



## Review

# Management of waste electrical and electronic equipment in two EU countries: A comparison

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## ABSTRACT

The paper presents some data regarding waste electrical and electronic (WEEE) management in one of the founding countries of the EU, Italy, and in a recent entry into the EU, Romania. The aim of this research was to analyze some problems that countries entering the EU will have to solve with respect to WEEE management. The experiences of Italy and Romania could provide an interesting reference point. The strengths and weaknesses that the two EU countries have encountered can be used in order to give a more rational plan for other countries. In Italy the increase of WEEE collection was achieved in parallel with the increase of the efficiency of selective Municipal Solid Waste collection. In Romania, pilot experiences were useful to increase the awareness of the population. The different interests of the two populations towards recyclable waste led to a different scenario: in Romania all types of WEEE have been collected since its entrance into the EU; in Italy the “interest” in recycling is typically related to large household appliances, with a secondary role of lighting equipment.

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## 1. Introduction

Italy is one of the founding members of the European Union, being one of the seven countries that formed the European Coal and Steel Community in 1952, the European Economic Community (EEC) in 1957, which, in 1992, became the EU. During these decades significant EU directives were issued, with a growing interest in environmental problems. Waste management was one of the environmental sectors that took advantage of this evaluation.

The EU regulation, restricting the use of hazardous substances in electrical and electronic equipment (Directive 2002/95/EC) and promoting the collection and recycling of such equipment (Directive 2002/96/EC) has been in force since February 2003. The EU Directive provides for the creation of collection schemes where consumers return their used e-waste free of charge. The objective is to increase the recycling and/or re-use of such products. It also requires heavy metals such as lead, mercury, cadmium, chromium and flame retardants such as polybrominated biphenyls (PBBs) or polybrominated diphenyl ethers (PBDEs) to be replaced by safer alternatives. Despite such rules on collection and recycling, only one-third of electrical and electronic waste in the European Union is reported as being appropriately treated, and the other two thirds go to landfills and potentially to sub-standard treatment sites in or outside the EU

(Eur-Lex, 2008). The collection target of  $4 \text{ kg}_{\text{WEEE}} \text{ inhab}^{-1} \text{ y}^{-1}$  set by the directive 2002/96/EC does not properly reflect the situation in individual Member States. For example, Italy and Romania are two of the European Countries that have not reached the target for 2008 ( $2.6 \text{ kg}_{\text{WEEE}} \text{ inhab}^{-1}$  and  $0.8 \text{ kg}_{\text{WEEE}} \text{ inhab}^{-1}$  respectively), while  $7.8 \text{ kg}_{\text{WEEE}} \text{ inhab}^{-1}$  was collected in Germany,  $6.9 \text{ kg}_{\text{WEEE}} \text{ inhab}^{-1}$  in the UK,  $6.3 \text{ kg}_{\text{WEEE}} \text{ inhab}^{-1}$  in Spain,  $4.4 \text{ kg}_{\text{WEEE}} \text{ inhab}^{-1}$  in France and almost  $10 \text{ kg}_{\text{WEEE}} \text{ inhab}^{-1}$  in Norway, Sweden and Finland (Eurostat, 2012). WEEE needs a specialized collecting, transport, treatment and final disposal system (Ciocoiu et al., 2010).

In both Romania and Italy, it is certain that part of the WEEE flux follows an incorrect path and thus does not contribute to the specific separated collection. In fact, considering the above mentioned data, we must also remember and take into account the illegal trade of electrical and electronic waste to non-EU countries (Ladou and Lovegrove, 2008; Tompson and Chainey, 2011) which continues to be widespread even though the Basel Convention regarding the movements of hazardous wastes has been in force since 1992. However in the last few years, countries such as China, India and others have adjusted their laws to fight WEEE imports (Joshef, 2007; Dwivedy and Mittal, 2010; Chung and Zhang, 2011; Ongondo et al., 2011; Townsend, 2011).

As the national transposition of the WEEE Directive varies between the member states, a patchwork of requirements and compliance solutions is emerging across Europe.

Extended Producer Responsibility (EPR) has been introduced as an environmental policy approach, in which the producer's

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responsibility for a product is extended to the post-consumer stage of the product life cycle, including its final disposal.

If WEEE is inadequately treated it can pose major environmental and health problems. For this reason, in December 2008, the European Commission revised the directives on electrical and electronic equipment (EEE) in order to tackle the fast increasing stream of WEEE. The result is the Directive 2008/34/EC. The aim of this directive is to increase the amount of WEEE that is appropriately treated, to reduce the amount that will go on to final disposal, but also to reduce the administrative burden. Two collection targets have been proposed: one equal to 45% of the average weight of EEE placed on the market by 2013, and the other equal to 65% by 2016 in each Member State.

To have an idea of the required effort, considering data provided by Eurostat, in Italy in the year 2008, the potential market of EEE regarding types R1 and R2 (refrigerators, conditioners dishwashers, washing machines, ovens, etc.) was almost 641,000 tons and the separate collection around 16.5% only. Types R1 and R2 were less than the half of the total EEE, but were the only EEE involved in source separation activities (with the exception of lighting equipment). In the same period Romania showed lower values for R1 and R2 collection (5.5%), but the source separation activities involved all the EEE types (Eurostat, 2012).

In practice, Italy must change from a situation of less than  $4 \text{ kg}_{\text{WEEE}} \text{ y}^{-1}$ , required in 2008, to  $10.9 \text{ kg}_{\text{WEEE}} \text{ y}^{-1}$  and  $16.4 \text{ kg}_{\text{WEEE}} \text{ y}^{-1}$  set as targets for 2013 and 2016, respectively (Huisman, 2010). The targets for Romania ( $5.7 \text{ kg}_{\text{WEEE}} \text{ y}^{-1}$  and  $9.9 \text{ kg}_{\text{WEEE}} \text{ y}^{-1}$ ) seem to be easier but it must be taken into account that this country entered the EU in 2007 (Huisman, 2010). Compared to the other countries that became part of the EU long before Romania, the targets imposed for Romania seem to be slightly more realistic because the starting point from which Romania can be held responsible for the WEEE generation and disposal is 2007 when it became an automatic obligation for the country to comply with the EU regulations and targets regarding WEEE. The EU regulation has taken into account the fact that a more drastic target for Romania would be difficult to reach in such a short period.

We thought it would be more interesting to evaluate and to compare the situations in Romania and in Italy, instead of the other of the 27 member states, because these countries failed to meet the 2008 WEEE target. The reason for this failure in Italy was a lack of organization, information and responsible use of economic funds to put into practice the above mentioned points with the obligation of member states under the WEEE directive. In particular, the lack of information about the location of the few collection points and the habit of considering the landfill the main solution of disposal was a great obstacle. The information about the availability of collection points close by is very important. Gutierrez et al. (2008) analyzed the environmental impact of disposing of waste electrical appliances and concluded that, under current regulatory practices, the distance to the recycling facility plays a key role in determining whether recycling is more environmentally-friendly than landfill disposal. The study made clear recommendations on the maximum distances to travel to collect and dispose of electrical waste to avoid negative environmental impacts.

The fast economic development that Romania has shown in the last few years has multiplied the number of environmental problems to be faced. These problems and the consequent difficulties can be expected also in the future EU new entries.

As a result of their failure to achieve the objectives, the two countries have dedicated great effort to organize WEEE collection, and, in a short time, have achieved very encouraging results. There are countries that must implement WEEE collection (although Italy has had this obligation much longer than Romania) that can also take inspiration from the mistakes and shortcomings highlighted in Romania and Italy in the past, by considering the experience

of these countries since 2008, which, nonetheless has yielded positive results.

## 2. WEEE in Romania and Italy

The quantity of WEEE produced per year in Europe has already reached 10 million tons (UNU, 2007). Taking into account the gross domestic product (GDP) and the quantity of WEEE produced in Italy and Romania, it is clear that the amount of waste to be managed is “proportional” to the economic development of a country: in Italy in 2006 the GDP was  $31.3 \text{ kUSD inhab}^{-1}$  with a per-capita WEEE of  $17.6 \text{ kg y}^{-1}$  while in Romania the GDP in 2007 was  $7.9 \text{ kUSD inhab}^{-1}$  with a per-capita WEEE of  $5.5 \text{ kg y}^{-1}$ . This situation was not stable as the economy in Romania showed rapid development. Indeed, with respect to the EEE placed on the market, in Romania the forecast for 2014 is around  $16 \text{ kg}_{\text{EEE}} \text{ inhab}^{-1} \text{ y}^{-1}$ , while in Italy it is around  $25 \text{ kg}_{\text{EEE}} \text{ inhab}^{-1} \text{ y}^{-1}$  (Huisman, 2010). These values represent an increase of less than 10% for Italy compared to 2008, but for Romania the increase is around 50%. In the various EU countries the WEEE collection tends to improve every year. Although some equipment is sent for recycling, the annual volume of waste generated is increasing to between 3% and 5% in Europe alone. The annual estimate has exceeded 6 million tons and is expected to rise to 12 million tons by 2015, equivalent to  $14 \text{ kg}$  per person per year (Barba-Gutiérrez et al., 2008).

France, Germany, Belgium, Holland and the UK started WEEE collection earlier than Italy and Romania and now have a better per-capita separate collection (Huisman, 2010).

### 2.1. Romania

In Romania, the WEEE management system developed in a short period of time. After becoming a candidate and then a member of the European Union, Romania transposed the European regulations into its national legislation (Ciocoiu and Tartiu, 2012).

Before the application of the 2002/96/EC Directive, WEEE management in Romania was very unclear. There is not a lot of data regarding this problem, but because Romania started the implementation of selective waste collection only recently; before that, WEEE could be found together with other types of wastes in the landfills. However, in Romania each inhabitant owns about  $30 \text{ kg}_{\text{EEE}}$  with a lifetime almost double compared to other EU countries (ISPE, 2006).

Since 2006, the quantity of WEEE that must have been collected for the Member States has been set to  $4 \text{ kg}_{\text{WEEE}} \text{ inhab}^{-1} \text{ y}^{-1}$ . Taking into account the impossibility of reaching this target, Romania asked for a transition period of 2 years (ISPE, 2006). Romania is not the only country in Europe in this situation; countries in Central and Eastern Europe, as well as some Baltic Countries, have asked for a postponement of the deadline. The reasons were varied and related to: the population's limited ownership of electrical and electronic equipment, the long period of usage (because of low incomes), and the difficulties of the population that live in the rural areas (high percentage) to create a collection infrastructure (ISPE, 2006).

In 2004, Romania established intermediary collection objectives, from 2 to  $4 \text{ kg}_{\text{WEEE}} \text{ inhab}^{-1} \text{ y}^{-1}$  by 2007, through the WEEE implementation plan (Annex 4 – Implementation Plan for DIRECTIVE 2002/96/EC on waste electrical and electronic equipment (MININD, 2004)).

The demographic characteristics (total population, density, age structure) play a key role. An increasing consumption determines the need for resources, goods and services, directly influencing the pressure on the environment. During 1990–2008, Romania's population decreased from 23,211,395 inhabitants, to 21,565,119

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