivers and seas and on the quality of fresh water"*. However, one in ten (10%) said they did not understand what the symbol meant.

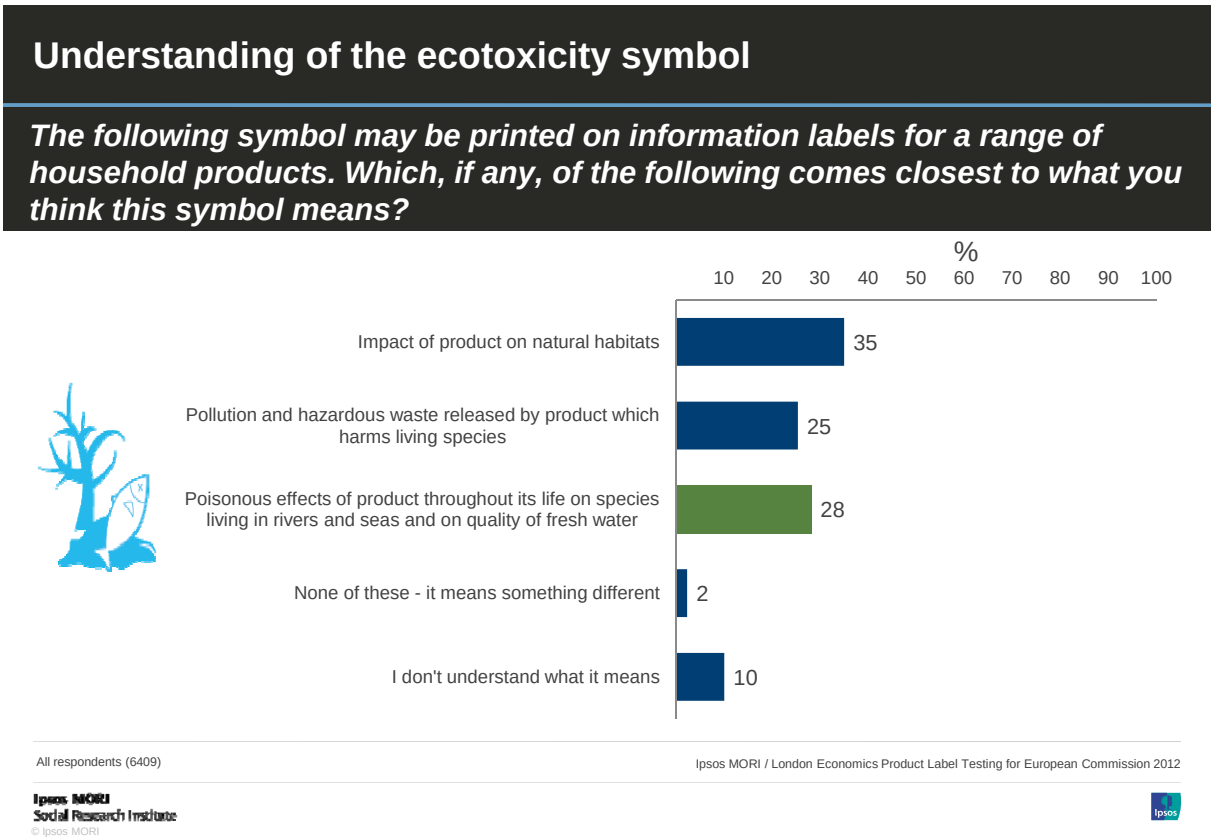


Figure 28: Understanding of the eco-toxicity symbol

The most common interpretation of the resource depletion symbol by the Phase 2 participants was an overall measure of the environmental impact of the product, and one which possibly summarised the ratings given to the three other symbols. This interpretation was also most common among the Phase 2 survey respondents with over a third (37%) selecting *"overall environmental impact of product"* as the definition. This symbol was also misunderstood to illustrate the *"contribution of the product to the depletion of the ozone layer"* by over a quarter of respondents (28%).

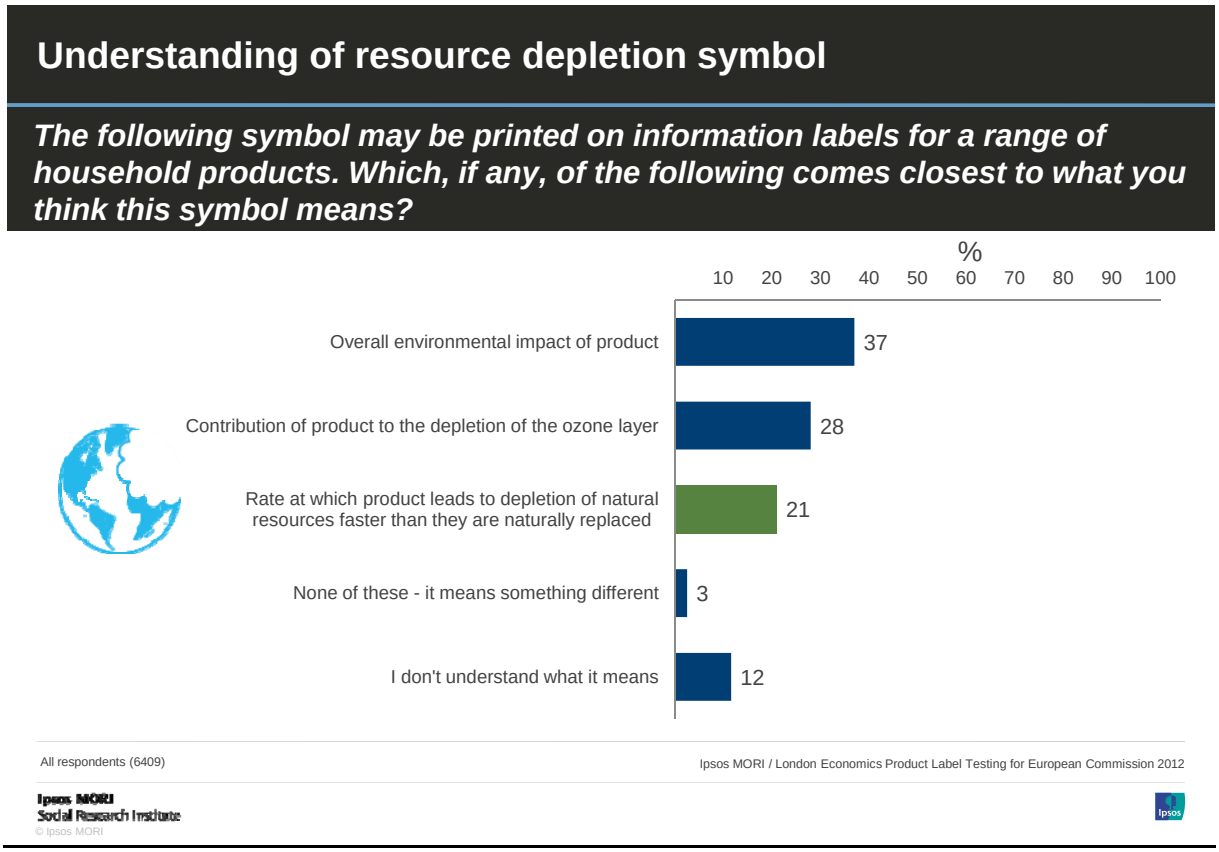


Figure 29: Understanding of resource depletion symbol

5.4.2 Consumer understanding of the scale used to rate the new environmental symbols

Three different rating scales which could be used on the new product labels were tested qualitatively in Phase 2 (see Chapter 3). On the basis of the Phase 2 findings it was decided to use a letter rating scale on the labels shown to respondents in the Phase 3 experiment. The Phase 3 survey tested understanding of this rating scale across all respondents. Three identical symbols were shown with a different rating underneath each one: Product A was given a rating of G; Product B was given a rating of D; and Product C was given a rating of B. The survey respondents were asked to identify the most environmentally friendly product based on the information given to them.

Three quarters of Phase 3 respondents (75%) correctly identified Product C as the most environmentally friendly product showing a reasonably high level of

understanding of the rating scale. However, this leaves a quarter of consumers who may have been misinterpreting the labels.

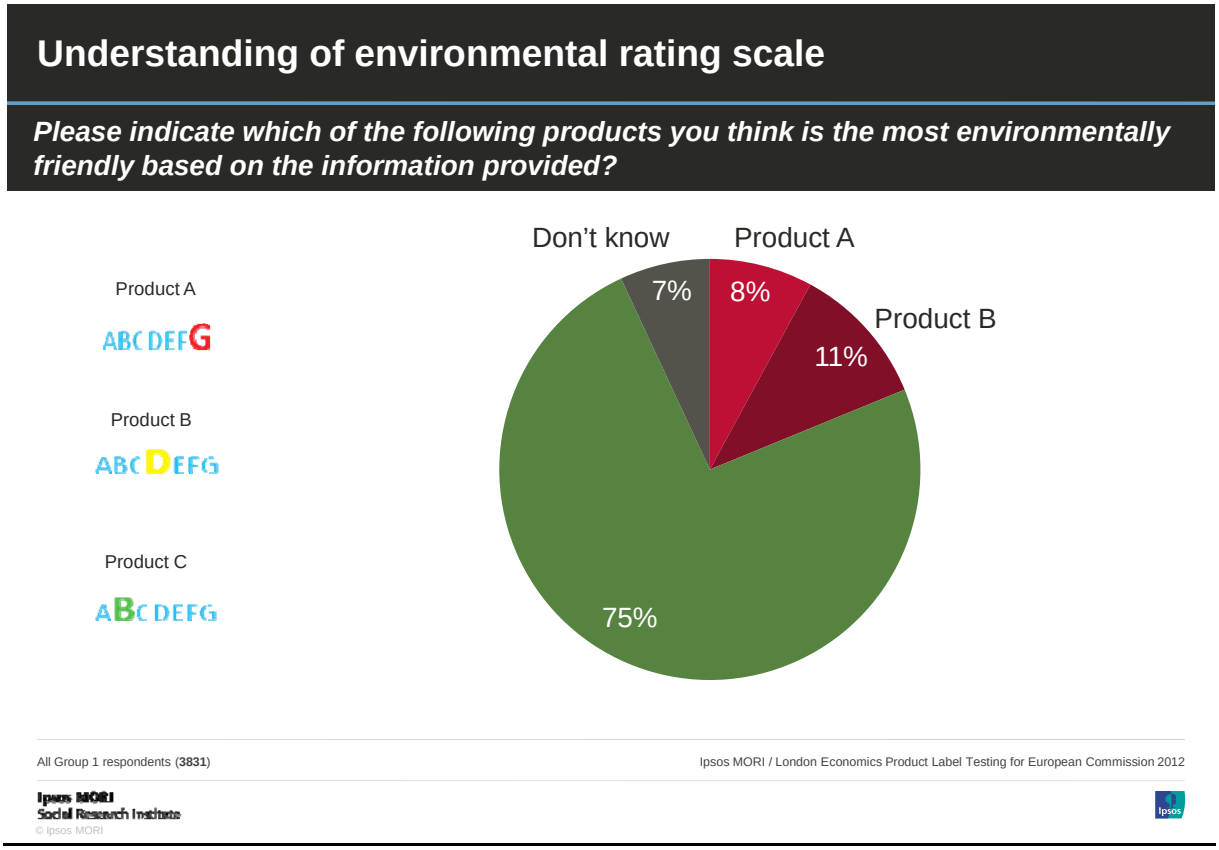


Figure 30: Understanding of environmental rating scale

Across the consumers taking part in the survey, different symbols were used in this test. The chart below shows that the correct product was chosen by the majority of respondents regardless of the symbol presented. Phase 3 respondents who saw the resource depletion symbol were, however, slightly less likely to identify the correct product based on the rating scales (72%).

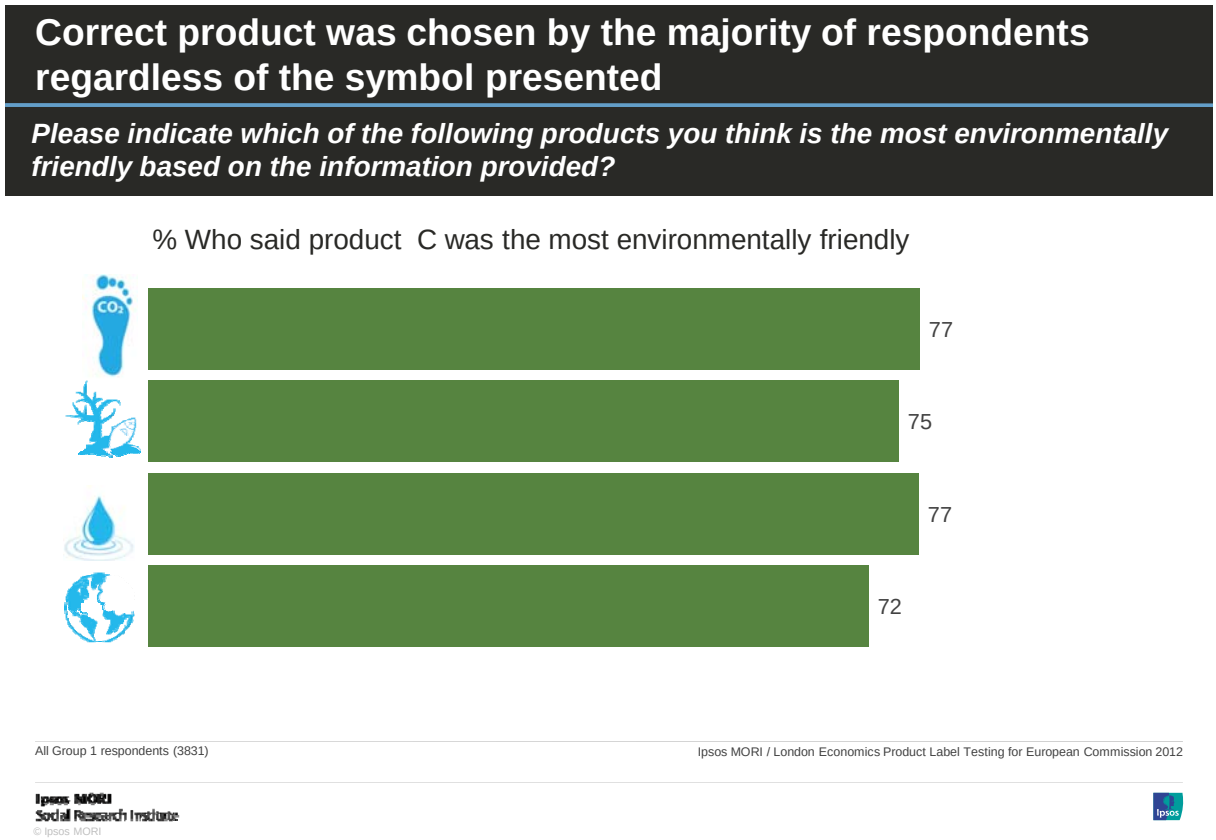


Figure 31: Correct product was chosen by the majority of respondents regardless of the symbol presented

5.4.3 Impact of level of understanding on bids for products and choices between products

The bidding experiment data has been analysed to check for a relationship between understanding of the new symbols and bids submitted for environmentally friendly products. This has been conducted through a regression of bid values on an interaction term between the *Good product* variable and understanding level. Respondents were categorised as 'understanding' the labels if they gave any of the following as the definition of each symbol:

- **Carbon footprint:**
    - The total greenhouse gas emissions released throughout the product's life
- **Water use** - The amount of water used throughout the product's life
- **Water eco-toxicity** - The poisonous effects of the product throughout its life on species living in rivers and seas and on the quality of fresh water

- **Resource depletion** - The rate at which this product leads to the depletion of natural resources faster than they are naturally replaced

Analysis of bids and understanding of the Energy and Carbon Footprint Label

Table 20 shows that respondents who understood the carbon footprint symbol submitted lower bids for "bad" products carrying the Energy and Carbon Footprint Label (this can be seen by looking at the coefficient on CO2 understanding, which is negative for all three products and significant for washing machines and televisions).

However, understanding the carbon footprint symbol did not significantly affect the difference between bids for "good" products and bids for "bad" products (this can be seen by looking at the coefficient on CO2 understanding * Good product, which is insignificant across all product types). That is, the results do not show that understanding the new symbol increases the extra amount that a consumer will bid for a "good" product.

Table 20: Regression results: Effect of understanding the new symbols on bids for products carrying the proposed Energy and Carbon Footprint Label (all respondents)

	Washing machines	Televisions	Light bulbs
Good product	4.39***	3.04***	-0.09
CO2 understanding	-2.54***	-1.60*	-0.75
CO2 understanding * Good product	1.50	-0.41	0.50
Constant	416.64***	412.46***	4.20***
Observations	6,643	6,700	6,274

Note: Outliers more than three standard deviations from the mean have been excluded. *** p<0.01, ** p<0.05, * p<0.1.

Analysis of bids and understanding of the Energy and Environmental Label

In order to test understanding of products carrying the proposed Energy and Environmental Label, a variable was constructed capturing respondents' overall understanding of the new environmental symbols. This variable (*Level of understanding*) is equal to 4 if they correctly identified all four symbols, 3 if they correctly identified three out of four symbols, etc.

For washing machines and televisions, the results for the interaction term (*Level of understanding * Good*) in Table 21 show that the difference between bids for "good" products and bids for "bad" products increased as understanding levels increased.

For example, the difference between bids for "good" washing machines and bids for "bad" washing machines increased by €0.97 for a one level increase in understanding. Similarly, for televisions a one unit increase in level of understanding is associated with a €1.65 increase in the difference between the bids submitted for a "good" television and a "bad" television.

On the other hand, for light bulbs the opposite result are found (i.e. a higher level of understanding is associated with a smaller difference between bids for "good" and "bad" light bulbs).

Table 21: Regression results: Effect of understanding the new symbols on bids for products carrying the proposed Energy and Environmental label (all respondents)

	Washing machines	Televisions	Light bulbs
Good	1.99***	1.07*	0.88*
Level of understanding	-0.90***	-1.17***	0.39
Level of understanding * Good	0.97**	1.65***	-1.05***
Constant	417.21***	413.83***	3.70***
Observations	10,459	10,520	9,895

Note: Outliers more than three standard deviations from the mean have been excluded. *** (**, *) implies significant at 10% (5%,10%).

Analysis of choices and understanding of the Energy and Carbon Footprint Label

The choice experiment data does reveal a relationship between understanding of the labels and selecting the more environmentally friendly product however.

For products carrying the proposed Energy and Carbon Footprint Label, understanding the new carbon footprint symbol increased the likelihood that a respondent chose the "better" washing machine by around 5%, the "better" television by almost 4%, and the "better" light bulb by around 5% (Table 22).

Table 22: Logistic regression coefficients and marginal effects: Effect of differences in understanding of label on product choice (proposed Energy and Carbon Footprint Label, all respondents)

	Washing machines		Televisions		Light bulbs	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
PricePremium	-0.062***	-0.015***	-0.063***	-0.015***	-0.052***	-0.013***
CO2 understanding	0.205**	0.051**	0.152*	0.037*	0.211**	0.050**
Constant	0.809***	-	0.646***	-	0.979***	-
Observations	4,396	4,396	4,422	4,422	4,378	4,378

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. *** (**, *) implies significant at 10% (5%, 10%).

Analysis of choices and understanding of the Energy and Environmental Label

For the products carrying the proposed Energy and Environmental Label, an increase in overall understanding of the new symbols by one level (on the scale defined above) was associated with a 2.6% increase in the likelihood that the respondent chose the "better" washing machine, a 3.7% increase in the likelihood that the respondent chose the "better" television, and a 5.4% increase in the likelihood that the respondent chose the "better" light bulb (Table 23).

Table 23: Logistic regression coefficients and marginal effects: Effect of differences in understanding of label on product choice (proposed Energy and Environmental Label, all respondents)

	Washing machines		Televisions		Light bulbs	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Price Premium	-0.054***	-0.013***	-0.057***	-0.014***	-0.040***	-0.010***
Level of understanding	0.108***	0.026***	0.151***	0.037***	0.215***	0.054***
Constant	0.439***		0.474***		0.385***	
Observations	8,629	8,629	8,652	8,652	8,633	8,633

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. *** (**, *) implies significant at 10% (5%, 10%).

5.4.4 Impact of education campaign on levels of consumer understanding

One of the objectives for this research was to explore the necessity for an education campaign and the likely impact of this on consumer understanding of the labels and, ultimately, willingness to pay for more environmentally preferable products. Respondents to the Phase 3 experiment were therefore allocated to one of three different education scenarios.

Methodology recap

The three education scenarios were:

1. Respondents saw no information on the meaning of the labels (*No Info*)
2. Respondents saw an explanation of the new symbols (*Explanation*). This information campaign is based along the lines of the information currently available for the EU energy efficiency label.
3. Respondents saw an explanation of the new symbols and were prompted to consider them when making their decisions (*Explanation and Prompt*)

Phase 3 respondents who saw the education campaign were significantly more likely to identify the correct definition for each symbol when these questions were posed to them at the end of the survey. The chart below, for instance, shows that 30% of respondents who had been shown information about the labels then identified the correct definition for the water use symbol. This compares with 20% of those who did not see any explanatory information.

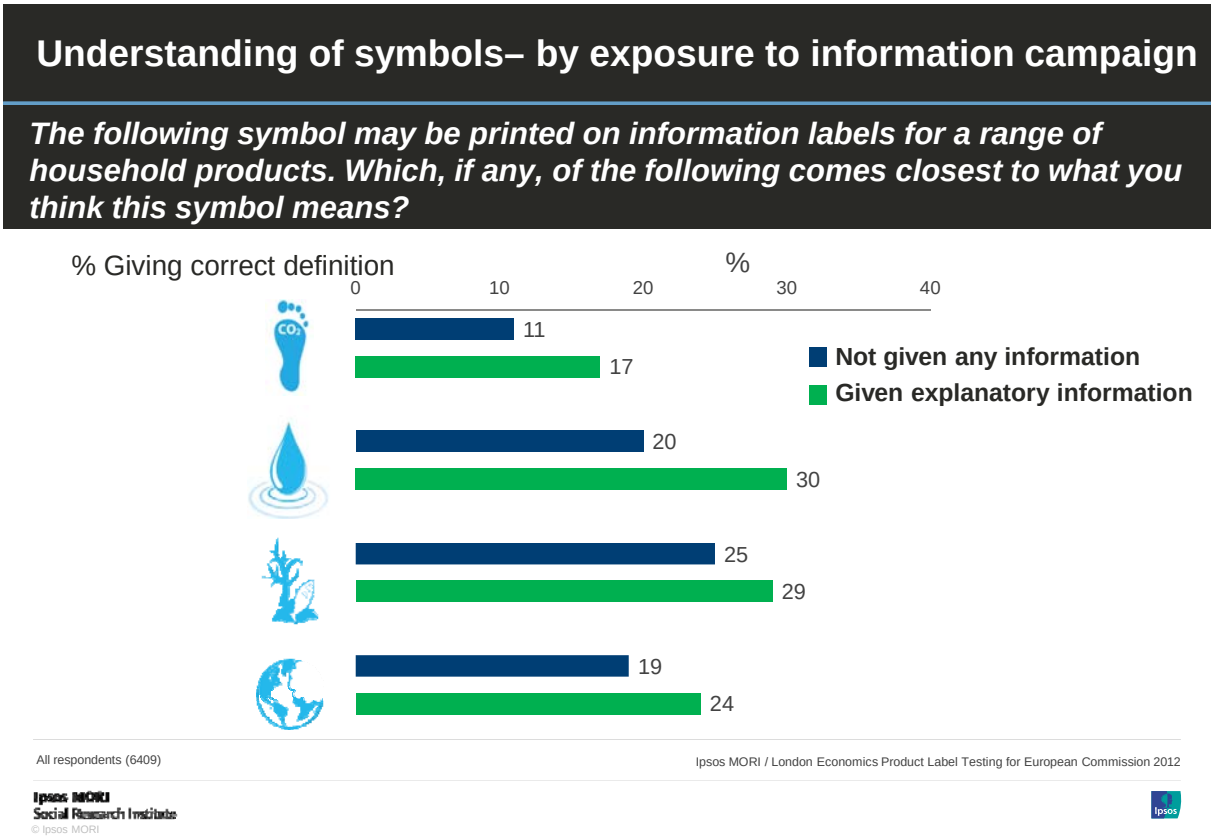


Figure 32: Understanding of symbols- by exposure to information campaign

Similarly to improved levels of understanding of the new environmental symbols, comprehension of the rating scale was significantly higher among consumers who had seen the education campaign at the start of the behavioural experiment. The chart below shows that 79% of respondents who were shown the education campaign correctly identified Product C as the most environmentally friendly product. This compared to 68% of those who were not shown any explanatory information.

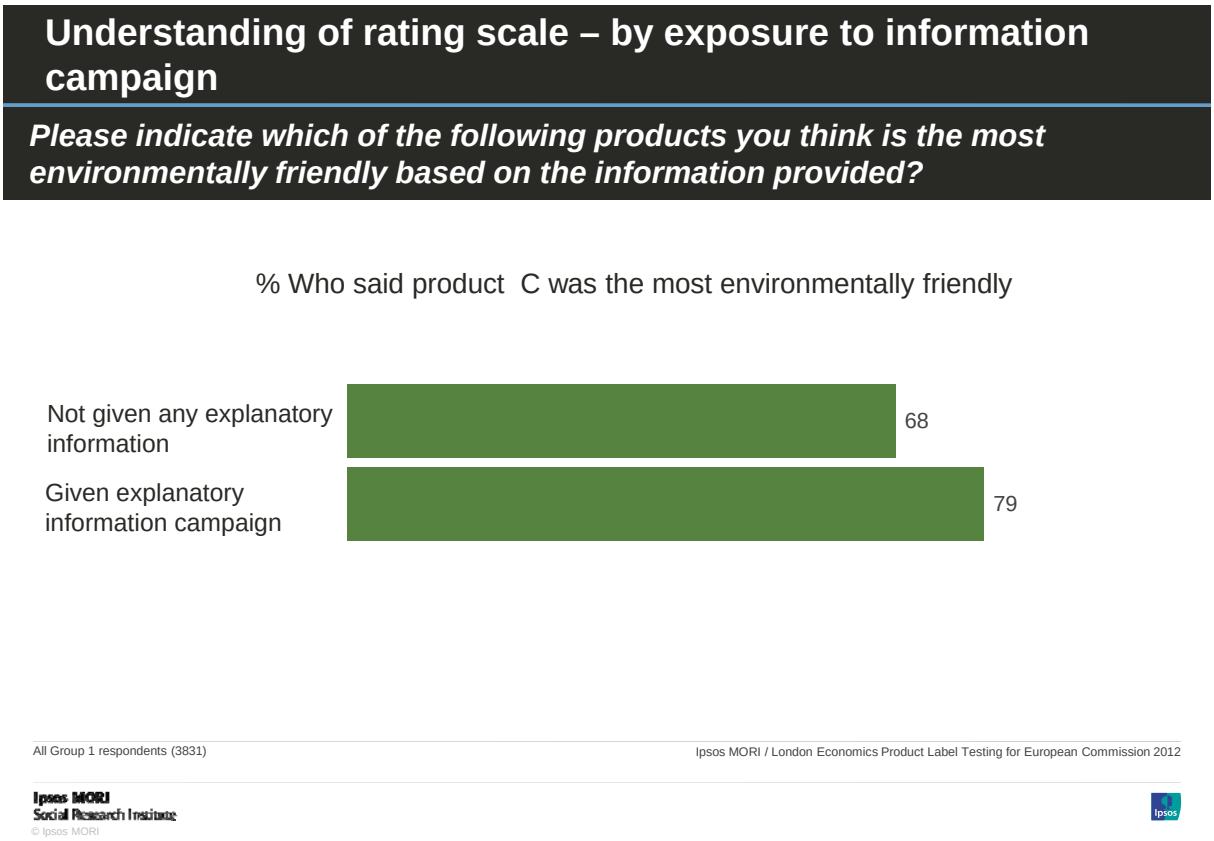


Figure 33: Understanding of rating scale- by exposure to information campaign

5.4.5 Impact of information campaign on bids and choices for products

Analysis was also conducted to investigate the likely impact of an education campaign on consumers' choice of products and willingness to pay.

<u>Information campaign and bids for products</u>

In the bidding experiment, since there were three education scenarios and products were either "good" or "bad", the bids fall into one of six categories. These six categories are denoted G1, G2, G3, B1, B2 and B3, as shown in Table 24.

Table 24: Categories of bids on products carrying the CO2 label

	Type of product:	
Information scenario:	"good"	"bad"
No Info	G1	B1
Explanation	G2	B2
Explanation and Prompt	G3	B3

We estimate the following regression equation for the bidding experiment:

$$Bid = \alpha + \beta_1.G1 + \beta_2.G2 + \beta_3.B1 + \beta_4.B2 + \beta_5.B3 + \varepsilon$$

Where:

- *'Bid'* is the bid submitted.
- *'G1'* indicates that the bid falls into category G1 (Good, No Info).
- *'G2'* indicates that the bid falls into category G2 (Good, Explanation).
- etc.
- *'ε'* is the error term.

The base category is G3 which corresponds to the strongest education campaign and the good product. The hypothesis is that average bids for other education scenarios would be lower, and the estimated regression coefficients would be negative.

The analysis shows that average bids for "good" products were higher among respondents who were provided with an "explanation and prompt" relative to when they were *only* given an explanation or were given *no* information at all[72]. However, in most cases these effects are not significant (since most of the estimated coefficients for G1 and G2 in Table 25 are not significant[73]).

Furthermore, respondents did not bid more for "good" products if they were given an explanation of the new symbols rather than no information at all (since the estimated

[72] This is shown by the negative coefficients on G1 and G2 in Table 11, which imply that bids for "good" products are higher when respondents are provided with an explanation and given a prompt.

[73] The only two that are statistically significant are the coefficient for G1 for washing machines with the Energy and Carbon Footprint label, which is significant at the 5% level, and the coefficient for G1 for televisions with the Energy and Environmental label, which is significant at the 10% level.

coefficients for G1 and G2 are not statistically different to each other). Therefore, for "good" products in the bidding experiment the education cannot be concluded to change bidding behaviour.

However, for washing machines and televisions, the education campaign, with or without the additional prompt did have a statistically significant impact on average bids for less environmentally friendly products. This can be seen by comparing the coefficients on B1, B2 and B3 in Table 25. Bids were lower among those who saw explanatory information (B2 and B3) than those who did not (B1) and these differences are statistically significant[74].

For example, on average bids for "bad" washing machines carrying the proposed Energy and Carbon Footprint label were €2.96 lower if the respondent had see the full education campaign.[75] For "bad" televisions carrying this label average bids were €2.58 lower for respondents who had see the education campaign.

The bidding experiment data does not prove, however, that the more extensive education campaign ('explanation and prompt') had more of an effect on behaviour than the less intensive ('explanation') campaign (G2 and G3, and B2 and B3 are not statistically different from one another[76]).

Table 25: Regression results: Effect of the information campaign on the average bid submitted for products carrying the proposed Energy and Carbon Footprint Label (all respondents)

	Proposed Energy and Carbon Footprint Label			Proposed Energy and Environmental Label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
G1	-1.91**	-0.53	-1.13	-0.75	-1.14*	0.04
G2	-0.77	-0.54	-0.76	-0.32	-0.29	-0.52
B1	-3.74***	-2.10**	-0.93	-2.25***	-2.44***	-0.01
B2	-6.70***	-4.68***	-0.86	-4.16***	-4.29***	-0.44
B3	-6.08***	-3.21***	-0.08	-4.72***	-4.54***	-0.47
Constant	421.75***	415.55***	4.70***	419.63***	415.85***	4.09***
Observations	6,643	6,700	6,274	10,459	10,520	9,895

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 1% (5%, 10%). In the regression for the proposed Energy

[74] For televisions with the proposed Energy and Carbon Footprint Label the difference between B1 and B3 is not significant.

[75] This is calculated by taking the difference between the coefficients on B1 and B2.

[76] For the Energy and Carbon label the difference between B2 and B3 for televisions is significant but only at the 10% level.

and Environmental Label dummies for the mid-range product were also included, These are not reported on here as the focus is on the impact of information on average bids for "good" and "bad" products.

Information campaign and product choice

The choice experiment data was also analysed to test for the effect of an education campaign. Dummy variables were created to indicate whether or not the education campaign was shown to each respondent in a regression of product choice.

The regression equation is:

$$Choice = Logistic(\alpha + \beta_1.PricePremium + \beta_2.Explanation + \beta_3.Explanation\&Prompt) + \varepsilon$$

Where:

- *'Choice'* indicates whether the respondent chose the "better" product (i.e. the more environmentally friendly product).[77]
- *'PricePremium'* is the additional cost of the "better" product (as a percentage).
- *'Explanation'* indicates that the respondent saw an explanation of the new environmental symbols (but was not prompted to consider them when making decisions).
- *'Explanation&Prompt'* indicates that the respondent saw an explanation of the new environmental symbols and was prompted to consider them when making decisions.
- *'ε'* is the error term.

The term "better" product refers to:

- the product with better environmental ratings from choice pairs 1 to 9 in section 4.3.1 (for choices between products carrying the proposed Energy and Environmental Label); or
- the product with better carbon footprint rating from choice pairs 1 to 4 in section 4.3.1 (for choices between products carrying the proposed Energy and Carbon Footprint label).

[77] Since the dependent variable is binary we use a logistic regression.

Tables 26 and 27 report the regression coefficients and marginal effects (for choices between products carrying the proposed Energy and Environmental Label and the proposed Energy and Carbon Footprint Label respectively).

For all products and under both labelling schemes, the coefficient on the *Explanation* variable is positive and significant, which indicates that showing consumers an explanation of the new environmental symbols increases the likelihood that they will choose the "better" product (compared to when no information is given)[78].

Furthermore, in all cases, the coefficient on *Explanation and Prompt* is positive and significant, and larger than the coefficient on *Explanation*. This indicates that providing an explanation of the new symbols and prompting consumers to consider them increases the likelihood that they will choose the "better" product, and that this effect appears to be greater than the effect of *only* giving the explanation.

However, the differences between the coefficients on *Explanation and Prompt* and *Explanation* are only statistically significant for washing machines and light bulbs carrying the proposed Energy and Environmental Label, and for washings machines carrying the proposed Energy and Carbon Footprint Label. For other product and label combinations there is no evidence to suggest that adding the prompt (in addition to the explanation) increases the likelihood that the "better" product will be chosen.

Showing consumers an explanation of the new symbols and prompting them to consider the new symbols when making their choices implies an expected increase in the likelihood that they choose the better product of 15% for washing machines, 16% for televisions and 18% for light bulbs when these products carry the proposed Energy and Environmental label.

[78] Note that the base used in the regression is the scenario where the respondent is not shown any information on the new environmental symbols. Therefore, the parameter estimates show the impact of providing an explanation or explanation plus prompt relative to the 'no-info' scenario.

Table 26: Logistic regression coefficients and marginal effects: Effect of the information campaign on product choice (Proposed Energy and Environmental Label, all respondents)[1]

	Estimated coefficients and marginal effects:					
	Washing Machines		Televisions		Light bulbs	
Explanatory variable	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
PricePremium	-0.054***	-0.013***	-0.058***	-0.014***	-0.040***	-0.010***
Explanation	0.476***	0.117***	0.570***	0.141***	0.568***	0.141***
Explanation&Prompt	0.610***	0.150***	0.655***	0.162***	0.721***	0.178***
Constant	0.177***	-	0.215***	-	0.152***	-

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. *** (**, *) implies significant at 1% (5%, 10%).

For products carrying the proposed Energy and Carbon Footprint Label, showing consumers an explanation of the new symbols and prompting them to consider the new symbols when making their choices, implies an expected increase in the likelihood that they chose the better product of 16% for washing machines, 17% for televisions and 16% for light bulbs.

Table 27: Logistic regression coefficients and marginal effects: Effect of the information campaign on product choice (Proposed Energy and Carbon Footprint Label, all respondents)[1]

	Estimated coefficients and marginal effects:					
	Washing Machines		Televisions		Light bulbs	
Explanatory variable	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
PricePremium	-0.061***	-0.015***	-0.063***	-0.016***	-0.053***	-0.013***
Explanation	0.446***	0.111***	0.580***	0.143***	0.651***	0.153***
Explanation&Prompt	0.632***	0.157***	0.677***	0.166***	0.685***	0.161***
Constant	0.472***	-	0.260***	-	0.584***	-

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. *** (**, *) implies significant at 1% (5%, 10%).

5.4.6 Most appropriate channels for information campaign

Analysis of the Phase 3 experiment indicates that there would be merit in running an education campaign around the new product label designs. This would increase levels of consumer understanding of the labels, and would be likely to encourage consumers to purchase more environmentally friendly products. It is unclear

however, whether it would encourage any willingness to pay higher prices for these products.

For an education campaign to be effective it is critical that it reaches the right consumers and a key element to this will be using the right communication channels to reach the target consumers. The channels through which consumers currently access product information, and the channels through which they would like to receive information about any new product label designs, were explored briefly in the Phase 2 discussion group. However, as this was not a key focus for the study, it is advised that further research is conducted to support these emerging findings.

Most Phase 2 participants said they looked online for product information. In particular, they used supplier stores' websites and, commonly, looked at sections of the websites which included consumer reviews of the product. Television advertising was also a common source of information, as was visiting stores in person.

Phase 2 participants were also asked directly about the channels they would recommend for an education campaign about the new labels. There was a consensus that a multitude of channels should be used to maximise the exposure of consumers to this information. The key channels through which they felt it would be appropriate to disseminate explanatory information were:

- The internet:
  - Information on websites of suppliers and retailers as these are commonly accessed sources of information about products;
  - Information on government websites as this is considered independent and may be consulted by a few consumers to check on the validity of information given to them by a retailer; and
- Advertising campaigns:
  - TV campaigns, as this is already a common way of finding out about products;
  - Billboards;
  - Leaflets delivered through doors as this may access those who are unlikely to look for information themselves (although there was some opposition to

a postal campaign among Phase 2 participants in Great Britain due to the environmental impact of large scale printing and distribution); and

- In-store communications:
  - Leaflets/cards in checkout area and in close proximity to products;
  - Boards/posters with environmental indicators/rating scale on walls;
  - Stickers/labels prominently displayed on the products; and
  - Knowledgeable shop assistants

5.5.Impact of environmental labelling history on product choices and willingness to pay

This study was conducted across nine markets which were deliberately selected due to their varying histories of displaying energy or environmental labels on household products. The markets have been grouped into three categories:

- *Countries with long history of product labelling*: These include countries with national environmental labelling schemes -
  - France
  - Germany
  - Norway
- *Countries with some history of product labelling*: These include countries with no strong uniform national approach, but which have discrete environmental labelling schemes -
  - Italy
  - Spain
  - UK
- *Countries with no, or very limited, history of product labelling*: New EU Member States that have introduced the current Energy Label relatively recently, and have very few national environmental labelling schemes -
  - Romania
  - Estonia
  - Poland

This section considers whether the history of product labelling in a market has any relationship with levels of consumer understanding of the new label designs, or their

engagement with them when making product choices or deciding what they are willing to pay for a product.

Key observations

In general, Phase 3 respondents from markets which have a long history of product labelling were more likely to correctly identify the meaning of each of the new environmental symbols, and to understand the rating scale. French respondents in particular had a high level of understanding. This may be linked to the national labelling experiment conducted this year in France.

There is no clear evidence from the experiment analysis however, that having a history of environmental labelling led respondents from this market to make different choices or bids.

5.5.1 Differences in levels of understanding across markets with different labelling history

The charts below show the levels of understanding Phase 3 respondents in different markets had of the new environmental symbols and the rating scale.

It is clear that Phase 3 respondents from France were the most likely to correctly identify Product C as the most environmentally friendly product based on the information given to them. They were also more likely than respondents from most other markets to identify the correct definition for each of the symbols used on the new Energy and Environmental label.

This may reflect increased familiarity with product labelling among French consumers due to the national labelling experiment which has been taking place over the last 12 months. Over 160 major manufacturers and retailers have been participating in this with many choosing to present a number of environmental impacts (similar to the proposed Energy and Environmental Label tested in this study).

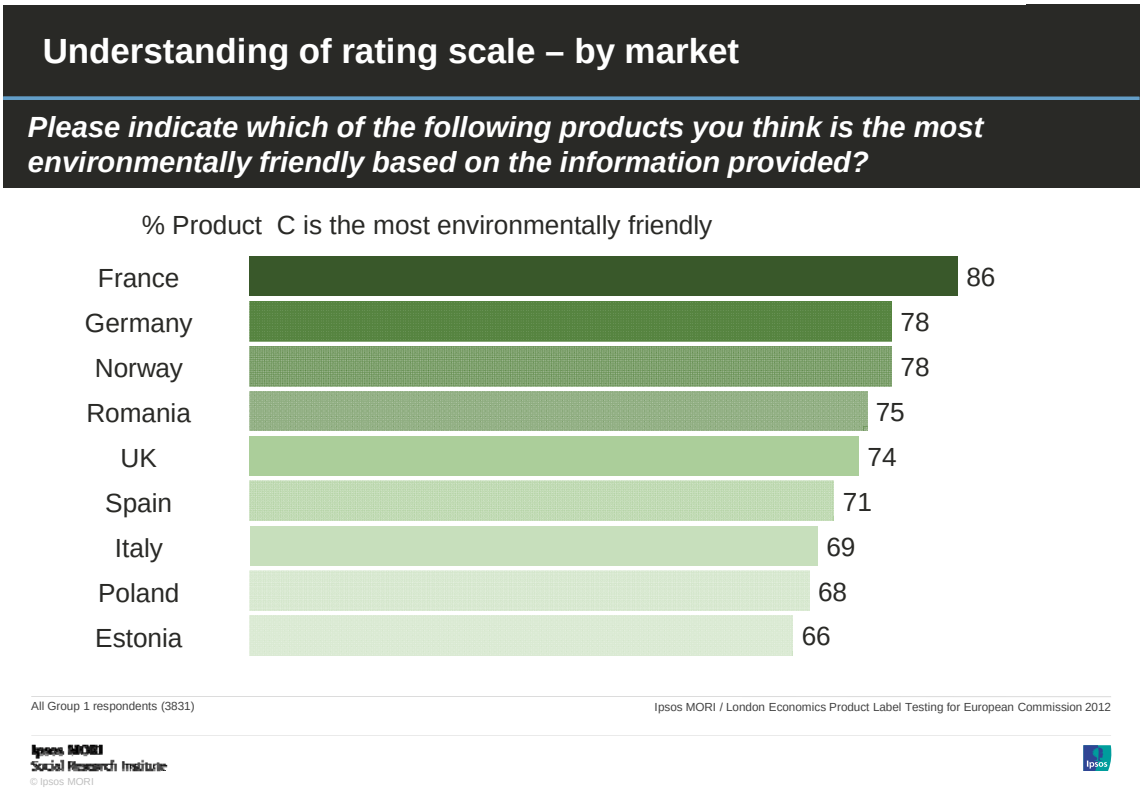


Figure 34: Understanding of rating scale- by market

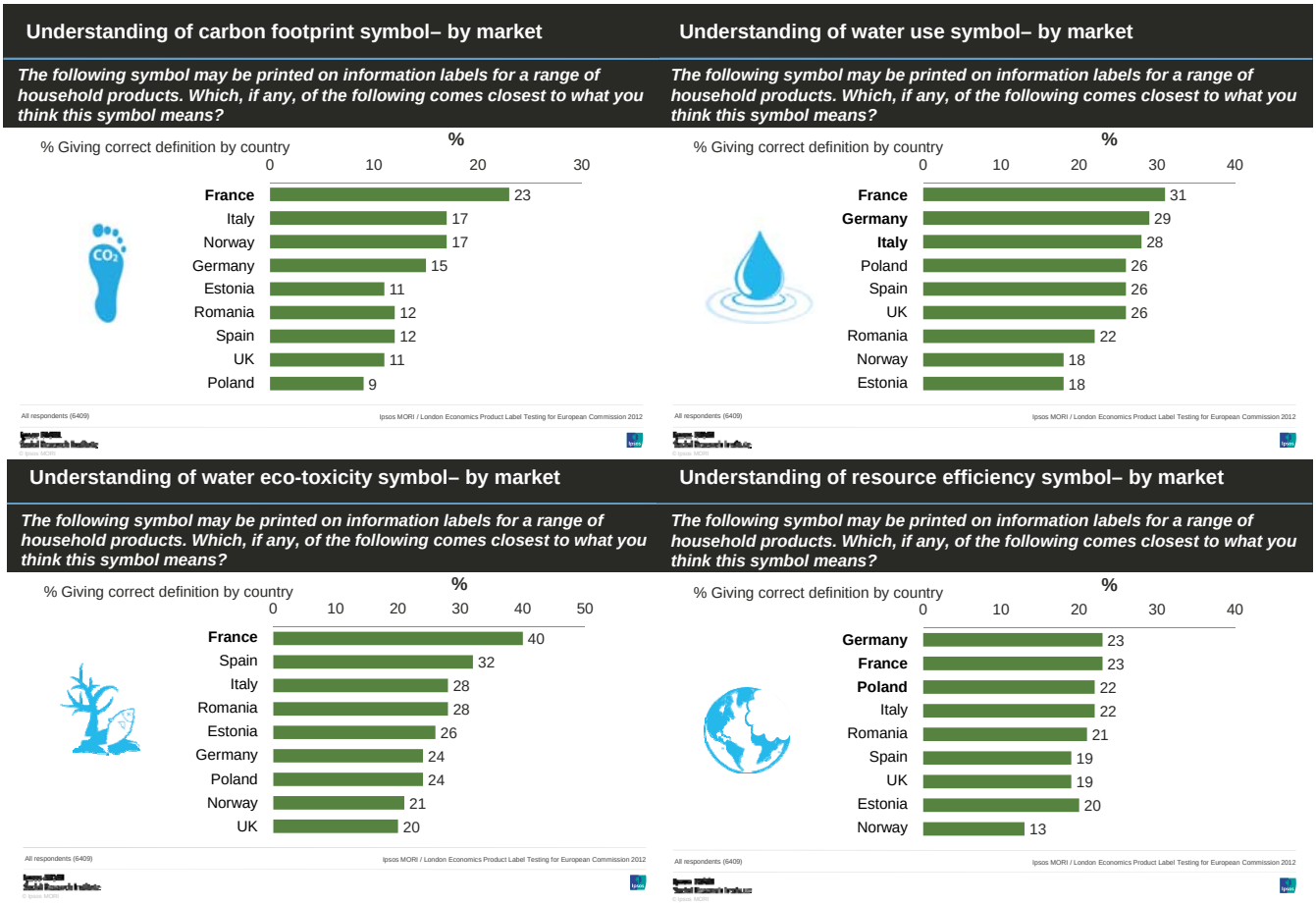


Figure 35: Understanding of carbon footprint symbol, water footprint symbol, water eco-toxicity symbol and resource efficiency symbol- by market

It is interesting to consider the results for Germany and for Norway as these are also countries which have a long and significant history of product labelling. Phase 3 respondents from these markets were among the most likely to correctly interpret the rating scale. However, the charts above reveal varying levels of understanding of the four new environmental symbols.

Although respondents from Norway were among the most likely to interpret the carbon footprint symbol correctly (17%), they were among the least likely to recognise the correct definition of any of the other three symbols. These were correctly understood by only 21% for water eco-toxicity, 18% for water footprint and 13% for resource depletion symbols.

In Germany, although these respondents were among the most likely to correctly define the water footprint (29%) and resource depletion symbols (23%), they were

less likely than respondents from many other markets to understand the carbon footprint (15%) or water eco-toxicity symbols (24%).

While both markets have a long history of environmental labelling, this has been via national ecolabels where all the environmental impacts of a product are rolled up into a single indicator. Consumers in these markets are, therefore, more likely to look for a branded ecolabel to inform them of the environmental performance of a product rather than information about the individual impacts of that product. Indeed branded ecolabels such as the Blue Angel, the Nordic Swan and the EU's own Flower have been marketed for many years as the simple way for consumers to identify environmentally preferable products. As a result, this is likely to mean that consumers in Germany and Norway are no more likely to have a good understanding of the new environmental symbols than other markets with a shorter history of environmental labelling.

5.5.2 Differences in willingness to pay across consumers from countries with different labelling history

Analysis was conducted on the bidding experiment and choice experiment to test whether the history of labelling in market was likely to have any impact on their product choices and willingness to pay.

Figure 36 shows that across all markets the average bids were higher for products categorised as "good" in terms of environmental performance than "bad" products, except for light bulbs.

With a small number of exceptions, Phase 3 respondents from markets with a history or some history of product labelling tended to bid more, both for products with "good" and with "bad" environmental ratings[79]. This is likely to be because these groups of markets are different in many ways other than their environmental labelling history, such as, for example, per capita income.

[79] The exceptions are: a) for "bad" televisions with the Energy and Carbon Footprint label, countries with no history of labelling bid slightly more than countries with history or some history, and b) for "good" washing machines, countries with history bid slightly less than countries with some history or no history.

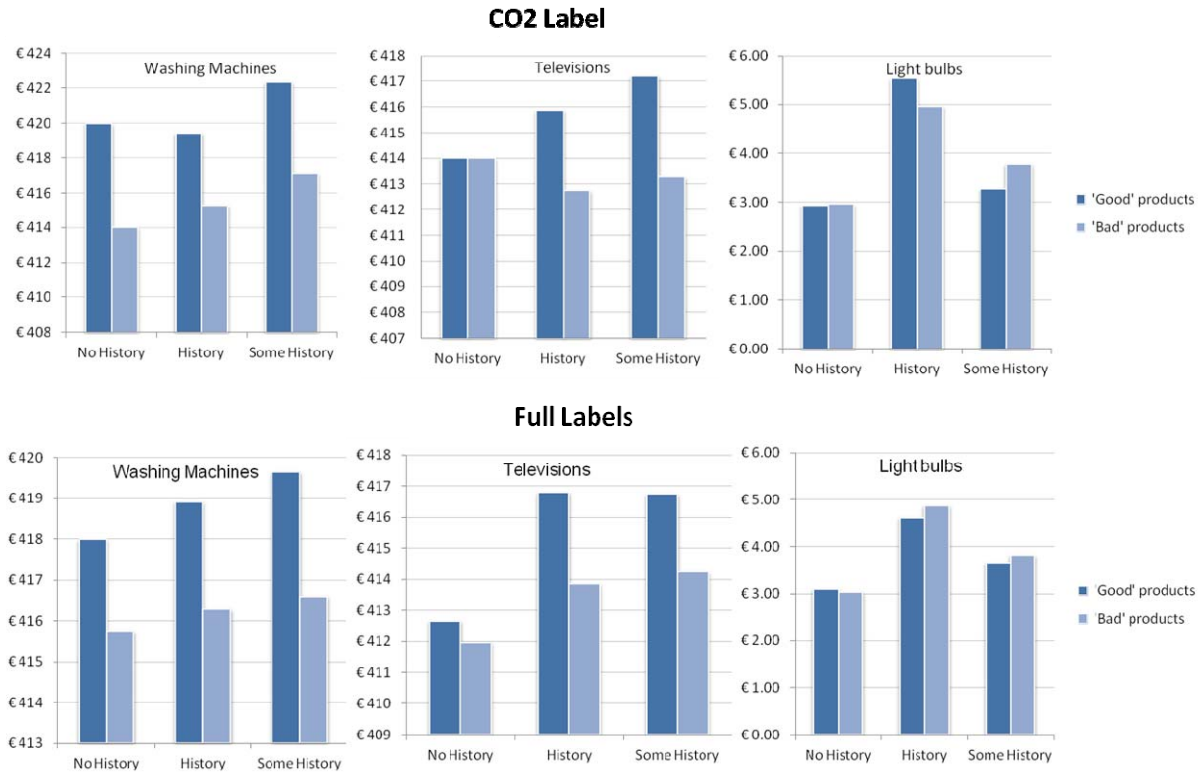


Figure 36: Average (mean) bids submitted, by labelling history and whether a product is "good" or "bad" (average across products carrying the proposed Energy and Carbon Footprint Label and the proposed Energy and Environmental Label)

Note: Outliers more than three standard deviations from the mean have been excluded. Definitions of "good" and "bad" are in the methodology section above.

Regressions were conducted to test whether the differences between bids for "good" and "bad" products varied according to labelling history. However, there is no evidence of significant variation across country groups (Appendix 4). Therefore, there is no evidence to support the hypothesis that previous exposure to environmental labelling results in higher bids for more environmentally friendly products.

The choice experiment data was analysed to assess whether respondents from markets with a history of environmental labelling were more likely to choose the "better" product (i.e. the more environmentally friendly product).

For washing machines and televisions carrying the proposed Energy and Environmental Label, the likelihood that a consumer chooses the "better" product is unaffected by the history of labelling in their home country (Table 28). For light bulbs,

it is observed that for markets with some history of environmental labelling (i.e. Italy, Spain and the UK) the likelihood that the consumer chooses the better product is lower. However, this effect is most likely due to other factors than the history of labelling.

Table 28: Logistic regression coefficients and marginal effects: Effect of a history of environmental labelling in a consumer's home country on product choice (Proposed Energy and Environmental Label, all respondents)

Explanatory variable	Washing Machines		Televisions		Light bulbs	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
PricePremium	-0.053***	-0.013***	-0.057***	-0.014***	-0.040***	-0.010***
History	0.026	0.006	-0.089	-0.022	0.002	0.001
SomeHistory	-0.076	-0.019	-0.019	-0.005	-0.178***	-0.044***
Constant	0.559***	-	0.652***	-	0.653***	-
Observations	8,629	8,629	8,652	8,652	8,633	8,633

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. *** (**, *) implies significant at 1% (5%, 10%).

For products carrying the proposed Energy and Carbon Footprint Label, respondents were less likely to choose the better product if they come from countries with a history of labelling (Table 29).

Table 29: Logistic regression coefficients and marginal effects: Effect of a history of environmental labelling in a consumer's home country on product choice (Proposed Energy and Carbon Footprint Label, all respondents)

Explanatory variable	Washing Machines		Televisions		Light bulbs	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
PricePremium	-0.061***	-0.015***	-0.063***	-0.015***	-0.052***	-0.013***
History	-0.304***	-0.076***	-0.183**	-0.045**	-0.600***	-0.146***
SomeHistory	-0.027	-0.007	0.122	0.030	-0.380***	-0.092***
Constant	0.959***	-	0.694***	-	1.394***	-
Observations	4,396	4,396	4,422	4,422	4,378	4,378

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. *** (**, *) implies significant at 1% (5%, 10%).

5.6 Impact of individual-level characteristics on product choices and willingness to pay

Finally, individual-level characteristics, such as demographic information and past purchasing behaviour have been analysed to see whether they have an effect on the bids submitted and the product choices made.

Key observations

Individual demographic characteristics do not provide a clear pattern on behaviour. However, younger respondents were more likely to choose "better" performing products overall.

Respondents who are more environmentally conscious tended to choose the "better" performing washing machine but there was no indication that they also chose the "better" performing television or light bulb. We find that respondents who are more environmentally conscious are more likely to submit a higher bid for a "good" television and a lower bid for a "bad" television. For all other products, however, no such pattern emerged.

5.6.1 Demographic information

Regressions have been carried out on bid values and product choices on individual-level characteristics including age, gender, education and income.

First, using the bidding experiment data, the results of a linear regression of bid values on individual-level characteristics for products carrying the proposed Energy and Environmental Label are presented (Table 30).

These results show that the average bid varies according to a number of individual-level characteristics, irrespective of whether a product is "good" or "bad" in terms of its environmental characteristics:

- Older respondents bid less than younger participants for washing machines and televisions.

- Higher income respondents and those with higher levels of education also tend to bid less for these two products.
- Women bid more for these two products, as do those who have recently bought the product in question.
- Only age has a statistically significant effect (at the 10% level) on bids for light bulbs, increasing average bids by €0.03 year of age of the respondent.

Importantly, the coefficient on the *Good product* variable remains significant for washing machines and televisions, meaning the finding that respondents bid more for products with better environmental ratings is robust to the inclusion of all these characteristics.[80]

Similar results are found for a number of demographic characteristics for products carrying the proposed Energy and Carbon Footprint Label (also shown in Table 30). Interestingly, under the proposed Energy and Carbon Footprint Label more demographic variables correlate significantly with bids for light bulbs. For instance, higher levels of education are associated with lower bids for light bulbs and women bid more for light bulbs than men.

The results in Table 30, for both new label designs, show there are no significant relationships between demographic characteristics and the level of bid submitted for such products.[81]

Table 30: Regression results: Effect of individual-level characteristics on bids for products carrying the proposed Energy and Environmental Label (all respondents)

	Proposed Energy and Carbon Footprint Label			**Proposed Energy and Environmental Label**		
Explanatory variable	Washing machines	Television	Light bulbs	Washing machines	Television	Light bulbs
Good product	4.01***	2.52***	0.21	2.40***	2.94***	-0.11
Age	-0.07***	-0.03	0.06***	-0.08***	-0.07***	0.03*
Income	-0.76***	-0.45	-0.12	-1.09***	-1.52***	-0.27
Education	-0.80***	-0.91***	-0.76**	-0.52**	-0.55**	-0.09
Gender	3.64***	3.77***	1.60***	0.79*	1.66***	0.13
Bought product recently	1.06	2.24***	-0.15	1.73**	1.42***	0.15
Constant	419.37***	412.42***	3.19*	423.31***	418.46***	3.62***

[80] Regression results for the effect of age, gender, income and education on bids for environmentally friendly products are shown in Appendix 4.

Observations	5,224	5,241	4,870	8,076	8,113	7,606

Note: Outliers more than three standard deviations from the mean have been excluded. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Using the choice experiment data, regression of product choice on age, gender, education and income was conducted. As before, the dependent variable indicates whether the participant chose the "better" product (i.e. more environmentally friendly product).

The results for the proposed Energy and Environmental Label show that age has a statistically significant effect on the likelihood of selecting the "better" product (Table 31). Namely, the older you are the less likely you are to have chosen the "better" product. However, for all three products this effect was very small. There is no statistically significant effect of income on product choice, except for light bulbs but this effect is only significant at 10% level.

Gender had an effect on product choice for some products carrying the proposed Energy and Environmental Label. Female respondents were 4% more likely to select the "better" television and 2% (significant at 10%) more likely to select the "better" light bulb.

Table 31: Logistic regression coefficients and marginal effects: Effect of individual-level characteristics on product choice (Proposed Energy and Environmental Label, all respondents)

	Washing machines		Television		Light bulbs	
Explanatory variable	Coeff-icient	Marginal Effect	Coeff-icient	Marginal Effect	Coeff-icient	Marginal Effect
PricePremium	-0.053***	-0.013***	-0.056***	-0.014***	-0.039***	-0.010***
Age	-0.007***	-0.002***	-0.007***	-0.002***	-0.011***	-0.003***
Income	-0.035	-0.009	-0.023	-0.006	-0.043*	-0.011*
Education	0.008	0.002	0.028	0.007	0.028	0.007
Gender	0.059	0.015	0.171***	0.042***	0.093*	0.023*
Bought product recently	0.048	0.012	0.048	0.012	0.177***	0.044***
Constant	0.747***		0.541***		0.723***	
Observations	6,657	6,657	6,689	6,689	6,659	6,659

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. *** (**, *) implies significant at 1% (5%, 10%).

For products carrying the proposed Energy and Carbon Footprint Label, women and more highly educated respondents were more likely to choose the "better" product

(Table 32). Further, for televisions and light bulbs carrying the proposed Energy and Carbon Footprint Label, those who have bought the product recently are more likely to choose the "better" product.

Table 32: Logistic regression coefficients and marginal effects: Effect of individual-level characteristics on product choice (proposed Energy and Carbon Footprint Label, all respondents)

	Washing machines		Television		Light bulbs	
Explanatory variable	Coeff-icient	Marginal Effect	Coeff-icient	Marginal Effect	Coeff-icient	Marginal Effect
PricePremium	-0.062***	-0.016***	-0.062***	-0.015***	-0.050***	-0.012***
Age	-0.007**	-0.002**	-0.002	-0.000	-0.007***	-0.002***
Income	-0.029	-0.007	0.019	0.005	0.024	0.006
Education	0.127***	0.032***	0.080**	0.020**	0.067**	0.016**
Gender	0.149**	0.037**	0.307***	0.075***	0.155**	0.038**
Bought product recently	-0.089	-0.022	0.163**	0.040**	0.482***	0.118***
Constant	0.399*	-	-0.182	-	0.355	-
Observations	3,472	3,472	3,478	3,478	3,433	3,433

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. *** (**, *) implies significant at 1% (5%, 10%).

5.6.2 Environmental attitudes of Phase 3 survey respondents

This section reports on the environmental attitudes of the Phase 3 respondents. This is followed by analysis of the environmental attitudes held by a respondent and the product choices and bids they made during the experiment. This has been conducted to test whether the proposed Energy and Environmental Labels and proposed Energy and Carbon Footprint Labels assist those who are more environmentally conscious to make informed product choices.

On the whole the Phase 3 respondents appeared to be fairly pro-environmental. More than three quarters agreed with the statements, *"I can personally help to reduce climate change by changing my behaviour"* (77%) and *"Even if others don't do the same, it's worth me doing things to live a sustainable lifestyle"* (80%).

By contrast 15% agreed that *"the effects of climate change are too far in the future to really worry me"* and almost a quarter (24%) agreed *"it's not worth us trying to combat climate change, because other countries will just cancel out what we do"*.

The results suggest that it is not only climate change which is of concern to these respondents. Three quarters (76%) agreed that the *"earth has very limited room and resources"* compared to one in ten (9%) who disagreed.

While, on the whole, this data shows high levels of agreement with statements stressing the importance and seriousness of climate change and other environmental issues, it also highlights that a large proportion of respondents either displayed ambivalence to the statements or said they did not know. For each statement, this was the case for between 14% and 34% of respondents.

The results for the full list of statements asked of Phase 3 respondents are shown below:

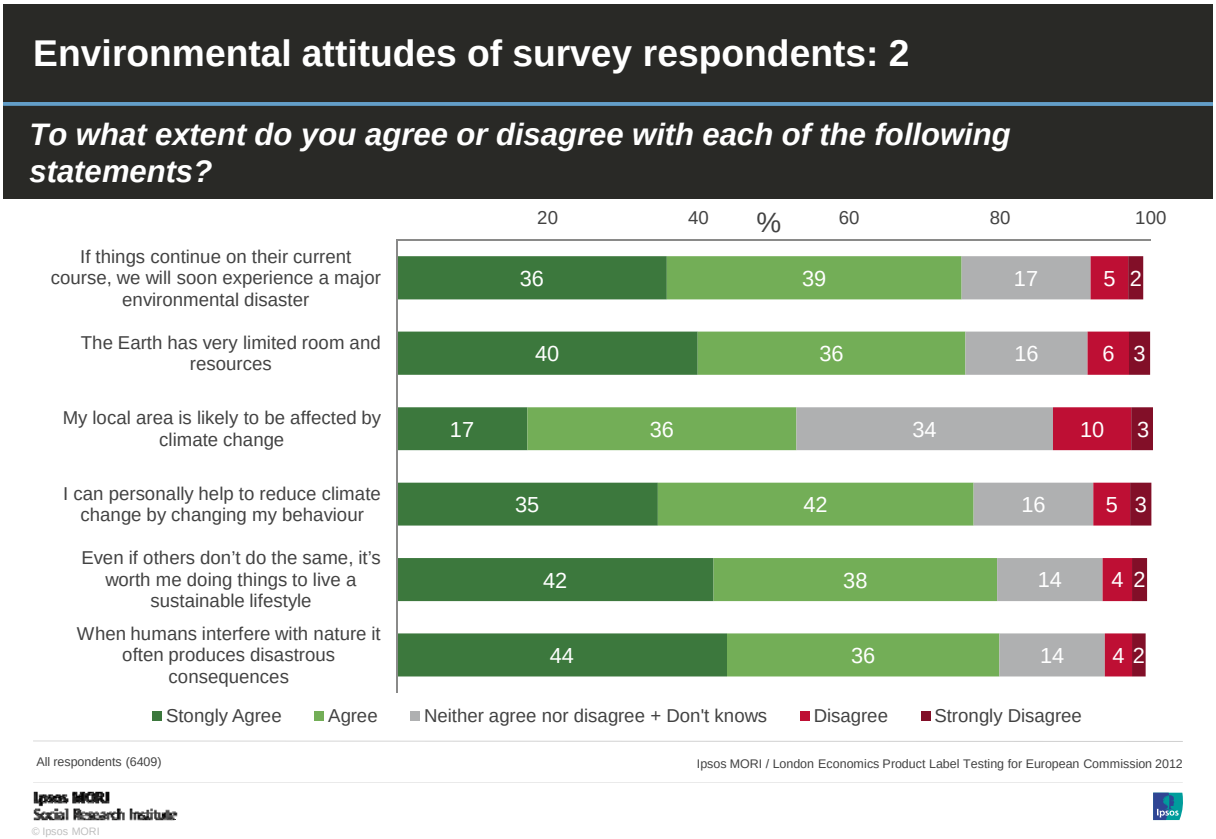


Figure 37: Environmental attitudes of survey respondents: 2

5.6.3 Relationship between environmental attitudes and bids and product choices

In order to study the extent that attitudes towards the environment drive the findings of the two experiments, each respondent was graded on an environmental index based on their responses to the survey questions presented above. The index is a score between 1 and 5, where respondents who scored 1 are the most environmentally conscious and respondents who scored 5 are the least environmentally conscious.

Using the bidding experiment data, the existence of a relationship between scores on the index and bids for environmentally friendly products was tested by regressing bid values on an interaction term between the *Good product* variable and the index. The results are presented in Table 33.

For washing machines (carrying either type of label), the negative coefficients on both the index and the interaction term show that respondents who were more environmentally conscious submitted higher bids for *both* good and bad products (this was also true for televisions carrying the proposed Energy and Environmental Label).

In addition, it is also observed that the difference between bids submitted for “good” and “bad” televisions (carrying either label) is increasing in the environmental consciousness of the respondent. This can be seen by looking at the interaction term ‘Environmental Index*Good product’ which is negative and significant, implying that the difference in bids for “good” and “bad” products varies significantly depending on the environmental index of a respondent.

For example, an increase in the environmental index by one unit (where higher units are associated with lower environmental consciousness) was associated with a decrease of €1.96 in the difference between bids for “good” and “bad” televisions carrying the proposed Energy and Carbon Footprint Label.

In conclusion, respondents who are more environmentally conscious were more likely to submit a higher bid for a “good” television and a lower bid for a “bad” television. For all other products, however, no such pattern emerged.

Table 33: Regression Results: Effect of environmental conscience on bids for products carrying either the Energy and Carbon Footprint Label or the Energy and Environmental Label (all respondents)

	Proposed Energy and Carbon Footprint Label			Proposed Energy and Environmental Label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
“Good” product	7.97***	7.52***	-0.75	4.16**	7.00***	-1.08
Environmental Index	-0.32	0.75	-0.20	-1.10*	-0.06	0.31
Environmental Index * Good	-1.45	-1.96**	0.32	-0.53	-1.87***	0.40
Constant	416.97***	410.48***	4.53***	418.89***	412.81***	3.36***
Observations	6,643	6,700	6,274	10,459	10,520	9,895

Note: Outliers more than three standard deviations from the mean have been excluded. *** p<0.01, ** p<0.05, * p<0.1.

The choice experiment data was also analysed to establish whether more environmentally conscious respondents were more likely to select the “better" product.

This was the case for washing machines that carried the proposed Energy and Environmental Label in the experiment. Respondents who scored more poorly on the index were less likely to choose the “better” washing machine (Table 34). This effect was very small however (1.7% for a unit change on the environmental index).

However, there is no evidence of this relationship for either televisions or light bulbs. The analysis also reveals there is no relationship between environmental attitudes and the likelihood of choosing the “better” product for products carrying the proposed Energy and Carbon Footprint Label (Table 35).

Table 34: Logistic regression coefficients and marginal effects: Effect of environmental attitude on product choice (Proposed Energy and Environmental Label, all respondents)

Explanatory variable	Washing Machines		Televisions		Light bulbs	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
Price	-0.053***	-0.013***	-0.057***	-0.014***	-0.040***	-0.010***
Environmental Index	-0.070**	-0.017**	0.033	0.008	-0.038	-0.009
Constant	0.697***		0.535***		0.669***	
Observations	8,629	8,629	8,652	8,652	8,633	8,633

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. *** (**, *) implies significant at 10% (5%, 10%).

Table 35: Logistic regression coefficients and marginal effects: Effect of environmental attitude on product choice (Proposed Energy and Carbon Footprint Label, all respondents)

Explanatory variable	Washing Machines		Televisions		Light bulbs	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
Price	-0.061***	-0.015***	-0.063***	-0.015***	-0.052***	-0.013***
Environmental Index	0.002	0.001	-0.041	-0.010	0.031	0.007
Constant	0.835***		0.766***		0.943***	
Observations	4,396	4,396	4,422	4,422	4,378	4,378

Notes: 1. Dependent variable indicates whether the "better" product was chosen (=1 if the better product was chosen). 2. *** (**, *) implies significant at 10% (5%, 10%).

6. Limitations to this research

6. Limitations to this research

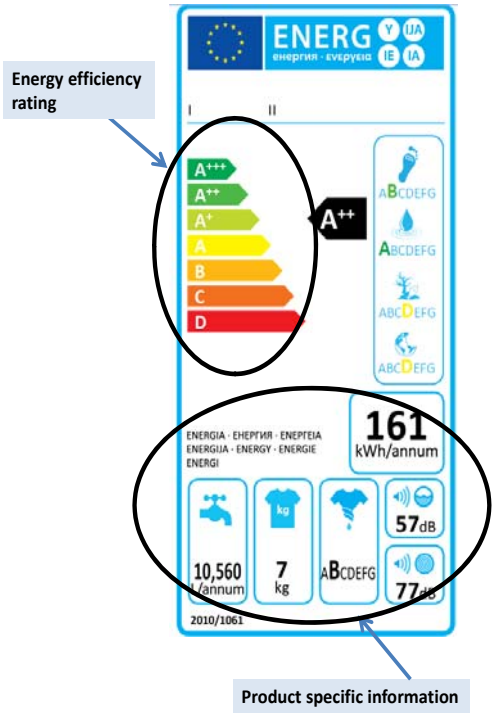
This chapter considers whether there are any limitations to this research study and the extent to which policy makers and industry can have confidence in the results presented in this report.

Key observations

The benefit of all controlled experiments is that they isolate the effect of individual drivers of behaviour. In this study, the effect of different labels and different ratings on willingness to pay and product choice was isolated. In the field it is not possible to have this level of control as many factors influence consumers' choices and their level of focus on product labels. In the experiment respondents were focused solely on the experiment task. This means that the measured effects in the field may not be of the same magnitude as we observe in the experiment, however there is no reason to believe that the direction of the effects would be different, or that the main policy observations would change.

6.1 Experiment tested identical products

As discussed in Chapter 5, the Phase 3 behavioural experiment demonstrated that the addition of environmental impact symbols on a product label led to greater take-up of the product and willingness to pay more for the product than if presented with the current Energy Label. However, all other aspects of the product label were held constant across the experiment. That is, the energy efficiency rating of the product and the product specific information (e.g. noise, spin speed, capacity, battery life) were held constant.



These elements of the label were held constant to the focus of the experiment was on the impact of introducing *additional* environmental performance information to the current Energy Label.[82]

The behavioural experiment did of course make the environmental label compete against price which is known to be a key determinant of product choice, but in reality, the environmental label would also have to compete with many other product features. The Phase 2 qualitative discussion groups highlighted a range of product characteristics which were considered by these consumers when making a purchase decision.

The Phase 2 respondents weighed up a wide range of factors when choosing between different products. They were specifically asked to consider washing machines, light bulbs and smart phones[83]. These factors are listed below broadly in order of priority, although there was some variation between markets.

For washing machines, the key product features considered were:

- Price
- Size / weight
- Functionality (efficiency + speed of wash + spin cycle) / settings / interface)
- Brand
- Aesthetics / design
- Noise
- **Energy efficiency**
- Longevity / build quality

For smart phones, the key product features considered were:

- Brand / style / design
- Internet / Email

[82] This was also a pragmatic choice to allow us to implement the experiment within the time-limit for the online experiment and survey.

[83] The decision to test product labels for televisions rather than smart phones was made after Phase 2.

- Battery life
- Apps (number / type available)
- Usability / quality of technical design
- Media functions / camera
- Size
- Call quality

For light bulbs, the key product features considered were:

- Time it takes to deliver full brightness / quality of light
- Price
- Longevity
- Wattage
- Kitemark *(mentioned by respondents in Great Britain only)*
- Socket type

These lists demonstrate the challenge for environmental information to cut through to consumers. It is important to note that across all markets energy efficiency was only spontaneously mentioned as a factor which these consumers considered when they purchased a washing machine.

In the UK and Italy, energy efficiency was generally noted by participants as a factor that was 'nice to have' but non-essential. In the UK, this was especially true of younger respondents.

Those participants who did consider the energy consumption of washing machines admitted this was more due to the "*impact on your wallet*" rather than the impact on the environment. In Italy particularly there was an awareness that "*the price of energy is increasing every day…in the past I didn't take it into consideration, but now I check the energy consumption.*" For white goods like washing machines, there was agreement with one participant's view that, "*the more you use them [washing machine] the more important energy efficiency becomes*".

In Poland, energy efficiency was of greater importance. All respondents wanted an A-rated machine "*with as many pluses as possible*". Participants in Poland said they were prepared to pay more for a machine with high energy efficiency as they believed it would save money in the long run: "*in time one uses less energy and water, and makes up for that money*" (45-64 year olds).

The Phase 2 participants were asked what other elements of a product's environmental performance affected their purchase decision-making. On the whole it was clear that Phase 2 participants across all markets rarely considered any other environmental issues in relation to household products.

In Italy, more than Poland and the UK, water consumption was considered an important factor. This may reflect recent communication by manufacturers about appliances which consume less water. As one respondent stated, "*I don't want to waste water*..."

Across all markets, the environmental performance of smart phones and light bulbs were not considered at all in the purchasing decision.

Evidence collected during the Phase 3 survey also backs up the argument that considering the behavioural experiment results alone may overestimate the impact of the environmental label.

The chart below shows how Phase 3 respondents overall, across all markets, viewed the two alternate sets of symbols which appear on the new EU environmental label.

The symbols in Group A relate to issues around the environmental impact of the product (carbon footprint etc), whereas those in Group B convey attributes of the product which have a direct personal impact for the consumer (e.g. size, noise, capacity, water consumption per use). The symbols in Group B were the product characteristics held constant during the behavioural experiment.

A third (33%) of respondents saw the symbols in Group B as being more useful to them when choosing which product to buy. Only 16% felt the symbols in Group A were most useful. 34% felt both sets of symbols would be equally useful.

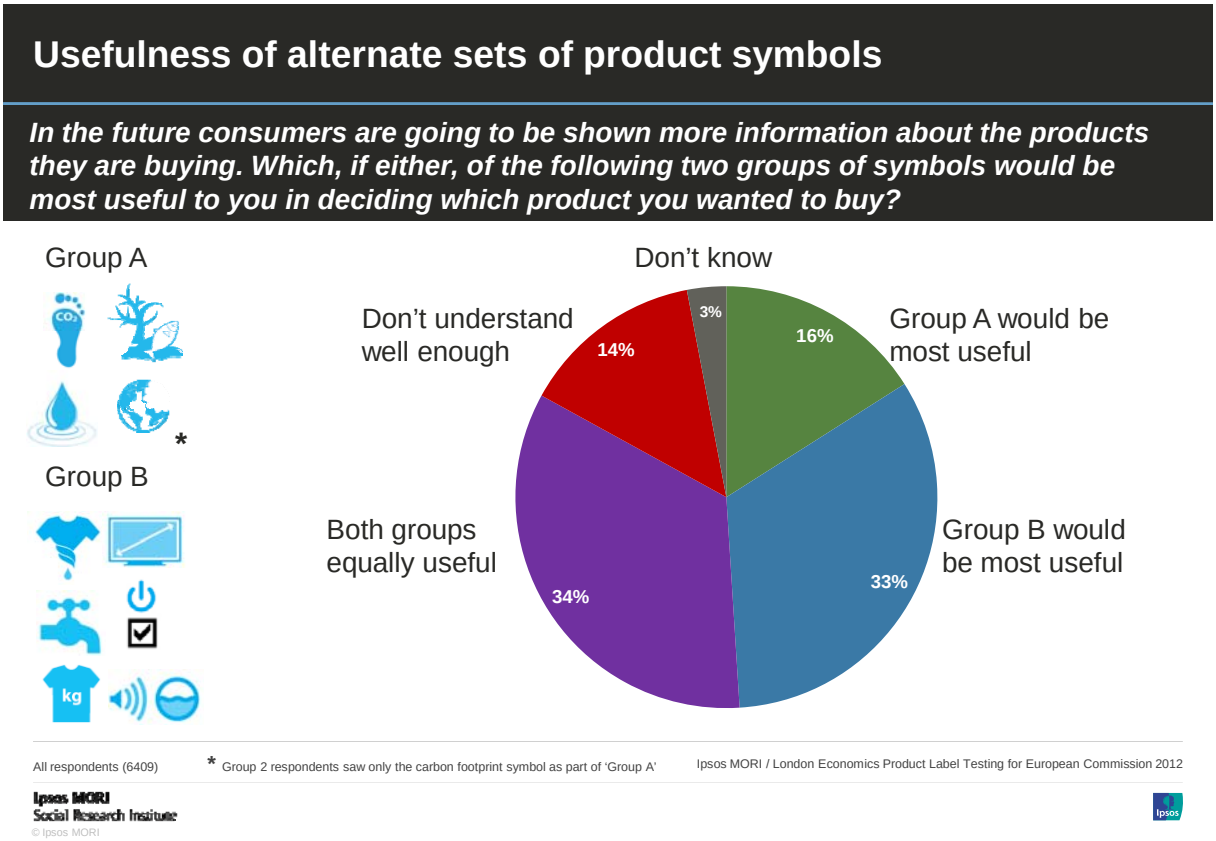


Figure 38: Usefulness of alternate sets of product symbols

The Phase 3 survey identified that older respondents (aged 55+) would be most likely to look at the Group B symbols before the Group A symbols. The chart below shows the stated preference respondents of different ages gave between the environmental symbols included in Group A and the product specific characteristics included in Group B.

Older respondents (aged 54+) were the most likely to say the Group B symbols would be most useful to them when choosing between product options. Older respondents (aged 54 +) were also the most likely to say that they did not understand the symbols well enough to make a decision between the two groups.

The youngest group of respondents (aged 17-24) were the most likely to say that both groups of symbols would be equally useful to them in making product purchasing decision.

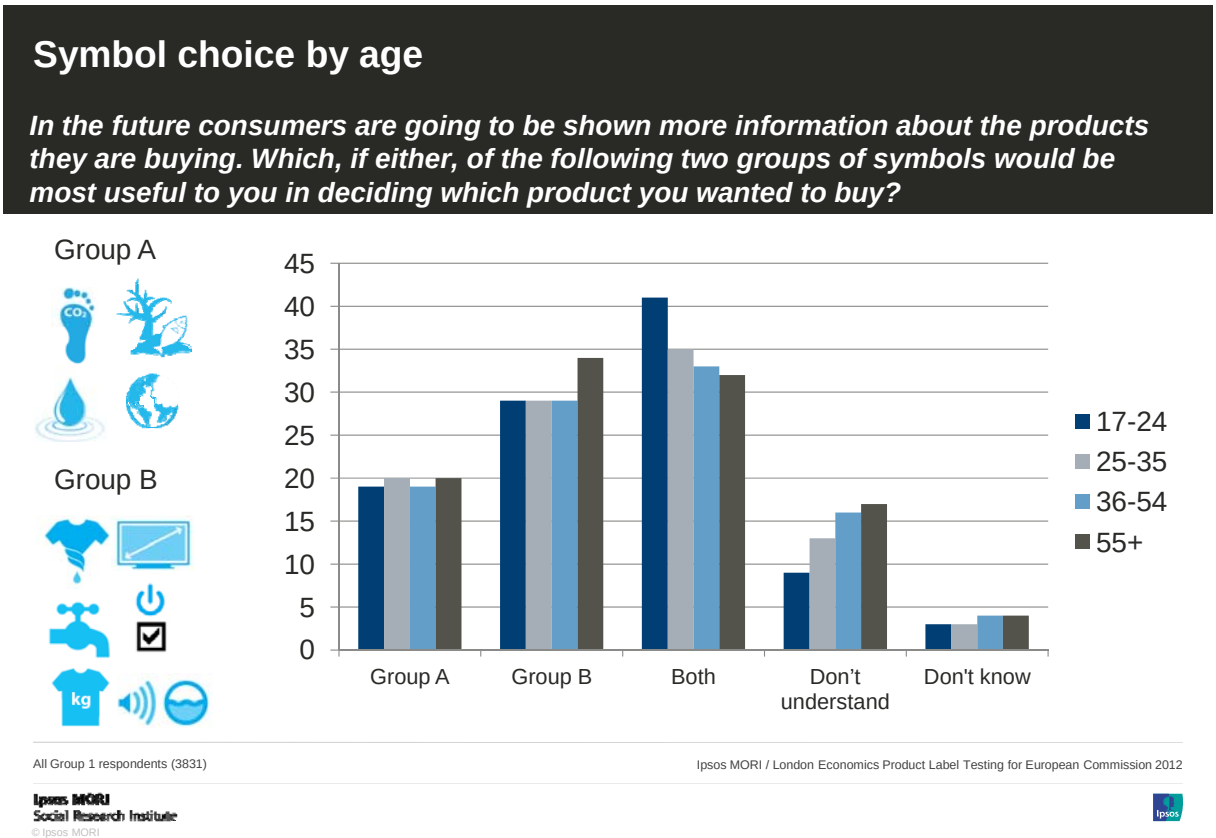


Figure 39: Symbol choice by age

The Phase 2 participants were also shown mock-up labels containing both groups of symbols. The product specific information displayed at the bottom of the label (Group B above) was felt to be most important by the majority of participants.

> "*The bottom symbols are good, but the rest [of the phone label] is irrelevant. I go to buy phone, the rest of the information is not important, it [environmental impacts] won't change my decision*". [Phase 2 participant in Great Britain]

> "*I am more interested in what the product does for me than what it does for the environment*." [Phase 2 participant in Poland]

In Great Britain, only one Phase 2 participant believed the environmental performance symbols were important.

"*We need to be more aware of materials used, the waste. It is better to have all the symbols as it gives you more choice to compare*."

[Phase 2 participant in Great Britain]

The Phase 2 participants in Italy were more favourable towards receiving environmental product information however. Many of these participants felt that all four of the environmental impact symbols were useful to consider when purchasing a product. However, there was an acknowledgement that these consumers were not looking for this at the moment, and would need a change of attitudes to consider this important in relation to other product characteristics. The inclusion of these symbols on product labels was considered by these participants as a good first step to initiating this change in awareness and attitudes.

In Poland, there was a desire to have "*one summary symbol made for all four current symbols.*" In Great Britain and Italy also there was also a preference towards just one environmental impact symbol.

Appendices

Appendices

Appendix 1 – Phase 1

Appendix 1.1

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Appendix 1.3

- **1.3** Review of consumer awareness and understanding of energy, carbon and eco-labels for energy using and energy related products
  - **1.3.1** Review of four commonly used product labels
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Appendix 2 – Phase 2

- **2.1** Phase 2: Qualitative research with consumers discussion guide

Appendix 3 - Phase 3

Appendix 4 – Phase 3

Appendix 1: Phase 1

Appendix 1.1 Long list of methodologies

1.1.1 Long list of identified water footprinting methodologies

Name		Short description
Alliance for water Stewardship Standard Developed by Alliance for Water Stewardship (AWS) In development	Global	AWS seeks to establish a voluntary certification program for water users based on: • A robust international standard, with a focus on the impacts of direct and indirect water use at the site and watershed level. • Verification to determine performance against standards and risk mitigation. • A global brand that allows managers, users and organizations to demonstrate compliance with, or support for, water stewardship. • • Training and education. AWS aims to establish a credible global water stewardship program that recognizes and rewards responsible water users, by improving impacts and verifying the mitigation of both site level and shared water risk.
BP X 30-323 Environmental footprint Developed by ADEME (French ministry of the Environment) released in 2009	France	BPX 30-323 has been developed as part of a French law "Le Grenelle 1" and lays the framework and general methodology for French environmental product labelling. The methodology has been developed as an environmental footprint one, and covers carbon impact, water, resource depletion and human toxicity. Beyond requiring an environmental footprint for each product category, BPX 30-323 provides general guidelines for product-specific communication and is in line with ISO 14040/44. France conducted a nationwide pilot starting in July 2011. Participating companies had to agree to be involved for a minimum of 12 months. The pilot covers the quantification of environmental impacts and the communication of environmental footprints to the consumer. In parallel, ADEME has initiated the development of a public database to provide generic data that will enable the calculation of these indicators. BPX 30-323 was developed with over 300 organisations representing all the various relevant stakeholders, sectors, and NGOs gathered in the ADEME (Agency for Environment and Energy Management) / AFNOR (French Association of Normalization) platform. As BPX 30-323 is in line with ISO 14040 and ISO 14044 it can evolve following international or European community normative evolution. BPX 30-323 gives general principles for the environmental communication of products. The environmental communication includes limited indicators (a maximum of three can be displayed on the product) and specific to a category of product. These indicators take into account the main relevant

Name		Short description
		impacts generated by the product. The leading objective is the development of multicriteria environmental performance data (carbon + other impacts) for products that can be used to assist consumers in their purchasing decisions. So the methodology: • must allow comparisons between products from the same category (or between products from different categories if relevant), in the same purchasing place or in different purchasing places; • must lead to a standardization of labelling practices with two objectives: cost and consideration of scientific knowledge; and, • must include at least CO2 and other relevant impacts. The objective includes the development of product category rules besides the general guidelines. All consumer products (goods and services) are targeted.
European Water Stewardship Standard Developed by the European Water Stewardship Released 2011	Global	Aims to change the behaviour of all water users towards sustainable water management, by establishing the integrative system for business and agriculture to assess, verify and communicate sustainable water management practices. EWS defines a system of clear steps towards sustainable water management at operational and river basin levels. It is in line with the EU's comprehensive set of regulations to achieve Resource Efficiency, including the Water Framework Directive. The EWS includes a standard, a certification and communication scheme. it has been shaped within the project "Communication of Sustainable Water Management" of the European Water Stewardship program in order to: • Define Sustainable Water Management principles and criteria in a comprehensive and concrete manner. • Provide guidance to European water users on how to become a good water steward. • Create the basis for an objective reporting, certification and communication scheme for water stewardship. • Initiate and support the discussion within Europe and within the global Water Stewardship movement. The EWS standard aims to be applicable to a broad range of water users and industries that may affect the availability and quality of water while still respecting the complexity of impacts linked to water use, and therefore: • Comprises environmental, social and economic aspects. • Is valid on global scale but based on local assessment with focus on Europe. • Is valid across sectors. The EWS consists of a standard, an inspection and certification scheme, and communication guidelines. The standard includes: • Four principles, which outline the overarching aims of the standard and associated criteria. • Criteria are further divided into indicators, which are used to evaluate compliance with the principles and criteria.

Name		Short description
		• Indicators are classified as major indicator, minor indicator or recommendation. http://www.ewp.eu/activities/water-stewardship
Global Water Tool Developed by the World Business Council on Sustainable Development, released in 2007	Global	This is a web-based software tool designed for companies with global operations and extended supply chains to assess their water use and risks associated with water availability. It also contains the UN's water availability predictions for 2025, enabling users to assess both current and future risks. WBCSD also recently launched the Fairwater Initiative to promote responsible water management in the private sector. It aims to enable businesses to: • Engage with stakeholders on water issues, • Collaborate with a wide range of similarly-focused initiatives, • Better understand the complexities of water concerns • Reduce duplication of work in the private sector. The initiative is currently developing an evolving "Fairwater Framework" which will first serve to map out existing related initiatives and eventually define best practice in water stewardship through three dimensions: 1) Process of Stewardship, 2) Methodology of Measurement, and 3) Concepts & Principles. The tool is composed of: • An Excel workbook. • An online mapping system plotting site locations with external water, sanitation, population and biodiversity datasets. • Spatial viewing via Google Earth interface. The tool generates automatic outputs including: • GRI, CDP Water, DJSI and Bloomberg water related indicators. • Inventories, risk and performance metrics charts and maps combining company • sites' location with country and/or watershed data. • The tool establishes relative water risks in a global company's portfolio, in order to prioritize action. Two sector customizations are also available: • Global Water Tool for Power Utilities • Global Water Tool for Oil & Gas (led by IPIECA)
ILCD - International Reference Life Cycle Data System	Global	The International Reference Life Cycle Data System (ILCD) has been established to help ensure consistent and reproducible life cycle data and robust impact assessments. This system consists primarily of the ILCD Handbook and the ILCD Data Network. It provides a series of technical guidance documents developed through peer review and consultation and is in line with the ISO 14040 and 14044. The ILCD Handbook provides detailed provisions for product (situation A and situation B) and corporate analysis (situation C). It is linked to established National LCA Database projects in all

Name		Short description
		parts of the world, and with the World Business Council for Sustainable Development (WBCSD) and the United Nations Environment Programme (UNEP).
Life Cycle Initiative - Water Use Assessment within Life Cycle Assessment Developed by the UNEP and the Society for Environmental Toxicology and Chemistry (SETAC)	Global	The initiative aims to provide industrials with a coherent framework within which to measure and compare the environmental performance of products and operations regarding freshwater use, and related environmental consequences. Developed by a Working Group under the auspices of the United Nations Environment Program (UNEP), and the Society for Environmental Toxicology and Chemistry (SETAC)'s Life Cycle Initiative, which is a partnership enabling users to put life cycle thinking into effective practice. The Life Cycle Initiative's long term deliverables are focused on: • Integrating indicators within the ISO I4040 standardized Life Cycle Assessment (LCA) framework that already provides a standardized carbon footprinting methodology. • Developing indicators that measure the environmental impacts on human health, ecosystems and freshwater resources generated by freshwater use and depletion. • Developing a multi-criteria assessment scheme within the LCA framework that allows industrials to benchmark the performances of products, processes and services on freshwater resources, human health and biodiversity protection. • Training modules for SMEs and developing countries. • • Strategies for communication of life cycle information to relevant stakeholders.
Life+ Water and Energy Developed by the UK Energy Saving Trust	UK	Project to raise consumer awareness of energy impacts of water use in the home. Investigated how key messaging could be communicated to consumers to understand combined energy and water efficiency. Concluded they could be successfully introduced in customer engagement and marketing.
National Geographic Water Footprinter	US	Tool to inform consumers how much water they use per household. Categories: appliances, garden, food, transport. Inconsistency of methodology applied to categories. Indirect water use included in some product categories. Generic tool to provide approximate information for consumers.
Product Environmental Footprint, European Commission	Global	The Commission's JRC IES and other European Commission services have developed a harmonised methodology for the calculation of the environmental footprint of products (including carbon footprint), this is still at the draft stage, but is out for stakeholder consultation. The purpose of the environmental footprint method is to group and aggregate the collected inventory data (Resource Use and Emissions Profile) according to the respective contributions to impact categories. This subsequently provides the necessary basis for interpretation of the footprint results relative to the goals of the footprint study. The methodology has been developed building on the

Name		Short description
		International Reference Life Cycle Data System (ILCD) Handbook as well as other existing methodological standards and guidance documents (ISO 14040-44, PAS 2050, BP X30, WRI/WBCSD GHG protocol, Sustainability Consortium, ISO 14025, Ecological Footprint, etc). The technical guide developed by JRC IES is tested using a limited number of pilot studies (10) representative of a wide variety of goods and services including: agriculture, retail, construction, chemicals, ICT, food, manufacturing (footwear, televisions, paper).
Sustainability Consortium Developed by a consortium led by Wal-Mart http://www.sustainabilityconsortium.org/open-io/	Global	The Sustainability Consortium is a project originally launched by a group of consumer goods companies, including Wal-Mart, with the objective of establishing a scientifically grounded system for characterizing the environmental and social impacts associated with the production of consumer goods. Wal-Mart initiated the project with its own suppliers but the objective is to create a global framework. Thus, a consortium has been created and is administered by Arizona State University and the University of Arkansas. It is a voluntary and private standard development with the support of: • 60 companies (including 6 retailers plus L'Oréal, BASF, HP, Dell, Unilever, KPMG, Intel, 3M, Toshiba) • NGO: WWF, BSR, and GS1 The consortium's method assesses suppliers on 4 subjects: • Energy and Climate • Natural resources (including water) • Material efficiency • People and Community It is a first attempt to assess supplier engagement on sustainability. The sustainability consortium goal is to "develop transparent methodologies, tools and strategies to drive a new generation of products and supply networks that address environmental, social and economic imperatives."
The CEO Water Mandate - Corporate tool Developed by the UN Global Compact	Global	The CEO Water Mandate, was established by the UN Global Compact in 2007. The Mandate represents both a call-to-action and a strategic framework for responsible water management by business. It is voluntary in nature, but is built around six core areas of responsibility with which its endorsers must commit to and demonstrate improvement: Direct Operations, Supply Chain and Watershed Management, Collective Action, Public Policy, Community Engagement, and Transparency. The initiative serves as a platform to collect and share experiences with regard to the six elements, with the ultimate aim of advancing best practice in the field. The Mandate is currently developing a Transparency Framework that will provide endorsers with a compilation and analysis of innovative practice and common approaches for reporting on water management and performance. With membership limited to

Name		Short description
		UN Global Compact members, the Mandate now features close to 50 endorsers with sector- and geographic diversity, including companies such as Coca-Cola, Dow Chemical, Levi Strauss, Nestlé, PepsiCo, Royal Dutch Shell and Unilever. "Corporate water stewardship is both good business and critical for the well-being of communities, ecosystems, and watersheds. Stewardship helps companies identify and manage water-related business risks and allows them to contribute to and help enable more sustainable management of shared freshwater resources. Stewardship also reduces operational costs; protects the company from ensuing water stress; and improves the company's image in the eyes of consumers, investors, and nearby communities."
The water footprint assessment manual: Developed by The Water Footprint Network	Global	System of water footprinting accounting - globally recognised. • Individual footprint • Product footprinting • National footprinting The methodology is based on blue, green and grey water use and direct and indirect impacts. • Provides a comprehensive set of methods for water footprint assessment. • Shows how water footprints can be calculated for individual processes and products, as well as for consumers, nations and businesses. • Contains detailed, worked examples of how to calculate green, blue and grey water footprints. • Describes how to assess the sustainability of the aggregated water footprint within a river basin, or the water footprint of a specific product. • Includes an extensive library of possible measures that can contribute to water footprint reduction. The WaterStat Database including: • Product water footprint statistics • National water footprint statistics. • International virtual water flows statistics. • Water scarcity statistics. Water Footprint Assessment Tool (to be released mid-2012): • Facilitates Water Footprint Assessment. • Provides easy access to WaterStat Database. • Produces maps, graphs, output tables and reports.
Water Footprint Index ISO 14046 Developed by the International Standard Organisation		Preliminary Work Item, ISO 14046, *Water footprint – Requirements and guidelines,* being developed to complement existing LCA standards and work on carbon footprint metrics by ISO technical committee ISO/TC 207. It will take into account the ISO 14064 on the accounting and verification of greenhouse gases
Water Impact Index Developed by Veolia Environment Research &	global	The Water Impact Index was the first indicator to integrate in one single metric all the key water aspects, namely water volume, as well as the level of water stress and the quality of water withdrawn and discharged. It measures the impact of activities on a local water resource. The online application allows assessing two equivalent technical

Name		Short description
Innovation		solutions. It also enables identification of water hotspots in the value chain and can provide information on the main environmental improvement leverages. The tool is designed for those with some degree of operational understanding of water and wastewater systems, and requires an understanding of a variety of factors including water chemistry and the energy-water nexus. It can be used to analyse both municipal and industrial systems. The results of the calculation can be used in conjunction with a traditional cost analysis to determine the best ROI in terms of areas in which impact on local water resources can be minimized – and may lead to cost savings. growingblue.com/footprint-tools/water-impact-index/

1.1.2 Long list of resource depletion methodologies

Name		Short Description
BRE Environmental Profiles	UK	The Environmental Profiles Methodology is a standardised method developed by BRE. This is a method of identifying and assessing the 'cradle to grave' environmental profile of specific manufacturers' building materials, products or systems. Environmental Profiles measure environmental performance throughout a product's life in manufacturing, building use and demolition. This methodology is using a lifecycle approach to quantify environmental impacts. http://www.bre.co.uk/greenguide/page.jsp?id=2106

Name		Short Description
French Environmental Footprint (BPX 30-323)	France	BPX 30-323 has been developed as part of a French law "Le Grenelle 1" and lays the framework and general methodology for French environmental product labelling. The methodology has been developed as an environmental footprint one, and covers carbon impact, water, resources depletion and human toxicity. Beyond requiring an environmental footprint for each product category, BPX 30-323 provides general guidelines for product-specific communication and is in line with ISO 14040/44. France conducted a nationwide pilot that started in July 2011, participating companies had to agree to be involved for a minimum of 12 months. The pilot covers the quantification of environmental impacts and the communication of environmental footprints to the consumer. In parallel, ADEME has initiated the development of a public database to provide generic data that will enable the calculation of these indicators. BPX 30-323 was developed with over 300 organisations representing all the various relevant stakeholders, sectors, and NGOs gathered in the ADEME (Agency for Environment and Energy Management) / AFNOR (French Association of Normalization) platform. As BPX 30-323 is in line with ISO 14040 and ISO 14044 it can evolve following international or European community normative evolution. BPX 30-323 gives general principles for the environmental communication of products. The environmental communication includes indicators limited (a maximum of three can be displayed on the product) and specific to a category of product. These indicators take into account the main relevant impacts generated by the product. The leading objective is the development of multicriteria environmental performance data (carbon + other impacts) for products that can be used to consumers in their purchasing decisions. So the methodology: • must allow comparisons between products from the same category (or between products from different categories if relevant), in the same purchasing place or in different purchasing places; • must lead to a standardization of labelling practices with two objectives: cost and consideration of scientific knowledge; and, • must include at least CO2 and other relevant impacts. The objective includes the development of product category rules besides the general guidelines. All consumer products (goods and services) are targeted.

Name		Short Description
ILCD: International Reference Life Cycle Data System This is a tool rather than a methodology	Global	The International Reference Life Cycle Data System (ILCD) has been established to help ensure consistent and reproducible life cycle data and robust impact assessments. This system consists primarily of the ILCD Handbook and the ILCD Data Network. It provides a series of technical guidance documents developed through peer review and consultation and is in line with the ISO 14040 and 14044. The ILCD Handbook provides detailed provisions for product (situation A and situation B) and corporate analysis (situation C). It is linked to established National LCA Database projects in all parts of the world, and with the World Business Council for Sustainable Development (WBCSD) and the United Nations Environment Programme (UNEP).
Kyocera - Environmental Assessment in Product Development	Japan	Kyocera Group strives for all of its products to be "Kyocera Environmentally Friendly Products". Kyocera launched and applied the "Environmental Consciousness Evaluation System" at all divisions and research groups in order to facilitate the manufacture of Environmentally Friendly products. For new products and technologies, this system is designed to evaluate in three steps: planning, prototype creation, and mass production. Products that meet the internal criteria at the final stage will be certified as "Kyocera Environmentally Friendly Products." Therefore, we have established and operate an internal system and certification program for supplying top class, environmentally friendly products with a focus on environmental consciousness that begins at the R&D stage.
O2 Eco-Rating Developed by O2 mobile operator	UK	O2 invested in this project so as to develop a simple and transparent rating system that evaluates the sustainability credentials of mobile phone handsets and rewards innovation by implementing an Eco rating. The ultimate goal of this work is to enable O2's customers to evaluate phones' sustainability credentials along with their other features. It expects that consumers' interest in this aspect of their mobile phones will in turn encourage manufacturers to take a leadership role in driving forward sustainability. The ratings are established based on a questionnaire that has been developed by O2 and that suppliers need to fill. The areas in which handset manufacturers answer questions are: • Policy, • Management systems, • Supply chain requirements, • Supplier management, • Communications, • Social inclusion and community, • Climate change and energy, • Resource use • handset obsolescence and waste kit, • External recognition.

Name		Short Description
Philips Green logo Developed by Philips	Worldwide	Across our product range, we are driving sustainability in all aspects of product creation through our EcoDesign process. Introduced in 1994, our EcoDesign procedures deal with all phases of product development.
Product Environmental Footprint, Developed by the European Commission	Europe	The Commission's JRC IES and other European Commission services have developed a harmonised methodology for the calculation of the environmental footprint of products (including carbon footprint), this is still at the draft stage, but is out for stakeholder consultation. The purpose of environmental footprint impact assessment is to group and aggregate the collected inventory data (Resource Use and Emissions Profile) according to the respective contributions to impact category. This subsequently provides the necessary basis for interpretation of the footprint results relative to the goals of the footprint study. The methodology has been developed building on the International Reference Life Cycle Data System (ILCD) Handbook as well as other existing methodological standards and guidance documents (ISO 14040-44, PAS 2050, BP X30, WRI/WBCSD GHG protocol, Sustainability Consortium, ISO 14025, Ecological Footprint, etc). The technical guide developed by JRC IES is tested using a limited number of pilot studies (10) representative of a wide variety of goods and services including: agriculture, retail, construction, chemicals, ICT, food, manufacturing (footwear, televisions, paper). The current draft document also provides guidance on how to create product category-specific methodological requirements for use in Product Environmental Footprint Category Rules (PFCRs).
Vodafone Eco rating of handset		The score is based on answers to 162 questions about the environmental and social impacts of the mobile phone. These cover: • The impacts of the phone throughout its life, from mining of raw materials to produce components, to production of the phone by manufacturers, use by consumers and disposal when the phone comes to the end of its life. • How committed the manufacturer is to managing its own environmental and social impacts. Vodafone plans to make these questions more difficult over time to encourage manufacturers to design phones that are better for the environment and society. The Eco-rating was launched in the Netherlands in 2011 and will be introduced to other European markets in 2012.

Name		Short Description
Sustainability consortium Developed by Wal-Mart	USA	The Sustainability Consortium is a project originally launched by a group of consumer goods companies, including Wal-Mart, with the objective of establishing a scientifically grounded system for characterizing the environmental and social impacts associated with the production of consumer goods. Wal-Mart initiated the project with its own suppliers but the objective is to create a global framework. Thus, a consortium has been created and is administered by Arizona State University and the University of Arkansas. It is a voluntary and private standard development with the support of: • 60 companies (including 6 retailers plus L'Oréal, BASF, HP, Dell, Unilever, KPMG, Intel, 3M, Toshiba) • NGO: WWF, BSR, and GS1 The consortium's method assesses suppliers on 4 subjects: • Energy and Climate • Natural resources (including water) • Material efficiency • People and Community It is a first attempt to assess supplier engagement on sustainability. The sustainability consortium goal is to "develop transparent methodologies, tools and strategies to drive a new generation of products and supply networks that address environmental, social and economic imperatives."

Appendix 1.2 – Methodologies Review

1.2.1 Review of selected carbon footprint methodologies

Name of methodology		**ISO 14067: carbon footprint of product**
Country		Global
general description		International Standard that specifies principles and requirements for studies to quantify the carbon footprint of a product, based on life cycle analysis specified in ISO 14040 and ISO 14044. It is used to calculate the greenhouse gas emissions from companies and their activities. Requirements and guidance for the assessment of a partial carbon footprint (partial CF) are also provided.
Indicators	**CO2**	✓
	Water	
	Res Depletion	
	Water Eco-Tox	
Life cycle thinking		Yes
Applicability		Any goods or services
Reliability & robustness		Methodology developed by the International Standard Organisation and will become the global reference methodology for completing a carbon footprint.
Data sources		Primary data shall be collected for all individual processes under the financial or operational control of the organization undertaking the study, and shall be representative of the processes for which they are collected. Secondary process data shall be used for inputs where the collection of primary process data is not possible or practicable, and may include literature data, calculated data, estimates or other representative data. The data for inclusion in the inventory shall be collected for each unit process that is included within the system boundary. When data have been collected from public sources, the source shall be referenced. For those data that may be significant for the conclusions of the study, details about the relevant data collection process, the time when data have been collected, and further information about data quality indicators shall be referenced.
Maturity		Standard yet to be published – expected early 2013
Credibility		developed by ISO, with the involvement of stakeholders from 40 nations worldwide and a consultation process
How is it communicated		Communication of CFP may take the form of a self-declared environmental claim according to ISO 14021 or of an environmental product declaration according to ISO 14025. Another form of carbon footprint communication is performance tracking. "When an organization discloses information on the CFP to consumers it shall disclose the absolute emission levels of the product and information as described in ISO 14067-1, clause 7, explaining how these emissions were assessed e.g. on a homepage. "Thus, the final figure of carbon footprint is not designed to be displayed alone. The standard addresses type II and type III environmental declaration. ISO 14067 carbon labels are used for B2C and B2B communication, and requirements will depend on the type of communication made: self-declared environmental claim according to ISO 14021, environmental product declaration according to ISO 14025.
Name of methodology		**The International Reference Life Cycle Data System (ILCD) Handbook**
Country		Global
general description		The ILCD Handbook was developed by the European Commission's Joint Research Centre.

		It was established to help ensure consistent and reproducible life cycle data and robust impact assessments. This is a tool rather than a methodology in itself, it provides guidelines and a framework to establish the environmental impact of a product (or service). The handbook provides the detailed guidance on how to complete product analysis i.e. comparing Situation A, B and C.
In		**CO2**
Lif	**Water**	✓
	Res Depletion	✓
	Water Eco-Tox	✓
	Yes	✓
Applicability		Any goods or services
Reliability & robustness		Recognised globally
Data sources		It is linked to established National LCA Database projects in all parts of the world, and with the World Business Council for Sustainable Development (WBCSD) and the United Nations Environment Programme (UNEP).
Maturity		Released 2010
Credibility		Developed by the European Commission, and working closely with the WBCSD, the UNEP and several national governments on data management.
How is it communicated		In report format and data base (where required)
Name of methodology		**Greenhouse Gas Protocol Standard, (WRI/WBCSD),**
Country		Global
general description		The GHG Protocol Corporate Standard provides standards and guidance for companies and other types of organizations preparing a GHG emissions inventory. It covers the accounting and reporting of the six greenhouse gases covered by the Kyoto Protocol—carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF6). this methodology does not provide specific information on product CF calculations
In		**CO2**
Lif	**Water**	✓
	Res Depletion	
	Water Eco-Tox	
	Yes	

Applicability		Any goods or services
Reliability & robustness		Developed in partnership between WRI and WBCSD, governments and NGOS and a number of large corporations.
Data sources		Primary data should be product/ site specific for the dominant processes, the use of secondary data is possible for all secondary process if necessary. The methodology does not endorse any specific publicly available data base.
Maturity		First release in 2011
Credibility		The standard uses the term of "assurance" in order to be in conformance with the Standard. Internal or external assurance is permissible. The assurance opinion shall be expressed in the form of either reasonable or limited assurance. When reporting a product GHG inventory, the assurance opinion shall also be presented, including or accompanied by a clear statement identifying whether First or Third Party assurance has been obtained. It is possible to assure the entire product GHG inventory or specific parts of it, although the assurance providers should need to satisfy themselves that assurance over a part of a product GHG inventory is meaningful to the user. Assurance providers should assess the suitability of the criteria the standard sets a method for that.
How is it communicated -		The methodology requires that a company shall disclose the GHG inventory in a summary and detailed report. The summary report is aimed at the public, whilst the detailed report is aimed at GHG inventory/ LCA practitioner.

Na	**Product Carbon footprint (PAS 2050)**	
Country		Global
general description		The methodology was developed by the UK carbon Trust. The PAS 2050 specifies requirements for the assessment of the life-cycle GHG emissions associated with the life cycle of goods and services

		("products"), based on life cycle assessment techniques and principles. Requirements are specified for identifying the system boundary, the sources of GHG emissions that fall inside the system boundary, the data requirements for carrying out the analysis, and the calculation of the results. It includes the six GHGs identified under the Kyoto protocol and covers the whole life cycle of products, including the use phase and emissions from direct land-use changes that have taken place over the past 20 years.
In		**CO2**
Lif	**Water**	✓
	Res Depletion	
	Water Eco-Tox	
	Yes	
Applicability		Any goods or services
Reliability & robustness		Developed by the UK Carbon Trust in consultation with the UK Government, industry stakeholders and academia. The methodology is owned by the British Standard Association.
Data sources		Primary data has to be collected from those processes owned, operated or controlled by the organization implementing this PAS. The primary activity data requirement shall not apply to downstream emission sources, where the organization implementing the PAS does not contribute 10% or more to the upstream GHG emissions of the product or input prior to its provision to another organization or the end-use. Primary activity data can be collected across the supply chain either by an internal team or by a third party (e.g. consultants). - In some cases, secondary data may be preferable to enable consistency and comparability: global warming potentials, electricity emissions factors from various energy sources, fuel emissions per litre, transport emissions per vehicle type, waste emissions per kg, agriculture emissions from livestock and/or soils. Secondary data will come from the following sources by priority: 1. use of partial GHG assessment information as secondary data (data verified as being compliant with the PAS), 2. peer review publications, 3. competent sources (national government, official UN publications, publications by UN-supported organizations), 4. other sources Specific requirements are stated to increase the data quality
Maturity		This is the most matured methodology of PCF. It has been in used since 2008 and constitutes the base of many other PCF methodologies.
Credibility		Owned by the British Standards Institute and has been applied worldwide to a large number of products.
How is it communicated -		As a label and a single value in CO_2 equivalent

	PAS 2050 does not aim at developing guidelines related to communication. However users can turn to the initiative of the Carbon Trust to write a "Code of Good Practice for Product Greenhouse Gas Emissions and Reduction Claims". A Carbon Reduction Label has been designed by the Carbon Trust Footprinting Company to show the total greenhouse gas emissions. The figure is given as the total CO2 equivalent as is consistent with other recognised GHG reporting. The "Code of Good Practice for Product Greenhouse Gas Emissions and Reduction Claims" defines the standard unit of measurement, the functional unit, the result precision and rounding. Moreover it states that 'claims relating to a product's lifecycle GHG emissions shall be reported as a single figure encompassing the total emissions for the product per functional unit, taking into account of all the phases of the product's life cycle, and assessed in conformity with PAS 2050. Specific guidelines have been established for reduction claims (period of The Code of good practice distinct the communication on product lifecycle GHG emissions and the communication on lifecycle GHG emissions reduction.

Na	**BP X 30-323**	
Country		FRANCE
General description		BPX 30-323 has been developed as part of a French law "Le Grenelle 1" and lays the framework and general methodology for French environmental product labelling. Beyond requiring a carbon footprint for each product category, BPX 30-323 provides general guidelines for product-specific communication and is in line with ISO 14040/44. The methodology can evolve following international or European community normative evolution.
Ξ		**CO2**
Life cycle thinki	**Water**	✓
	Res Depletion	✓
	Water Eco-Tox	✓
	Yes	✓

n g		
Applicability		Any goods or services
Reliability & robustness		Methodologies, product category rules and databases based on work carried out by the AFNOR ADEME platform and ADEME. Publication of General Principles for Environmental Labelling of Mass Consumption Products and its methodological annex (BP X30-323 September 2009) as well as the launch and extension of work on product categories. In parallel with this work by category, ADEME has initiated the construction of a public database (generic LCA data).
Data sources		ADEME is developing a national database as well as implementing sectorial standards
Maturity		launched in 2011, but has been pilot through a national labelling experiment which included 160 different manufacturers and retailers that are testing the methodologies
Credibility		LCA approach (ISO 14040 and ISO 14044) and life cycle thinking
How is it communicated -		A Label which can present separate indicator values or an overall eco score. Guidelines on the use of labels on products state that at least CO_2 impacts have to be shown, additional indictors can be display but recommends that no more than three indicators should be displayed. Further guidelines on communication are expected as part of this methodology which should be in accordance with ISO 142X series of standards.
Na	**Product Environmental Footprint Guide**	
Country		EU
General description		The Product Environmental Footprint is a multi-criteria measure of the environmental performance of a good or service throughout its life cycle. Product Environmental Footprint information is produced for the overarching purpose of seeking to reduce the environmental impacts of goods and services, but can also be used to support comparative assertions. This document provides guidance on how to calculate a Product Environmental Footprint, as well as how to create product category-specific methodological requirements for use in Product Environmental Footprint Category Rules (PFCRs).
Im		**CO2**
Lif	**Water**	✓
	Res Depletion	✓
	Water Eco-Tox	✓

	Yes	✓
Applicability		Any goods or services
Reliability & robustness		Based on a two-step approach. First step is a Screening Step where readily available specific or generic data is used to populate the resource use and emissions profile. The environmental footprint impact assessment method is then applied and finally the environmentally significant processes are determined as a basis for further data collection efforts. Secondly the resource use and emissions profile is completed. Data collected for environmentally significant processes meet the data quality requirements and if necessary additional data should be collected.
Data sources		Ideally, the model of the product supply chain would be constructed using facility or product/service specific data (i.e. modelling the exact life cycle depicting the supply-chain, use, and end-of-life phases as appropriate). In practice, and as a general rule, for directly collected, facility-specific inventory data should be used wherever possible. For processes where the company does not have direct access to specific data, generic data will typically be used. However, it is good practice to attempt to access directly collected data from suppliers where possible, in particular for environmentally significant processes. Generic data is data sourced from third-party life cycle inventory databases, government or industry association reports, statistical databases, peer-reviewed literature, or other sources. All such data shall satisfy the quality requirements specified in the Organisation Environmental Footprint guidance document.
Maturity		Still in development, latest draft released 2012
Credibility		Developed by the European Commission and through expert consultation
How is it communicated -		Report

1.2.2 Review of selected water footprint methodologies

Name of methodology	**BP X 30-323**
Country	France
General description	BPX 30-323 has been developed as part of a French law “Le Grenelle 1“ and lays the framework and general methodology for French environmental product labelling. Beyond requiring a carbon footprint for each product category, BPX 30-323 provides general guidelines for product-specific communication and is in line with ISO 14040/44. The methodology can evolve following international or European community normative evolution.

Indicators	**CO2**	✓
	Water	✓
	Res Depletion	✓
	Water Eco-Tox	✓
Life cycle thinking		yes
Applicability		Any goods or services
Reliability & robustness		Methodologies, product category rules and databases based on work carried out by the AFNOR[84] ADEME[85] platform and ADEME. Publication of General Principles for Environmental Labelling of Mass Consumption Products and its methodological annex (BP X30-323 September 2009) as well as the launch and extension of work on product categories. In parallel with this work by category, ADEME has initiated the construction of a public database (generic LCA data).
Data sources		ADEME is developing a national database as well as implementing sectorial standard
Maturity		launched in 2011, but has been pilot through a national labelling experiment which included 160 different manufacturers and retailers that are testing the methodologies
Credibility		LCA approach (ISO 14040 and ISO 14044) and life cycle thinking
How is it communicated -		A Label which can present separate indicator values or an overall eco score. Guidelines on the use of labels on products state that at least CO_2 impacts have to be shown, additional indictors can be display but recommends that no more than three indicators should be displayed. Further guidelines on communication are expected as part of this methodology which should be in accordance with ISO 142X series of standards.

Name of methodology		**Product Environmental Footprint Guide**
Country		EU
General description		The Product Environmental Footprint is a multi-criteria measure of the environmental performance of a good or service throughout its life cycle. Product Environmental Footprint information is produced for the overarching purpose of seeking to reduce the environmental impacts of goods and services, but can also be used to support comparative assertions. This document provides guidance on how to calculate a Product Environmental Footprint, as well as how to create product category-specific methodological requirements for use in Product Environmental Footprint Category Rules (PFCRs).
Indicators	**CO2**	✓
	Water	✓
	Res Depletion	✓
	Water Eco-Tox	✓
Life cycle thinking		yes
Applicability		Any goods or services

[84] AFNOR – Association Française de normalisation (French Standard Organisation)

[85] ADEME - French Environment and Energy Management Agency

Reliability & robustness	Based on a two-step approach. First step is a Screening Step where readily available specific or generic data is used to populate the resource use and emissions profile. The environmental footprint impact assessment method is then applied and finally the environmentally significant processes are determined as a basis for further data collection efforts. Secondly the resource use and emissions profile is completed. Data collected for environmentally significant processes meet the data quality requirements and if necessary additional data should be collected.
Data sources	Ideally, the model of the product supply chain would be constructed using facility or product/service specific data (i.e. modelling the exact life cycle depicting the supply-chain, use, and end-of-life phases as appropriate). In practice, and as a general rule, for directly collected, facility-specific inventory data should be used wherever possible. For processes where the company does not have direct access to specific data, generic data will typically be used. However, it is good practice to attempt to access directly collected data from suppliers when possible, in particular for environmentally significant processes. Generic data is data sourced from third-party life cycle inventory databases, government or industry association reports, statistical databases, peer-reviewed literature, or other sources. All such data shall satisfy the quality requirements specified in the Organisation Environmental Footprint guidance document.
Maturity	Still in development, latest draft released 2012
Credibility	Developed by the European Commission and through experts consultation
How is it communicated -	Report

Name of methodology		**Sustainability Consortium**
Country		USA
general description		The Sustainability Consortium is a project originally launched by a group of consumer goods companies, including Wal-Mart, with the objective of establishing a scientifically grounded system for characterizing the environmental and social impacts associated with the production of consumer goods. Wal-Mart initiated the project with its own suppliers but the objective is to create a global framework. Thus, a consortium has been created and is administered by Arizona State University and the University of Arkansas. It is a voluntary and private standard development with the support of: • 60 companies (including 6 retailers plus L'Oréal, BASF, HP, Dell, Unilever, KPMG, Intel, 3M, Toshiba) • NGO: WWF, BSR, and GS1 The consortium's method assesses suppliers on 4 subjects: • Energy and Climate • Natural resources (including water) • Material efficiency • People and Community It is a first attempt to assess supplier engagement on sustainability. The sustainability consortium goal is to "develop transparent methodologies, tools and strategies to drive a new generation of products and supply networks that address environmental, social and economic imperatives."
☑	**CO2**	✓

	Water	✓
	Res Depletion	✓
	Water Eco-Tox	
Life cycle thinking		yes
Applicability		Goods
Reliability & robustness		This is a private scheme managed by an Academic institute and finance by private companies.
Data sources		Wal-Mart is working in close collaboration with 60 major manufacturers and utilising its supply chain
Maturity		Launched in 2009
Credibility		The consortium is supported by 60 large manufacturers such as L'Oreal, Unilever. Dell, KPMG and so on, but also by NGOs.
How is it communicated -		The Sustainability Consortium is developing a standardized framework for the communication of sustainability-related information throughout the product value chain.

Name of methodology		**Water Footprint Index ISO 14046**
Country		Global
General description		Preliminary Work Item, ISO 14046, Water footprint – Requirements and guidelines, being developed to complement existing LCA standards and work on carbon footprint metrics by ISO technical committee ISO/TC 207. It will take into account the ISO 14064 on the accounting and verification of greenhouse gases
Indicators	**CO2**	
	Water	✓
	Res Depletion	
	Water Eco-Tox	
Life cycle thinking		Yes
Applicability		Goods and services
Reliability & robustness		Methodology developed by the International Standard Organisation and will become the global reference methodology to complete a carbon footprint.
Data sources		No information is yet available however it can be assumed that primary data will need to be collected for all individual processes under the financial or operational control of the organization undertaking the study, and shall be representative of the processes for which they are collected. Secondary process data shall be used for inputs where the collection of primary process data is not possible or practicable, and may include literature data, calculated data, estimates or other representative data.
Maturity		In development, expected to be released in 2014
Credibility		Developed by the International Standard Organisation in consultation with stakeholders
How is it communicated		No information yet available.

Name of methodology	**Water Impact Index**[86]
Country	Global

[86] growingblue.com/footprint-tools/water-impact-index/

General description		The Water Impact is developed by Veolia Environment Research & Innovation in the USA. The Water Impact Index was the first indicator to integrate in one single metric all the key water aspects, namely water volume, as well as the level of water stress and the quality of water withdrawn and discharged. It measures the impact of activities on a local water resource. The online application allows assessing two equivalent technical solutions. It also enables identification of water hotspots in the value chain and can provide information on the main environmental improvement leverages. The tool is designed for those with some degree of operational understanding of water and wastewater systems, and requires an understanding of a variety of factors including water chemistry and the linkage between energy-water. It can be used to analyse both municipal and industrial systems. The results of the calculation can be used in conjunction with a traditional cost analysis to determine the best Return On Investment in terms of areas in which impact on local water resources can be minimized – and may lead to cost savings.
Indicators	**CO2**	
	Water	✓
	Res Depletion	
	Water Eco-Tox	✓
Life cycle thinking		Yes
Applicability		Goods and services
Reliability & robustness		This is a privately developed scheme
Data sources		Water Stress Index (WSI) database
Maturity		Launched 2010
Credibility		The tool is run by Veolia but was developed in consultation with The Nature Conservancy, the U.S. Water Alliance, the World Business Council for Sustainable Development, the United Nations Global Compact CEO Water Mandate, The Earth Institute at Columbia University, Global Water Intelligence and Cardno ENTRIX
How is it communicated		It is represented as an index in m^3 equivalent

1.2.3 Review of selected resource depletion methodologies

Name of methodology		**BP X 30-323**
Country		France
General description		BPX 30-323 has been developed as part of a French law "Le Grenelle 1" and lays the framework and general methodology for French environmental product labelling. Beyond requiring a carbon footprint for each product category, BPX 30-323 provides general guidelines for product-specific communication and is in line with ISO 14040/44. The methodology can evolve following international or European community normative evolution.
Indicators	**CO2**	✓
	Water	✓
	Res Depletion	✓
	Water Eco-Tox	✓
Life cycle thinking		Yes
Applicability		Any goods or services
Reliability & robustness		Methodologies, product category rules and databases based on work carried out by the AFNOR[87] ADEME[88] platform and ADEME. Publication of General Principles for Environmental Labelling of Mass Consumption Products and its methodological annex (BP X30-323 September 2009) as well as the launch and extension of work on product categories. In parallel with this work by category, ADEME has initiated the construction of a public database (generic LCA data).
Data sources		ADEME is developing a national database as well as implementing sectorial standard
Maturity		Launched in 2011, but has been piloted through a national labelling experiment which included 160 different manufacturers and retailers that are testing the methodologies
Credibility		LCA approach (ISO 14040 and ISO 14044) and life cycle thinking
How is it communicated -		A Label which can present separate indicator values or an overall eco score. Guidelines on the use of labels on products state that at least CO_2 impacts have to be shown, additional indictors can be display but recommends that no more than three indicators should be displayed. Further guidelines on communication are expected as part of this methodology which should be in accordance with ISO 142X series of standards.

[87] AFNOR – Association Française de normalisation (French Standard Organisation)

[88] ADEME - French Environment and Energy Management Agency

Name of methodology		**Product Environmental Footprint Guide**
Country		EU
General description		The Product Environmental Footprint is a multi-criteria measure of the environmental performance of a good or service throughout its life cycle. Product Environmental Footprint information is produced for the overarching purpose of seeking to reduce the environmental impacts of goods and services, but can also be used to support comparative assertions. This document provides guidance on how to calculate a Product Environmental Footprint, as well as how to create product category-specific methodological requirements for use in Product Environmental Footprint Category Rules (PFCRs).
Indicators	**CO2**	✓
	Water	✓
	Res Depletion	✓
	Water Eco-Tox	✓
Life cycle thinking		Yes
Applicability		Any goods or services
Reliability & robustness		Based on a two-step approach. First step is a Screening Step where readily available specific or generic data is used to populate the resource use and emissions profile. The environmental footprint impact assessment method is then applied and finally the environmentally significant processes is determined as a basis for further data collection efforts. Secondly the Resource use and emissions profile is completed. Data collected for environmentally significant processes meets the data quality requirements and, where necessary, collect better data.
Data sources		Ideally, the model of the product supply chain would be constructed using facility or product/service specific data (i.e. modelling the exact life cycle depicting the supply-chain, use, and end-of-life phases as appropriate). In practice, and as a general rule, for directly collected, facility-specific inventory data should be used wherever possible. For processes where the company does not have direct access to specific data, generic data will typically be used. However, it is good practice to attempt to access directly collected data from suppliers when possible, in particular for environmentally significant processes. Generic data is data sourced from third-party life cycle inventory databases, government or industry association reports, statistical databases, peer-reviewed literature, or other sources. All such data shall satisfy the quality requirements specified in the Organisation Environmental Footprint guidance document.
Maturity		Still in development, latest draft released 2012
Credibility		Developed by the European Commission and through experts consultation
How is it communicated		Report

Name of methodology		**O2 Eco-Rating**
Country		UK
General description		O2 (mobile phone operator) invested in this project to develop a simple and transparent rating system that evaluates the sustainability credentials of mobile phone handsets and rewards innovation by implementing an Eco rating. The ultimate goal of this work is to enable O2's customers to evaluate a phone's sustainability credentials along with their other features. It expects that consumers' interest in this aspect of their mobile phones will in turn encourage manufacturers to take a leadership role in driving forward sustainability. The ratings are established based on a supplier questionnaire that has been developed by O2. The questions posed concern: • Policy, • Management systems, • Supply chain requirements, • Supplier management, • Communications, • Social inclusion and community, • Climate change and energy, • Resource use • Handset obsolescence and waste kit,
dicators	**CO2**	✓
	Water	
	Res Depletion	✓
	Water Eco-tox	
Life Cycle approach		Yes
Applicability		Targeted to mobile phone handset –but could be applied to other product
Reliability & robustness		No transparency as the data is not available to those outside of O2 The methodology was developed in partnership with Forum for the Future a not-for-profit organisation.
Data sources		Bulk of the information is internal to O2 and provided by its suppliers
Maturity		Launched August 2010 in the UK and 2011 in Germany
Credibility		This is a private scheme, with little information publicly available
How is it communicated		The scheme calculate an eco-score for each mobile phone handset (where data is available from the supplier) with no broken-down information of what impact contribute (and at what level) to the eco score. The eco-score is currently only published on O2 website.

Name of methodology		**Vodafone Eco rating of mobile phone handset**
Country		EU
General description		Vodafone as developed an Eco rating focusing on rating mobile phone handsets only. The score is based on answers to 162 questions about the environmental and social impacts of the mobile phone. These cover: • The impacts of the phone throughout its life, from mining of raw materials to produce components, to production of the phone by manufacturers, use by consumers and disposal when the phone comes to the end of its life. • How committed the manufacturer is to managing its own environmental and social impacts. Vodafone plans to make these questions more difficult over time to encourage manufacturers to design phones that are better for the environment and society. The Eco-rating was launched in the Netherlands in 2011 and will be introduced to other European markets in 2012.
Indicators	**CO2**	✓
	Water	✓
	Res Depletion	✓
	Water Eco-tox	✓
Life Cycle approach		Yes
Applicability		Targeted to mobile phone handset – but could be applied to other product
Reliability & robustness		No transparency as the data is not available to those outside of Vodafone.
Data sources		Suppliers are required to answer 162 questions. The answers to the lifecycle questions are analysed and the environmental impact of the phone is calculated following the International Organization for Standardization's lifecycle assessment framework – ISO 14040:2006. Bureau Veritas analyses and verifies the results, and requests further information or evidence if needed.
Maturity		2011 in the Netherland and form 2012 across Europe
Credibility		KPMG audits the Eco-rating process and provides assurance that the methodology is applied correctly by the independent parties producing the scores.
How is it communicated		Eco rating displayed on product fiche

1.2.4 Review of selected water ecotoxicology methods

Name of methodology		**BP X 30-323**
Country		France
General description		BPX 30-323 has been developed as part of a French law "Le Grenelle 1" and lays the framework and general methodology for French environmental product labelling. Beyond requiring a carbon footprint for each product category, BPX 30-323 provides general guidelines for product-specific communication and is in line with ISO 14040/44. The methodology can evolve following international or European community normative evolution.
Indicators	**CO2**	✓
	Water	✓
	Res Depletion	✓
	Water Eco-Tox	✓
Life cycle thinking		Yes
Applicability		Any goods or services
Reliability & robustness		Methodologies, product category rules and databases based on work carried out by the AFNOR[89] ADEME[90] platform and ADEME. Publication of General Principles for Environmental Labelling of Mass Consumption Products and its methodological annex (BP X30-323 September 2009) as well as the launch and extension of work on product categories. In parallel with this work by category, ADEME has initiated the construction of a public database (generic LCA data).
Data sources		ADEME is developing a national database as well as implementing sectorial standard
Maturity		Launched in 2011, but has been piloted through a national labelling experiment which included 160 different manufacturers and retailers that are testing the methodologies
Credibility		LCA approach (ISO 14040 and ISO 14044) and life cycle thinking. In the context of water toxicity it uses the USETOX model developed by a team of researchers from the Task Force on Toxic Impacts under the UNEP-SETAC Life Cycle Initiative.
How is it communicated		A Label which can present separate indicator values or an overall eco score. Guidelines on the use of labels on products state that at least CO_2 impacts have to be shown, additional indictors can be display but recommends that no more than three indicators should be displayed. Further guidelines on communication are expected as part of this methodology which should be in accordance with ISO 142X series of standards.

[89] AFNOR – Association Française de normalisation (French Standard Organisation)

[90] ADEME - French Environment and Energy Management Agency

Name of methodology		**Product Environmental Footprint Guide**
Country		EU
General description		The Product Environmental Footprint is a multi-criteria measure of the environmental performance of a good or service throughout its life cycle. Product Environmental Footprint information is produced for the overarching purpose of seeking to reduce the environmental impacts of goods and services, but can also be used to support comparative assertions. This document provides guidance on how to calculate a Product Environmental Footprint, as well as how to create product category-specific methodological requirements for use in Product Environmental Footprint Category Rules (PFCRs).
Indicators	**CO2**	✓
	Water	✓
	Res Depletion	✓
	Water Eco-Tox	✓
Life cycle thinking		Yes
Applicability		Any goods or services
Reliability & robustness		Based on a two-step approach. First step is a Screening Step where readily available specific or generic data is used to populate the resource use and emissions profile. The environmental footprint impact assessment method is then applied and finally the environmentally significant processes are determined as a basis for further data collection efforts. Secondly the resource use and emissions profile is completed. Data collected for environmentally significant processes meet the data quality requirements and if necessary additional data should be collected.
Data sources		Ideally, the model of the product supply chain would be constructed using facility or product/service specific data (i.e. modelling the exact life cycle depicting the supply-chain, use, and end-of-life phases as appropriate). In practice, and as a general rule, for directly collected, facility-specific inventory data should be used wherever possible. For processes where the company does not have direct access to specific data, generic data will typically be used. However, it is good practice to attempt to access directly collected data from suppliers when possible, in particular for environmentally significant processes. Generic data issourced from third-party life cycle inventory databases, government or industry association reports, statistical databases, peer-reviewed literature, or other sources. All such data shall satisfy the quality requirements specified in the Organisation Environmental Footprint guidance document.
Maturity		Still in development, latest draft released 2012
Credibility		Developed by the European Commission and through experts consultation. USETOX model developed by a team of researchers from the Task Force on Toxic Impacts under the UNEP-SETAC Life Cycle Initiative.
How is it communicated		Report

Name of methodology		**Vodafone Eco rating of mobile phone handset**
Country		EU
General description		Vodafone as developed an Eco rating focusing on rating mobile phone handsets only. The score is based on answers to 162 questions about the environmental and social impacts of the mobile phone. These cover: • The impacts of the phone throughout its life, from mining of raw materials to produce components, to production of the phone by manufacturers, use by consumers and disposal when the phone comes to the end of its life. • How committed the manufacturer is to managing its own environmental and social impacts. Vodafone plans to make these questions more difficult over time to encourage manufacturers to design phones that are better for the environment and society. The Eco-rating was launched in the Netherlands in 2011 and will be introduced to other European markets in 2012.
Indicators	**CO2**	✓
	Water	✓
	Res Depletion	✓
	Water Eco-tox	✓
Life Cycle approach		Yes
Applicability		Targeted to mobile phone handset –but could be applied to other product
Reliability & robustness		No transparency as the data is not available to those outside of Vodafone
Data sources		Suppliers are required to answer 162 questions. The answers to the lifecycle questions are analysed and the environmental impact of the phone is calculated following the International Organization for Standardization's lifecycle assessment framework – ISO 14040:2006. Bureau Veritas analyses and verifies the results, and requests further information or evidence if needed.
Maturity		2011 in the Netherland and form 2012 across Europe
Credibility		KPMG audits the Eco-rating process and provides assurance that the methodology is applied correctly by the independent parties producing the scores.
How is it communicated		Eco rating displayed on product fiche

Name of methodology		**Water Impact Index**[91]
Country		Global
General description		The Water Impact is developed by Veolia Environment Research & Innovation in the USA. The Water Impact Index was the first indicator to integrate in one single metric all the key water aspects, namely water volume, as well as the level of water stress and the quality of water withdrawn and discharged. It measures the impact of activities on a local water resource. The online application allows assessing two equivalent technical solutions. It also enables identification of water hotspots in the value chain and can provide information on the main environmental improvement leverages. The tool is designed for those with some degree of operational understanding of water and wastewater systems, and requires an understanding of a variety of factors including water chemistry and the energy-water nexus. It can be used to analyse both municipal and industrial systems. The results of the calculation can be used in conjunction with a traditional cost analysis to determine the best Return On Investment in terms of areas in which impact on local water resources can be minimized – and may lead to cost savings.
Indicators	**CO2**	
	Water	✓
	Res Depletion	
	Water Eco-Tox	✓
Life cycle thinking		Yes
Applicability		Good and services
Reliability & robustness		This is a privately developed scheme
Data sources		Water Stress Index (WSI) database
Maturity		Launched 2010
Credibility		the tool is run by Veolia but was developed in consultation with The Nature Conservancy, the U.S. Water Alliance, the World Business Council for Sustainable Development, the United Nations Global Compact CEO Water Mandate, The Earth Institute at Columbia University, Global Water Intelligence and Cardno ENTRIX
How is it communicated		It is represented as an index in m^3 equivalent

[91] growingblue.com/footprint-tools/water-impact-index/

Appendix: 1.3 Consumer awareness and understanding of energy, carbon and eco- labels for energy using and energy related products

1.3.1 Review of 4 commonly used product labels

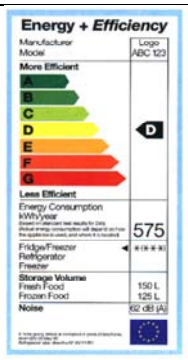
There are 4 main types of labels[92]:

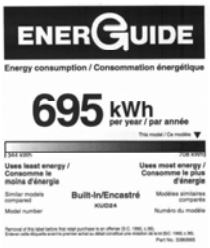
- Endorsement (energy-only)
- Eco-label (environmental)
- Comparison: Categorical and Continuous
- Information-Only

Label type	Features	Example/s
Endorsement (energy-only)	• Seal of Approval • No energy performance data on label • Typically targets top 15-20% of models on market • Success in US and the EU with Energy Star label[93] • After initial market change, impact can be limited Example: Energy Star	
Eco-label (environmental)	• Environment is the main criterion; energy may be one of the criteria • Many programmes exist internationally • Danger -- too many labels may confuse consumers Example: EU Ecolabel	

[92] Designing and Implementing a Labelling Programme, Peter du Pont, IIEC, Presentation at the CLASP Latin American Regional Workshop on Energy Efficiency Standards and Labelling, 2000

[93] The EU ENERGY STAR programme follows an Agreement between the Government of the US and the European Community (EU) to co-ordinate energy labeling of office equipment. It is managed by the European Commission. US partner is the Environmental Protection Agency (EPA), that started the scheme in the US in 1992

Comparison: Categorical	• Provides basis for comparison shopping
	• Rankings by number scales, stars, shaded bar
	• Others:
	  • Thai Label
	  • Australian Label
	  • Korean Label
	  • Mexican Label
	
	Example: EU energy label
		

Comparison: Continuous	• Models compared using continuous scale • Provides basis for comparison shopping, but makes consumers work harder • Other: US label Example: Canadian label	

Information-Only	• Provides information on:
	  • Energy consumption
	  • Energy efficiency rating and/or
	  • Operating cost
	• No comparison to other models on the market
	• Difficult to understand for common customers
	
	Example: Philippines label
		

1.3.2 Consumer views and buying habits

One of the key problem with ecolabels is they have vastly different quality standards and criteria. It should, therefore, not come as a surprise that their reliability and informational content have repeatedly been called in question. In a recent study analysing ecolabels, Van Amstel et al. (2008) concluded that the "main shortcomings of the ecolabels were found in their ambiguity about environmental themes, their failure to assure the buyer about the product's ecological impact [and] the insufficient information about producers' compliance"[94].

Research indicates there is some confusion over the different terms used[95] e.g:

Low emissions Environmentally friendly Green Climate change/Global warming	Low carbon Eco-friendly Organic Energy efficient

The effectiveness of product environmental labelling is complicated by the fact that environmental consciousness does not necessarily affect purchasing behaviour directly. Consumers prioritise other aspects, such as price and quality, and their purchases are often guided by habit (Gallastegui 2002). Other key factors on which consumers base their purchasing decisions include consumer satisfaction, values, identification, availability and social pressure/consumer boycotts (Hemmelskamp & Brockman 1997). Furthermore, different factors may affect purchasing decisions at different times (Pedersen & Neergaard 2006, p.25). Thus, product environmental labelling (in their widest sense i.e. covering timber, and food etc.) has been shown to only be moderately successful in relation to the individual consumer (OECD 2005)[96].

There are typically two types of purchases of energy using and energy related products:

- Planned purchases
    - Desire to upgrade existing equipment for reasons of wear and tear or aesthetics
    - Trend-driven obsolescence
    - Home renovations/conversions moving house
    - Change in family situation (e.g. birth of children)
- Distress purchases

[94] Ecolabeling, consumers' preferences and taxation, Ingmar Schumacher 2010

[95] Ibid 99

[96] Product Environmental Labels Scoping Study Stage 1: The roles of PELS for sound Life Cycle management of Product Environmental impacts, Dr. Ralph Horne, Kendra L. Wasiluk and Helen Lewis, Centre for Design at RMIT University, Melbourne Australia, 2007

- Mainly for vital appliances that break down/come to the end of their lives
- Purchase usually very soon after appliance failure
- Little time for research or choice of replacement appliance[97]

The key purchasing factors for consumers when buying energy using or energy related products include:

• Price • Size/Dimensions • Brand • Features and functionality • Energy consumption • Aesthetics	• Special features • Availability • Delivery • Installation • After-sales service • Manufacturer guarantees/warranty[98]

Price is commonly the most important criteria with energy efficiency a lower priority than other product features. Historically, take-up of low carbon products has tended to happen where there are benefits (e.g. save individual money and hassle) and also involve minimal individual effort[99].

More than a third of US consumers now say they are willing to pay a premium for eco-friendly products (according to a March 2010 Mintel study). In some cases this is even higher, for example 53% of US consumers would be willing to pay a premium for a greener television, according to the Consumer Electronics Association[100].

There is strong awareness of energy issues among most consumers (particularly in Europe) and that consumers are acutely aware of energy consumption and efficiency issues - with cost savings being cited overwhelmingly as most common reason for importance followed by governmental/social pressure to be "greener"[101]. According to Flash Eurobarometer 258 study approximately 50% of indicated European citizens, ecolabels play a significant role in their consumption decisions[102].

Some product categories are more associated with energy efficiency than others (e.g. fridges and washing machines are, televisions less so). Energy efficiency also means different things to different people, and in product different categories (e.g. recycling, sustainable manufacturing, save electricity, saves water etc.). This

[97] EU Energy Labelling, Global Research Report, Ipsos Marketing, December 2008

[98] Ibid 97

[99] Growing the market for low carbon products and services, Consumer Research, Ipsos MORI, October 2010

[100] Global Ecolabel Monitor 2010, Big Room and World Resources Institute, 2010

[101] Ibid 97

[102] Ecolabeling, consumers' preferences and taxation, Ingmar Schumacher 2010

awareness is strongly associated with income, social grade and education i.e. the higher the socio-economic group/better the education the higher the awareness[103].

1.3.3 Consumer awareness of environmental labels

UK research for Defra[104] shows varying levels of consumer awareness of eco-labels. Fewer than one in ten survey respondents said they were 'very' or 'fairly' familiar with the Marine Stewardship Council (MSC) label (9%), EU Eco-label (8%) or Sustainable Palm Oil label (7%). This rose to between one in four and one in three respondents in relation to the Green Dot (32%), Soil Association organic mark (28%), Forest Stewardship Council (FSC) label (26%) and Carbon Trust footprint (24%). The exception was the EU A-G Energy Efficiency rating for white goods – a label that just over three quarters (76%) said they were familiar with.

Specific consumer understanding of some labels was very strong – for example, over four in five (82%) respondents who had seen the A-G energy efficiency rating label showed a specific understanding of what it meant. A similar pattern was evident for the Soil Association organic mark (76% who had seen it had a specific understanding) and Carbon Trust footprint (75% who had seen it showed a specific understanding). Specific understanding of the MSC label was relatively strong among those who had seen it (61%), while survey participants who had seen the FSC and Sustainable Palm Oil labels were less likely to be able to give an accurate definition (42% and 36% respectively). Very few survey respondents (5%) showed a specific understanding of the EU Ecolabel. However, 61% did make broad associations to environmental standards of some kind. Virtually no survey respondents (1%) had a specific understanding of the Green Dot.

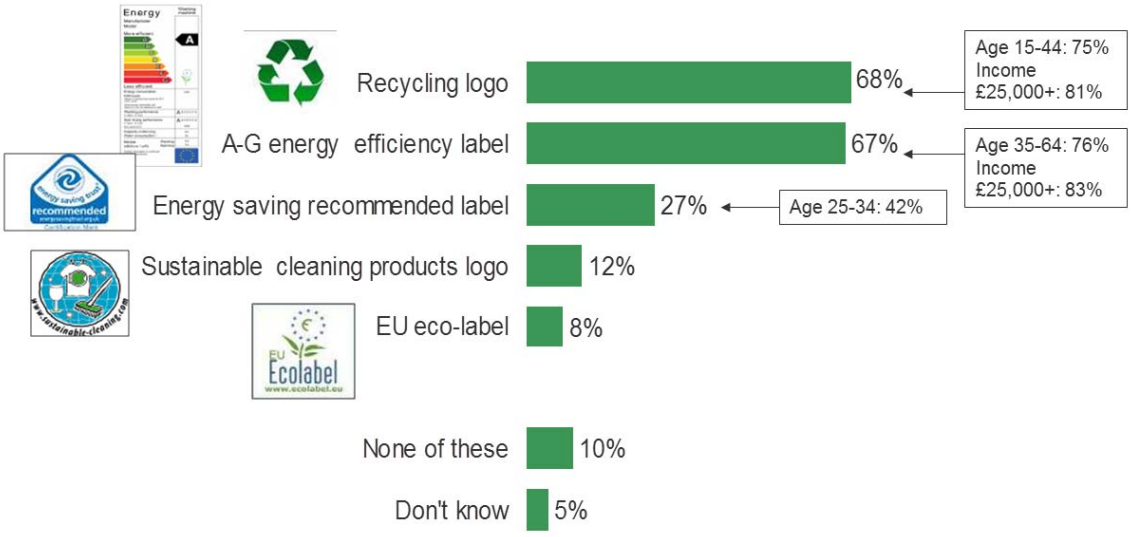
Only a very small minority of online survey respondents reported to habitually use environmental labels when they were considering what to buy. With the exception of the A-G Energy Efficiency rating (which close to one in three (34%) respondents said they 'always used'), levels of use were low. It is worth noting that the A-G Energy Efficiency label is generally used on larger, one-off purchases, whereas many of the others relate to foods or fast moving consumer goods. When those respondents who said they 'often used' labels were included, levels of use rose – most notably for the A-G rating (59%), Green Dot (23%), FSC (13%) and Soil Association label (13%)[105]. Other UK research has similar results with most widely recognised labels being the Mobius loop (recycling) and EU Energy label[106]

[103] Ibid 99

[104] Consumer understanding of green terms – A supplementary report on consumer responses to environmental labels, A research report completed for DEFRA (UK) by Brook Lyndhurst and Icaro Consulting

[105] Consumer understanding of green terms: a supplementary report on consumer responses to environmental labels - A report to the Department for Environment, Food and Rural Affairs. Fletcher, J. and Downing, P, Brook Lyndhurst & Icaro Consulting, for Defra, London, 2011

[106] Ibid 99



Research carried out for Eurostat and the Directorate-General for Health and Consumers into consumer empowerment looked at recognition of different packaging logos by consumers right across Europe (see examples in table on next page).

Around two-thirds of respondents indicated they were familiar with Logos B (66%) and E (64%), and just over half claimed familiarity with Logo D (55%). More than a fifth (22%) of respondents were not able to correctly identify the meaning of any of the 5 logos shown. 21% knew the meaning of only one of the logos, 25% knew the meaning of two logos, and 20% understood the meaning of three logos. Only 12% of respondents were sufficiently well-informed to be able to correctly provide the meaning of four or five of the logos. More than one in ten (11%) of respondents claimed they had never seen any of the logos before, and 5% did not know if they recognised them.

Logo A	Logo B	Logo C	Logo D	Logo E
				
The product is organically farmed	The product conforms with the relevant European legislation	The product meets strict ecological standards: it is eco-friendly	The product is made of paper that can be recycled	The product will be detrimental to your health if not used properly

Regarding comprehension, the lowest number of respondents giving the correct definition for each logo occurred amongst:

- the oldest (e.g. 54% of the oldest (55+) are able to correctly identify logo E whereas 68% of the respondents aged 25-39 can do so);
- those who stopped education before the age of 16;
- those who live alone/ who are widowed;
- retired, house persons and unemployed people;
- Those respondents who are low on the 'social staircase';
- those who have never used a computer.

Further analysis focussed on identifying the most vulnerable groups (those who do not know the meaning of any of the logos) revealed:

- respondents in Romania (83%) and Bulgaria (85%) were those who answered most often that they did not know at least one of logos. At the same time, 63% of respondents in Romania and 56% in Bulgaria did not know the meaning of any of the logos; and
- there were also low levels of awareness amongst respondents in Poland (40% did not know the meaning of any of the logos), Hungary (37%) and Lithuania (36%).

In contrast, the most knowledgeable respondents (those who are able to identify the meaning for four or five of the logos) were found in Finland (33% correctly identified four or five logos), Denmark (29%) and Malta (27%). 34% of people in Norway and 27% of respondents in Iceland could also describe at least four logos correctly.

People in the EU15 countries tended to be more aware of the meaning of the logos; 84% could provide one correct answer or more, whereas only 59% of respondents in NMS12 countries could do the same. More people in NMS12 countries answered that they did not know at least one logo (71%) than in EU15 countries (64%)[107].

[107] SPECIAL EUROBAROMETER 342, Consumer empowerment, TNS Opinion & Social for Eurostat and the Directorate-General for Health and Consumers (DG SANCO) April 2011

1.3.4 Who uses environmental labels?

European research indicates that women consider environmental concerns like energy and water consumption significantly more when making their choice than men. In contrast, men considered significantly more the number of functions and marginally significantly more, the accessories and the technological innovation provided by the appliance.

Thus, in order to persuade men to consider environmental aspects, it might be more successful if the characteristics that are more relevant to them can be associated with energy efficiency.

Compared to younger consumers, the choices of respondents over 48 years of age were found to have significantly higher frequencies of considering environmental issues. Respondents in the 31–37 year age grouping placed significantly less consideration on water consumption; while respondents between 38 and 47 years of age placed less emphasis on brand/model. Respondents in the oldest age quartile placed more consideration on user friendliness, while those in the youngest quartile considered the design/colour/decoration aspect significantly more.

Adding to this, it is very important to consider whether or not the customer is accompanied by other people at time of purchase. In this study, respondents who were accompanied by family or friends seemed to be more predisposed to consider aspects associated with water and energy consumption, and to search for information regarding energy consumption and energy efficiency class, than respondents who were not accompanied.[108]

Research[109] has also identified a number of different energy consuming audience segments with different energy-related behavioural characteristics. These are outlined in the table below:

[108] Energy efficiency and appliance purchases in Europe: Consumer profiles and choice determinants, Rui Gaspar n, Dalila Antunes, 2011

[109] Who puts the most energy into energy conservation? A segmentation of energy consumers based on energy-related behavioural characteristics, Bernadette Sutterlin, Thomas A .Brunner, Michael Siegrist, 2011

Idealistic energy-savers (15.6%) Idealistic energy-savers show the most energy-saving efforts based on curtailment behaviour as well as based on energy efficiency measures. Driven by idealistic thoughts, they do not mind financial efforts and restrictions of convenience and also fully accept policy measures in terms of sales and use regulations. Their awareness of consequences is highly pronounced and they believe in their ability to induce a positive change.	**Selfless inconsequent energy-savers (26.4%)** Selfless inconsequent energy-savers demonstrate considerable energy-saving efforts. But given their readiness to make sacrifices reflected in their high acceptance of policy regulations, their pronounced awareness of consequences, and their belief that consumers' energy-saving actions can make a difference, energy-saving efforts seem rather inconsequential. Energy-saving actions, in particular, with respect to curtailment behaviour in the food domain and energy efficiency measures in the housing domain, are comparatively small.
Thrifty energy-savers (14%) Thrifty energy- savers highly engage in energy-saving efforts as long as they involve no financial disadvantages. Accordingly, they disapprove of policy measures based on sales or use regulations that are associated with additional financial efforts. Their energy-saving efforts are, in general, rather extrinsically motivated, since besides financial considerations they also experience the most social pressure to engage in energy-saving behaviour.	**Materialistic energy consumers (25.1%)** Materialistic energy consumers show less energy-saving efforts, especially in the domains of mobility and food. Energy-saving actions based on energy efficiency measures in the housing domain, however, are considerably pronounced. Policy measures with possible financial consequences are less accepted. If they engage in energy-saving behaviour, this is mainly due to financial considerations.
Convenience-oriented in different energy consumers (5.3%) Convenience-oriented indifferent energy consumers are least likely to engage in energy-saving actions. They largely ignore the fact that the increase in energy consumption and its consequences constitute a serious problem for society, and they neither feel jointly responsible for the present energy situation, nor have energy consciousness anchored in their personal norms. Their behaviour is less driven by financial considerations than by concerns regarding personal comfort and convenience. Restrictive political regulations and interferences are strongly disapproved of.	**Problem-aware well-being-oriented energy consumers (13.6%)** Problem-aware well-being-oriented energy consumers are not eager to engage in energy-saving actions. Their awareness of consequences is rather pronounced and they believe that their energy-saving efforts can make a difference. However, they still do not feel obliged to avoid un necessary energy. Furthermore, they consider their ability to perform energy-saving behaviours as rather limited. A possible loss of comfort and convenience constitutes a barrier to their engagement in energy-saving efforts, but on the other hand, they perceive a certain social pressure to save energy.

1.3.5 Who consumers trust

When it comes to product labelling, independent organisations like consumer NGOs, governments or government agencies are the most trusted by consumers. Retailers, trade association sand manufacturers are amongst the least trusted.

European consumers do trust the EU-energy label, and they also to a large degree take the label into account when they buy electrical household appliances[110].

1.3.6 EU Energy labels

The world's first energy label research involved testing five label designs[111] (Figure 1a-e) that comprised:

- the existing EU label;
- a design based on the US Energy Guide label;
- a design loosely based on the Australian categorical label using stars;
- the 'Leiden Horizontal' label; and
- the 'Leiden Vertical' label.

The last two labels drew upon earlier research by the University of Leiden. All labels, except the EC label, included information on both the product's absolute energy consumption and its consumption relative to similar products. Labels exhibiting energy operating cost were considered, but discarded because so many differing tariffs were in place across Europe.

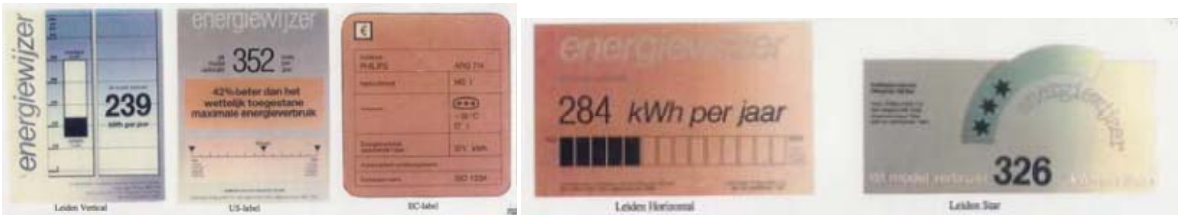


Figure 1: *The first five label designs including the old EC label*

Source: Egan and Waide[111].

The research tested:

- consumers' ability to remember the energy consumption value (the so-called "recall" level)

110 Consumers and the EU Energy Label Report from a European comparative study, Lisbeth Berg, Eivind Stø & Pål Strandbakken, BARENERGY project, Deliverable D 23 (2009)

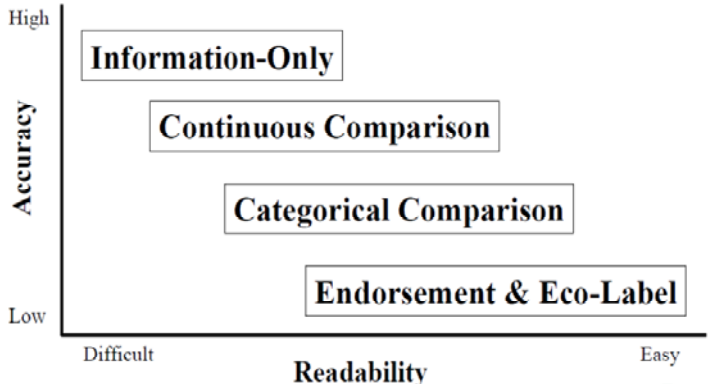
111 A multi-country comparative evaluation of labelling research, Christine Egan & Paul Waide presented at ECEEE 2005 SUMMER STUDY – WHAT WORKS & WHO DELIVERS?

- how fast and accurately information was retrieved from the labels.

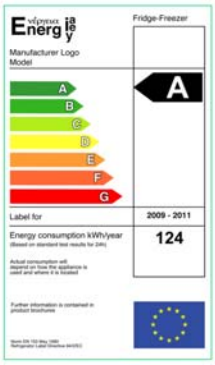
The speed vs. accuracy trade off was deemed important for label effectiveness as earlier research found that when consumers choose between models they use a two-stage process:

1. Initially, people tend to compare all alternatives on one or a few attributes (e.g. price, dimensions, etc.); and then
2. They compare a few products on all available attributes.

The trade-off between accuracy and readability has been noted across different label types and is illustrated in the chart below[112]:



It is therefore important that the information given in an energy label be "top-of-mind" throughout both stages.



The second stage of the review involved expert input and after that, detailed development took place by an EC-led committee with support from a graphic design agency which led to the A – G label (left). The use of a common label efficiency scale and format for all labelled products is also reported to have aided comprehension and "brand" recognition levels – the latter of which are said to be very high[113].

Research by Ipsos Marketing[114] found:

- There is strong awareness of energy issues among most consumers (particularly in Europe)

[112] Designing and Implementing a Labelling Programme, Peter du Pont, IIEC, Presentation at the CLASP Latin American Regional Workshop on Energy Efficiency Standards and Labelling, 2000

[113] A Multi-Country Comparative Evaluation of Labelling Research, C Egan (CLASP) and P Waide (IEA)

[114] Ibid 97

    - Energy labels are spontaneously mentioned throughout Europe as sources of information but less so in the UK.
    - Energy efficient appliances represent money-saving first and foremost and environmental benefits are secondary
    - However, consumers don't want to spend time deciphering the meaning of energy labels and seek CLARITY and SIMPLICITY in energy labelling
- Existing labels are clear and intuitive but some consumers would like additional details:
    - Alphabetical scale and colour-coding are key to the appeal and clarity of the existing labelling and should thus be maintained in future labelling
    - Some European consumers (particularly French, Polish and Dutch) want to know which levels of energy consumption correspond to the alphabetical energy bands
    - Consumers understand that A is the most energy efficient and want to retain this simple labelling

The current label (with A-G rating and dates - see right) is the clear preference for future labelling. While it is generally understood that A on the new label is more energy efficient than A on the previous label, some consumers would like more detail on band consumption levels.

Between 2000 and 2005 the proportion of A-rated fridges went from less than 10 per cent to over 75 per cent. This was driven primarily by the introduction of the energy efficiency label which prompted retailers and manufacturers to remove 'inefficient' models from their ranges, as they did not wish to be seen to be selling poorly performing models. John Lewis is one retailer whose own-brand white electrical goods are now all A-rated in terms of efficiency.

The influence of the EU energy labels can be seen in the graph below which shows the comparative percentages of people from seven European countries that indicated whether energy labels influenced their purchasing behaviour.

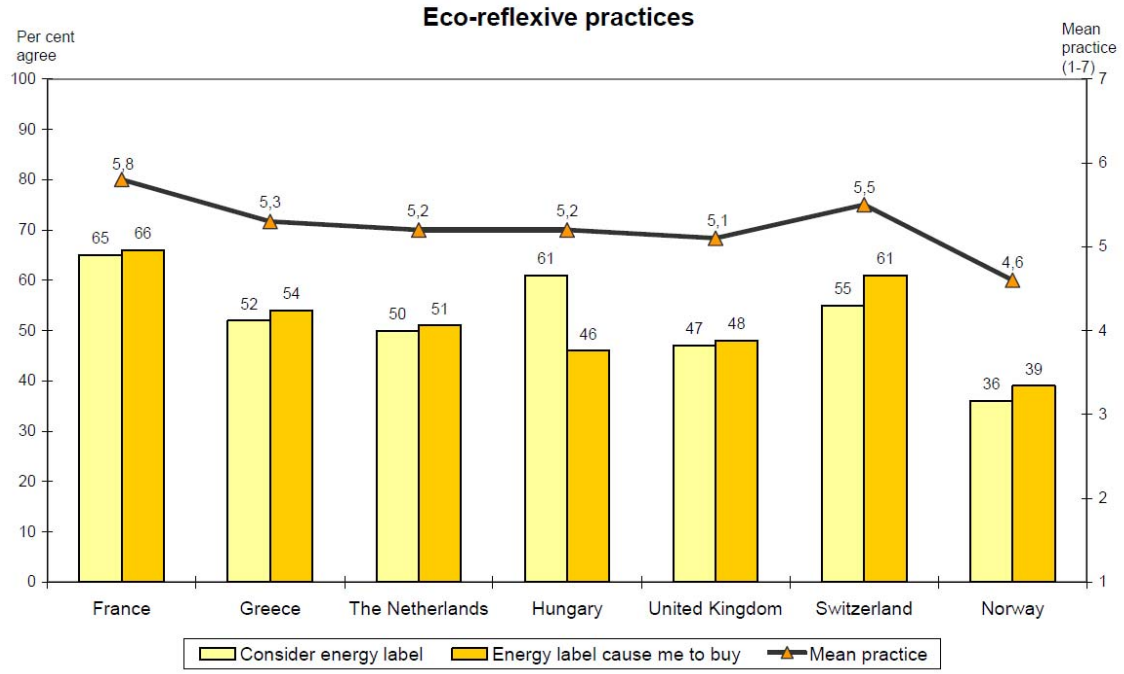


Figure 2: *Percentages expressing that they consider energy labels when purchasing new appliances, and percentages expressing that energy labels cause them to buy more energy efficient appliances in seven European countries.*

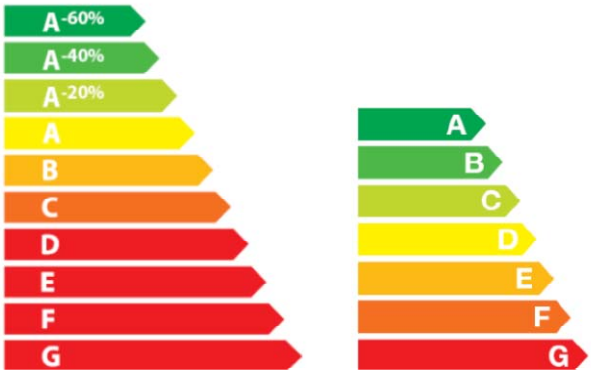
***Source**: Consumers and the EU Energy Label Report from a European comparative study*[115]

This research[115] indicates European consumers do trust the EU-energy label and they also, to a large degree, take the label into account when they buy electrical household appliances. There are, at the same time, significant differences between the counties. Norwegian consumers express the lowest trust level among our seven countries and the reason for this is probably the energy prices and the clean hydro-electricity in Norway which has meant the topic (energy efficiency) is not as high on the political agenda as in the other countries.

[115] Consumers and the EU Energy Label Report from a European comparative study, Lisbeth Berg, Eivind Stø & Pål Strandbakken, BARENERGY project, Deliverable D 23 (2009)

What happened next: From A to A+++

The success of the EU label resulted in class A becoming the dominant efficiency class and this necessitated a revision to take this into account. A technical study established the need for a rapid revision of the refrigerator energy label including higher efficiency thresholds but no study was commissioned to consider what should happen to the appearance of a revised energy label. A revised label (see right) with two new higher efficiency classes (A+ and A++) was developed without research on consumer comprehension of the proposed design change and little industry consultation. In an attempt to fill the research gap quickly, a consumer focus group organised in France by the French energy and environment agency ADEME tested the revised label candidates advanced by the industry association, CECED and the EC. Participants in this research misunderstood the A+, A++ concept and found it to be among the least favoured revision concepts.



These results were echoed in produced by research by the University of St Gallen whose conjoint analysis results provided much richer results than simple willingness-to-pay studies or direct inquiries into people´s preferences. They reduced social desirability bias by asking consumers to face realistic trade-offs between different product attributes and the survey showed that the well-known "A-G closed" scale had a greater impact on consumer decisions than a “beyond A” scale.

The results also showed that introducing the new label with its additional categories weakened the effect of the label, resulting in lower awareness amongst consumers about energy efficiency as an important attribute. Whereas with the old label, the energy efficiency rating was almost equally important as price, the importance of the energy label sharply dropped (from 33.5% to 23.5%) with the introduction of the new label, and consumers relied much more heavily on price (importance increasing from 34.5% to 44.3%). The results suggested that the confusion introduced by the new label categories made consumers switch away from energy efficient products and shop for the cheapest product instead.[116].

This underlines the importance of conducting good consumer research into product labelling.

[116] Consumer survey on the new format of the European Energy Label for televisions - Comparison of a "A-G closed" versus a "beyond A" scale format, Stefanie Heinzle and Rolf Wüstenhagen. University of St. Gallen, 2009

The categorical label design stimulated not only consumer demand, but also manufacturers to develop products targeting specific higher efficiency thresholds both in advance of (i.e. in anticipation of) and in response to heightened consumer demand (Waide 2004). This demonstrates the clear value of using a categorical scale with thresholds that challenge manufacturers to develop more efficient products[117]

Marketing communications and general publicity are key for raising consumer awareness about future labelling changes – potentially on the reverse side of the label in product packs

1.3.7 Labelling in India

The Bureau of Energy Efficiency (BEE) has been responsible for Indian energy efficiency policy since the introduction of the 2002 Energy Conservation Act (EC Act). Before this a draft energy label was developed via market research conducted sequentially from 1997 to 2000 (Dethman et al 2000). The label was not implemented at the time due to a lack of legal authority.

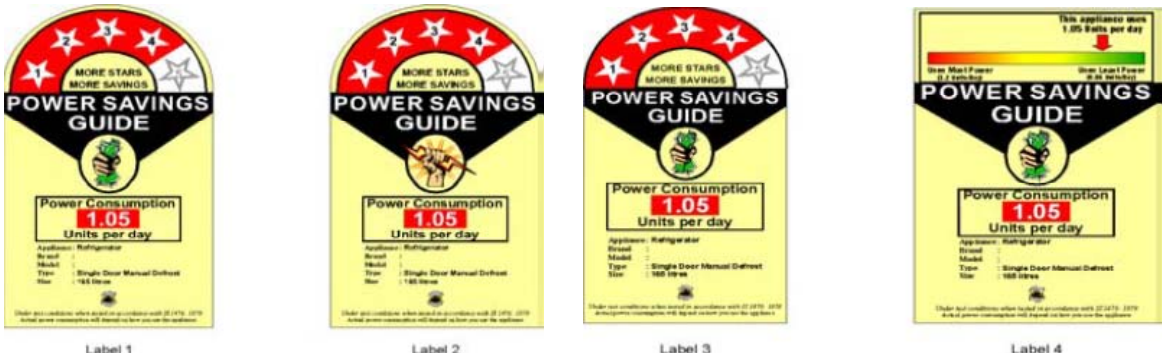


Figure 3*: The four Indian trial labels*

Subsequent research (following the EC Act) was undertaken to finalise the draft designs and revealed (Egan et al 2004):

- Consumers preferred less technical terminology such as “power” or “current” to represent electricity and “units per day” over “kWh per day” to discuss quantities. The unit and/or rupee consumption information presented in a central outlined box was the most noticed element on the label
- The concept of efficiency was not well understood or associated with appliances. The term power savings seemed to better convey the idea of effective energy use

[117] A Multi-Country Comparative Evaluation of Labelling Research, C Egan (CLASP) and P Waide (IEA)

- Government endorsement enhanced the label's credibility - 90% of consumers and 90% of retailers felt it made the label look "more authentic and trustworthy."
- While label designs using efficiency categories or continuous horizontal scales were tested and were well received, categorical approaches such as stars had better rates of comprehension in side-by-side tests of two labels with the same design
- The vast majority made a correct general inference regarding the purpose of the label but just fewer than 10% of respondents said that more stars mean more electricity consumption (incorrectly concluding the star-rating worked in the opposite direction to that intended).

This Indian research confirms the findings of many other comprehensive label design programs worldwide:

- the receptivity of consumers to the idea of energy labelling and its value as an information tool
- the stronger performance of categorical labels (e.g. stars) compared to labels with a continuous scale
- the importance of government endorsement to authenticate the logo
- the importance of understandable labels that avoid being overly technical
- the value of highlighting important information as the unit/rupee consumption information that was blocked-off in the centre of the label was also the most noticed element
- the importance of multi-method approaches to label design i.e. qualitative and quantitative research.

1.3.8 Labelling in China

The China National Institute for Standardization (CNIS) was the agency responsible for developing a mandatory energy information label for refrigerators in China and a comprehensive multi-method primary research project was run including: a consumer intercept survey; consumer focus groups; and semi-structured interviews with consumers, retailers, manufacturers, and policymakers.

Figure 4: *The final five Chinese label designs tested in the consumer survey*

Based upon the research results label 2 was adopted as the mandatory energy label for refrigerators and with minor adaptation for room air conditioners.
One element of the Chinese research demonstrated a very important factor in energy label design research: namely that consumer *perceptions* of which label is easiest to understand do not necessarily correlate with their actual levels of comprehension. In the Chinese research, it is possible that many of the factors respondents found appealing about a label design were actually distracting them from its the main message. This is echoed in the Indian research where just under 10% incorrectly concluded the star-rating worked in the opposite direction to that intended.

From analysis of a stated choice experiment to examine the effect of China Energy Efficiency Label on consumers' preferences, it appears that energy efficiency ranks presented on the energy label do have a significant effect on the choice of air conditioners and refrigerators. The research also indicated that consumers are prepared to pay more for energy efficiency in products used more frequently, which implies that the effect of the energy label on consumers' choice may differ depending on the frequency of product usage[118].

Experience from Mexico and South Africa, where a priori decisions were made regarding labels and research undertaken to confirm the decision, showed, like the EU experience when it introduced the A+ to A+++ labelling, that levels of consumer understanding were not as good as when labels were developed with consumer

[118] Does an energy efficiency label alter consumers' purchasing decisions? A latent class approach based on a stated choice experiment in Shanghai, Junyi Shen, Tatsuyoshi Saijo, 2008

testing from first principles – around 50% for a priori designs compared to compared to ~70% comprehension of research optimised designs[119].

1.3.9 Labelling in Malaysia

In 2005/06 Malaysia was conducting necessary preparatory work for the introduction of a fully-fledged labelling programme. A demand-working group on "standard and labelling" had been set up in collaboration with the university professionals, representative of appliances manufacturers, consumer association, Energy commission of Malaysia, and Standard and Industrial Research Institute of Malaysia (SIRIM) in order to develop energy guide labels for major energy consuming appliances.

Research was carried out to understand consumer views on energy labels and develop labels to test.

This survey was conducted in two phases: in the first phase of survey, 20 labels from all over the world were tested with consumers with the aim of selecting just 3. In the second phase survey, these 3 labels were tested again on and the responses analysed to select 2 labels for further development.

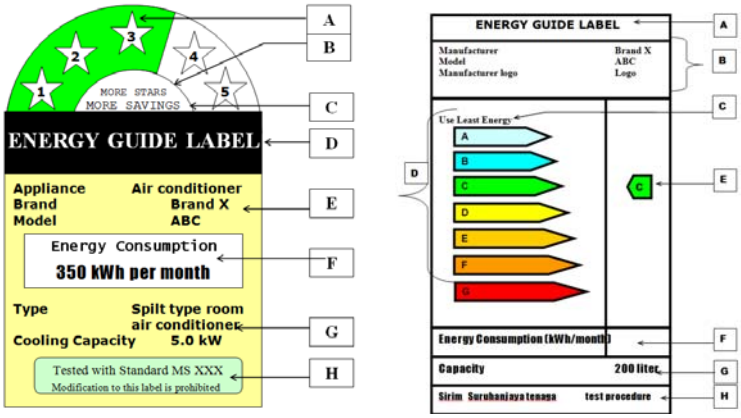


Figure 5 : *The final two Malaysian labels selected through consumer research*

The main conclusions from the research were that respondents preferred:

- Clear graphic and details information in the labels in an easy, comprehensive and simple manner. Labels that meet these features will attract people to read and considerably help guarantee the success of energy guide label implementation.
- The information on labels should be endorsed by government bodies[120].

[119] A Multi-Country Comparative Evaluation of Labelling Research, C Egan (CLASP) and P Waide (IEA)

1.3.10 Labelling in the USA

USA – EnergyGuide label

The US EnergyGuide label had been in place for many years before research was conducted that demonstrated that a large percentage of consumers interpreted it in exactly the opposite manner to how it was intended (by interpreting annual operating cost information as annual operating cost savings). Despite this, the label was not fundamentally altered at the time to address this weakness (Egan 2000a, Egan 2000b). Other key US research findings included

- Like the international research, American consumers preferred a categorical style based on stars compared to continuous labels
- The need to highlight important information through font emboldening and further blocking off related information. US consumers find the label too cluttered, poorly organised and without relational grouping.
- The need to minimise technical terminology and use easy to understand and appealing visual images. US consumers find the label overly technical and graphically unappealing.

USA – Energy Star label

Introduced in 1992 by the U.S. Environmental Protection Agency (EPA), the “Energy Star” program originally created a labelling system to promote the use of energy efficient computers and monitors for offices. The program grew from this singular task, evolving into a joint venture between the U.S. Department of Energy and the EPA and currently encompasses over 60 different product categories (U.S. Environmental Protection Agency, 2008a), including major ‘white’ appliances, refrigerators, dishwashers, and washing machines (clothes washers) that account for 65% of household electricity use (Berry, 2009).

Consumer awareness of the Energy Star label has grown significantly since its initial implementation in 1992. In 1999, only 30% of consumers were aware of the existence of an Energy Star label and generally what it meant (U.S. Environmental Protection Agency, 1999). Consumer awareness then doubled by 2005 (U.S. Environmental Protection Agency, 2005). More recent research suggests that increases have not levelled off, as estimated consumer awareness of Energy Star labelling has exceeded 75% of the population in 2008 (U.S. Environmental Protection Agency, 2008a).

[120] Developing a Comprehensive Energy Guide Label for Household Appliances through Consumers Research Survey R. Saidur, M. A. Sattar, A. Izudin and H. H. Masjuki, University of Malaya, 2006

However, despite overall awareness of the branding of Energy Star increasing, certain racial and ethnic groups appear to remain relatively unaware of the Energy Star label; i.e. Asians and Hispanics.

Hispanics are also less likely to purchase Energy Star washing machines. The EPA may need to adopt different marketing techniques to target these population groups with information about the Energy Star classification and started publishing their Energy Star pamphlets and information sheets in both English and Spanish.

Poor and near poor households are also less likely to own Energy Star dishwashers or refrigerators, most likely due to financial constraints or very high discount rates, since extra upfront costs for an Energy Star appliance is very likely to come at the cost of basic necessities such as food, clothing, and shelter[121].

Other research from the USA suggests consumer willingness to pay was influenced by demographics and attitudes. Preferences for refrigerators awarded the Energy Star label decreased with age, but were higher among males than females. There was also evidence that respondents were influenced by both the public and private benefits ie concern for the environment and electricity cost savings associated with the Energy Star label. These results suggest that promotion of Energy Star labelled products on the basis of both public and private benefits is well-targeted and that both of these sets of attributes will likely play a significant role in a consumer's decision making process when selecting a new appliance[122]

Research from China, Tunisia and India proves that a well-designed label can be correctly interpreted by greater than 70% of the population, despite them never having seen the label design before. This should rise after a period of familiarity with the labelling scheme and especially if accompanied by a consumer awareness and retailer training campaign during its launch.

Research from the EU and elsewhere has demonstrated how important it is to present the comparative energy performance of the appliance (i.e. the energy performance of the appliance in question compared to the range of energy use of appliances with the same functionality).

The EU, Indian and Thai/US research has demonstrated the value of using discrete efficiency categories or classes rather than having a continuous scale. This finding has been supported by focus group results elsewhere too.

The research results from Mexico, South Africa and USA indicate considerable risks from choosing a label without testing its performance first.

[121] Read the label! Energy Star appliance label awareness and uptake among U.S. consumers, Anthony G. Murray, Bradford F. Mills, 2011

[122] Factors influencing willingness-to-pay for the ENERGY STARs label, David O. Ward, Christopher D. Clark, Kimberly L. Jensen, Steven T. Yen, Clifford S. Russell, 2011

Many label design research projects have demonstrated that information needs to be grouped, delineated and presented in a hierarchy of importance (e.g. by using font size and reading order to delineate importance). The corollary of this is that presenting too much information will reduce the labels effectiveness.

Research into the extension of the EU Energy label to incorporate A+ - A+++ categories showed the effectiveness of a well-established energy labelling scheme can be reduced by the introduction of new rating categories[123]. The conclusion for policy makers is that responding to industry requests for 'more flexibility' can result in more complexity for consumers which can be undermine efforts to increase consumer awareness about the real energy use of appliances.

The research also showed that the impact of an 'A–G scale' on consumers' decisions is much stronger and therefore consumers are more willing to pay a higher premium for the highest classes of the 'A–G scale' than for the classes of the 'A-plus' scale.

1.3.11 Carbon messaging

To date, carbon messaging around products has been sporadic and often tells consumers climate change impacts without making it clear what the consumer should do with the information.

Communicating carbon is difficult as carbon 'literacy' amongst consumers is low, and producers and retailers face overloading the consumer with too much information.

Generally, consumers:

- do not engage with grams of CO2;
- do not understand carbon terminology; and
- have higher awareness and understanding of simpler ecolabel schemes, such as the EU Energy label.

This research is supported by other UK research which suggests that most consumers find it difficult to make sense of grams of carbon relative to their lifestyle emissions, so a numerical product label will not provide a frame of reference within which consumers may judge product-related emissions. A 'best-in-class' approach or product sector banded approach that provides a 'traffic-light' or A-G rating system, as is currently used for rating the energy emissions of white goods, would be better. In terms of GHG emissions reduction, the main benefits of carbon labelling are likely to be realised not through communicating emissions values to consumers, but

[123] Dynamic Adjustment of Eco-labeling Schemes and Consumer Choice – the Revision of the EU Energy

Label as a Missed Opportunity? Stefanie Lena Heinzle and Rolf Wüstenhagen, Institute for Economy and the Environment, University of St Gallen, Switzerland, 2011

upstream via manufacturers looking for additional ways to reduce emissions. This point is quite widely accepted as applying to eco-labelling in general[124].

Research carried out by Forum for the Future[125] into carbon labelling found:

- the most popular label format would be traffic lights (where green indicates 'low-carbon'; amber 'medium-carbon' and red 'high-carbon').
- shoppers also wanted 'education' - educational messages on-pack where it was appropriate e.g. where the big impacts were in-use.
- 85 per cent of consumers surveyed said they wanted to be given information about the environmental impacts of products they buy.

Carbon labels must provide relevant information in a simple, clear and engaging way. To be effective the carbon label format would need certain key attributes:

- be simple to understand and intuitive (i.e. need little interpretation)
- provide context
- be noticeable/ distinctive - to cut through the 'noise' (ever increasing information on products)
- be from a trusted voice and fit with other sustainability labels

[124] Carbon Labelling: Public Perceptions of the Debate, Dr Paul Upham, Dr Mercedes Bleda, The University of Manchester Sustainable Consumption Institute, 2009

[125] Check-out carbon - the role of carbon labelling in delivering a low-carbon shopping basket, Tom Berry, Dan Crossley, Jemima Jewell, Forum for the Future, June 2008

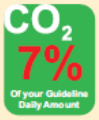
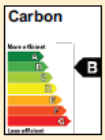
Example format	Label format type	What consumers liked	What they didn't like
	Traffic lights	•simplicity (particularly time-poor shoppers) •familiarity (because of its use in nutritional labelling) •intuitive	•does not provide detailed information that some wanted •unclear what 'good' (green) compares to, e.g. to another similar product or a product in a different category?
	Guideline Daily Amount ("GDA")	•familiarity (again from nutritional labelling) •puts things in context	•provokes questions about how the GDA was derived •less intuitive – would need further explanation/ education
	Sliding scale	•easily recognised •simple and informative	•requires more time to interpret information
	Absolute numbers	•clear and simple •allows direct comparisons between products (like calories) •potential to make comparisons with other actions, if helped with wider communications, e.g. cars (grams of CO_2 per kilometre)	•numbers are useless without context: value in isolation means nothing •difficult for consumers to understand what a gram of carbon relates to and whether it is good or bad
	Stamp of approval	•noticeable / distinctive if consistently branded •suggests 'this claim can be trusted'	•currently no trusted voice for consumers in this space

Figure 6: *Forum for the Future carbon labelling research findings*

Source: *Check-out carbon: the role of carbon labelling in delivering a low-carbon shopping basket Tom Berry, Dan Crossley, Jemima Jewell, Forum for the Future 2008*

Appendix 2: Phase 2

Appendix 2.1 - Qualitative research with consumers – discussion guide

Energy Labelling Research	Discussion Guide FINAL UK Date: 26th March 2012
Job No: 12-013639-01	

Research Objectives:

- To understand from a consumer perspective:
    1. What is the most effective scale for measuring the environmental impact a product has – stars, letters or drops?
    2. What level of information does the consumer want about the different types of environmental impact?
    3. How does environmental impact affect purchasing decisions?
    4. What other information is useful to provide to consumers before they make a decision to purchase?

The groups last 2 hrs each

1 Discussion Guide		Objectives

1. Introduction (5 mins)
 	
• Confidentiality of respondent identity
• Seeking honest opinions
• Permission to record the session
• Ipsos MORI's neutrality
• Moderator introduction
• Respondent introduction
  o Name
  o Location
  o Family composition
  o Occupation
  o What they do in their spare time
		Introduce purpose of session
		
		Reassure respondents about confidentiality
		
		Allow respondents to get to know each other and be put at ease

2. Buying electronic goods (15 mins) Identify who has bought a washing machine, smart phone or light bulbs in the last year ASK EACH GROUP (i.e. those who bought smart phone /light bulbs/washing machine) IN TURN: • What prompted you to buy your new washing machine/smart phone/light bulbs? • Was it a planned purchase or a 'distress' purchase i.e. broken washing machine, stolen phone etc.? • How long did you spend thinking about this appliance before going out to actually buy it? • What factors were important to you when considering buying that appliance? What else? • Which of these were important 'need to have' factors and which were less important but 'nice to have'? • Did you do any research on the internet to decide which product to buy? IF YES: what information about the product did you look up? How did you use this information to make your decision? • How did you make your final decision about which product to purchase? • What trade-offs did you have to make? AS A WHOLE GROUP DISCUSS: • Which factors are the same when making decisions about		Set energy labelling in a wider context of purchase decisions

purchasing any of these appliances? • In what ways is the importance of each of the factors different for each appliance? E.g. are some factors more important for washing machines than smart phones etc? Which ones? Why is that?		
3. <u>Importance of environmental performance in purchase decision (5 minutes)</u> If not yet mentioned ask: • Did you consider anything to do with the environmental performance of the appliance? Why? Why not? What aspects of the environmental performance were you interested in? • IF RESEARCHED ON INTERNET: Did you look up any information about the products' environmental performance? Why? Why not? • Was energy consumption one of the factors you considered when you were buying the appliance? Why? Why not? • IF YES PROBE: why was energy consumption a factor for you? Concern for environment? Impact on cost of running appliance? What did it allow you to save? How important is it to know the energy consumption of something before you buy it? Why is that? • How important a factor was energy consumption when purchasing the appliance compared to the other factors we have already discussed? • Do you think energy consumption is more important to know for one type of appliance rather than another? Which is it more important for? Why? PROBE AROUND differing assumptions about the energy use of different appliances • Did you consider any other aspects of the products' environmental performance? Which? Why? • PROBE: the greenhouse gases/CO2 released by the product? The waste produced? The amount of water it uses? The materials used to produce the product?		Set energy consumption into context of purchase decision and uncover its relative importance against other factors

4. <u>Sources of information on environmental performance of products (5 minutes)</u> If considered any aspect of environmental performance: • How did you find out about the environmental performance of the appliance? • How did you find out how much energy the appliance used? How did you find out about the greenhouse gases/CO2 it emitted? Waste/water/materials used etc. • How was this information illustrated? PROMPT IF NEEDED: did you see an energy rating, a consumption figure? • What do you think about the way this information is displayed? • In what ways is it useful? In what ways is it not useful? • Is there anything else you would have liked to know about the product?		Understand importance of energy label as an information source and uncover any information needs
5. <u>Information labels (40 minutes)</u> SHOW ENERGY LABEL 1 *(washing machine, tear drops, carbon footprint only)* • What are your first reactions to this? What do you immediately like about it? What do you immediately not like? Why? • Have you seen this kind of label before? PROBE – which elements are familiar? • If you saw this label on an appliance, what would that mean about its environmental performance? PROBE: how do you know that? • Which parts of the label do you not understand, if any? What would you guess this means? LOOKING AT THE RATING SCALE • What does the colour-coded scale mean? - Do you think it is measuring this appliance against all other white goods (washing machines, fridges etc.) or against similar appliances (all large fridge-freezers, all small dishwashers)? - Do you think it an absolute or a relative measure? LOOKING AT FOOTPRINT SYMBOL: • Have you seen it before? What do you think this symbol means? EXPLAIN IF NECESSARY – this shows the carbon footprint of the product.		Establish views on the current information label Extent of understanding, strengths, weaknesses Explore understanding of footprint symbol

• What do you understand 'carbon footprint' to mean? - How easy/clear is this symbol to understand? - Is there any other way to represent this? What do you think about adding the carbon footprint information to the label? What do you like about it? Is there anything you do not like about it?*NOTE TO MODERATOR:* *Allow short discussion of product-specific symbols, but explain that main focus for discussion is the rating scale and footprint symbols* SHOW ENERGY LABEL 2 *(smart phone, tear drops, all 4 symbols)* • What are your first reactions to this? What do you immediately like about it? What do you immediately not like? Why? • Have you seen any of these 3 symbols before? Which? • If you saw this label on an appliance, what would that mean about its environmental performance? PROBE: how do you know that? • What do you think these 3 symbols mean? What do they make you think of? AFTER DISCUSSION EXPLAIN IF NECESSARY. Water Usage, Eco Toxicity, Resources WORK THROUGH EACH SYMBOL IN TURN - How easy/clear is this symbol to understand? - Is there a need for an explanation of the symbols? - Is there any other way to represent this? - Do you prefer the label showing only the carbon footprint, or the label displaying the full range of environmental ratings e.g. toxicity, water use etc.? Or do you prefer the old style label which only included the energy rating? Why do you say this? What do you think is helpful/less helpful about each of these different labels? SHOW ENERGY LABEL 3 *(light bulbs, stars, all 4 symbols)* and ENERGY LABEL D *(light bulbs, letters, all 4 symbols)* *Explain that these labels show the same symbols but use different scales to show their environmental rating.* - Which is the clearest scale for representing the impact of an appliance on the environment?		Explore understanding of complete set of symbols Uncover preference between scales Select 2 scales for further testing

- Why do you say this? What about this scale do you prefer? PROBE How important is the use of colour in the scale? **6. <u>Individual Exercises (15 mins)</u>** *Without discussing this with anyone else, can you now write down the SCALE approach that you like best, then your second choice and the one that you like least. i.e. do you prefer the start rating scale, the letters or the tear drops? Remember there are no right or wrong answers, we just want your individual answers.* When everyone has completed the task, please ask them to say which one they chose as their favourite – write it up on the board GET GROUP TO COME TO CONCENSUS ON WHICH TWO OF THE THREE SCALES TO TAKE FORWARD FOR FURTHER TESTING SHOW ENERGY LABEL 4, 5, 6 (*three labels for same appliance with same overall rating but different ratings for water/footprint/resource/toxicity)*. ASK EACH INDIVIDUAL IN TURN TO CONSIDER THEIR PREFERENCE • Looking at these three labels, which one of these products would you choose? Why? • Which factor is most important to you? Why? • Which is least important? Why? • What are your overall thoughts about the new label layout? - What do you like about it? Why? - What do you not like about it? Why? • What is helpful about the information it provides? What is less helpful? How important is it to you personally to know these things? • How useful do you think it will be when choosing between different products in the future? Why do you say this? • Which parts of this information, if any at all, would you use when deciding whether to purchase an appliance? Why do you say this? *Moderator to probe between information which offers an*		Uncover relative importance of different symbols and likely impact of these on purchasing decisions.

individual benefit e.g. reduced energy use meaning lower energy bills, and information which offers indirect societal/wider environmental benefit but no direct individual gain e.g. lower carbon emissions, better resource efficiency. • What impact, if any, do you think this will have on the types of product that are available in the future? Why do you say this? PROBE: do you think it will encourage more energy-efficient and high environmental performance products, or do you think it will make no difference?		
7. <u>Marketing Communications -</u> the information given to consumers before they make a decision to purchase (20 minutes) • What information, if any, do you think should be provided about the new energy labels? How necessary is it to communicate the change to people? • Why is this needed / not needed? • How would this information be best communicated? AFTER DISCUSSION PROBE: leaflet, TV, website, SHOW EXAMPLE COMMUNICATIONS (2 example leaflets) - What do you think about this? What is good about it? What is less good? - Would you prefer this information communicated in a leaflet, through a website or through video? Why? - Where would you expect to see this information? How could these communication materials be improved? What other information, if any, should they include? SHOW DEFINITIONS OF SYMBOLS. Ask participants to read through each of them and circle words they do not understand. - What do you think about these definitions? - Is there anything you do not understand? What do you think this means? How could it be rephrased to make better sense? - How helpful, or not, do you think these are in explaining the symbols we have been looking at?		Explore necessity, and preference, for marcomms

8. <u>Final thoughts (5 minutes)</u> Sum up overall findings Relative importance of environmental performance labelling in purchase decision Effectiveness of different scales for environmental impacts symbols Group choice for scales Value of additional information Types of marketing communications recommended Anything else they would like to add? **End group and thank participants**		

Appendix 3: Phase 3

Appendix 3.1 Module 3 survey questions

ASK GROUP 1 RESPONDENTS ONLY
SP
ROTATE CODES 1-4
CODE 5 ALWAYS AT THE END

1. In the future consumers are going to be shown more information about the products they are buying. Which, if either, of the following two groups of symbols would be most useful to you in deciding which product you wanted to buy?

   Please choose one answer

   Group A

   Group B

   1. The symbols in Group A would be most useful in deciding which product to buy
   2. The symbols in Group B would be most useful in deciding which product to buy
   3. The symbols in both groups would be equally useful when deciding which product to buy
   4. I do not understand the symbols well enough to know which would be most useful
   5. I am not sure/ I do not know

GROUP 2 RESPONDENTS ONLY
SP
ROTATE CODES 1-4
CODE 5 ALWAYS AT THE END

2. In the future consumers are going to be shown more information about the products they are buying. Which, if either, of the following two groups of symbols would be most useful to you in deciding which product you wanted to buy?

   Please choose one answer

   Group A

   Group B

   1. The symbol in Group A would be most useful in deciding which product to buy
   2. The symbols in Group B would be most useful in deciding which product to buy
   3. The symbols in both groups would be equally useful when deciding which product to buy
   4. I do not understand the symbols well enough to know which would be most useful
   5. I am not sure/ I do not know

ASK GROUP 1 RESPONDENTS ONLY
SP

1.1.1

3. Please indicate which of the following products you think is the most environmentally friendly based on the information provided?

Please choose one answer

Product A

Product B

Product C

1. Product A is the most environmentally friendly

2. Product B is the most environmentally friendly
3. Product C is the most environmentally friendly
4. I do not know

ASK GROUP 2 RESPONDENTS ONLY
SP

4. Please indicate which of the following products you think is the most environmentally friendly based on the information provided?

Please choose one answer

Product A

Product B

Product C

1. Product A is the most environmentally friendly
2. Product B is the most environmentally friendly
3. Product C is the most environmentally friendly
4. I do not know

RANDOMISE Q5-8
ASK ALL
SP
ROTATE CODES 1-4
CODES 5-6 ALWAYS AT END

5. The following symbol may be printed on information labels for a range of household products. Which, if any, of the following comes closest to what you think this symbol means?

Please choose one answer

1. The carbon dioxide emissions released by the product when it is being used by the consumer
2. The carbon dioxide emissions released throughout the product's life
3. The total greenhouse gas emissions released by the product when it is being used by the consumer
4. The total greenhouse gas emissions released throughout the product's life
5. None of these – I think it means something different
6. I do not understand what this symbol means
7.

ASK ALL
SP
ROTATE CODES 1-4
CODES 5-6 ALWAYS AT END

6. The following symbol may be printed on information labels for a range of household products. Which, if any, of the following comes closest to what you think this symbol means?

Please choose one answer

- The amount of water used by the product when it is being used by the consumer
- The amount of water used throughout the product's life
- The amount of gas used by the product when it is being used by the consumer
- The amount of gas used throughout the product's life
- None of these – I think it means something different
- I do not understand what this symbol means

ASK ALL
SP
ROTATE CODES 1-3
CODES 4-5 ALWAYS AT END

7. The following symbol may be printed on information labels for a range of household products. Which, if any, of the following comes closest to what you think this symbol means?

Please choose one answer

1. The impact of the product on natural habitats
2. The pollution and hazardous waste released by the product which harms living species
3. The poisonous effects of the product throughout its life on species living in rivers and seas and on the quality of fresh water
4. None of these – I think it means something different
5. I do not understand what this symbol means

ASK ALL
SP
ROTATE CODES 1-3
CODES 4-5ALWAYS AT END

8. The following symbol may be printed on information labels for a range of household products. Which, if any, of the following comes closest to what you think this symbol means?

Please choose one answer

2. The overall environmental impact of the product
3. The contribution of the product to the depletion of the ozone layer
4. The rate at which this product leads to the depletion of natural resources faster than they are naturally replaced
5. None of these – I think it means something different
6. I do not understand what this symbol means

ROTATE Q9-10
ASK ALL
SP
ROTATE CODES 1-4
CODES 5-6 ALWAYS AT END

9. The following symbol may be printed on information labels for a range of household products. Which, if any, of the following comes closest to what you think this symbol means?

Please choose one answer

1. The amount of water used by the product when it is being used by the consumer
2. The amount of water used throughout the product's life
3. The amount of gas used by the product when it is being used by the consumer
4. The amount of gas used throughout the product's life
5. None of these – I think it means something different
6. I do not understand what this symbol mean

ASK ALL
SP
ROTATE CODES 1-4
CODES 5-6 ALWAYS AT END

10. The following symbol may be printed on information labels for a range of household products. Which, if any, of the following comes closest to what you think this symbol means?

Please choose one answer

1. The amount of water used by the product when it is being used by the consumer
2. The amount of water used throughout the product's life
3. The amount of gas used by the product when it is being used by the consumer
4. The amount of gas used throughout the product's life
5. None of these – I think it means something different
6. I do not understand what this symbol means

1.1.2 ASK ALL

SP PER ROW
ROTATE STATEMENTS

11. To what extent do you agree or disagree with each of the following statements?
Please choose one answer per row

	1. Strongly agree	2. Tend to agree	3. Neither agree nor disagree	4. Tend to disagree	5. Strongly disagree	6. Don't know
A. Being green is an alternative lifestyle it's not for the majority						
B. If things continue on their current course, we will soon experience a major environmental disaster						
C. The Earth has very limited room and resources						
D. The seriousness of climate change is exaggerated						
E. My local area is likely to be affected by climate change						

F. I can personally help to reduce climate change by changing my behaviour						
G. The effects of climate change are too far in the future to really worry me						
H. It's not worth us trying to combat climate change, because other countries will just cancel out what we do						
I. Even if others don't do the same, it's worth me doing things to live a sustainable lifestyle						
J. Living a sustainable lifestyle is a low						

priority compared to other things in my life						
K. When humans interfere with nature it often produces disastrous consequences						

1.1.3

1.1.4 ASK ALL

SP PER ROW

ROTATE STATEMENTS

12. Thinking about the UK, how concerned, if at all, are you that in the future…

Please choose one answer per row

	1. Not at all concerned	2. Not very concerned	3. Fairly concerned	4. Very concerned	5. No opinion	6. Don't know
A. …electricity will become unaffordable?						
B. …supplies of fossil fuels (e.g. coal and gas) will run out?						
C. …power cuts will become more frequent due to changes in supply						

Appendix 4: Phase 3

Appendix 4.1 Key findings based on all data without omission of outliers

4.1.1 Impact of environmental labelling

Average BDM bids under alternative labelling schemes, full dataset

	Average bids for products under alternative labelling schemes and environmental standards						Differences in average bids across alternative labelling schemes and environmental standards[1]				
Labelling scheme	CO2 label		Full Environmental label			EU label	"good" product carrying CO2 label vs. Product carrying EU label	"good" product carrying Full label vs. Product carrying EU label	"good" product carrying CO2 label vs. "bad" product carrying CO2 label	"good" product carrying Full label vs. "bad" product carrying Full label	"good" product carrying Full label vs. "good" product carrying CO2 label
Environmental standard[2] (Based on the new environmental characteristics only)	Bad	Good	Bad	Good	Mid-range	Not Applicable					
	(1)	(2)	(3)	(4)	(5)	(6)	(2)-(6)	(4)-(6)	(1)-(2)	(3)-(4)	(4)-(2)
Means											
Washing machines	413.93	425.17	412.26	414.53	414.74	412.63	12.54***	1.90	11.24**	2.27*	-10.64***
Televisions	414.64	419.12	410.75	414.40	419.22	411.63	7.49*	2.77	4.49	3.66	-4.72
Light bulbs	26.23	26.65	23.07	26.60	23.31	29.25	-2.60	-2.65	0.43	3.53**	-0.05
Medians											
Washing machines	408.08	413.12	408.08	412.64	410.72	410.09	3.02***	2.54***	5.04***	4.56***	-0.48***
Televisions	405.00	410.00	405.00	410.00	409.52	405.71	4.29***	4.29***	5.00***	5.00***	0.00
Light bulbs	2.88	2.91	2.88	2.90	2.92	2.88	0.03***	0.02***	0.03***	0.02***	-0.01

Notes: Calculated across all respondents using truncated bid variable. 1. *** (**, *) implies significant at 10% (5%, 10%). 2. For definitions of "good", "bad" and 'Mid-range'

4.1.2 The impact of improving individual ratings

Regression results: Effect of improving individual ratings by one level on the average bid submitted for products carrying the CO2 label (all respondents), full dataset

	Washing machines	TVs	Light bulbs
CO2 rating	2.09***	1.62	-0.36
	(0.65)	(1.04)	(0.59)
Constant	410.83***	410.55***	27.83***
	(2.21)	(2.66)	(2.68)
Observations	6,716	6,739	6,732

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

Regression results: Effect of improving individual ratings by one level on the average bid submitted for products carrying the Full label (all respondents), full dataset

	Washing machines	Televisions	Light bulbs
CO2 rating	0.55*	0.68**	-0.15
	(0.29)	(0.30)	(0.59)
Water rating	0.47	0.15	-0.08
	(0.29)	(0.28)	(0.56)
Eco-toxicity rating	0.52	0.84***	0.58
	(0.38)	(0.30)	(0.56)
Resource depletion rating	-0.20	0.49**	1.16**
	(0.47)	(0.25)	(0.52)
Constant	406.79***	401.94***	17.38***
	(2.71)	(3.41)	(4.90)
Observations	10,573	10,586	10,574

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.1.3 Impact of the information campaign

The effects of information on average bids submitted, full dataset

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
G1	11.58	15.61**	-4.04	-2.15	-4.03*	0.40
	(8.10)	(7.76)	(3.63)	(1.59)	(2.15)	(2.43)
G2	4.10	1.83	-1.33	-3.06*	-3.12	-0.82
	(8.18)	(7.86)	(3.68)	(1.57)	(2.17)	(2.43)
B1	-8.41	4.33	-2.40	-1.13	-3.82	-2.52
	(7.65)	(7.33)	(3.42)	(1.77)	(2.43)	(2.73)
B2	-1.57	-2.80	-6.38*	-7.33***	-7.34***	-5.00*
	(7.59)	(7.29)	(3.38)	(1.77)	(2.34)	(2.69)
B3	-8.30	2.91	2.21	-3.66**	-6.71***	-3.41
	(7.62)	(7.24)	(3.40)	(1.74)	(2.41)	(2.76)
M1				-0.82	-0.89	-3.47
				(3.01)	(3.91)	(4.71)
M2				-2.24	-5.48	0.79
				(2.98)	(4.20)	(4.38)
M3				-1.54	12.46***	-8.26*
				(2.85)	(3.89)	(4.66)
Constant	420.36***	413.62***	28.43***	416.65***	417.20***	26.72***
	(5.69)	(5.54)	(2.57)	(1.12)	(1.51)	(1.71)
Observations	6,716	6,739	6,732	10,573	10,586	10,574

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.1.4 Impact of a national history of environmental labelling - the effect of the country having some history of labelling on the average bid submitted, full dataset

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	6.35	1.96	-2.82	3.52	-0.97	5.18
	(10.72)	(10.09)	(4.73)	(2.32)	(3.16)	(3.59)
History of labels	0.16	4.25	17.93***	2.83	2.49	17.94***
	(8.52)	(7.88)	(3.65)	(2.04)	(2.77)	(3.19)
Some history of labels	3.55	5.13	9.19**	0.12	4.81*	9.31***
	(8.35)	(7.74)	(3.59)	(2.01)	(2.72)	(3.13)
History*Good product	-1.44	-2.24	5.86	-4.01	3.93	1.03
	(12.86)	(12.14)	(5.68)	(2.77)	(3.79)	(4.30)
Some History* Good product	12.61	7.64	1.84	-0.42	3.07	-4.77
	(12.64)	(11.91)	(5.58)	(2.72)	(3.72)	(4.22)
Constant	412.67***	411.19***	15.26***	411.97***	409.82***	12.00***
	(7.10)	(6.54)	(3.02)	(1.71)	(2.31)	(2.67)
Observations	6,716	6,739	6,732	10,573	10,586	10,574

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.1.5 Impact of individual-level characteristics

Regression results: Effect of individual-level characteristics on bids for products carrying the Full label (all respondents), full dataset

	CO2 label			Full label		
Explanatory variable	Washing machines	Television	Light bulbs	Washing machines	Television	Light bulbs
Good product	10.25	5.35	0.73	1.87*	2.19	4.35**
	(6.52)	(6.07)	(2.71)	(1.06)	(1.81)	(2.02)
Age	-0.54	-0.25	0.44***	-0.26***	-0.24***	0.55***
	(0.35)	(0.35)	(0.11)	(0.04)	(0.09)	(0.08)
Income	-1.40	0.05	-0.78	-0.66	-0.70	-1.47
	(1.81)	(1.32)	(1.19)	(0.48)	(0.58)	(0.93)
Education	-8.02	-8.51	-6.41***	0.24	-0.08	-6.21***
	(6.98)	(6.75)	(1.61)	(0.50)	(0.68)	(0.94)
Gender	13.43**	9.02	7.17***	2.25**	6.71***	3.60*
	(6.53)	(6.41)	(2.70)	(1.09)	(1.72)	(2.04)
Bought washing machine recently	20.27			-0.04		
	(14.96)			(1.73)		
Bought TV recently		9.74			1.72	
		(9.61)			(2.13)	
Bought light bulb recently			-4.04			-0.78
			(3.00)			(2.17)
Constant	454.74***	448.40***	33.72***	421.45***	414.67***	29.12***
	(32.11)	(31.25)	(10.20)	(3.41)	(3.23)	(6.58)
Observations	5,275	5,269	5,260	8,153	8,164	8,172

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.1.6 The effect of understanding the label better on the average bid submitted, full dataset

	CO2 Label		
	Washing machines	TVs	Light bulbs
Good product	12.52**	4.78	0.83
	(6.35)	(6.03)	(2.55)
Footprint understanding	-3.59	-5.18**	-5.72
	(2.61)	(2.41)	(3.52)
Footprint understanding* Good product	-8.11	-2.00	-2.69
	(6.87)	(6.28)	(5.26)
Constant	414.89***	415.91***	27.12***
	(2.09)	(2.14)	(1.71)
Observations	6,716	6,739	6,732

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

Regression results: Effect of understanding the new symbols on bids for products carrying the Full label (all respondents), full dataset

	Washing machines	Televisions	Light bulbs
Good product	2.08	0.92	5.19**
Level of understanding	-1.22*	-1.32***	-1.95*
Level of understanding * Good product	-0.25	1.05	-1.78
Constant	414.30***	414.19***	25.01***
Observations	10,573	10,586	10,574

Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

Regression Results: Effect of environmental conscience on bids for products (all respondents), full dataset

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	-12.54	6.67	9.50	2.81	11.34***	-1.37
	(12.12)	(7.59)	(8.11)	(3.60)	(3.26)	(5.68)
Environmental index	-6.02*	1.41	5.43**	-2.38**	0.20	-1.98
	(3.18)	(1.73)	(2.39)	(1.06)	(1.06)	(1.64)
Environmental index * Good product	10.29	-0.95	-3.90	-0.44	-4.07***	2.10
	(6.29)	(5.11)	(3.54)	(1.60)	(1.52)	(2.31)
Constant	428.27***	411.83***	13.60**	418.61***	412.44***	27.68***
	(8.73)	(3.84)	(5.33)	(2.39)	(1.83)	(4.03)
Observations	6,716	6,739	6,732	10,573	10,586	10,574

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.1.7 The effect of education on the average bid submitted for good or bad products, full dataset

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	69.89	50.50	0.70	-5.83	0.25	18.46**
	(64.09)	(62.18)	(13.36)	(5.71)	(5.68)	(8.53)
Education	-0.67	-1.73	-6.45***	-0.55	-0.30	-4.66***
	(1.16)	(2.00)	(2.04)	(0.74)	(0.69)	(1.18)
Education* Good product	-12.79	-10.06	0.03	1.69	0.32	-3.29*
	(12.73)	(12.39)	(2.71)	(1.16)	(1.40)	(1.70)
Constant	418.87***	423.74***	57.41***	416.03***	415.06***	46.87***
	(7.04)	(9.31)	(10.04)	(3.54)	(2.75)	(5.90)
Observations	5,810	5,825	5,803	8,984	8,999	9,008

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.1.8 The effect of income on the average bid submitted for good or bad products, full dataset

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	12.05	2.43	-1.33	-0.03	5.18**	6.16
	(8.77)	(7.27)	(5.05)	(2.31)	(2.08)	(3.82)
Income	-2.67	-2.15	-2.58*	-0.79	-0.04	-2.06*
	(1.68)	(1.34)	(1.32)	(0.63)	(0.93)	(1.07)
Income* Good product	-0.73	1.53	0.74	0.84	-1.41	-0.93
	(2.25)	(1.46)	(2.12)	(0.87)	(1.05)	(1.56)
Constant	420.77***	419.09***	32.36***	415.37***	412.85***	26.92***
	(5.18)	(4.16)	(3.32)	(1.60)	(1.38)	(2.65)
Observations	6,103	6,101	6,107	9,599	9,611	9,597

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.1.9 The effect of age on the average bid submitted for good or bad products, full dataset

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	43.79	28.32	5.37	2.10	0.20	1.12
	(26.85)	(26.68)	(7.76)	(3.16)	(7.22)	(5.13)
Age	-0.03	0.06	0.60***	-0.23***	-0.27**	0.54***
	(0.12)	(0.16)	(0.13)	(0.05)	(0.12)	(0.08)
Age* Good product	-0.81	-0.59	-0.13	-0.01	0.04	0.07
	(0.55)	(0.55)	(0.18)	(0.08)	(0.15)	(0.12)
Constant	415.42***	412.55***	2.19	422.64***	423.68***	0.81
	(3.69)	(5.68)	(5.39)	(1.93)	(5.89)	(3.44)
Observations	6,716	6,739	6,732	10,573	10,586	10,574

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.1.10 The effect of gender on the average bid submitted for good or bad products, full dataset

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	-5.66	-19.69*	-10.03	2.71	1.62	3.57
	(10.73)	(11.72)	(6.99)	(3.55)	(3.70)	(5.31)
Gender	6.59*	-0.84	2.09	3.00**	6.25***	3.69
	(3.53)	(3.60)	(3.03)	(1.35)	(2.28)	(2.38)
Gender* Good product	11.03	15.96	6.94	-0.58	0.26	-0.11
	(10.34)	(9.91)	(4.53)	(2.07)	(2.94)	(3.38)
Constant	404.42***	416.34***	23.05***	408.58***	403.54***	17.62***
	(4.00)	(6.97)	(4.69)	(2.28)	(2.79)	(3.71)
Observations	6,716	6,739	6,732	10,573	10,586	10,574

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.1.11The effect of recently having bought any of the products, full dataset

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	4.87**	0.23	1.78	1.83	4.04***	1.17
	(2.33)	(2.60)	(4.21)	(1.11)	(1.41)	(3.03)
Bought washing machine recently	0.11			2.79		
	(2.63)			(1.88)		
Bought washing machine recently * Good product	33.97			-0.30		
	(26.73)			(2.91)		
Bought TV recently		-0.24			5.28	
		(2.97)			(3.37)	
Bought TV recently * Good product		14.69			-6.66*	
		(16.61)			(3.75)	
Bought light bulb recently			-2.88			-2.93
			(3.32)			(2.63)
Bought light bulb recently * Good product			-2.10			3.39
			(4.99)			(3.65)
Constant	414.28***	415.16***	28.20***	412.60***	411.24***	25.10***
	(2.13)	(2.51)	(2.78)	(0.73)	(0.69)	(2.22)
Observations	6,716	6,739	6,732	10,573	10,586	10,574

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%)

Appendix 4.2 Additional tables – Outlier free data

4.2.1 The effect of the country having a history of environmental labelling on bids for "bad" and "good" products, outlier free data

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	5.468***	0.166	-0.016	2.588**	0.696	0.060
	(1.557)	(1.400)	(0.103)	(1.198)	(1.229)	(0.121)
History of labels	0.827	-1.394	2.000***	0.571	1.889*	1.833***
	(1.131)	(1.123)	(0.695)	(1.064)	(1.089)	(0.585)
Some history of labels	2.173*	-0.828	0.822**	0.921	2.269**	0.780**
	(1.120)	(1.082)	(0.400)	(1.040)	(1.050)	(0.373)
History*Good product	-1.758	3.025*	0.580	0.385	3.045**	-0.314
	(1.716)	(1.601)	(1.062)	(1.394)	(1.390)	(0.754)
Some History* Good product	-0.273	3.730**	-0.490	0.428	1.798	-0.218
	(1.737)	(1.640)	(0.496)	(1.352)	(1.370)	(0.480)
Constant	414.938***	413.107***	2.962***	415.714***	410.950***	3.039***
	(1.017)	(0.952)	(0.063)	(0.922)	(0.959)	(0.089)
Observations	6,643	6,700	6,274	10,459	10,520	9,895

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.2.2 The effect of education on bids for "bad" and "good" products, outlier free data

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	2.41	-0.70	-2.92	-2.30	2.13	-0.33
	(2.64)	(2.94)	(3.08)	(2.49)	(2.49)	(2.01)
Education	-0.84**	-1.12***	-0.99**	-1.24***	-0.98**	-0.37
	(0.36)	(0.42)	(0.46)	(0.45)	(0.44)	(0.33)
Education* Good product	0.46	0.76	0.71	1.07**	0.14	0.02
	(0.53)	(0.59)	(0.63)	(0.53)	(0.54)	(0.40)
Constant	420.49***	417.62***	8.47***	422.41***	417.49***	6.04***
	(1.77)	(2.05)	(2.26)	(2.05)	(1.97)	(1.64)
Observations	5,751	5,787	5,381	8,890	8,942	8,380

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.2.3 The effect of income on bids for "bad" and "good" products, outlier free data

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	4.39***	3.49***	-1.25	1.39	3.80***	0.41
	(1.11)	(1.18)	(1.03)	(0.95)	(0.91)	(0.79)
Income	-0.99***	-0.52	-0.67**	-1.36***	-1.37***	-0.12
	(0.32)	(0.36)	(0.28)	(0.28)	(0.25)	(0.23)
Income * Good product	-0.05	-0.33	0.53	0.68*	-0.50	-0.22
	(0.46)	(0.47)	(0.33)	(0.39)	(0.37)	(0.31)
Constant	418.30***	413.28***	5.61***	419.48***	415.42***	4.18***
	(0.76)	(0.87)	(0.85)	(0.68)	(0.65)	(0.56)
Observations	6,041	6,072	5,683	9,504	9,551	8,987

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%,10%).

4.2.4 The effect of age on bids for "bad" and "good" products, outlier free data

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	5.12***	5.41***	-0.62	3.94***	5.64***	-1.71*
	(1.77)	(1.86)	(1.19)	(1.44)	(1.47)	(0.98)
Age	-0.05**	-0.01	0.04	-0.06***	-0.04*	0.02
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Age*Good product	-0.01	-0.06	0.01	-0.02	-0.07**	0.04
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Constant	418.21***	412.72***	2.64***	418.95***	414.50***	3.36***
	(1.07)	(1.18)	(0.96)	(1.08)	(1.10)	(0.76)
Observations	6,643	6,700	6,274	10,459	10,520	9,895

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.2.5 The effect of gender on bids for "bad" and "good" products, outlier free data

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good	2.93*	0.86	0.50	2.57*	2.17	0.78
	(1.67)	(1.74)	(1.12)	(1.40)	(1.37)	(1.09)
Gender	2.77***	2.59***	1.69***	1.07	1.74***	0.47
	(0.66)	(0.73)	(0.62)	(0.67)	(0.64)	(0.55)
Gender*Good	1.09	1.37	-0.33	0.26	0.36	-0.63
	(1.03)	(1.08)	(0.90)	(0.88)	(0.85)	(0.71)
Constant	412.06***	408.33***	1.53**	414.73***	410.07***	3.39***
	(1.06)	(1.16)	(0.73)	(1.03)	(1.06)	(0.80)
Observations	6,643	6,700	6,274	10,459	10,520	9,895

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).

4.2.6 The effect of recently having purchased a similar product on bids for "bad" and "good" products, outlier free data

	CO2 Label			Full label		
	Washing machines	TVs	Light bulbs	Washing machines	TVs	Light bulbs
Good product	4.96***	3.21***	0.12	3.14***	3.21***	-0.52
	(0.56)	(0.62)	(1.02)	(0.48)	(0.51)	(0.68)
Bought washing machine recently	1.54*			3.09***		
	(0.82)			(0.83)		
Bought washing machine recently * Good product	-1.72			-1.16		
	(1.38)			(1.19)		
Bought TV recently		2.10***			1.85***	
		(0.78)			(0.70)	
Bought TV recently * Good product		-0.67			-1.65*	
		(1.25)			(0.91)	
Bought light bulb recently			-0.70			-0.43
			(0.81)			(0.65)
Bought light bulb recently * Good product			-0.21			0.53
			(1.13)			(0.79)
Constant	415.94***	411.56***	4.56***	415.76***	412.10***	4.38***
	(0.37)	(0.44)	(0.74)	(0.37)	(0.38)	(0.58)
Observations	6,643	6,700	6,274	10,459	10,52	9,895

					0	

Notes: Robust standard errors in parentheses. Estimates calculated across all respondents, excluding bids more than three standard deviations from the mean. *** (**, *) implies significant at 10% (5%, 10%).