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THE ROLE OF INFORMAL SECTOR WITHIN WEEE MANAGEMENT SYSTEMS: A ROMANIAN PERSPECTIVE

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Abstract
The waste electrical and electronic equipment (WEEE) are characterized by a profound dynamism due to the pace of growth of waste quantities generated, but also because of the continuous diversification of equipment sold as an effect of the technical progress and the growth of living standards. WEEE is characterized by two main attributes: it is hazardous, due to its content of toxic substances, but at the same time it is valuable, due to the content of precious and strategic metals. The extraction of these elements is especially critical in terms of environmental and health hazards during dismantling and processing. On the other hand, in practice, there are economic, environmental, and social advantages associated with informal sector. The researches indicate that the main obstacle to better manage WEEE in the developing countries is lake of environmental laws and, particularly, of control instruments regarding the informal sector. In Romania, the emergence and the development of WEEE management system has been stimulated by the need to align to the European Commission directive. Because the system has not yet reached maturity the share of informal sector in total WEEE activities is significant. The paper begins with characteristics of informal sector as a component of WEEE management systems and then presents the state of research in this field. In the next section is summarized the situation of Romania regarding the management of electronic waste, and the last section addresses the role of the informal sector from the Romanian perspective.

Keywords: Waste Electrical and Electronic Equipment - WEEE, Romania, management, informal sector.

1. INTRODUCTION

Nowadays, a new type of economy is developing worldwide, which enhanced the digital technologies to become rapid means of productivity increase, innovation and global knowledge sharing, influencing both the success and the reliability of the economic and social processes (Digital Europe, 2010).

The digital revolution, which begun at the end of the 1970's (Shanmugavelan, 2010), contributed to the global manufacturing and use of an ever increasing quantity of electric and electronic equipment, meant to satisfy the consumer's changing needs. The shorter lifetime of electric and electronic equipment, due to the technical progress expansion, lead to a higher output of Waste Electrical and Electronic Equipment. Thus, today the Waste Electrical and Electronic Equipment (WEEE) is the municipal waste

type with the highest global growth rate. By the end of 2012, it is estimated that the ITC industry will generate 53 million tons of electronic waste (Sinha, 2010).

WEEE's represent an actual problem due to: (1) continuous increase of their quantity and types, which poorly managed can become a real danger for the environment and human health; (2) the important quantities of raw materials (e.g. iron, steel), precious metals (e.g. gold, silver, copper), reusable materials (e.g. plastic, glass, rubber, cardboard) and energy which can be recovered and introduced back into the economic usage.

The waste electrical and electronic equipment represents one of the World's most important environmental issues. WEEE management has particularities from one country to another and the highest gap is between the developed and developing countries.

The base of any waste management system is a well-developed infrastructure (Williams, 2011). The lack of infrastructure is the main factor limiting the collection of WEEE. Equally important is a WEEE collection system easily to use by consumers so as to provide them comfort and to determine the consumers to dispose properly the old electrical equipment.

In countries (especially with low and middle-income) where the formal WEEE collection system does not provide a proper collection to all areas and households, the informal pickers remove the waste. They are important actors in collecting and valorizing recyclables waste from households and businesses and scavenging from containers. Worldwide, collecting, sorting and recycling provides income for many people that represent so called "informal sector".

The term 'informal' is understood as non-registered and illegal and as lacking in regulation, structure and institutionalization. Informal activities are persistent, universal and occurring in countries and regions with different levels of economic development (Castells and Portes, 1989).

The informal waste sector is defined by NSW MC (May 2009, p.2) as *individuals, families, groups or small enterprises engaged in the recovery of waste materials with revenue generation as the motivation either on a full-time or part-time basis*. They are classified as: itinerant waste buyers, jumpers at collection trucks, garbage crew, waste reclaimers and small and illegal junkshops (NSW MC, May 2009).

Informal sector activities contribute to some positive environmental effects in waste management. For instance, the recycling activities of the informal waste sector allow conservation of resources and recover the productive use of the materials. They also are more energy efficient and more sustainable

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compared to their counterpart formal activities. Unfortunately, they are known to work in unsafe and hazardous environment.

The reason for an analysis of the informal sector of WEEE is that, because of its informal nature, there is very little data on this sector and even less systematic analysis of its impact on society in general, and on the formal WEEE system in particular.

2. LITERATURE REVIEW

A lot of studies present various aspects regarding the informal sector and waste management, but the role of informal sector in WEEE management is a recent topic in the international literature and on the political agenda.

Hicks et al. (2005) discuss the current status of WEEE recycling and disposal in China, and its impacts on the environment, human health, and the economy. They also examine the legislative and market responses to the WEEE issue, and how these will be affected by Chinese attitudes and practices towards WEEE recycling.

The study NSW MC (May 2009) provides a preliminary assessment of existing regulations, policies, practices on the involvement of the informal sector in solid waste management in the Philippines. The National Solid Waste Management Comission identifies areas and activities, and appropriate strategies for the national framework of informal sector integration.

The EEA (2009) report makes an exhaustive analysis of the trans-boundary shipments of waste. It presents the international and EU legislation on waste shipment and information about the increasing quantities of shipped hazardous and problematic waste between EU Member States as well as shipments from EU Member States to other non-EU countries. The report also looks at how the shipped waste is treated and whether the treatment is better in the importing countries than in the countries of origin and we also examine the illegal shipment of waste, including e-waste.

In november 2010, Sycom Projects Consultants Pvt. Ltd. submited to Advisory Services in Environmental Management (ASEM) a study on the legal status of the profit making registered entity of the group of informal sector workers in India. The study (Sycom Projects Consultants, 2010) mentions that approximately 95% of total e-waste management in India is done by informal/unorganized sector. This study is an effort to channelize the informal work force into a well-defined legal framework. The study critically assesses various legal forms pertaining in India and analyze the best business model for the informal groups to make their business sustainable and viable in the long run.

Chen and Wu (2010) propose a simplest form of epidemic spreading, namely a criss-cross epidemic model, and examine the legislative stringency for observing the diffusion dynamics of informal and formal sectors in an WEEE recycling system.

Chi et al. (2011) made a review of informal electronic waste recycling with special focus on China. The paper gathers information on informal WEEE management, takes a look at its particular manifestations in China and identifies some of the main difficulties of the current Chinese approach.

In 2006, WASTE. Advisers on Urban Environment and Development in Gouda (Netherlands) teamed up with Skat in St. Gallen (Switzerland) and local organisations in six cities to analyse the "Economic aspects of the informal sector in solid waste" and to make recommendations for ways to integrate. The six cities studied include: Cairo, Cluj-Napoca, Lima, Lusaka, Pune and Quezon City. The study was co-financed by GTZ (German Technical Co-operation) and the CWG (Collaborative working group on solid waste in low- and middle-income countries). The main results of the study of Scheinberg, Simpson, Gupt et al. (2010) were to show that in all six cities the informal sector in solid waste is a global phenomenon and is truly the private recycling sector, the informal sector in solid waste is good for the environment and there is broad room for improvement, strengthening, and integration of the informal sector in solid waste, to improve working conditions and secure livelihoods. The study shows that the informal waste sector contribute positive economic impacts on the overall solid waste management. They handle large volume of waste materials at a marginal or no cost to the municipal government or taxpayers. The recovery of materials by the informal waste sector directly results to the extension of the life of the sanitary landfills. Even if the study refers to solid waste, the results are also conclusive for electrical and electronic waste, as part of their.

3. OVERVIEW OF WEEE MANAGEMENT IN ROMANIA

In Romania, the WEEE management system developed in a short period of time. Due to its quality as candidate and then member of the European Union, Romania transposed the European regulations into the national legislation.

From the legislative point of view, Romania adopted the European Directive no. 2002/95/CE (RoHS) on the restriction of certain dangerous substances which are used in electrical and electronic equipment (transposed in Romania by Government Decision no. 992/2005), as well as the European Directive 2002/96/CE regarding waste electrical and electronic equipment (transposed in Romania through Government Decision no. 448/2005, replaced by Government Decision 1037/2010)

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At the national level, the WEEE collecting system is based on three collection channels, namely (Ciocoiu, Burcea and Tartiu, 2010):

a. ***„single day" collection actions*** – these actions are organized at fixed dates, previously announced; the main purpose is to collect WEEE from households; the secondary purpose is to inform and educate the citizens regarding proper WEEE management

b. ***the „buy-back" system*** – this system is a „one-to-one" approach, which means that the returned EEE must be of a similar type or function to the new purchased item. Some retailers, in order to increase their sales, also offer a 10%-15% or even 20% discount when buying a new equipment from the same product line as the old EEE.

c. ***the municipal collection centers*** – the consumers can get rid of theirs WEEE's, free of charge, by giving them to the municipal collection centers.

Nowadays, at the national level, the WEEE collection infrastructure through the municipal centers is under development, the number of the collection places being 240. In Bucharest there are 67 collection locations which are collecting electrical and electronic equipment, light bulbs and fluorescent tubes, batteries, for a total of 27,8% from the ones existing at the national level (http://www.coltverde.ro/ro/locatii/?j=B).

The Romanian citizens have free access to an online map (permanently updated), which includes all the national WEEE's collection and recycling centers (as a result of the project „Green corner"). This map is a tool meant to ensure comfort and easy usage of the collection service for this type of municipal waste.

The producers and importers of electrical and electronic equipment organized themselves into collective associations which are taking their responsibilities regarding WEEE collection, treatment, revaluation and safe disposal, according to the national legislation regulations. The national Agency for Environment Protection (Agentia Nationala pentru Protectia Mediului - ANPM) gave operating license to 6 such organizations in 2010 (ANPM, 2010).

Across the European Union there are great variations regarding the quantity of collected WEEE's (compared to the 4 kg/capita target established by the 2002 European Directive). As it can be observed in Figure 1, the EUROSTAT 2008 figures show the existence of countries in which the collection rate counts for more than 8 kg/capita (Austria, Belgium, Ireland, Norway, Sweden, Finland), but there are also countries in which this indicator doesn't reach at least 1 kg/capita, such as Romania.

The studies carried out at the Community level (EUROSTAT, nd; Huisman et al, 2007) shows that, despite the fact that legislation exists since 2002, from the 24 kg/capita of WEEE which are generated

annually in EU, only 33% are being collected and treated. Still, another 13% of them are reaching into the landfills, while the rest of 54% are treated under the standards within, and outside, EU. The impact of this situation, which reaches dramatic aspects in some Member States, generated a lot of worry and the preoccupation of finding proper solutions.

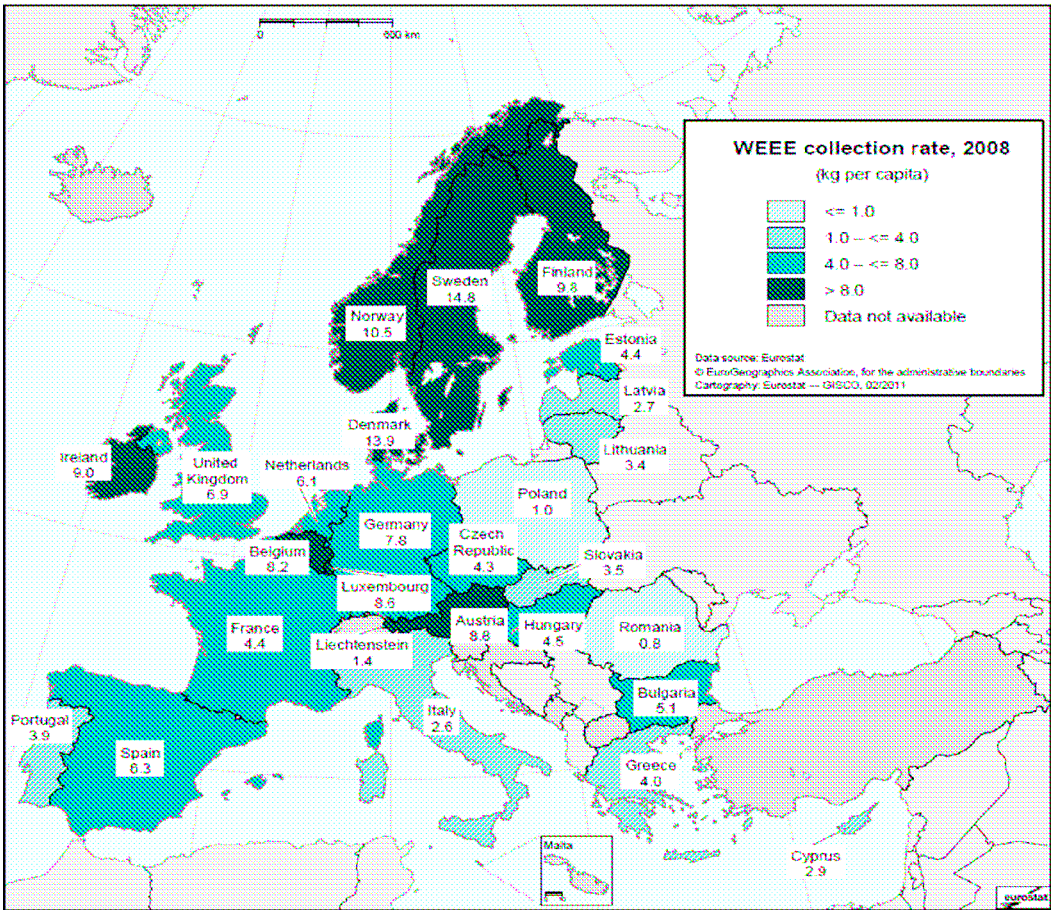

FIGURE 1 - WEEE COLLECTION RATE IN 2008
Source: Eurostat

The report ANPM (2010) mentions that in 2009 were collected 38 700 tone WEEE (preliminary data). In total, 55% WEEE were included in 1st Category, 24% in 3rd Category and 13% in 4th Category. Of the total collected quantity, 95% was treated (preliminary data), of which approximately 88% in Romania, the rest being at the end of 2009, in the stock of collectors or treatment operators.

According to the Huisman et al. (2007) report, the quantity of WEEE generated by the Romanian households is going to increase within the period 2010-2020. The computers and the fixed phones are examples of household equipments with high rate of moral depreciation. Another example is represented by the current TV sets, which will become obsolete when the UHF analogical television

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services will be replaced by the digital television services. In Romania, this step is scheduled to be complete by 01.01.2015.

Regarding the recycling, in Romania there are now 4 big recyclers, among which can be found the biggest integrated WEEE treatment facility in Eastern Europe (having an annual capacity of 50.000 tons WEEE) and one of the most modern in Europe.

Although there were taken positive measures in order to face the WEEE challenge, the expected results such as: prevention and minimizing WEEE, increasing reuse rate, EEE recycling and recovery at the end of their life, diminishing illegal exports, minimizing the negative impact over the environment and human health, did not achieved the desired level.

In this context, the informal activities which are influencing the WEEE's collection and treatment must not be treated separately from the formal activities.

A framework for integration of informal sector in WEEE management system needs to look at: stakeholders (includes everyone who has a stake or interest in the current WEEE management system); e-waste system elements (includes the operational elements from generation to disposal); and sustainability aspects (includes the technical, social, political, environment and financial-economic).

Instead, it should be developed an approach based on their interactions and on the nature of their interaction, the way in which they affect the decision making process within the WEEE management system.

4. THE ROLE OF INFORMAL SECTOR WITHIN WEEE MANAGEMENT SYSTEM IN ROMANIA

Informal collection and recovery process is a special category of WEEE management in Romania. Intervention of the informal sector is visible in waste collection (mixed or purchased separately from interested persons), in waste treatment and final storage.

In general, informal recovery persons go from house to house and collect WEEE and other recyclable waste before they enter into the formal waste management system. Waste picking is most common in poor groups that do not have access to paid labor. Generally, a large percentage of the waste pickers have only basic education.

Although there can be found no explicit references nor in the EU Directive, nor in Romanian legislation, the WEEE's informal recycling by the informal sector and by the registered recycling companies that act outside the WEEE system interfere with the official WEEE management. The informal recycling causes problems referring to:

- the WEEE collection targets, due to the fact that those waste quantities are not reported to the authorities, and
- the recycling activities are not conducted according to the recycling standards imposed regarding the environment, and the recycling targets established by WEEE legislation are not considered.

The informal sector handles large volumes of waste materials at a marginal or no cost to the municipal government. In this way, informal sector activities contribute to moderating the overall costs of WEEE management.

Projects aiming at raising awareness of the negative impact of WEEE on the environment and human health are in an early stage of development. This can be explained by the fact that before 2005 this was not a priority either for the public sector or private one in Romania, as there was no obligation to align with EU environmental directives.

According to the study Scheinberg, Simpson, Gupt et al. (2010) conducted in 2008 in six cities from different countries, among the city of Cluj-Napoca in Romania, the following conclusions aroused:

- informal sector recycles 10% of the total waste, representing twice the amount of waste recycled by the formal sector;
- the existence and information activities in the informal sector are ignored when planning waste management;
- informal sector is discriminated by all official important factors involved in waste management.

Generally, in Romania the public awareness regarding the negative impact of poor waste management practices over the environment is very low. The same can be said about the obligations imposed by the current legislation. There are major gaps between the large cities situated in the country's more developed areas and the less important cities and especially between rural and urban areas. The people form the big cities understand the detailed messages referring to waste management and are willing to change their behavior due to environmental issues. In the rural areas, people do not care about the environmental impact of throwing away waste according to their will.

The developing and implementing of a sustainable WEEE management system requires a long period of time. In Romania, the frequent changes of the central and local administration lead to changes of the previous decisions, and the objectives of a sustainable long term solution cannot be applied.

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In 2008, the European Commission proposed the revision of the directives related to WEEE and RoHS, based on the fact that their efficiency is still influenced by factors which cannot be fully controlled and influenced by the Member States, thus being unable to support the objectives regarding sustainable development of the Union with minimum impact over the environment. The last version of the WEEE revised proposal, namely the European Parliament Report, is mentioning significant changes compared to the first Commission version. These changes refer to: applicability, collection targets (a collection target of 65% from the marketed quantity during the past 2 years, compared to the 4 kg/capita target until now), recovery and recycling objectives, treatment requirements, regulations regarding producer's responsibility, etc. (Council of the European Union, 2010).

In this context in Romania the Government Decision 448/2005 was replaced by the Government Decision 1037/2010 regarding electrical and electronic waste, having the purpose to raise the efficiency of the WEEE management system and to transpose the corresponding European directive. The final result is considered by the producer's associations (according to a statement of Environ representatives: www.environ.ro) as being worse than the former legislative act, which was replaced.

The critiques made by economic analysts and producer's associations are many. Some of them refer to the fact that this regulation contains aspect that may encourage the development of the informal sector. The most important refers to the fact that GD 1037 fully transfers, only towards producers, Romania's obligation of reaching collection objectives, although that the collection responsibility is belonging to the local authorities and a large part of the WEEE are collected by informal recyclers. Practically, all the economic agents from the industry will be threatened to have the activity suspended for not doing some of the duties that should have been conducted by the local authorities. According to Government Decision 1037/2010, the only part that is obliged to ensure the delivery of the national targets is represented by the producers registered at ANPM, as they were the only one that has access to DEEE. It has been estimated that 2/3 of the waste quantities generated by the individual households are not reaching into the producers systems, in order to be treated and recycled according to the environmental regulations. The quantity sold illegally by Romanians into the third world through European harbors reached even 10.000 tons annually, according to the 2009 statements of the EcoTic president.

Regarding the recycling, the Government Decision 1037/2010 is sanctioning only the authorized recyclers, without mentioning the treatment that is to be applied to those which are conducting these operations illegally, without being registered.

The new GD eliminated the sanctions regarding the producers which are not registered into ANPM, which can enhance the phenomenon of "free riding" especially for the small producers which are

supplying equipments on a business to business base. This fact will encourage unfair competition due to the fact that the producers which are not willing to assume legal obligations will be able to do this without the threat of any sanction, thus avoiding the additional costs associated to WEEE management.

With regards to the national startegy and plan for waste management, the informal WEEE sector was not included as key actor or as stakeholder. Recycling and recovery are listed as the preferred management options but only recognizes the private sector as the government's partner. Opening channels of communications with formal stakeholders and decisionmakers into the planning process can help the integration of informal activities in the formal WEEE management system.

Improving the work conditions through the implementation of environmental and occupational safety practices and systems represent an intervention that would help improve the conditions of the informal waste sector. In this respect, Ecotic, one of the most representative associations of producers in Romania, as a member of WEEE Forum (the European association of 38 producer responsibility organisations for WEEE) offers everyone interested in collecting and treating WEEE a series of standards called WEEELABEX, translated into Romanian. On April 2011, the WEEE Forum approved a set of standards with respect to the collection, sorting, storage, transportation, preparation for re-use, de-pollution, recycling and disposal of all kinds of WEEE. This package is referred to as 'WEEELABEX' (or 'WEEE LABel of EXcellence'), a project run by the WEEE Forum in co-operation with stakeholders from the producers' community and waste processing industry.

These standards can help reduce the risks generated by improper handling of WEEE, because WEEE contains toxic materials like lead and mercury. Recyclers are exposed - often without knowing or understanding the dangers - to these materials when dismantling computers and other electronic equipment, but they also expose themselves to fumes related to smelting metals using fluxes like arsenic and cyanide (Spies and Wehenpohl, 2006). WEEE streams increase health risks in the sector, partly because it takes a long time for specific health risks to become obvious, but also because it takes the informal sector some time to learn how to handle materials safely, or even, what the valuable elements are that can be extracted.

Currently, in Romania there is no database regarding the informal sector in the field of WEEE. Carrying out studies on the number of those active in the informal sector and on WEEE quantities they manage may be an essential starting point to integrate the informal system in WEEE management.

According to Scheinberg (2008), the main reasons for which the informal sector needs to be integrated into WEEE management are: increasing coverage of collection, recycling services, etc.; supply with secondary raw materials for the recycling industry; informal sector activities are very effective, people in

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the informal sector have the ability to react to the market, to adapt quickly to conditions; creating new jobs especially for low income groups and for the very poor people, who have no training, thus contributing to the integration in society of these social categories.

In the traditional approach, the focus is usually in helping waste reclaimers in terms of financial and social aspects and alleviating their poverty. They also are not asked what they want, and are not recognized as an important stakeholder group.

5. CONCLUSIONS

Waste electrical and electronic equipment is a issue of great actuality due both to continued growth of quantities and their types (which by the content of some hazardous substances represent a threat to the environment and human health), and important quantity of raw materials, reusable energy and materials that can be recovered and placed into the economic circuit.

Romania has a formal WEEE management system organized according to the EU and the national legislation. It continues to grow and incorporate the best practices at European level, but still exist some limitations imposed by economic development level lower than the EU average.

Even though there are some types of WEEE that generate profit and that in certain conditions could be higher than the corresponding costs, fully WEEE management generates higher costs than profits from recycling. Recovery of WEEE collected material requires dismantling and recycling activities in addition to current practices of the informal sector. This encourages further development of the informal sector. The scrap dealers in Romania collect the equipments that have the potential to be reused or recycled, they are not organised and operate only for profit or survival motives.

Integrating the informal sector can only have positive effects on the management of WEEE in Romania. Applying a sustainable WEEE management system involves major changes of current practices. Implementing these changes will require the participation of all society segments, including the informal waste reclaimers.

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