



## Consumer behaviour and environmental education in the field of waste electrical and electronic toys: A Spanish case study



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### ABSTRACT

This paper reports on a project focused on obtaining the current consumption and disposal habits of electrical and electronic toys from a survey aimed at parents of children of nine pre- and primary schools. In addition, it is also focused on identifying the most effective way of transmitting environmental information to parents and children to promote the collection of electrical and electronic toys at their end-of-life. The study was implemented in a Spanish municipality. With regard to the consumption habits, aspects related to the amount of toys that children receive annually and percentage of those which are electrical and electronic toys have been obtained and classified according to the family size. Results from Chi-squared analysis and Ordinal Logistic Regression show that there is a statistically significance relationship among these variables. Regarding disposal habits, aspects related to the reasons and way for discarding electrical and electronic toys, time that toys are kept at home or the willingness to rent or buy second hand e-toys have been obtained. What really attracts attention is that, apart from consumers who donate the toy to family or social associations, 67.1% of consumers discard them along with other waste fractions in domestic bins, whereas only 32.9% do so at recycling points, as [Directive 2012/19/EU](#) requires. To increase this percentage, three environmental education actions (distinguishing from each other by the way used to transmit the environmental information: paper, audiovisual or personal communication) have been designed, applied and evaluated their efficiency according to the amount of waste toys collected.

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### 1. Introduction

Waste electrical and electronic equipment (WEEE) is one of the waste fractions that has grown the most in recent years ([Morf et al., 2007](#); [Widmer et al., 2005](#)) causing an increase in pollution problems worldwide ([Cui and Forsberg, 2003](#); [Kiddee et al., 2013](#); [Nnorom and Osibanjo, 2008](#)). [Directive 2012/19/EU](#) states the European regulatory framework applicable to WEEE and tries to ensure that EU Member States prevent or minimise the amount of discarded electrical and electronic equipment (EEE) entering the general waste stream, thus reducing the environmental impact of EEE at their end-of-life. To fulfil this objective, all operators involved in WEEE management need to adopt new habits, including consumers who have actively to contribute to the success of their proper collection for their later reuse or recycling.

This study is focused on waste from electrical and electronic toys, belonging to Category 7 (toys, leisure and sports equipment)

until 15 August 2018 and Category 5 (small WEEE (S-WEEE)) from that date onwards ([Directive 2012/19/EU](#)). According to [Feuilherade \(2013\)](#), they could be defined as products designed specifically for children for the purpose of entertainment or education, and that require a power source (e.g. batteries or power cord) or need to be connected to another powered product (e.g. TV or computer) to work. These electronic games/toys have to be considered as WEEE at their end-of-life, since they are waste electronic goods ([Robinson, 2009](#)).

According to the legal framework, from 15 August 2018 these toys will have to fulfil the minimum targets of 75% for recovery and 55% for preparation for reuse and recycling. Consumers are the key factor to be able to reach these objectives ([Gorauskiene, 2008](#)), and to succeed it is necessary to know their current habits regarding the management of WEEE and to offer them environmental information supplementing their weaknesses.

For S-WEEE and specifically for toys, disposal habits have not been assimilated as in the other WEEE categories due to the fact that their small size means they can easily be disposed of along with other waste fractions in domestic bins ([Bigum et al., 2013](#)).

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Consumers do not perceive S-WEEE as e-waste (Darby and Obara, 2005; Dimitrakakis, 2009).

The amounts of WEEE collected are not uniform throughout the EU. For example: 29.5 kg per capita in Norway (State of the Environment Norway, 2014), 15.47 kg per capita in Sweden (El-Kretsen, 2012) or 3.2 kg per capita in Spain (European Commission, 2013). Apart from the specific legislation of each country, this is largely due to the level of awareness and environmental knowledge in each case, which is directly correlated to the environmental information that the population has.

Considering that consumer behaviour is one of the most important factors in the management of WEEE and the correct disposal of this waste fraction is a prerequisite for the successful implementation of Directive 2012/19/EU, it is necessary to know the consumer habits to identify relevant weaknesses in order to design awareness-raising campaigns to solve them.

With this approach, this article is organised as follows. First, key articles related to consumer behaviour on household WEEE management and environmental awareness are reviewed. Then, a survey focused on obtaining information about consumption and disposal habits of electrical and electronic toys is presented along with the results of its implementation in a Spanish municipality. Next, based on the weaknesses identified, three environmental education actions which are differentiated by the means used to transmit the environmental information are presented and analysed their efficiency according to the number of waste toys collected. Finally, conclusions from the twofold study are described.

## 2. Background

Increasing the quantities of WEEE collected and providing them with a proper means of treatment are two key objectives to be achieved through Directive 2012/19/EU and both of them largely depend on consumers' behaviour and their WEEE disposal habits. Thus, information about consumer attitudes and behaviour towards WEEE management is essential for the design of the management system, so as to be able to better plan the recycling needs, the estimation of the amount of WEEE to be managed or the exploration of the most effective ways for engaging householders in the management and recycling of WEEE. Therefore, studies focused on consumer behaviour and their WEEE disposal habits are numerous. Table 1 provides a brief overview of these studies, which have been classified according to several characteristics: main objective of the study, consumer behaviour (specific content), category of product analysed according to Annex 1 of Directive 2012/19/EU, source of information (surveys, questionnaires, etc.), number of participants and location of the study.

The articles in Table 1 analyse consumer behaviour through surveys which are mainly aimed at consumers. Most of them are focused on WEEE belonging to categories 1–4. These EEE range from large appliances such as dishwashers, refrigerators, washing machines, etc. to consumer electronics such as mobile phones, mp3 players, and so on. Other articles focus exclusively on the disposal and recycling of specific products such as mobile phones (Nnorom et al., 2009; Jang and Kim, 2010; Ongondo and Williams, 2011a, 2011b). Darby and Obara (2005) is the only paper focused on S-WEEE as a whole.

In addition to analysing consumer behaviour, several studies are also focused on key factors influencing the disposal and recycling habits related to e-wastes. While some of them state that demographic factors, such as gender (Saphores et al., 2006, 2009), age (Nnorom et al., 2009; Song et al., 2012) or level of education (Gutiérrez et al., 2011; Li et al., 2012; Nixon and Saphores, 2007; Song et al., 2012) are the factors with the greatest influence on this behaviour, others refer to household incomes (Darby and Obara,

2005; Song et al., 2012). Wang et al. (2011) underlined the importance of the convenience of recycling facilities and services, residential conditions, recycling habits and economic benefits. Saphores et al. (2012) concluded that distance to a drop-off recycling centre is statistically significant since it was observed that the amount of collected e-wastes decreases with that distance. However, this factor is not significant for Bouvier and Wagner (2011).

Beyond these factors, it can be concluded from the literature that, in general, there is little consumer engagement in the proper management of WEEE, mainly due to the lack of public awareness. Thus, awareness-raising campaigns and educational initiatives are needed to fulfil the objectives derived from Directive 2012/19/EU.

Some research shows that consumers who progressively acquire information on certain environmental issues are more likely to adopt general environmentally friendly attitudes (De Young, 1986; Simmons and Widmar, 1990; Durón-Miranda, 2000). Others argue that environmental knowledge indeed influences people's behaviour and determines why those people with more information about the environment display a greater predisposition to behave in a more ecological way (Fraj and Martínez, 2005). In the specific case of WEEE and consumers' environmental awareness, Gurauskienė (2008) claimed that the WEEE management system cannot be efficient if consumers are not actively involved in it and if they have no environmental awareness and information, since the generation of WEEE and its efficient treatment are closely related to consumers of EEE. Song et al. (2012) stated that there is a need for educational campaigns to promulgate the proper methods of recycling and reusing WEEE, while Saphores et al. (2012) claimed that recycling could be stimulated by promoting moral norms and educating the public about the benefits of recycling. According to Torretta et al. (2013), a significant improvement in WEEE separate collection results could be obtained through intensive campaigns to inform the population about the importance of WEEE collection and how and where to dispose them, and to support and encourage sustainable consumption. Bigum et al. (2013) recommended that informative material focused more on WEEE directive categories could improve their rate of collection.

In the case of Spain, little information is available about WEEE, although there are studies focused on the evaluation of the sites for the location of WEEE recycling plants (Queiruga et al., 2008) or the evolution of WEEE management systems (Queiruga et al., 2012). With reference to consumption and disposal habits, Gutiérrez et al. (2010) analysed consumer behaviour towards the disposal of TV sets, refrigerators, microwave ovens and irons. Regarding the specific case of waste from electrical and electronic toys, Solé et al. (2012) conducted a pilot project for the recovery and recycling of toys, Pérez-Belis et al. (2013) characterised and disassembled a representative sample of electrical and electronic toys, and Muñoz et al. (2009) defined general ecodesign measures for the toy sector in Catalonia. Yet, to date no specific studies have been conducted to analyse consumer behaviour and disposal habits for electrical and electronic toys.

According to Solé et al. (2012), no specific collection of toys can be found in most Spanish cities, and they end up being mixed with regular waste and going to a landfill. Hence, education and information are the main tools with which to make consumers more aware and thus get them involved in acquiring the habit of reusing these toys, prolonging their lifespan or segregating them from regular waste.

## 3. Knowledge about consumption and disposal habits of electrical and electronic toys

Although there are several variables for explaining household willingness to recycle e-waste, such as gender, distance to a drop-off recycling centre, education, age, etc. (Saphores et al.,

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