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Consumers' Comprehension of the EU Energy Label for Washing Machines

Energy Labels are an instrument supporting on-going market transformation towards higher energy efficiency by motivating consumers to select more energy-efficient products. Since the purchase decision can be influenced by the consumers' understanding of the Energy Label, this paper addresses the clarity of the Energy Label of washing machines from a consumer's point of view, and their expectations and wishes concerning a future Energy Label. Information on consumers' opinions/expectations regarding the Energy Label was collected by a semi representative survey in eleven European countries in 2015. The main outcome of the study is that consumers are generally familiar with the symbols on the Energy Label, but they do not know this information belongs to which programme. They believe that a washing machine with the highest Energy efficiency class available on the market can help make savings on energy and water in all its programmes. Finally, the study suggests which modifications need to be applied to the current version of the Energy Label to improve its effectiveness.

Key words: Energy efficiency, european consumers, washing machines, sustainability, revision

Verständnis des Verbrauchers zum EU-Energielabel für Waschmaschinen. Energielabel sind ein Instrument, das eine kontinuierliche Marktumstellung in Richtung einer höheren Energieeffizienz unterstützt, indem es die Verbraucher motiviert, energieeffizientere Produkte auszuwählen. Da die Kaufentscheidung des Verbrauchers durch das Verstehen des Energielabels beeinflusst werden kann, befasst sich dieser Beitrag mit der Verständlichkeit des Energielabels von Waschmaschinen aus der Sicht des Verbrauchers und den Erwartungen und Wünschen der Verbraucher an ein zukünftiges Energielabel. In einer im Jahr 2015 durchgeführten semi-repräsentativen Umfrage in elf europäischen Ländern wurden Informationen über die Verbrauchermeinungen und Erwartungen bezüglich des Energielabels gesammelt. Das wichtigste Ergebnis der Studie ist, dass die Verbraucher in der Regel mit den Symbolen auf dem Energielabel vertraut sind, aber nicht wissen, zu welchem Programm diese Informationen gehörten. Sie glauben, dass in allen Programmen einer Waschmaschine mit der höchsten Energieeffizienzklasse, die auf dem Markt verfügbar ist, Energie und Wasser gespart werden kann. Schließlich schlägt die Studie vor, welche Änderungen an der aktuellen Version des Energielabels vorgenommen werden müssen, um seine Wirksamkeit zu verbessern.

Stichwörter: Energieeffizienz, europäische Verbraucher, Waschmaschinen, Nachhaltigkeit, Revision

1 Introduction

The Ecodesign directive No. 2009/125/EC [1] and the Energy Label directive No. 2010/30/EU [2] are two of the policy instruments deployed in the European Union (EU) for reduc-

ing the environmental impacts of products throughout their entire life cycles.

The first A to G EU Energy Label for household washing machines was introduced in 1995 by Commission Directive 95/12/EC of 23 May 1995, implementing Council Directive 92/75/EEC [3]. The Label was based on a kWh/kg capacity efficiency definition, with 0.19 kWh/kg being the threshold of class A. The energy consumption was defined based on a full load test using a 60 °C cotton programme [4]. The Energy Label was amended in 2010 and new energy efficiency classes (A+, A++ and A+++) were introduced by Commission Delegated Regulation (EU) No. 1061/2010 of 28 September 2010, supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to Energy Labelling of household washing machines [5]. At the same time, the efficiency definition was changed: The label classes were defined based on an Energy Efficiency Index (EEI), the calculation of which is based on annual energy consumption, including low power modes, and also considers tests at 40 °C with a half load, in addition to the half load/full load 60 °C programme [4]. This Regulation requires all washing machines placed on the European market to present the following information to the customer [6]:

- the energy efficiency class (from A+++ to D),
- annual energy consumption in kWh,
- annual water consumption in litres,
- capacity in kilograms,
- spin-drying efficiency class, and
- noise emissions during washing and spinning in decibels.

Despite the fact that almost all washing machines sold in 2010 were in Energy label category A, the production of washing machines with an A Energy label has been prohibited since 2013. This means that only A+, A++ and A+++ are currently available on the European market [4]. However, the energy efficiency classes which are no longer available due to being banned by the Ecodesign Directive are still displayed on the Energy Label. This may mislead the consumer who could buy an A+ appliance thinking that they are choosing one of the most efficient products when they are actually buying one of the least efficient classes available [7]. According to the survey conducted by Forsa among 1,000 people on behalf of the German consumer organisation Verbraucherzentrale Bundesverband (vzbv), only 12% of respondents understood they were choosing the least energy-efficient class on the market when buying A+ [8].

The EU Energy Label plays a significant role in the awareness of the energy consumption of appliances worldwide. However, the current Energy Label lacks the information on an aspect that many consumers find very important, i.e. the product's (yearly) running costs [9].

Several studies reveal a significant positive impact of energy labels on consumers' choices for energy-efficient appliances [10, 11]. The difference between Energy Labels is not only regarding their visualization of energy efficiency, but

also in the way of presenting information on energy consumption. The EU Energy Label, for instance, provides several types of physical information. However, no information in monetary units is disclosed on this label. By contrast, the US Energy Guide displays estimated yearly operating costs, while physical units are placed less obviously [12].

Rohling and Schubert [13] in their literature review on the empirically measured effects of different energy efficiency label formats on consumers' purchase decisions finds that a household's purchases of energy-using appliances might be affected by the Energy Label. However, which label format is best for guiding consumers' choices toward more energy-efficient products is uncertain.

Within the framework of a study conducted by Verbraucherzentrale Rheinland-Pfalz [14] about the comprehensibility of the Energy Label, a washing machine's Energy Label was presented to consumers and they were asked: "Which of the following pieces of information and symbols shown on the Energy Label are immediately understandable?" The minority of respondents (23%) understood the pictogram on the spin-drying efficiency class, whereas almost all the consumers (94%) admitted that they understood the information given in the energy efficiency scale on the Energy Label. The information about machine size and laundry capacity is widely understood (84%). However, slightly more than half of the respondents comprehended the information about the electricity consumption (61%) and water consumption (51%) per year. The pictograms on the acoustic noise during the wash cycle and spin-drying were understood by 64% and 59% of participants, respectively. This study also proves that the comprehensibility of the information about the absolute electricity consumption of appliances is particularly important for consumers, since the washing machines available on the market are becoming more and more efficient, but do not necessarily consume less electricity.

The University of Bonn, Germany, conducted an online survey in 2007 as a part of a Preparatory Study for Eco-design Requirements of Energy-using Products (domestic washing machines and dishwashers (EuP Lot 14)). A total of 2,497 participants from ten European countries took part in the survey. The results of this study revealed that 51.9% of participants opted for "Energy Label" when they were asked: "If you were considering buying a new household appliance, which source of information would you consult to support your decision?" Furthermore, respondents were asked: "Which information would you expect to find on this label?" and a list of options was provided. Results show that over 80% of the participants considered the energy efficiency class and water consumption to be very important information on the Energy Label. Respondents reconfirmed the need for elements already present on the Energy Label, such as load capacity (57.5%), noise emission (55.4%) and spin performance (50.5%). Moreover, including some information about washing performance is requested by over 50% of the respondents (58.1%). The respondents favoured energy consumption per cycle per day (56.4%) over annual consumption (34.1%). In addition, when respondents were asked about the criteria for purchasing a new appliance, 36% of them claimed good assessment results on the Energy Label as an important criterion [15].

London Economic and Ipsos launched a study on changing the Energy Label and its impact on consumers' understanding and their purchasing decisions. Results confirm that a simple A-G label is the best option to help consumers to choose the most energy-efficient product. The results of this study lead to the conclusion that introduction of the A+ to A+++ classes has reduced the effectiveness of Energy

Labels to motivate consumers to purchase more efficient products [16–18]. Consumers are less motivated to opt for the top class appliances without a clear "buy A" message [19]. A follow-up study by the University of St. Gallen and the University of Bielefeld showed that consumers perceive the difference in energy consumption between A+, A++ and A+++ as much smaller than the differences in energy consumption between classes A, B and C. Therefore, they are much less willing to pay for a higher efficiency class [19, 20].

Navigant Consulting, with the aid of Sowatt and SEVEN, conducted a survey in the form of focus group studies and questionnaires in ten cities across Europe, complemented by three sets of in-depth interviews held in London, Prague and Paris. The aim of the survey was to assess the consumer comprehension of the Energy Label and its effectiveness as a market transformation tool. The research indicates that most of the consumers appreciated the energy grades and coloured scales and found these to be the most useful element to use as a comparator with other labels, even if they did not understand the entire contents of the Energy Label. Energy and water consumption per cycle and size were the most commonly suggested as being missing from the Energy Label. They also suggested that the A to G efficiency scale in preference to adding more plus signs should be considered for future label revisions [21, 22].

The University of Bonn conducted an online survey in 2011 with over 2,000 households in ten European countries regarding the behaviour of their laundry washing. Results confirm that most of the consumers expect to have information regarding the energy efficiency class (83%) and water consumption (78%) on the Energy Label. Over 50% of the respondents requested the information about capacity (59%) and noise emission (54%). Information about spin-drying efficiency was requested by 43% of respondents [23].

The final report of the Commission study on the understanding of the Energy Label concludes that energy efficiency scales with letters (as opposed to numbers) are generally better understood by consumers. According to this study, European consumers recognize the EU Energy Label, with surveys confirming recognition rates up to 80 and 95%, and they mostly trust the label with a large majority using it in their purchasing decisions [17].

Regulation No. 1061/2010 on the Energy Labelling of household washing machines and Regulation No. 1015/2010 on the ecodesign of household washing machines are both currently under revision in the light of technological progress. The final report of the evaluation study acknowledges that "consumer understanding should be the chief concern for future label revisions" [17].

The studies mentioned are the most relevant studies on the European consumers' understanding of the Energy Label. Even though some research has been conducted in this area, to the best of our knowledge, there is no representative data available regarding the European consumers' understanding of the Energy Label in EU countries. Furthermore, none of these studies evaluate the effects of socio-demographic characteristics on the consumers' perception of the Energy Label. Therefore, the objective of this paper is to investigate the consumers' expectations and understanding of the current Energy Label in 11 large European countries, representing a majority of all households in the EU and assess the effects of socio demographic characteristics on their expectations and knowledge of the Energy Label. Moreover, the study should suggest modifications on the current Energy Label to provide support and guidance for the policy-makers. The following research questions will be answered specifically within the framework of this study:

- Is the Energy Label used as a source of information to support purchase decisions?
- Are symbols/information on the EU Energy Label understandable for consumers?
- Do consumers expect further/other types of information on the EU Energy Label?
- Are there any specific differences in EU countries regarding understanding the symbols on the Energy Label?
- Is understanding of the symbols on the EU Energy Label affected by the socio demographic characteristics of respondents?

2 Methodology

A semi-representative online survey, representing 82 % of all households in the EU was conducted by the University of Bonn in April and May, 2015. The aim of the survey was to assess the washing behaviour of over 5,000 households in 11 European countries (Czech Republic, Finland, France, Germany, Hungary, Italy, Poland, Romania, Spain, Sweden and the United Kingdom).

A questionnaire was developed by the University of Bonn based on an extensive literature review and the results of focus group interviews performed previously with the support from the JRC-IPTS¹ and other stakeholders. The on-line questionnaire consists of 61 questions including socio-demographic aspects, questions about the age and characteristics of washing machines (e.g. size, spin speed, delay start function), loading and sorting behaviour, washing and drying behaviour, washing programmes used and their frequency, important characteristics of washing programmes, and questions related to the Energy Label and possible options to save energy.

Toluna, a professional market research company located in Frankfurt am Main, Germany, was asked to translate the questionnaires into different languages, recruit respondents

from the panel of registered consumers and fulfil the quotas for each country. Translations were checked by native speakers via the JRC-IPTS of the European Commission.

Qualified households were chosen following a predefined quota:

- Involvement in laundry washing of the person interviewed: substantial.
- Distribution of gender: more than 50% female. To the best of the authors' knowledge, laundry is primarily a woman's responsibility [24, 25].
- Selected age groups:
 - 20–39 years
 - 40–59 years
 - 60–74 years
- Household size: 1, 2, 3, 4 and more than 4 people

Quotas for the size of the household and age groups selected were defined to fit the respective distribution for each country, so as to represent the relevant part of the population.

The validity of each dataset was assessed with the aid of control questions before starting the analyses. After excluding the outlier data, the number of the panel diminished from 5,100 to 4,843.

Furthermore, weighting according to the number of households of each country compared to the sum of all countries investigated was implemented for calculating the average EU results. Table 1 illustrates the contribution of European countries in the survey.

Results from the online questionnaire were analysed using Statistical Package for the Social Sciences (SPSS) and presented in descriptive and analytic format.

3 Results and Discussion

In order to find out the answer to the research question relating to using the Energy Label as a source of information when purchasing a new washing machine, respondents were asked “Where do you look for information before purchasing a new washing machine?” The main source of information they mentioned was “Online product rating”

¹ JRC-IPTS: Joint Research Centre – Institute for Prospective Technological Studies

Country	Panel	Valid data	Households	Contribution to total results %
Czech Republic	300	283	4,502,431	3
Finland	300	288	2,579,781	1
France	600	580	27,106,517	16
Germany	600	580	40,656,000	23
Hungary	300	279	4,105,708	2
Italy	600	555	25,007,000	14
Poland	600	563	13,567,999	8
Romania	300	275	7,470,429	4
Spain	600	567	18,083,690	10
Sweden	300	294	4,725,279	3
United Kingdom	600	579	26,414,000	15
All households in the sample	5,100	4,843	174,218,834	100
Total number of households in EU	...	...	213,656,847	Sample covers 82 % of total EU

Table 1 Contribution of European countries to the survey (source for number of households [26])

(51%) (Figure 1). “Label on the machine” was only important as a source of information for 23% of the participants in the survey. Within the framework of the study carried out by the University of Bonn in 2011, information on the Energy Label is used as a source of information for 46% of the respondents, whereas visiting manufacturers' internet sites (52%) was reported as a main source of information when buying a new appliance [23].

Interestingly, results of the 2007 survey carried out by the University of Bonn confirm that information on the Energy Label was used by over 50% of respondents as a source of information supporting a purchase decision, while their own experience was declared as a main source of information to support their purchase decision [15].

Results of these studies confirm that the usage of the Energy Label as source of information to support a purchase decision has reduced during the period of 2007 to 2015 from 51.9% to 23%. The reason behind this might be related to the introduction of a new version of the Energy Label in 2010. The old version of the Energy Label ran for about 15 years [27]. During that time, the Energy Label became a familiar sight to the public, who were mostly able to make good sense of the numbers and grades depicted on it. On the new Label, the units used to express energy and water consumption had been changed from kWh and litre per cycle to kWh and litre per annum, respectively. Furthermore, the rating scale had changed from A to G on the old Energy Label, to a A+++ to D rating scale on the new Energy Label. From the point of view of consumers and green NGOs, the introduction of plusses and the definition of the post-2010 implementing measures created more confusion and did not solve some of the issues identified before the revision in the best way [28]. Moreover, loss of differentiation between energy efficiency classes available on the market or types of information presented on the Energy Label might

also be reasons for this downtrend; consumers are probably willing to have different types of information rather than what was displayed on the Energy Label. The high usage of online product rating supports this claim. Furthermore, using manufacturers' internet sites, recommendation and advice from sales people and friends have also decreased during this period (by 10, 9 and 15%, respectively).

Country specific results illustrates that French respondents use the Energy Label more than other countries, while only a negligible number of Finish respondents use it. The results were analysed further regarding the employment status of the respondents. Statistical analysis proves that the usage of the Energy Label as a source of information when purchasing a new appliance is affected by the employment status of the participants (Kruskal-Wallis test $\chi^2 = 12.176$ (df = 5), $p < 0.05$). Households with retired people use information on the Energy Label more than other groups, while households containing participants in full-time employment are less likely to use this source of information (Fig. 2).

As the usage of the Energy Label as a source of information for purchasing a new washing machine reduced after the introduction of the current Energy Label in 2010, it was interesting to find out whether consumers understood the symbols on the Energy Label or not. Therefore, respondents were asked to indicate all types of information that they can identify on the Energy Label presented (Fig. 3) to investigate its clarity. Around 90% of respondents claimed that they could identify the energy efficiency classes, followed by noise emission during washing (73%), noise emission during spinning (71%), capacity (69%) and the average water consumption per year (69%). Information on spin-drying efficiency caused major difficulties and could only be identified by 46% of the participants (Fig. 4).

Further analysis was conducted to assess whether there is any relation between recognition of spin-drying efficiency

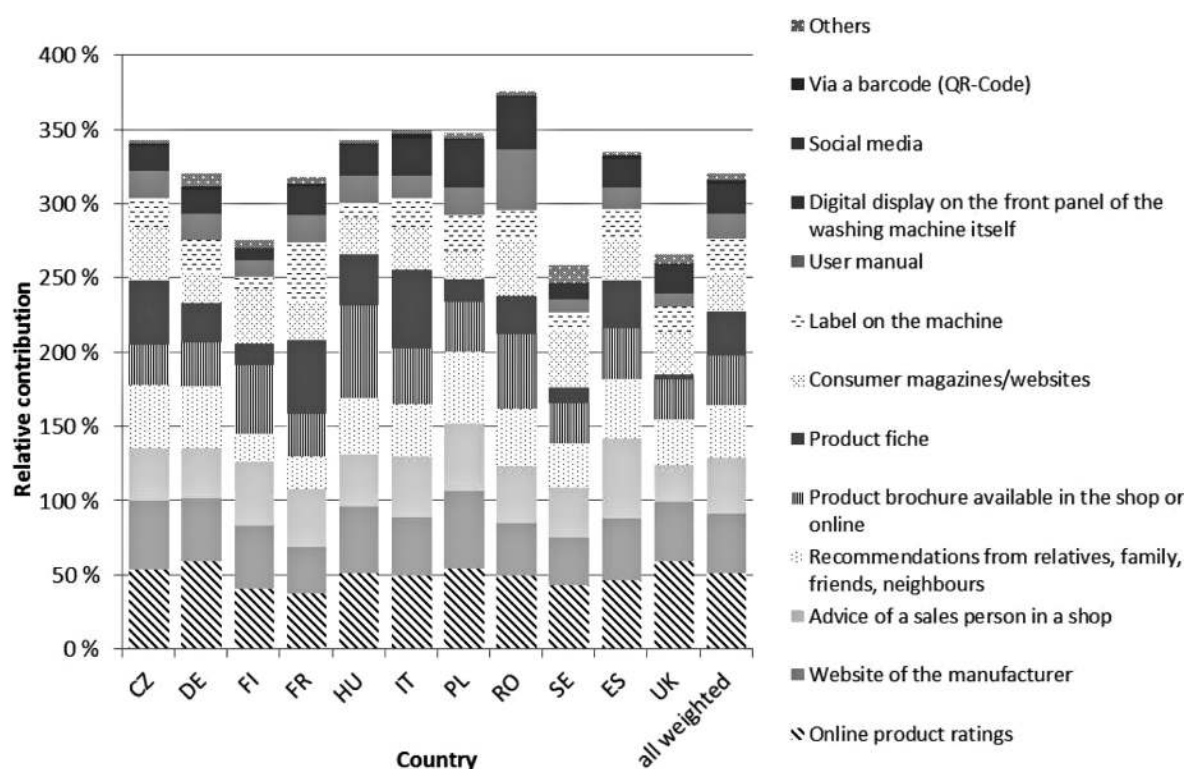


Figure 1 Source of information before purchasing a new washing machine

and socio-demographic characteristics. Results illustrate that recognition of spin-drying efficiency is higher among females (Kruskal-Wallis test $\chi^2 = 4.827$ (df = 1) and respondents within an age group of 40–59 years old (Kruskal-Wallis test $\chi^2 = 7.423$ (df = 2), $p < 0.05$).

Recognition of the average energy consumption per year (Kruskal-Wallis test $\chi^2 = 5.465$ (df = 2), $p < 0.05$), average water consumption per year (Kruskal-Wallis test $\chi^2 = 21.894$ (df = 2), $p < 0.05$) and noise emission during washing (Kruskal-Wallis test $\chi^2 = 13.301$ (df = 2), $p < 0.05$) was higher by the group of respondents with a university degree than by two other groups (elementary school and high school degree). Results prove that a higher educational level leads to better recognition of the symbols on the Energy Label.

Recognition of the symbols/information which are not listed on the current Energy Label, such as washing performance and average water consumption per cycle, were higher among students and respondents within the age group of 60–74 years old, respectively.

Country-specific results shows that the energy efficiency class is identified more by the respondents (over 80 %) and the least information identified are the ones which are not included on the Energy Label (Table 2), but were included in the list of options provided to the participants of the survey. Spin-drying efficiency class among all the symbols on the Energy Label was identified by the smallest number of respondents. Swedish respondents have the most difficulty recognizing the symbol of spin-drying efficiency, which was identified by 33.6 % of respondents. On the contrary, this symbol was recognized by around 58 % of Hungarian respondents.

Furthermore, the results illustrate that the UK respondents recognize the symbols of capacity and noise emission less than respondents from other countries. The symbols which are not included on the Energy Label, such as washing performance and average water consumption per cycle, were identified more by the respondents from Romania. Contrariwise, the symbol of washing performance was identified by Spanish respondents less than respondents from other countries.

It is important to note that recognition of the symbols on the Energy Label does not prove that respondents are en-

tirely familiar with the correct meanings and concepts of the symbols. This also appears to be confirmed by the results of Verbraucherzentrale Rheinland-Pfalz survey [14]. Although 61 % of consumers claim to understand the energy consumption information “175 kWh/annum” on the Energy Label for washing machines, in fact only 14 % know the correct meaning of it, namely that the appliance consumes “...175 kWh of electricity per year based on 220 cycles per year and a mixture of 40- and 60-degree washes”. Results from other studies indicate that most consumers in



Figure 3 Current Energy Label of a washing machine

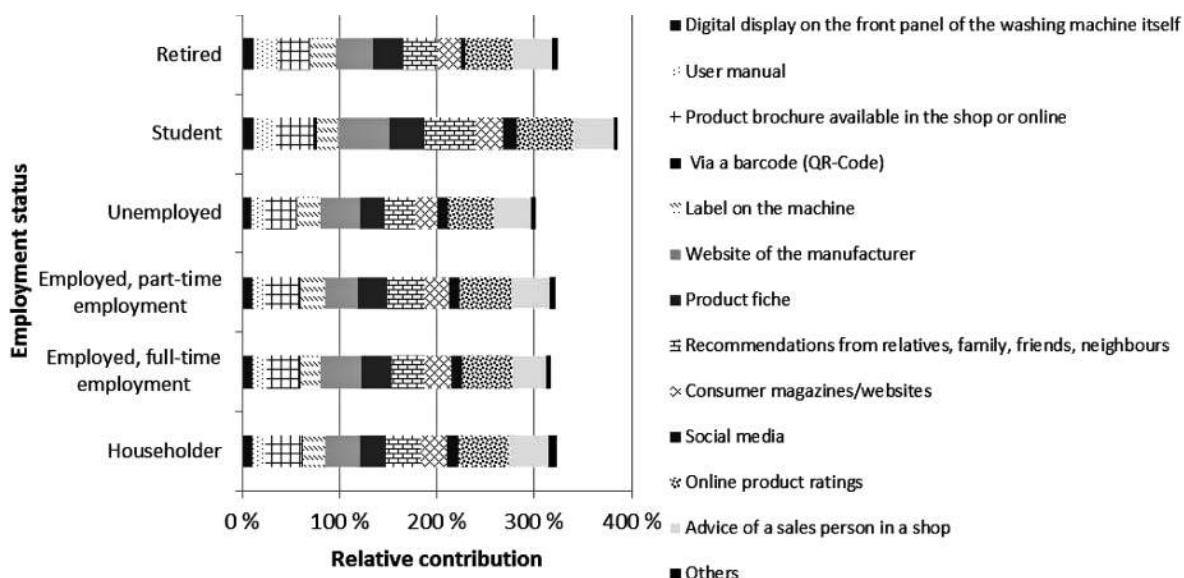


Figure 2 Source of information before purchasing a new washing machine and employment status

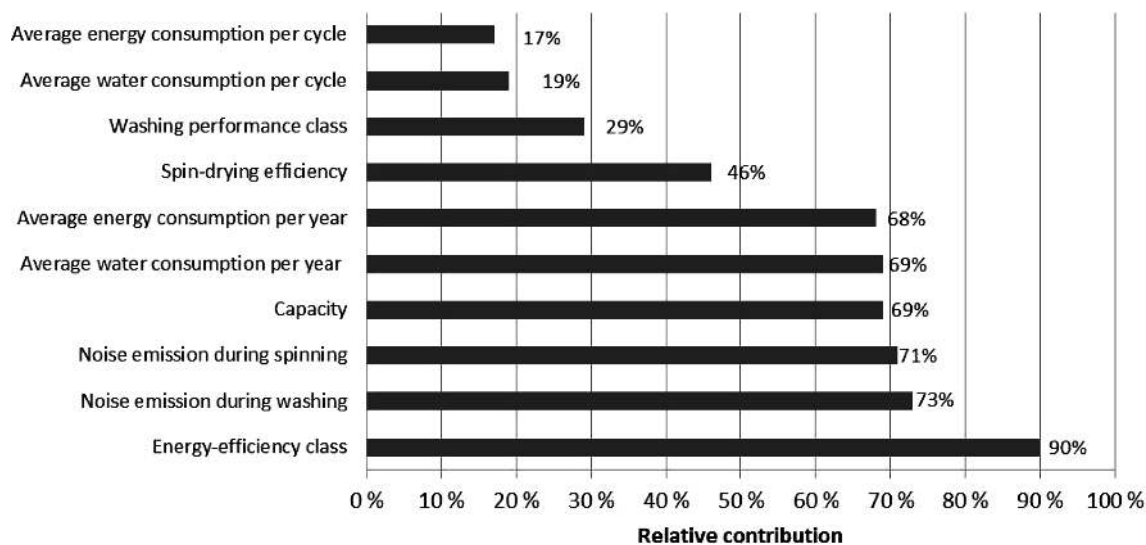


Figure 4 Recognition of information on the Energy Label (Information regarding the washing performance class, and average water and energy consumption per cycle are not included on the current version of the Energy Label but were included in the closed list of possible answers to check the consistency of the answers)

Recognition of information on the Energy Label	Countries (All the values are per percent)										
	CZ	DE	FI	FR	HU	IT	PL	RO	SE	ES	UK
Energy efficiency class	97.6	93.3	93.1	89.0	96.5	92.9	84.9	95.2	83.2	86.9	85.0
Average energy consumption per year	72.0	71.4	68.1	75.7	71.1	68.5	60.2	79.7	61.1	60.6	60.3
Average water consumption per year	70.4	71.7	69.4	76.4	67.5	69.8	58.9	76.8	59.5	65.4	64.2
Capacity	81.6	71.7	76.1	69.3	90.4	67.9	75.9	84.1	70.2	67.4	55.1
Noise emission during washing	84.0	77.8	83.3	78.5	85.1	66.9	78.2	79.7	80.9	66.0	60.6
Noise emission during spinning	82.4	75.5	80.6	75.6	82.5	65.6	76.1	75.4	79.4	64.2	58.6
Spin drying efficiency class	48.8	46.2	47.2	52.3	57.9	39.7	45.40	51.2	33.6	44.9	47.1
Average water consumption per cycle*	20.0	16.5	16.7	20.7	25.4	20.4	23.6	25.5	20.5	19.5	15.2
Average energy consumption per cycle*	16.0	15.8	13.9	19.7	21.1	14.4	20.2	17.8	14.5	15.5	15.0
Washing performance class*	30.4	27.8	27.8	32.4	34.2	31.2	27.6	39.9	34.4	17.3	27.7

Table 2 Recognition of information on the Energy Label (* this information is not included on the current version of the Energy Label)

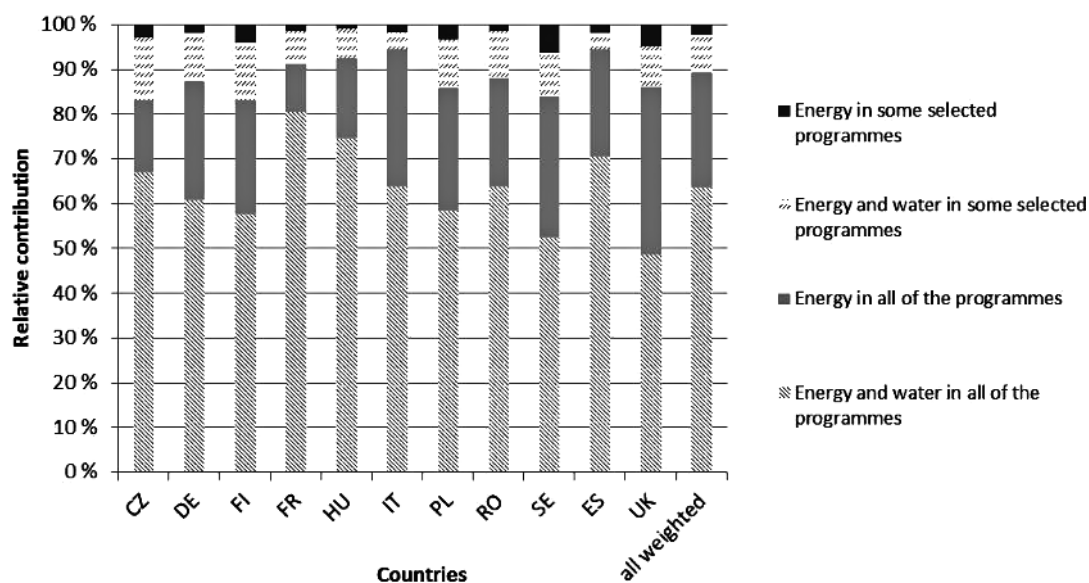


Figure 5 Expectation about a washing machine with the highest Energy Label efficiency class available on the market to be able to help make saving on ...

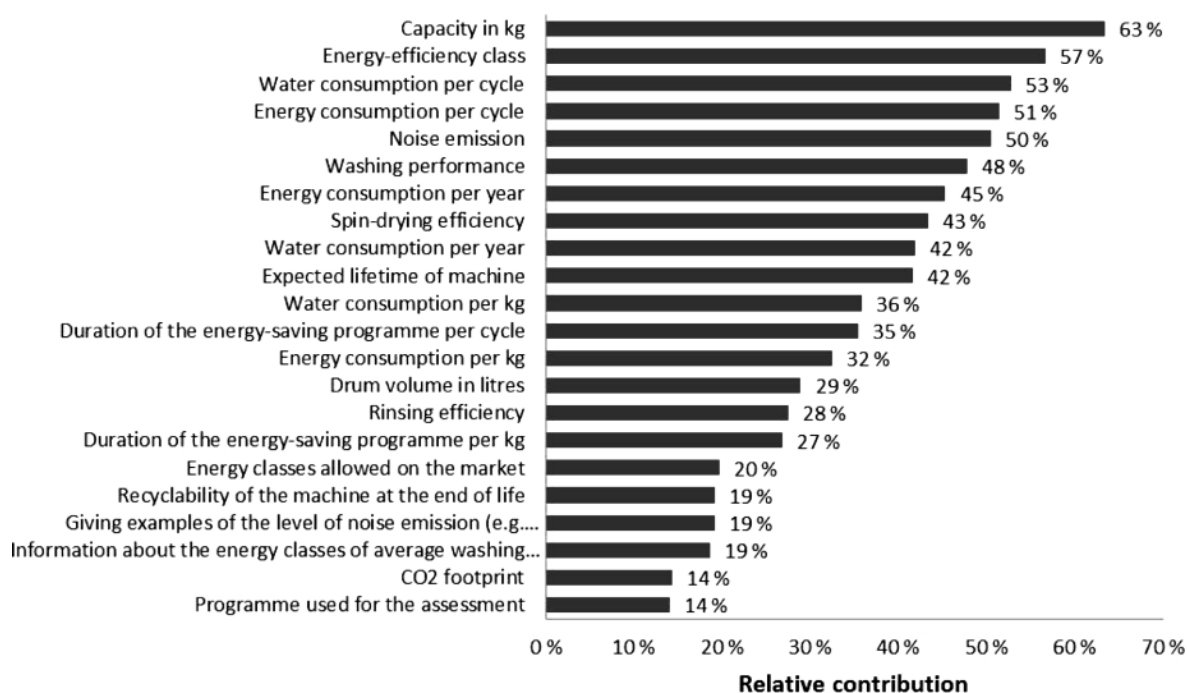


Figure 6 Information expected on the Energy Label

Information expected on the Energy Label	Countries (All the values are based on percentage)										
	CZ	DE	FI	FR	HU	IT	PL	RO	SE	ES	UK
Capacity in kg	80.8	65.5	53.5	62.1	59.6	57.7	66.8	75.0	64.1	60.6	62.2
Energy efficiency class	83.2	69.6	54.2	48.6	54.4	55.1	49.2	61.5	45.0	47.6	53.2
Water consumption per cycle	69.6	48.6	56.9	55.5	70.4	53.7	65.8	56.3	41.7	56.8	69.6
Energy consumption per cycle	65.6	46.0	50.7	55.4	57.9	56.4	64.5	56.7	47.3	50.5	40.7
Noise emission	76.8	48.5	55.6	60.2	53.5	42.3	56.5	58.9	60.3	52.1	37.6
Washing performance	57.6	51.2	50.7	45.0	47.0	40.1	40.1	59.1	49.6	47.9	51.1
Energy consumption per year	49.6	55.3	33.3	45.2	43.0	46.1	36.3	40.9	41.7	41.4	39.0
Spin drying efficiency	64.0	52.9	40.8	31.7	52.6	36.1	41.6	44.7	47.0	38.8	45.8
Water consumption per year	48.8	52.6	29.2	44.8	41.2	38.4	34.7	38.9	32.8	41.0	32.7
Expected lifetime of machine	37.6	37.6	52.1	46.3	50.9	34.4	46.7	57.5	35.1	51.3	35.0
Water consumption per kg	32.8	36.2	20.8	34.0	39.1	41.3	37.7	41.1	32.8	45.1	25.1
Duration of the energy saving programme per cycle	43.2	30.7	36.6	34.5	50.0	39.4	40.3	42.5	32.8	41.4	27.9
Energy consumption per kg	28.8	30.9	15.3	27.8	36.8	40.7	28.9	38.2	32.8	40.0	28.2
Drum volume in litres	34.4	33.1	19.4	28.3	27.2	29.8	38.2	27.4	29.8	26.4	19.7
Rinsing efficiency	35.2	21.2	27.8	27.6	30.7	25.2	29.7	46.9	26.0	27.8	31.1
Duration of the energy saving programme per kg	20.8	25.3	12.7	21.0	35.1	31.2	27.9	36.1	32.8	36.6	21.1
Energy classes allowed on the market	20.6	25.7	18.1	14.5	17.5	20.9	23.9	28.4	17.6	15.3	13.6
Recyclability of the machine at the end of life	16.0	14.2	36.6	18.1	21.1	20.4	19.9	26.0	25.0	24.1	18.8
Giving examples of the level of noise emission	20.6	20.0	20.8	14.6	12.3	16.0	21.2	22.1	22.9	21.1	22.3
Information about the energy classes of average washing machines on the market	10.4	17.4	19.4	15.9	14.0	20.1	24.4	24.0	20.5	19.3	18.5
CO ₂ footprint	4.8	14.7	9.9	14.2	18.4	16.3	7.2	16.9	6.9	10.9	20.2
Programme used for the assessment	8.8	16.0	7.0	15.5	17.5	13.5	11.6	12.5	14.4	13.1	13.5

Table 3 Country specific results of the information expected on the Energy Label ranked based on their importance

Germany do not understand the Latin term “annum” (year). Only 29% of respondents were able to explain the information correctly in a representative survey conducted in 2012 [31].

In order to check whether consumers realise that the information on the Energy Label is for some specific programmes, they were asked about their expectations regarding the washing machine with the highest Energy Label efficiency class available on the market to be able to help make savings whether on one programme or all of the programmes. Figure 5 illustrates that around 90% of respondents indicated that they would expect a washing machine with the characteristics mentioned to be able to save energy and water or only energy in all the programmes. Therefore, it seems that consumers may not know that the information on the Energy Label is only for some selected programmes and not for all programmes. It might be assumed that consumers expect to have not only an energy efficient programme, but also an energy-efficient washing machine.

Country-specific results prove that respondents from Sweden, Finland and the Czech Republic perceive better than respondents of other countries that information on the Energy Label is only for some selected programmes and not for all programmes (Fig. 5). The contrary is seen in Spain and Italy, where around 95% of respondents expect a washing machine to be able to save energy and water or only energy in all the programmes.

Respondents were asked to indicate “which information they would expect to see on the future Energy Label?” to find out which symbols/information are missing on the Energy Label according to their point of view (multiple answers were allowed). Information regarding “Capacity in kg” (63%) and “Energy efficiency class” (57%) are the most demanded to be indicated on the future Energy Label (Fig. 6). Referring to water and energy consumption, participants seem to prefer getting this information per wash cycle (53% and 51%, respectively) rather than the annual consumption levels (42% and 45%, respectively).

Other pieces of information including “Programme used for assessment” and “CO₂ footprint” resulted in being less important for indication on a future Energy Label (each selected by 14% of respondents).

It was interesting to find out whether there is any difference between countries in the selection of these options or not. Further analysis illustrates that there are small differences among countries (Table 3). Interestingly, respondents from Germany were the only ones who prefer to have information regarding energy and water consumption per year rather than per cycle.

Washing performance information is generally requested by most of the respondents, but it is demanded more by the respondents from Romania (59.1%) and the Czech Republic (57.6%). Information about noise emission is not as important for the respondents from Italy (42.3%) and the UK (37.6%) as other countries. Information regarding recyclability of the machine at the end of its life is requested more by Finish respondents (36.6%), whereas it is requested less by respondents from Germany (14.2%). Including information about the duration of the energy saving programme per cycle is demanded more by Hungarian respondents (50%) and is demanded less by the UK respondents (27.9%). The high demand of Hungarian respondents to have this information on the Energy Label might be explained by the high usage of energy saving programmes [29]. Even though Swedish respondents have the most difficulties in recognizing the symbol of the spin-drying efficiency class, 47% of them expected this information to be on the Energy Label.

Moreover, information regarding the expected life time of the machine is mostly demanded to be indicated on the future Energy Label by Romanian respondents (57.5%).

Expecting energy efficiency class information on the Energy Label varies a lot among the EU countries, ranging from 83.2% (in the Czech Republic) to 45% (in Sweden).

Statistical analyses prove that there is a significant relation between expecting washing performance information on the Energy Label and the following factors; gender (Kruskal-Wallis test $\chi^2 = 6.063$ (df = 1), $p < 0.05$), level of education (Kruskal-Wallis test $\chi^2 = 28.759$ (df = 2), $p < 0.05$), employment status (Kruskal-Wallis test $\chi^2 = 20.490$ (df = 5), $p < 0.05$) and the age group of respondents (Kruskal-Wallis test $\chi^2 = 18.072$ (df = 2), $p < 0.05$). Respondents with an elementary school degree, older respondents, females and households with retired people are more interested in having information regarding washing performance on the Energy Label (Table 4, Figure 7 and Table 5).

Further analysis confirms that expecting information regarding energy and water consumption per cycle on the Energy Label is affected significantly by the age group of respondents (Kruskal-Wallis test $\chi^2 = 13.994$ and 11.060, respectively; (df = 2), $p < 0.05$) and their level of education (Kruskal-Wallis test $\chi^2 = 17.911$ and 9.160, respectively; (df = 2), $p < 0.05$). This indicates that having information on energy and water consumption per cycle is requested more by respondents with a university degree and older respondents. Furthermore, energy consumption per cycle is affected by the employment status of the respondents (Kruskal-Wallis test $\chi^2 = 18.127$ (df = 2), $p < 0.05$). Households



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In your opinion, which of the following pieces of information are important to be indicated on a future energy label?	Age group				
	Between 20 and 29 years	Between 30 and 39 years	Between 40 and 49 years	Between 50 and 59 years	Between 60 and 74 years
Energy efficiency class	47.2 %	53.6 %	57.5 %	63.5 %	60.2 %
Energy classes allowed on the market	19.9 %	17.5 %	19.4 %	21.2 %	21.3 %
Information about the energy classes of average washing machines on the market	18.1 %	15.1 %	17.6 %	20.6 %	22.5 %
Energy consumption per cycle	49.2 %	48.5 %	51.0 %	52.4 %	56.1 %
Energy consumption per year	47.7 %	43.4 %	48.1 %	46.4 %	42.5 %
Energy consumption per kg	36.2 %	30.4 %	30.6 %	30.6 %	35.6 %
Water consumption per cycle	50.5 %	49.4 %	53.2 %	55.4 %	55.9 %
Water consumption per year	44.6 %	41.8 %	44.4 %	41.5 %	38.1 %
Water consumption per kg	38.2 %	33.0 %	34.0 %	35.8 %	39.4 %
Washing performance	42.4 %	44.3 %	48.5 %	53.1 %	50.7 %
Spin drying efficiency	32.7 %	36.9 %	46.6 %	48.5 %	51.2 %
Capacity in kg	57.9 %	59.7 %	65.3 %	68.7 %	65.5 %
Drum volume in litres	26.0 %	24.9 %	31.3 %	31.5 %	31.3 %
Duration of the energy saving programme per kg	24.8 %	24.2 %	28.1 %	27.6 %	29.6 %
Duration of the energy saving programme per cycle	31.7 %	30.6 %	35.8 %	40.0 %	39.7 %
Noise emission	47.2 %	48.3 %	52.1 %	53.1 %	51.7 %
Giving examples of the level of noise emission	23.8 %	19.6 %	20.3 %	17.4 %	15.8 %
Programme used for the assessment	14.1 %	14.9 %	14.1 %	13.9 %	12.9 %
CO ₂ footprint	20.7 %	13.8 %	12.7 %	14.2 %	12.1 %
Expected lifetime of machine	42.4 %	38.7 %	41.6 %	42.2 %	44.0 %
Recyclability of the machine at the end of life	19.4 %	17.1 %	19.1 %	20.2 %	20.8 %
Rinsing efficiency	22.9 %	25.7 %	27.5 %	28.9 %	31.9 %

Table 4 Information expected on the Energy Label and the age of respondents

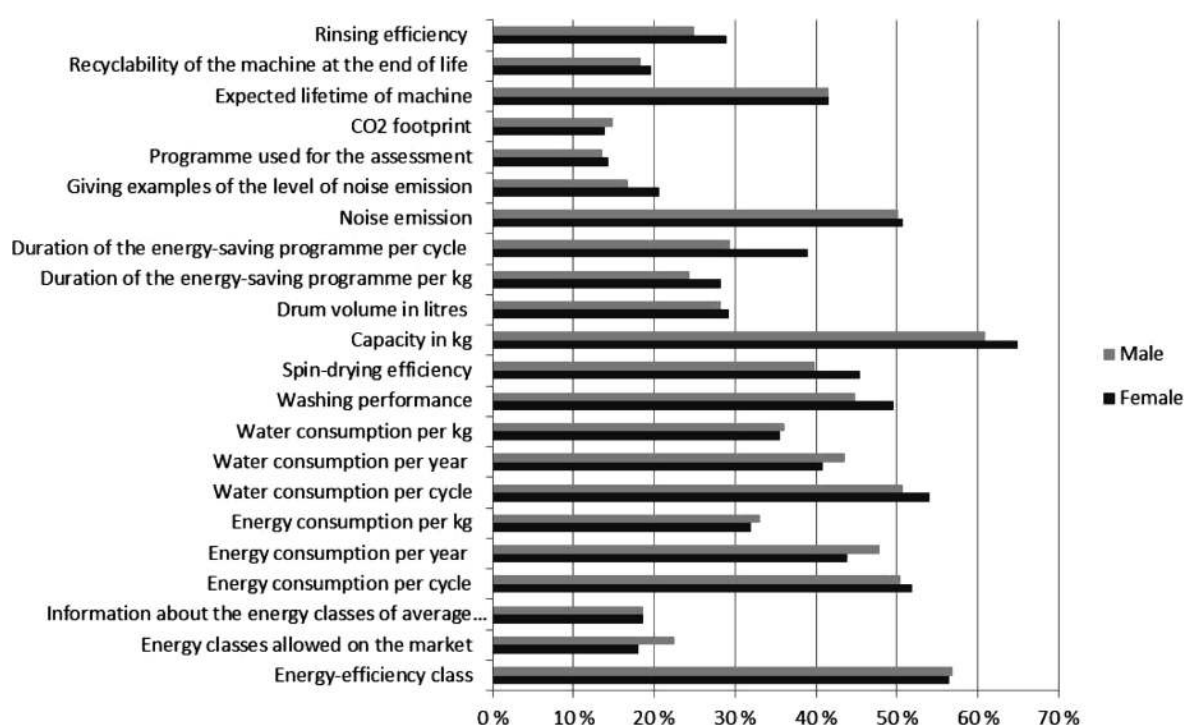


Figure 7 Information expected on the Energy Label and gender

In your opinion, which of the following pieces of information are important to be indicated on a future energy label?	Employment Status					
	Householder	Employed, full time employment	Employed, part time employment	Unemployed	Student	Retired
Energy efficiency class	59.1 %	54.3 %	60.3 %	53.7 %	47.6 %	61.9 %
Energy classes allowed on the market	16.2 %	19.6 %	18.6 %	20.0 %	22.5 %	22.1 %
Information about the energy classes of average washing machines on the market	16.8 %	16.7 %	20.1 %	18.1 %	16.6 %	24.0 %
Energy consumption per cycle	48.3 %	49.6 %	51.2 %	50.4 %	54.3 %	58.0 %
Energy consumption per year	48.6 %	44.5 %	45.8 %	45.8 %	51.6 %	43.3 %
Energy consumption per kg	32.9 %	31.1 %	32.6 %	30.1 %	37.8 %	35.5 %
Water consumption per cycle	49.3 %	52.0 %	51.0 %	54.7 %	52.7 %	57.5 %
Water consumption per year	43.5 %	41.6 %	43.2 %	43.4 %	48.4 %	38.2 %
Water consumption per kg	33.1 %	35.0 %	36.3 %	37.0 %	33.0 %	39.1 %
Washing performance	48.7 %	44.4 %	50.9 %	49.4 %	44.9 %	53.5 %
Spin drying efficiency	44.3 %	40.0 %	45.8 %	42.1 %	33.5 %	52.5 %
Capacity in kg	68.1 %	60.0 %	65.3 %	66.8 %	60.1 %	66.8 %
Drum volume in litres	26.7 %	27.4 %	32.9 %	25.5 %	22.3 %	34.0 %
Duration of the energy saving programme per kg	25.9 %	25.8 %	28.0 %	24.5 %	22.5 %	31.2 %
Duration of the energy saving programme per cycle	37.8 %	33.0 %	35.0 %	36.8 %	29.9 %	41.1 %
Noise emission	46.0 %	49.7 %	52.2 %	51.8 %	43.6 %	54.8 %
Giving examples of the level of noise emission	19.9 %	18.8 %	23.1 %	17.9 %	20.9 %	16.8 %
Programme used for the assessment	12.8 %	13.5 %	16.8 %	14.8 %	14.4 %	13.5 %
CO ₂ footprint	14.1 %	13.2 %	16.5 %	12.2 %	23.9 %	14.5 %
Expected lifetime of machine	42.2 %	40.0 %	38.7 %	43.7 %	50.0 %	44.6 %
Recyclability of the machine at the end of life	19.7 %	16.7 %	19.6 %	23.2 %	23.4 %	22.2 %
Rinsing efficiency	27.9 %	24.8 %	31.0 %	28.2 %	18.1 %	33.5 %

Table 5 Information expected on the Energy Label and employment status of the respondents

containing retired people are willing to have information regarding energy consumption per cycle on the Energy Label more than other groups (Table 4 and Table 5).

4 Conclusion

Using the Energy Label as a source of information to support a purchase decision has been decreased considerably during recent years, which might be explained by the fact that consumers do not want to spend time interpreting the meaning of the Energy Label and want clarity and simplicity in product labelling [30]. Our survey results confirm that some icons on the Energy Label for washing machines are clearly and well understood by consumers, but others seem to be more complicated and do not convey the information intended, especially the symbol for the spin-drying efficiency. Even though, consumers are generally familiar with the symbols on the Energy Label, but they may not know that the information on the Energy Label is only for some selected programmes. Around 90 % of respondents indicated that they would expect a washing machine with the higher energy efficiency on the market to be able to save energy and water or only energy in all the programmes.

Our research suggests that the Energy Label needs various improvements to allow most consumers to be able to

use the information provided and understand it better. Information related to energy and water consumption would be better displayed per wash cycle instead of per annum on the Energy Label. Consumers are interested in finding these values per cycle in all countries, except Germany.

As spin-drying efficiency was one of the symbols that respondents had the most difficulty recognizing and, consequently, does not convey its message plainly, developing another symbol would increase consumers' understanding of the symbol.

Even though, referring to the eco-design regulation No. 1015/2010, all the washing machines on the market have to meet a minimum washing performance, which corresponds to the A class washing performance of the old Energy Label following Commission Directive 95/12/EC, lots of respondents requested having this information on the Energy Label. This can be explained by the fact that consumers are not familiar with this requirement resulting from the eco-design regulation. Therefore, there is a need to communicate with consumers. A consumer awareness campaign is an option which would improve the consumer's understanding of the Energy Label, and make the Energy Label in such a way that supports consumers in their purchasing decision.

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