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PARTICULARITIES OF THE MANAGEMENT SYSTEM FOR PHONE MOBILES WASTE IN ROMANIA

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ABSTRACT

The main objective of this paper is to characterize the management system for mobile phones in Romania. The dimension of cell phone waste flow and the problems related to the collecting and recycling of this waste were considered. The study includes the characterization of behaviour of Romanian consumers, the regulations framework and the responsibilities of all actors involved in the cell phones lifecycle. The recycling and collecting practices in this sector are presented.

KEYWORDS: waste management, mobile phones, collecting, recycling, infrastructure, education

1. Introduction

The important objectives of phone mobiles management, like for other categories of EEE are: reducing the volume of waste and thus minimizing of amount of unusable materials disposed; materials recycling with economic and environmental benefits; reduction of pollution in environmental factors by the waste discharged and improper treated. The waste management system can be evaluated based on: structural framework (policies and regulations, industries, society, culture and education); current situation of existing recycling system; impact of waste fate on the environment factors and human health. In principal, an efficient management for mobile phones waste is based on improvement of collection operation and application of the best technologies for recycling. In this way, used mobile phones are prevented to reach in landfills or in common waste incinerators.

Romania as member state of the European Union has implemented the Directives on Waste Electrical and Electronic Equipment (WEEE) and began to organise for optimisation of the management system of these devices reached at their end lifecycle. The public authorities working with all actors involved in the EEE domain, as network operators, mobile devices dealers, recyclers, consumers, NGOs etc. Together they must solve the major problems related to management of all categories of WEEE to achieve recycling targets imposed by legislation in the field.

In this paper have been identified and evaluated weaknesses of the phone mobiles waste management system at present in Romania in accordance with the social, economical and political particularities from our country.

2. Major issues related to the cell phones waste in Romania

The issues related to the wastes of mobile phones that must be accounted at implementation of an efficient management system are following:

- dimension of cell phone waste flow;
- legal framework (for example, for ban on the disposal of waste into the environment, the management of hazardous substances, the constraints under recycling operations etc.);
- political framework (involvement of public authorities in establishing of environmental policies at municipalities level etc.);
- identify all those involved in the management of cell phones and determining their role and responsibilities in the management of mobile phones;
- culture of recycling and environmental education (awareness of mobile phone users in relation to the importance of collecting and recycling, as well as the negative effects of dumped waste, understanding consumers' attitudes towards programs, policies and opportunities of WEEE recycling, skills training in relation to giving back of equipment no longer used in contrast to their abandonment into the environment);

- existence of infrastructure for handling such materials (e.g., existence takeover points, facilities for the collection).

These are solved into states responsible for environment and oriented to develop a sustainable society [1-5].

The problems related to the wastes of mobile phones in Romania are considered and analyse realised was focused on these major components.

3. Dimension of cell phone waste flow

There are several factors that determined the cell phone waste flow in Romania. The volume of mobile phone waste is determined by the penetration rate of mobile phone services, the equipments placed on the market and by their useful life. The option chosen by consumers in rapport with unwanted device is also important. The destination of phone phones collected from consumers and the capability for theirs proper treatment in Romania influence the magnitude of waste flow.

The beginning of mobile telephony in Romania is dated back to 1995, when *Mobifon* and *Mobil Rom* came into the possession of licenses for telecommunication GSM system into Romanian market [6]. Since then to the present to the present, the number of subscribers at has known a huge increasing: from approximately 212,000 subscribers at the end of 1997 to 22.7 millions in middle of 2012. The maximum was recorded at the end of 2010, when about 24.4 million persons benefited from mobile services. The decreased rate of penetration in the coming years is attributed to the economic crisis. Mobile phone sales are annual increased as result of: the growth of new users (persons who not have cell phones before, or require additional phones); users who choose to leave their current provider and to choice another; enhancement of users number who buy a new phone for upgrading and replacement their old handset. According to research company GFK Romania analysis only in 2008, in our country have sold over five million mobile phones. Also, in 2010 were sold on the official channels between 4.5 and 5 million mobile phones. In 2012, according to estimates of the telecommunications market, sales of mobile phones were about 3-3.5 million units, of which 1 million were smart phones. It is estimated that at present, Romania has 1.3 mobile phones per capita. In these circumstances, a Romanian who dwells in city buys, on average, a new cell phone at least once a year [7].

The research realised by *The Gallup Organization* Romania in the period March-April 2010 (for *National Authority for Management and Regulation in Communications - ANCOM* in Romania, targeted on market for electronic communications services and on the lifetime of the mobile terminals at the first user) shown that the average useful life is 3 years. About the first utilisation, the respondents have estimated that they replaced the mobile phone after about 13 months [8].

The research of the organisation named *Forum for the Future* (which has investigated the impact of the second-hand mobile phone market in Romania, realized in 2004) report that the second-hand phones are significantly cheaper than new ones. Therefore, in 2004, almost a third of mobile phone users in Bucharest use second-hand phones, predominantly by persons with lower-income. Romania is one of the favourite destinations of the refurbished phones that are brought and brought from other countries. The mobile phone companies and retailers do not supply data on the volume of this market (Figure 1) [9]. The sales of the second hand phone have exploded in last years affected by crisis.

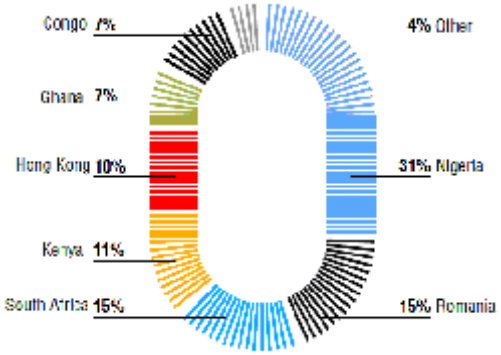

Fig. 1. *Destination country for some phones collected via Vodafone, period 2004/2005 (Sorce: Fonebak) [9]*

Regarding the quantity of cell phones waste accumulated in Romania, don't are published information. Starting with 2006, the quantities of WEEE collected (not generated) were be counted. These data are about the quantities of categories covered by Directive EU within ANNEX IA [10].

There are not information for mobile phones, only for category of IT and telecommunications equipment [11, 12]. Also in present those few information on mobile phone waste generated in Romania are mostly approximated.

4. Consumers behaviour

The main contributors at flow of cell phone waste are the consumers. Many Romanians who have purchased a new phone, have donate their old equipment to a family member, poorer relatives or friends who can not afford to purchase such a device. In many cases the consumers tend to want to keep their old phone as spare. But, in many cases exist the tendency for users to temporarily store the old equipment often due to emotional attachment to old equipment (these form so-called „hibernation equipments stocks" or stock from „drawers"). Others choose to sold or to trade when purchase the new phone.

The consumer behaviour (together with other factors as the infrastructure, awareness system, the convenience offered to the people etc.) influences the fate of mobile phones at their end life cycle. In this point the biggest challenge in waste recycling is the collection of the unused equipments from the consumers. The consumer plays a big part in the management chain. So the recycling behaviour of the individual is crucial for the recycling process. In Romania, as well as in other countries when the organisation of recycling process started recently, the collection activity must be motivated. There are few ways to stimulate the collection. Is necessary to be diversified the incentives provided to encourage return of the handsets based on examples put in practice into states with performing system for WEEE management [13]

Concerning Romanian consumer, it highlights the lack of a responsible attitude and behaviour appropriate for his mobile phone fate when stops its using. Due to the unawareness or ignorance of the harmful effects of uncontrolled management, the nonconforming solutions applied to old cell phones can damage to environment or human health. The uncontrolled disposal or applied of inappropriate treatment (as example, combustion as for solid municipal waste) lead to removing of harmful pollution emissions. Also the mobile phone owners are not aware of the importance of the collection and the advantages of recycling that means the recovery of materials and reducing of energy consumed. Added to this is the environmental impact at extraction of raw materials and additional costs for this activity. The deficiency in education and lack of responsible attitude make as the collection of cell phones in Romania to be made sluggishly and with difficulties. These weaknesses could be rehabilitated by cultivating the responsible behaviour at all consumers, by increasing the level of education, information and involvement. The change of public attitudes towards WEEE and the increasing of awareness for the negative impact of WEEE on the environment and human health are processes that are in the initial stage. The raising awareness and the providing of easy return ways are key factors in increasing the return rate of used devices and for creating the skills for collecting and recycling.

5. Regulation framework for WEEE

In general WEEE waste management has a short history in Romania. The implementation of WEE waste management system has beginning in 2005. Then were transposed into national laws two major directives of the European Parliament and of the Council: Directive on waste electrical and electronic equipment or Directive 2002/96/EC; Directive on restriction of the use of certain hazardous substances, named RoHS Directive, or Directive 2002/95/EEC. This was mandatory for EU accession. These main regulations together with other secondary legislation and government ordinances make up the legal framework for WEEE management in Romania.

For Romania alignment with other EU members is required the organization of management system for WEEE. That is able to ensure the targets introduced at Community level for recycling rates. These were recently updated. The new WEEE collection target for EU member states becomes: 45% of electronic equipments sold, applicable from 2016; in a second step, 65% of equipments that were sold, or 85% of the electronic waste collected, from 2019. Romania, like other countries in Central and Eastern Europe enjoying from a transition period, translated by achieving the following targets: in the first stage (2016-2019), a collection rates between of 40% and 45%; the delaying of the collection rate achievement of 65% (applicable in the EU from 2019) until a date decided by the Member State, but not later than 2021.

The collection target for which Romania is accountable to the European Commission can be achieved with optimal operating costs only through a sound management of WEEE. The main sources of mobile phone waste in Romania are from formal sector (importers, producers, retailers, individuals and collectives consumers, traders) and from informal sectors (dismantlers, recyclers).

6. Tasks and responsibilities

National legislation establishes objectives and responsibilities for all stakeholders. To all actors

involved in EEE management have assigned the following objectives: waste prevention by reusing, recycling and other forms of materials recovery in order to reduce the amount of waste eliminated into the environment; improving the environmental performance of all operators linked at the life cycle of equipments (producers, distributors and consumers), particularly for those that are directly involved in the treatment of electrical and electronic equipments waste. The players that have responsibilities for organisation and optimisation of mobile phones management system are: public authorities, producers, network providers, retailers, users, recyclers, NGOs etc. Regarding the responsibilities, these are clearly summarized further.

- Producers are responsible for financing the collection, treatment, recovery and disposal of waste that originate from their products. Their obligations can be performed individually or by joining a collective system or associations. They have obligation to take back the devices that no longer used to treat, recycle and store them safely.

- Suppliers of services and devices dealers are obliged to take back the old equipments from users and to give them to authorized recyclers.

- Central authority is responsible to establish the legislation framework for proper WEEE management.

- Local authorities must organize the collection points, the waste collection logistics and their functionality.

- Consumers must be responsible for the fate of their phones if do not use them anymore, facilitating its recycling and preventing the uncontrolled disposal of waste into the environment.

Central authorities are responsible for the non-compliance of the collection system and the lack of a coherent strategy for waste management at level of entire country. The frequent changes of authorities at central and local level lead to repeated changes in previous decisions so that the long-term solutions do not get to be implemented and short-term decisions are insufficiently grounded. Locally, the collection is hampered by delays of public authorities to fulfil their obligations under the Law 1037/2010 concerning the management of WEEE. They have the obligation to separately collect WEEE from individual consumers and to provide the sites for setting up the functional collection points for the authorised collector operators (by the National and County Agency for Environmental Protection).

Also in cooperation they must adopt a functional financial mechanism adapted to the two major conceptual alternatives to implement the WEEE management system [14]. One is national collection system, when a dominant system is responsible for the collection, recycling and financing of all (or most) of WEEE from national territory. A producer association or more can operate. These companies are non-governmental and non-profit societies that are specialised on some categories of products. Their activity is focused to achieve the maximum efficiency in the recycling process, to identify the markets for materials recovered and to reuse them. Other alternative is the competitive clearinghouse system which consists of creating a national framework in which multiple partners can provide recycling services.

Romanian Government has decided that „National System of Collecting" to represent overall strategy of WEEE sector and by so-called „collective organizations" to cover all WEEE categories defined by EU Directives and Romanian legislation.

From the point of view of the EEE manufacturers/providers, they can fulfil their obligations for management of their products, individually or jointly by creating such collective organizations. They develop directly or through these organizations, the services necessary for the management of WEEE, i.e. activities of collection, transport, treatment, recycling, storage etc. The costs for these services and for other activities (e.g. for the public awareness campaigns and for education of consumers) and the administrative costs are covered by visible fee or they are included in the price of products sold. In Romania were founded and have activity a number of collective organizations approved in accordance with WEEE legislation (Order 1225/2005): ECOTIC, RoRec, RECOLAMP, ENVIRON, CCR Logistics Systems RO S.R.L., ECOPOINT, ECOMOLD, etc.

Collective organizations are designed to provide efficient services to their partners who are EEE producers or telephone service providers. A collective organization complying the obligations on behalf of EEE producers: organizes special collecting points, via retailers provides exchange system one-on-one and based on diverse benefits; ensures the transport, treatment, recycling and disposal of waste; organizes the public awareness activities; make reports of data to environmental authorities, etc. The agreements with producers must be very serious. At the non-compliance of collective organizations with their obligations in respect with regulations, producers are responsible.

Romanian legislative framework allows the creating of new collective organizations and also the recording of individual companies for WEEE recycling. As result, it becomes possible as more collective organizations and companies to be specialised in the management of the same type of WEEE. In this situation, the responsibilities for achieving the targets at the national level are not divided between individual actors. Accordingly is necessary to establish individual collection

obligations, the definition of individual targets for WEEE recycling rates.

Romania does not manufacture mobile phones. Nokia, a Finnish multinational corporation, has closed at the end of 2011 the components factory in Jucu, Cluj County (an investment of 60 euro millions, inaugurated in 2008). In this situation, the telephone networks companies in Romania are primarily interested in the management of mobile phones. They provide telecommunication services and devices through own dealers or their partners. They are providers at international level which have subsidiaries into Romania. Ordered by number of subscribers, they are: Orange Romania with 10,383,481 subscribers, in function with valid SIM at 30 September 2013 (www.orange.ro);Vodafone Romania, the second largest mobile operator, with a customer base that reached a total of 8.08129 million subscribers on 31 March 2013 (www.vodafone.ro); Cosmote Romania with a market share of approximately 24.5% at the end of 2012 (www.cosmote.ro); RCS & RDS which had, in mid-2013, 1.1 million customers for mobile services, thus is the smallest player on the market after Orange, Vodafone and Cosmote (www.rcs-rds.ro). The mobile telecommunications operators agreed to joint at various collection programs to encourage people to donate their phones, educational programs for forming the culture of collection and recycling. They form with other EEE producers the authorized collective associations (Orange with CCR Logistics Systems RO SRL; Vodafone with RoRec; Cosmote and Environ).

Together they have implemented various collection programs of mobile phones from consumers or for own unsold or undelivered devices by following schemes: take back, buy-back, providing of diverse incentives to collect and recycle discarded cell phones, donations, charity etc.) [15].

At national level, buy-back programs for mobile phones were introduced on Romanian market by Orange since December 2009 and by Vodafone in 2011 (www.vodafone.ro).

Vodafone Romania was the first telecommunications company that launched in 2007 *The National Program for Recycling Mobile Phones and Accessories* (for batteries, chargers, hands-free, data cables) (www.rcs-rds.ro). Cosmote Romania and Germanos, in partnership with „Environ Association" (http://www.environ.ro/), based on „National System Battery Recycling" program, have developed a large electronic waste collection campaign called *I Love Recycling* [16].

Two providers companies have initiated a new measure for environmental protection and for the information of customers. They have introduced the eco-labelling for mobile devices commercialized. The criteria adopted by EU eco-label for some EEE (not yet for mobile phones) helps the consumers to identify products and services that have a reduced environmental impact throughout their life cycle, from the extraction of raw material through to equipments production and use, also for waste disposal [17]. In partnership with World Wildlife Fund and with expertise of BIO Intelligence Service expertise, Orange has introduced nationally, in 2011, an eco-label for its phones intended to be sold (For beginning, the eco-labelling is available only for online store Orange). Based on information received from the manufacturer, every phone receives an overall score (out of 5) according to five indicators related to: amount of greenhouse gases emitted during the main stages in the life cycle; energy consumed during use and standby as a measure of energy efficiency; amount of valuable materials (gold, silver, etc.) in the product, as the measure for the conservation of natural resources; if it can be easily dismantled and recycled based on the their composition, design and the recycling technologies available; the presence of toxic and hazardous chemicals and substances that are dangerous for human health and the environment [15]. Also Vodafone attaches the eco-label at its mobile phones. It is named „Eco-Score". This is the eco-label under which Vodafone promotes the ecological efficiency of its mobile phones (in partnership with *SKM Enviros* from UK and *Bureau Veritas* from France). By assessing of 162 criteria (106 criteria for the product itself and 56 for the activity of the manufacturer) the rating system is from 1 to 5: 1 represents the highest impact on the environment, while 5, the lowest impact (www.orange.ro, www.vodafone.ro).

Romania has received technical assistance through PHARE programs to educate people on waste management and to implement the implementation of Directive 2002/96 on WEEE. Some NGOs have regularly organized national awareness campaigns and education, fundraising galas for environmental projects and campaigns for waste collection. Also, with external assistance in 2007 was launched a national campaign to collect WEEE called *Great Disposal* (*The Big Get Rid of Waste*). In conducting its existing collective organizations, local authorities, health agencies, collection companies, local and regional agencies for environmental protection were involved. Its effects were reflected in the continued growth of the quantity of WEEE collected at each event [18]. The collective associations, some economic agents, commercial and banking companies started a "Green Corner" program. This action is materialized by offering a WEEE collection infrastructure in areas easily accessible or with intense people traffic.

As a novelty into collection activity based on compensation of WEEE from retailers, *Green Group* has installed so called „ecoATM" or „green recycler" (Figure 2).

Fig. 2. *EcoATM for cell phones and other EEE*

This machine works in a few steps and offers instant cash to consumers that have returned its unwanted mobile phone. Is a new way to sell used cell phones (or other electronic/electric equipments).

This was promoted in Romania through the voluntary agreement project signed between *Green Group*, Ministry of Environment and Climate Change and *Big Networks Commercial Association* of Romania. The first machines were installed in March 2013 at Cora stores in Bucharest and other cities (Buzău, Ploiești, Arad, Baia Mare, Drobeta Turnu Severin, Constanța, Bacău și Cluj) (www.greenweee.ro).

7. Existence of infrastructure for collection and recycling

If are considered the value of recycling rate and the amount of equipment collected, it can be appreciated that in Romania, organization of WEEE management in general and waste mobile phones, in particular, is at the beginning.

The collection and recycling are processes that still operate slowly. In 2008 Romania had the lowest recovery rate WEEE in the EU (Figure 3).

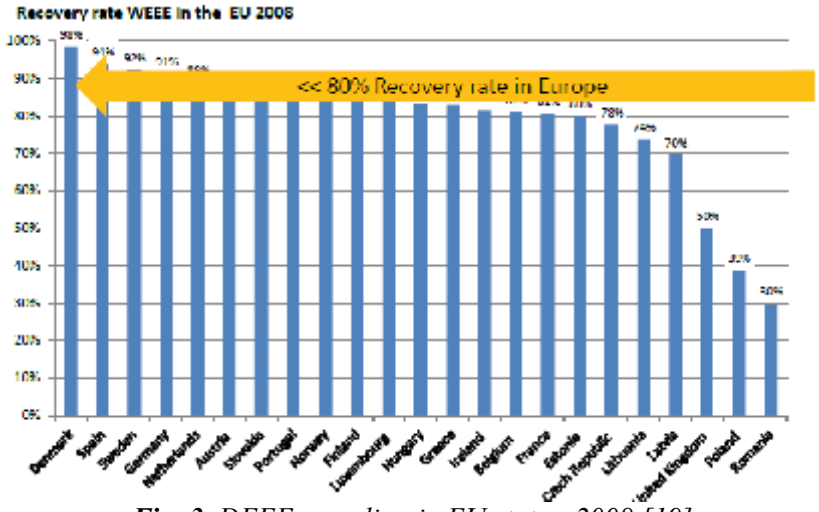

Fig. 3. *DEEE recycling in EU states, 2008 [19]*

At passing of years the situation from Romania seems to not have more changed: WEEE collection rate in 2010 remains lowest in Europe (Figure 4).

In Romania, the collection of mobile phones as well as of other types of WEEE, is organized through the canals: collection events in a special day for WEEE from households (with lower addressability at mobile phones waste); giving back to the retailers the old mobile device when is acquiring the new one (by following scheme: free take back, discounts, buy-back); return direct at the special points for separate collection that are organized by municipalities, recycling/reuse/refurbishment companies, collective organizations and others. The surveys have shown that for a management system that is at early stage such as this one from Romania, the incentives provided to mobile phones owners can encourage the return of handsets.

Regarding materials recycling from mobile phone waste, the variety and complexity of materials (especially the presence of Au, Ag, Pt, Pd, rare metals that are considered „critical metals for future sustainable technologies" in accordance with demand growth, supply risks due to scarcity of natural reserves, recovery potential) and the presence of hazardous substances (halogens, brominates flame retardants, Cd, Sb, Pb etc.) requires the adequate facilities for treatment. Efficient and environmentally sound treatment of waste requires advanced technology [21-23]. This requires sophisticated facilities that cannot be duplicated in every country (is not economic to duplicate in any country).

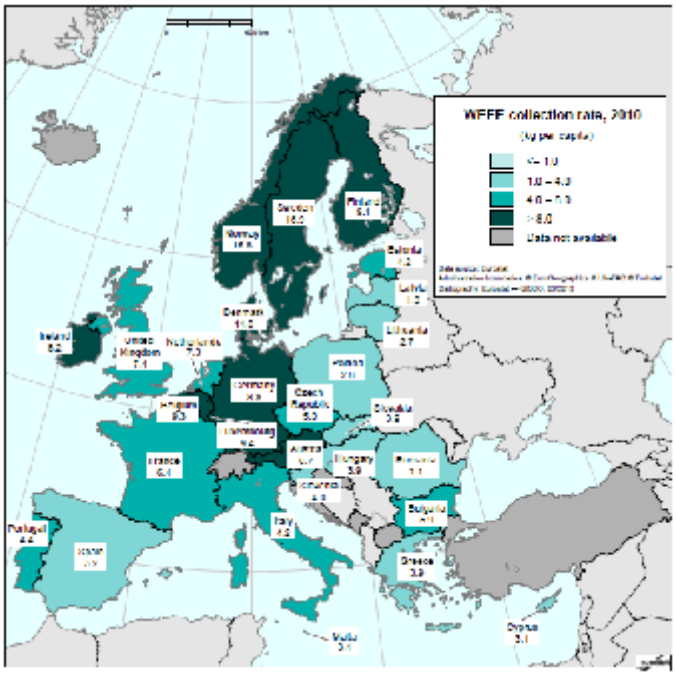

Fig. 4. *WEEE collection rate in 2010 [20]*

In the world were perfected the efficient technologies and few suitable plants already exist in Europe [24-29]. Romania do not has any units for recovering the valuable materials from these complex waste and therefore and it is not feasible to build such a unit. At end-of-life, the most phones collected were exported. Also, there not exists a market for materials resulted from the dismantling and/or recycling of EEE waste.

The certified companies from Romania are specialized only in: collection; transport; storage; dismantling with recovering of components; some operations for sorting and selecting of materials. Moreover, after 1989, Romanian metallurgical plants from non-ferrous industry have been closed and decommissioned. These would be able to upgrade their production flows in accordance with environmental regulations and work safety. Also these would be able to acquire the modern equipments and to adapt their technology to extract the valuable metals (Cu, Au, Ag) from mobile phones waste. In present, *GreenWEEE International* had an initiative to build at Frasinu, near to Buzău, the first plant that addresses to recycling of WEEE, ensuring all their stages of treatment. The investment is worth 10 million euros.

The recycling unit has a total area of 10,795 m^2, of which 6,100 m^2 for production and processing. This annual capacity is over 50,000 tonnes of WEEE recycled (http://www.greenweee.ro/).

8. Conclusions

The initiating and developing a sustainable waste management system (which in fact requires a long period of time) is hampered by a number of factors specific to our country.

The recycling strategy must be based on the economic sustainability, technical feasibility, and on educational support. The mobile phones recycling must be supported into a sustainable manner by organizing a formal institutional networks formed by private actors (network telecom operators, retailers, RRR companies, collective organizations, consumers) that are responsible for phone device life cycle and by public authorities (central and local) which are responsible in the development of guidelines and regulation framework within which private actors can be able to function. In accordance with the legislative requirements of the European Union and of Romania, a sustainable financial mechanism should be able to operate for ensuring the coverage of all costs of waste management, to contribute to their effective operation by establishing a competitive climate and to ensure the incentives. In Romania, in the managing of mobile phones can be identified a number of weaknesses that are common to all categories of WEEE. They must be solved.

Also must be sustained the education programs for forming the correct habit and normal attitude towards a product reached at end of life cycle.

The recycling culture can be formed in collaboration with schools, universities and other large communities or companies. The mobile phones collection must be encouraged by public authorities and private actors involved into mobile phones management. The collected system must take into account the low level of awareness of Romanian citizens for advantages of recycling and for environment protection. As many high visibility collection points, especially in high-traffic areas must be organized. At this moment the take back process is stimulated mainly by motivation of consumers. Accordingly there must diversify the incentives provided to encourage return of handsets. Successful solutions utilised in other countries can be adopted: free postage; charity donation; envelopes, bags, boxes; courier collection, cash payment; other as discounts, store credits; prize draws; environmental incentive; mobile phone airtime; mobile phone bill discount. Finally, for an efficient management system of phone mobiles waste is essential the logical and long-term cooperation and interaction of all players involved in the developing of a responsible attitude, the forming of the recycling culture, and applying in practice of correct recycling solutions with respect to environment and people.

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