



El Colegio
de la Frontera
Norte



Municipal Guide for Comprehensive Management of E waste in the Northeast of Mexico



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PRESENTATION

Preparation of this guide was under the guidance of El Colegio de la Frontera Norte according to Contract TAAE10-063B2012R61.1.PID:20,149 of the Project: “*Analysis of E-waste lifecycles in the border cities of Coahuila, Nuevo Leon and Tamaulipas*”. This guide’s main goal is to orient and complement knowledge for municipal authorities and sector’s technical workers, to carry out a Comprehensive Management for E Waste in the Northeast of Mexico.

Additional to the above, this guide want to encourage municipal authorities to start projects that achieve decrease and correct handling of this waste with the purpose of attaining a sustainable management of E waste that promotes environmental protection and reduce pollution; increase population’s health and wellness standards. This document pretends in unison, to kick-off studies and academic courses in College students on topics like E waste comprehensive management.

Introduction

Society's current way of life is creating serious problems to the environment, because among other things, to inefficient production processes, these requiring high amounts of energy for treat waste with complex chemistry; therefore, it is complicated to treat them to make them harmless to the environment and humans. At the same time, lifecycle of some electronic and electric appliances has reduces, technology innovation has caused an increase in E-waste volume (TVs, computers, cell phones, etc.). In previous times, many of these appliances were able to be repaired by technicians, today is cheaper to buy a new one and get rid of the old, what does not necessarily imply an adequate disposal/management.

Before continuing, let us define: What is waste? Answer would be: a series of materials not used comprehensively during production processes or after being used by society must be disposed in special sites. In consequence, waste represents an economic burden to society, because disposal must be adequately located, being their presence and own composition a risk to the environment and human health, thus, E Waste management has acquired worldwide attention (Ponce de León, 2009). This was reflected during the 1990's, when the "Whom who pollutes, pays" principle was coined in the European environmental policy and later the rest of the world, which took including waste as an economic, social and obviously, environmental term.

The above mentioned principle was incorporated in environmental legislature and further in models that made the Electronic/Electric Appliance Producer, responsible, until today, this responsibility has extended to distributors, carriers, import/export brokers, salesmen and even consumers participating in the product's value-chain. Also, environmental legislature recognized environmental, social and economic impacts of E waste, for which they were classified in two types: not dangerous and dangerous (DW), the latter have caused establishment of multi-lateral agreements like the Basil Agreement, focused on transboundary waste and the Stockholm Agreement which implies to reduce and/or eliminate adequately (Ponce de León, 2009). Within this group of waste are the Electronic and Electric Appliances (E Waste), an abbreviation of electronic waste; or *Waste Electrical and Electronic Equipment* (WEEE), *e-scrap*, *e-trash..* Although these terms may have other definitions, it is considered that all WEEE or E Waste have valuable materials inside (gold, silver, copper and other metals) in small quantities but still enough worth for business as well as extraction of recyclable materials. It is dangerous and non-recyclable parts like Mercury and other substances must be disposed in special and adequate sites without risk for population and the environment. However, this implies costs to be assumed by federal, state and municipal governments with regards to Mexico, because in other countries these costs have been extended from producers to the consumer.

What has been mentioned takes us to a dilemma: How to manage and dispose adequately E-Waste so it does not affect the environment or public health in local populations? That is to say, How to perform E-Waste Comprehensive Management from a municipal perspective? Where all social actors intervene in the value chain and it becomes economically sustainable and complies with current regulations. This implies, however, to carry out from management activities until correct disposal; and its dangerous components be taken from their origin where they can be reintegrated, being this a real challenge to society and the economy, both local and worldwide.

Under previous scenario, this municipal guide for Comprehensive Management of E Waste, pretends to be a management tool for municipal governments, with contents based in previous studies like the “First Inventory of E-waste generation in Mexico”, which estimated that between 150,000-180,000 tons/year of E-waste would be produced (INE, 2007). As well as the “Regional Assessment of E-waste generation in the Northeast of Mexico” (INE, 2008); where it was identified that E-waste was increasing in the states of Coahuila, Nuevo León and Tamaulipas, due among other things to a fast changes in technology, low cost and easy access to buy within the border region between U.S. and Mexico.

Also, this guide was based on the Life Cycle Analysis of E-Waste in the Northeast of Mexico” (INE, 2011), showing that both the cities of Piedras Negras and Reynosa, even though are not great consumers of Electric and Electronic Appliances, as compared with Monterrey’s Metroplex, do not carry any recycling activities nevertheless E-waste adequate disposal. Thus, there is a high possibility these residues are being disposed in open dumping and less in landfills. The latter means potential impacts in resources like water and soil, putting at risk not only the environment but human health.

Due to situation, this guide pretends not only to be a management tool that enables municipal authorities in establishing necessary bases to handle and dispose of E-waste in sustainable and feasible ways under each location’s socioeconomic and environmental context; all this in compliance with existent regulations on the matter and increasing quality of life in its populations and regional environment.

1. Goal of this Guide

It pretends to be a simple and practical tool assisting municipal governments and stakeholders in establishing an E-Waste Management Plan for Mexico's Northeast Region, at the same time that it complies with existing laws and regulations; diminishes risks of exposure to human health and the environment in communities, under a shared responsibility format among involved stakeholders in the value chain of these residues.

Also, this document has the intention of offering concepts, examples and practical proposals to establish a basic E-Waste Management Plan in each town, where both government authorities, producers, carriers, consumers, waste managers and other actors (Figure 1) can work together cooperatively, to provide an adequate use, management and disposal to E-waste. In addition, this aims to become a base or starter of proposals providing solutions to specific problems, having diverse social, economic and environmental characteristics in each municipality, which should not be an obstacle to develop their E-waste Management Plan according to their own economic, social and environmental condition.

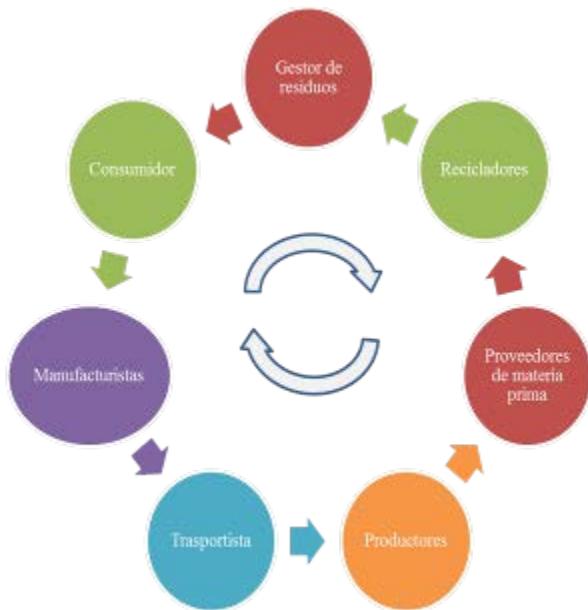


Figure 1. Involved actors in E-waste management

(Source: elaborated for this document)

1.1. Specific Objectives:

- a) To promote creation of E-waste Comprehensive Management Programs among municipal governments to improve the environmental and quality of life in their populations
- b) To reduce quantity of electronic appliances sent to landfills and open dump sites
- c) To reduce pollution generated by E-waste through correct management and final disposal in adequate sites
- d) To promote within these programs, E-waste comprehensive management, reuse of equipment through social institutions (social recovery) or by donations to encourage technological education and diminishing digital breaches in disadvantaged communities, low-income schools or community centers for the elderly.
- e) To foster collaboration between private social actors, especially small and micro-generators (small retailers, repair shops, etc.), informal recyclers and local population, to encourage comprehensive management of E-waste generated locally. As well as promoting social responsibility in these actors, that intervenes directly or indirectly in the value chain of Electronic/Electric Appliances that will become E-waste (Figure 2).
- f) To become a tool for the population, authorities and private sector to take responsibility in creating programs for E-waste comprehensive management.

Figure 2. Life Cycle of E-waste.



2. What is E-Waste (Electronic and Electric Waste)?

E-waste refers informally to define Electronic and Electric Appliance Waste that are approaching the end of their life-cycle, which can be computers, televisions, VCRs, stereos, copy machines and faxes, common electronic products in general. Many of these appliances can be reused, restored or recycled, depending on the country management and especially legal regulations regarding handling, as mentioned (Widmer, *et al*, 2005).

Another and more popular definition, although ambiguous, is proposed by OECD (Organization for Economic Cooperation and Development): “any appliance that uses electric power and has reached its life-cycle limit” (OECD, 2001).

In our case and according to current legislation in Mexico, E-waste are “*technological residues coming from the computer/technology industry, electronic manufacturing, engine vehicles and others that by the time they reach the limit of their life cycle will require special management due to their characteristics*” (SEMARNAT, 2003), thus we will adhere to the latter (Figure 3).



Figure 3. Electric and Electronic Appliances that will become E-waste at the end of their life-cycle

3. Which environmental hazards and health risks come from mismanagement and wrongful disposal of E-waste?

Fast growth of production and consumption of Electronics, as well as changes in this type of technological assets, has caused a short time for these appliances becoming obsolete, thus considered E-waste both in Mexico and the rest of the world.

According to national calculus, at least 411 tons/day of this type of waste is being generated in Mexico (National Protection and Comprehensive Management Program, PNPGIR). This results are alarming if we consider part of these components are substances considered dangerous, like lead, polybrominated biphenyl ethers, cadmium, mercury and hexavalent chromium, which can have harmful effects both in human health as to the environment, Figures 4 y Chart 1 (INE-SEMARNAT, 2007: 71).

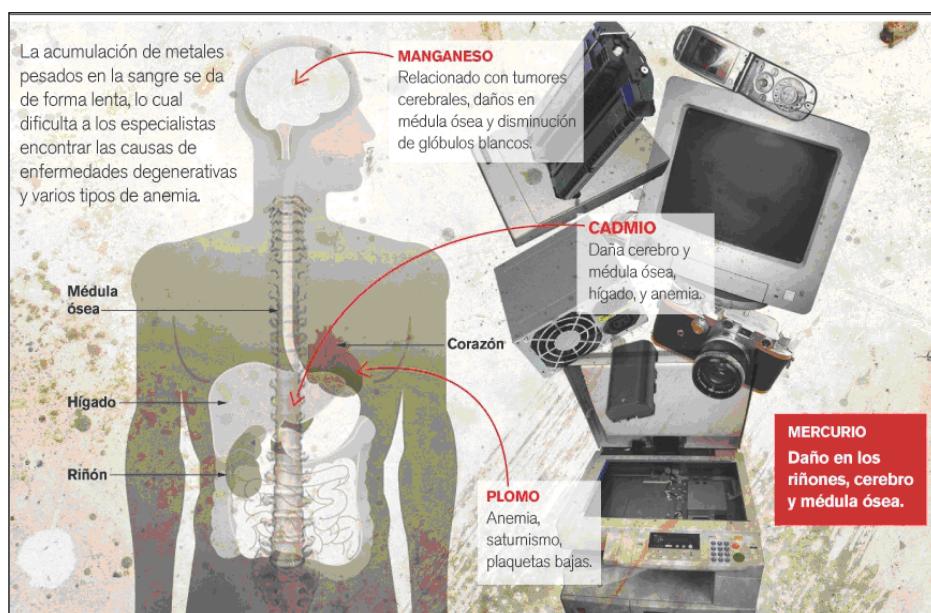


Figure 4. Harms to health due to exposure to substances present in E-waste

Chart 1, summarizes a series of substances found in different appliances used on a daily basis and its harms to humans and the environment can vary. Therefore, Poly chlorinated biphenyl (PCB) cause anemia, damage to the skin, liver, stomach and thyroid in humans. In the environment, when in contact with soil and water, aside of polluting, it affects the trophic chain and can be the entrance to contaminate some foods consumed by humans.

An extreme case of harm is caused by mercury, found in batteries and fluorescent lamps. This metal causes harm in lungs, nausea, vomit, diarrhea, high blood pressure, irritation in skin and eyes of human kind. Also, prolonged exposure to this substance can cause permanent damage to the brain, kidneys and in unborn children, neurological damage; therefore, mercury in any of its forms

when in contact with water or soil can be mortal to flora and fauna (Manahan, 2007; RAEE.org, 2011; Jiménez, 2006).

Recent studies indicated that E-waste artisan recyclers are prone to suffer neurotoxicity due to continuous exposure and conditions where recycling takes place (Chen, *et al*, 2011). In view of this, it becomes necessary a adequate E-waste management and disposal, at the same time information must be provided to the population that recycles in an informal way, about preventive actions that can be done to diminish health risks. In addition to the aforementioned, E-waste dangerousness increases when dumped on streets, open dumpsites, near rivers, ridges or other sites where hazardous substances will integrate to the water and soil, where people obtain food.

Sustancias	Presencia en RAEE
Compuestos halogenados:	
- Policloruros de bifenilo(PCB)	Condensadores, transformadores
- Tetrabromo-bifenol (ATBBA)	Retardantes de llama para plásticos (componentes termoplásticos, cables)
- Polibromo bifenilos (PBB)	TBBA es actualmente el retardante de llama más utilizado en placas de circuito y carcasa.
- Polibromo difenilo éteres (PBDE)	
- Clorofluorocarbonos(CFC)	Unidades de refrigeración, espumas aislantes
- Poli cloruro de vinilos(PVC)	Cables
Metales pesados y otros metales:	
- Arsénico	Pequeñas cantidades en forma de Small quantities in the form of gallium arsenide within light emitting diodes
- Bario	"getters" en los RTC
- Berilio	Cajas de suministro eléctrico
- Cadmio	Baterías recargables de níquel y cadmio recargables, capa fluorescente (monitores TRC), tintas de impresoras y toner, fotocopiadoras , etc.
- Cromo VI	Data tapes, floppy-disks
- Plomo	Monitores TRC, baterías, placas de circuito (PWB)
- Litio	Baterías Li
- Mercurio	Lámparas fluorescentes en LCD's, en ciertas baterías alcalinas y interruptores con mercurio
- Níquel	Baterías NiCd y NiMH recargables, pistola de electrones en TRC
- Elementos raros (Ytrio, Europio)	Capa fluorescente (monitores TRC)
- Selenio	Fotocopiadoras viejas ("photo drums")
- Sulfuro de zinc	Interior de monitores TRC,mezclado con metales raros
Otros:	
- Polvo de tóner	Cartuchos de toner para impresoras laser /fotocopiadoras
Sustancias radio-activas	Equipo medico, detectores de incendio, elementos sensibles detectan humo de cigarillo
- Americio	

Chart 1. Main substances contained in Electronic/Electric Appliances (Source: RAEE.org.com)

4. What are the benefits of an adequate E-waste management and disposal?

Together, a series of actions aimed to prevent E-waste generation, management and final disposal can generate benefits, both for municipalities and local governments as for the environment, since to human health risks decrease, it translates in a better quality of life for populations. Additionally, if re-furbishing of appliances still useful is possible, it can bring economic benefits and local jobs. It will also reduce costs related to investment in mitigation of environmental damage as well as health, E-waste being extremely pollutant when not handled

Following are some examples of how some local governments, businesses and foundations have achieved economic and social benefits, tangibles from E-waste management and disposal.

Social Foundations and Associations

-The Social Foundation “*Grupos EMAÚS*”, has been involved with recycling, the environment and ecology since 1949. Collection of different discarded objects and further sale has and continues to be main source of income to kick-off and to keep their economic initiatives and providing jobs for disadvantaged communities, as well as creating jobs and incentives for recycling companies.

One of many innovative initiatives by EMANÚS is to start promoting establish of modular structures in public places of common use as clean sites of proximity, these sites have the function of collecting and classifying simultaneously several types of household waste: vegetable oils, small electric and electronic appliances, and textiles. Thus, it helps to improve recovering index of dangerous waste. And it facilitates for the common citizen a place to deposit certain residues. Additionally, it creates work opportunities for people outside main job market (PTEORT, 2008 y Velasco, 2008).

-Another example is ECOTIC: A foundation to protect the environment and establish integrated systems for collection, treatment and control of electronic equipment, data technology and telecommunications at the end of their life cycle.

This organization covers at least five activity sectors part of the Comprehensive Management System (SIG, in Spanish). Each sector is independent in maneuvering and budget (Figure 5).

SIG of Electronic Consumption (SIGEC) is more developed; it has created an Industrial Board, with participation of main businesses and associations in the field (Sharp, AETIC, Philips, Pioneer, Sanyo, Panasonic). Other participating companies would be Sony, Kenwood, Samsung, LG

Electronics, Loewe, Thomson, Beko, Hitachi, Tecnimagen, Grundig, JVC, Vestel, Toshiba. With these, SIG is integrated by more than 95% of electronics consumed in Spain's market.

SIGEC Activities for development are:

- Organize SIG within the sector: internal organization regulations.
- Recycling: Locate and contract recycling capacity, according to competitiveness both on pricing and services; negotiate and subcontract services.
- Logistics: According to recycling people and CCAA, depending if they offer this Service, negotiate and subcontract service.
- Market Control: Data (confidential), control of companies not affiliated to SIG, relationships with other SIGs, relationships with other platforms, countries, entities or recycling companies (PTEORT, 2008).

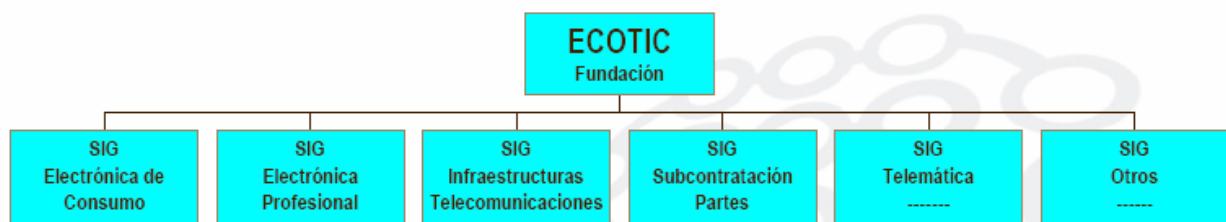


Figure 5. of Comprehensive Management System Phases in which ECOTIC participates.

Local Government and Private Companies level

-Waste Agency of Cataluña, opted in 2001 to open an RFP for E-waste appreciation of domestic origin in the region. Goal of this agency is to promote creating necessary infrastructure to guarantee a correct environmental management of these residues.

This agency provides 20% of necessary investment for construction of an E-waste treatment center, as well as financing of E-waste collection of domestic origin from all locations in Cataluña and its treatment, for a five year period. In 2003, call for proposals open at the Environmental Department, selected the company Electro recycling for appreciation of electronic and electric appliances generated in the region, including establishment of a collection network from all generation sites and construction of a treatment plant

Enterprise level

-**ASIMELEC** (Multi-sector association of Spanish Electronic and Communication Companies) has launched different environmental initiatives that have expressed the sector's commitment to environmental regulations and have resulted in four Environmental Foundations for E-waste and

batteries management. As of E-waste, the Foundations have more than 740 businesses affiliated and have handled more than 45,000 tons of E-waste. Their environmental commitment is:

1. Recover raw materials.
2. Prevent waste from going in open air dumpsites.
2. Natural Resources and Energy Savings.
3. Diminish environmental impacts derived from Electronic and Electric Appliances at the end of their life cycle.

-The **Foundation traperos (rag-pickers) of Emaús (Navarra)** is a social enterprise focusing in selective collection and scrap recovering for reuse and recycling in Navarra. Their services include collection services in seven communities of the Navarra Jurisdiction, and it provides stable jobs to 79 people that would hardly find work in the job market.

This social enterprise represents a model of social and labor integration in the traditional recovering activity (rag-pickers, junk-picker, small wholesalers) within a new and higher-level of operation, both organizational as technical and social, that allows highly-efficient incorporation to new requirements of sustainable management of E-waste.

-Other companies in the E-waste field are UTE of Electronic residues, that includes Empresa de Gestión Medioambiental, S.A (EGMASA), Indumetal Recycling, S.A. (IR), Senda Ambiental, S.A. del Grupo ENDESA (SENDA) y Técnicas de Protección Ambiental, S.A. del Grupo FCC (TPA). These companies have as priority goals to disseminate within the Province of Andalucía, the need of correct handling of obsolete electronics and to study logistical and infrastructural needed to give solution to E-waste collection in the Andalucian territory. UTE launched in 2003 a pilot program to collect E-waste.

Campaign had the following goals:

- To have an experience in designing a collection, transportation and treatment for E-waste.
Learn about data of quantities generated in Andalucia.
- Will provide the Autonomous Community of Andalucía with adequate infrastructure for correct E-waste management from industrial and domestic origin.
- EMANUS is constituted of a Trade Company providing component appreciation and correct treatment of items with no value.
- Compliance with current legislation and adaptation to new guidelines.
- Dissemination within the Andalucian community regarding the need to manage E-waste correctly (Figure 6).



Figure 6. Poster from a campaign aimed to reuse and recycling of televisions in Spain

Other initiatives on management and recovering Electronic and Electric Appliances:

-Canada has started a project “*Computer Scholl*” based in recovering donated equipment with enough life time, to be delivered at Public Schools without cost, and in some cases to nonprofit organizations (Uca, 2009).

-In Latin America, a computer program has started that differs from the example above mentioned in its design and coverage, but nevertheless has proved to be successful, it's named “*Computadores para Educar*” (Computers to educate). The Education Ministry of Colombia delivered in 2007 28.000 computers to schools, reaching a total of 110.000 since its inception in 2001. In the majority of cases, these computers are refurbished and are used in education public programs under the Ministry of Education of each country (Uca, 2009). Another project developed in Colombia that has become successful is carried by the Environmental Department of Riohacha and Camarones; and the Corporation Milagros Verdes (Green Miracles), subscribing an association that aside of reusing Electronic/Electric Appliances, it promotes adequate management and disposal within the population (Peñaranda, 2011).

5. Responsibilities of a municipality on waste, regulation and institutional framework related to E-waste

Article 115 of the Political Constitution of the United States of Mexico grants the authority to the municipalities of public services to clean, collect, transport, treat and final disposal of waste. This attribution is considered in all federal and state laws regarding this topic, like the General Law for Comprehensive Management of Waste (LGPGIR in Spanish) and state environmental laws addressing waste, as well as specific laws on matters of waste and public works (SEMARNAT-GLZ, 2006).

Also, Article 10 of LGPGIR stipulates municipalities are in charge of Comprehensive Management of Urban Solid Waste (RSU in Spanish).

Duties of municipalities will be according to the established on LGPGIR: local laws regarding Public Works, environmental protection and waste depending on each case and Mexican Official Regulations and State Technical Rules. According to the latter, municipalities will perform all activities related to:

- a) Integrated Management of Urban Solid Waste (RSU), including collection, sweep, transfer, transportation and final disposal.
- b) Institutional Framework: As any elaboration of regulations, policy, management plans and the municipal plan for prevention and comprehensive management for urban solid waste. It also includes activities for inspection and surveillance of federal, state and municipal regulations in each jurisdiction area.
- c) Dangerous Waste Management (RP in Spanish) and Special Handling (RME in Spanish), applying plans, programs and policies made for such residues and working in conjunction with state and federal governments. Responsibility of a municipality regarding dangerous waste is circumscribed to those proceeding from micro-generators. On Special Handling Residues, this consideration depends on each state and signed agreements.
- d) To protect the environment from residues: By elaborating assessments, inventories, promoting reducing generation, reuse and value appreciation of residue, as well as collaborating with environmental education campaigns.

From the aforementioned, it is assumed that municipalities are responsible of correct handling and disposal of RSU, RP and RME, first known as “trash” and where E-waste is classified in, although sometimes they hold characteristics from the two latter types. When the municipality provides collection services, it can pick up the last mentioned type of waste; either indirectly because they are mixed with household waste, or directly by being found on public streets, therefore

it will be sent to landfills. If the city does not have a landfill, these residues will be exposed on open dump sites like “orphaned and historic” E-waste, which results in hazards to population and the environment due to dangerous substances mentioned in previous chapters.

Under these circumstances, municipal authorities have the duty of take charge, therefore is important that governments learn about legal framework where E-waste is classified so its management and disposal is conducted in the more adequate way for the type of material.

5.1. Laws and regulations

Regulatory framework regarding environmental protection and waste management in Mexico, considers different legal instruments, first and foremost is The Political Constitution of the United States of Mexico, with the General Law for Ecological Balance and Environmental Protection (LGEEPA in Spanish) and the General Law for Prevention and Comprehensive Management of Waste (LGPGIR) which is responsibility of the Secretariat for the Environment and Natural Resources (SEMARNAT) and is in compliance with the Basil Agreement, where the country commits to conduct an adequate management and disposal of the waste classified as “special handling”, where E-waste can be registered: *e-waste; e-scrap* or any other denomination, for our case it will only cover: televisions of different sizes, cellular telephones, land telephones, wireless or wired, stereos or mini-stereos; as well as desktop computers and laptops.

Classification of E-Waste as Special Handling Residues (RME in Spanish) is listed in Article 19 of LGPGIR, with the exception of Dangerous Waste (RP in Spanish) that established by the law or Mexican Official Regulations, thus E-waste is:

VIII. Technological Residues from Information Technology Industries, electronic manufacturing, engine vehicle manufacturing and others that when their life cycle ends, require specific handling due to characteristics.

Even with the above, it is still possible to fall in contradictions, since part of residues, substances and electronic components in Electric/Electronic Appliances fall in Dangerous Waste (Article 31 LGPGIR), therefore subject to “Handling Plan” for used products, expired, retired from trade, discarded and classified by regulations, examples:

IV. Batteries for Vehicle Engines containing lead;

V. Electric Batteries mercury-based or nickel-cadmium-based;

VI. Fluorescent and mercury-vapor lamps;

VII. Accessories containing mercury, cadmium or lead.

In our case, this group mentioned by E-waste will not be addressed by notes from this study, however, due to the type of substances within their electronic components and materials used to build or clean Electric/Electronic Appliances (desktop and laptop computers, cell phones, televisions, land-line phones, CDR and VCR), fall within the group of Dangerous Waste therefore they must comply with NOM-052-SEMARNAT-2005, that dictates a series of characteristics to identify, classify and list E-waste as dangerous waste (DOF, 2006).

Under this legal framework of reference, it is proposed a Draft Project for NOM in establishing “Management Plans for Special Handling Residues”, where E-waste would enter as Special Handling Residues:

a) Technological Residues within the Information Technology industries and electronic products manufacturers such as:

- Personal desktop computers and peripherals.
- Personal laptop computers and peripherals.
- Cellular Telephones.
- Monitors with cathode rays tubes (including televisions).
- LCD and Plasma Screens (including televisions).
- Audio and Video portable units.
- Cables for electronic equipment.
- Printers, Copy machines and Multi-function units.

Therefore and based on Article 28, LGPGIR, it would entail responsibility in formulating and executing Management Plans, according to the following social actors:

- I. Manufacturers, importers, exporters and distributors of products that when discarded become dangerous waste like those referenced in fractions I to XI, article 31 of this law and those included in Mexican Official Regulations, respectively;
- II. Large generators and manufacturers, importers, exporters and distributors of products that when discarded turn into urban solid waste or special management be included in lists of residues subject to management plans in compliance with respective Mexican official regulations.

Under this legal and regulatory scenario, this group of social actors would come as denomination of Extended Responsibility, to be explained later.

Principales ordenamientos legales que aplican a RAEE

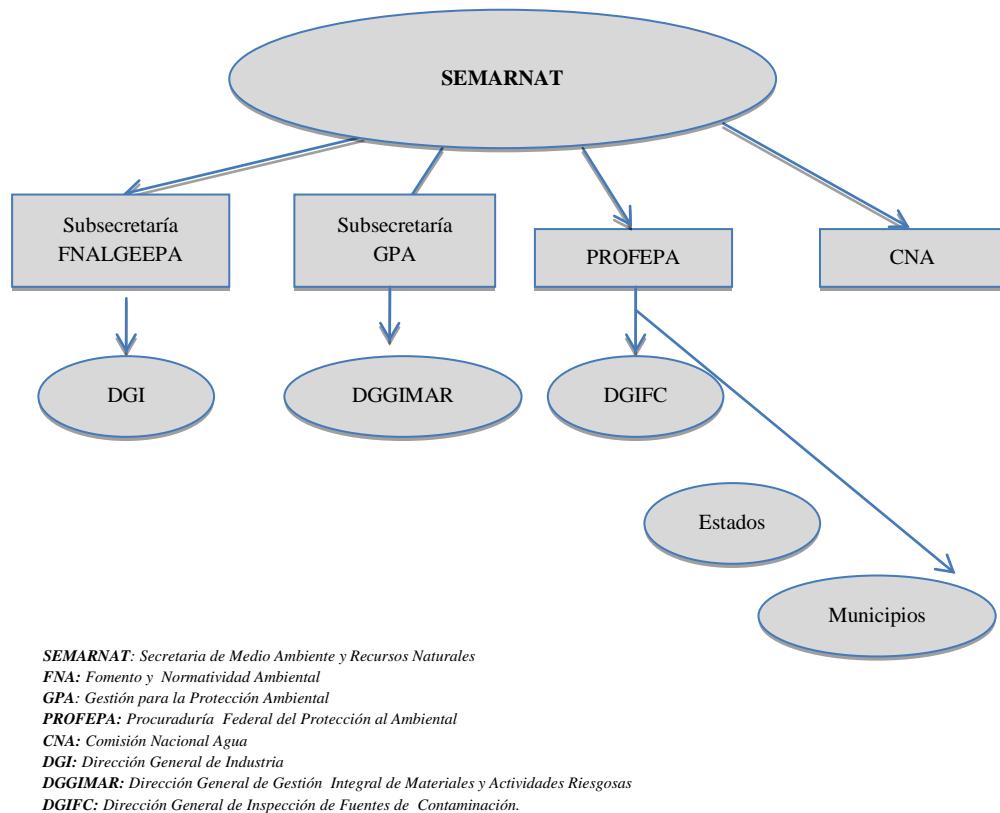
Ley General para la Prevención y Gestión Integral de los Residuos (2003) y su Reglamento (2006)

Norma Oficial Mexicana NOM-052-SEMARNAT-2005 (clasificación de residuos peligrosos)

*Anteproyectos de NOM de planes de manejo de residuos peligrosos y de manejo especial (aprobados por los grupos técnicos en diciembre del 2009 y septiembre del 2010, respectivamente)

5.2. Institutional responsibilities regarding E-Waste

As of institutional responsibilities, handling E-Waste falls under SEMARNAT, first, followed by The Under secretariat of Environmental Promotion and Regulations (FNA in Spanish); the Under secretariat of Management for Environmental Protection (GPA in Spanish); as well as PROFEPA and National Water Commission (CNA in Spanish), to enforce compliance of technical regulations (Figure 7).



Source: elaborated for this study following LGEEPA and LGPGIR (DOF, 2007)

Figure 7. Institutional and Government Responsibilities regarding waste

Second level of responsibility and attributions goes at the state and municipal level (Figure 7).

In the first case, the state government is in charge of regulating and controlling special management residues, including technological and large generators of urban solid waste (Cortinas, 2010).

Municipal governments in compliance and concurring regarding capabilities and shared responsibility in comprehensive management of urban solid waste, where sometimes E-waste is not

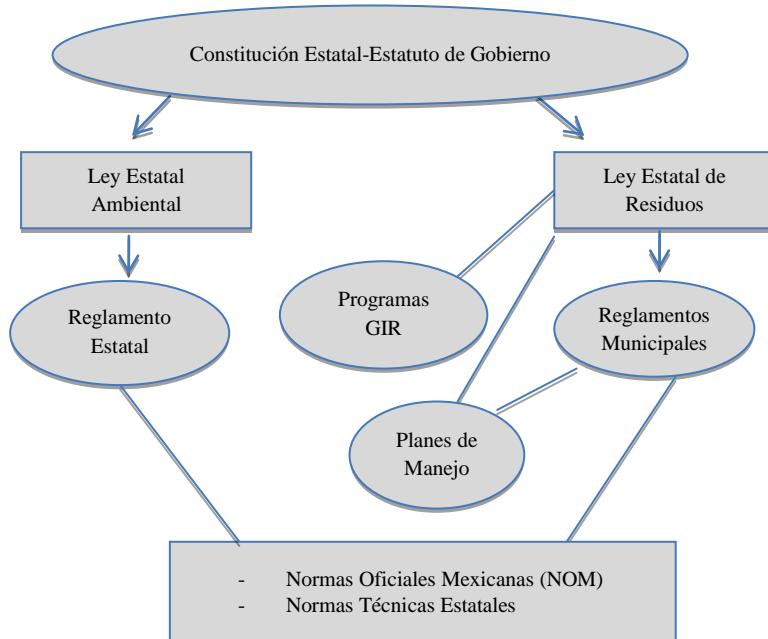
disposed through formal collection and after reaching the landfill or being picked up in streets, therefore they should be promoting disposal actions on the last mentioned type of waste, in other words, the municipal government would be responsible of E-waste handling, however, under a Comprehensive Management for E-waste it can prevent from these type of waste to reach final disposal sites, controlled or without control, Chart 2.

Chart 2. Summary of state and municipal responsibilities, with regards to waste requiring special handling, according to LGPGIR.

State	Municipal (Art. 10)
<ul style="list-style-type: none"> I. To formulate, conduct and evaluate state policy. II. To issue legal ordinances. III. Authorize management of special handling residues. IV. Establish registry of plans and programs. V. To promote, in coordination with State Government and respective authorities (SEMARNAT, PROFEPA, etc.). VII. To promote municipal programs for prevention and comprehensive management of residues under their mandate. XI. To promote participation of private and social sectors. XII. To promote education and training. XIV. To formulate, establish and evaluate environmental management systems. XIV. To Sign agreements. XV. To design and promote before agencies establishing and implementing economic instruments. XVIII. To submit under SEMARNAT's consideration, programs that qualify for technical assistance from the Federal Government. 	<ul style="list-style-type: none"> • To formulate by itself or in coordination with states all municipal programs. • To issue regulations and other rules. • To control urban solid waste. • To submit, through agents, public service. • To issue concessions and authorizations. • To establish and maintain registry of large generators updated.

Fuente: elaborado a partir de información de Cortina, 2010

In addition, and according to legal responsibilities, Art. 18 of Regulations of LGPGIR, it is stipulated that municipal authorities, in coordination with SEMARNAT are responsible of implementing the “management plans that include comprehensive management of dangerous waste” (INE, 1995) generated in households in similar or lesser quantities of those generated by micro-generators, as well as consumption residues containing dangerous materials, including residential units, offices, institutions, government agencies; and states that will implement them (Figure 8).



Source: Elaborated from information by LGEEPA and RLGEPA, DOF, 2005

Figure 8. Regulatory Framework of Waste in Mexico

Although there is not a law and specific rules in Mexico regarding E-waste, currently there are efforts being conducted to change consumption patterns and manufacturing processes that avoid waste and cause more residues, especially E-waste. To achieve this, there is a draft project submitted to NOM, where it is proposed to establish criteria, lists, elements and procedures to formulate Management Plans for E-waste.

Even though the above mentioned will require reorienting legislature regarding topic of residues and specifically E-waste, to be in compliance with Art. 19 of LGPGIR, residues coming from IT and electronic manufacturers; and other electronic residues are considered of Special Handling, in other words, they would have to be disposed of at specific sites due to their hazardous conditions, not in every case happens since the existence of retail consumers dispose of waste both in public streets and non-adequate sites (roads, arroyos, rivers, basins, etc.) that when getting in contact with the environment, sooner or later will reach humans.

6. What should the municipality do during E-waste management process?

According to legislature above mentioned, municipalities are in charge of handling and disposal of Urban Solid Waste and Dangerous Waste, where E-waste is classified.

Some basic alternatives to be considered by municipalities before and after developing a plan are:

- a) To reduce E-waste production within population to decrease the amount of quantities sent to the landfill
- b) To establish alliances with some company or civil association that takes conducts reconditioning of Electronic/Electric Appliances feasible to be reused, that requires the city or business determine which materials will be donated
- c) To establish alliances with local recycling companies to be in charge of E-waste, what implies establishing sites for disposal at specific locations
- d) To conduct periodical campaigns encouraging the community to take their E-waste to specific “green” sites called “E-waste” or any other name (Figure 9).



Figure 9. Example of management process of cell phones

7. What does the city have to do to comply with its part?

A basic strategy that must be adopted from the beginning among local and municipal authorities is to establish a basic E-waste Plan that considers communication strategies, participation, commitment, financial feasibility and sustainability in general, to launch the Plan. Which should be accompanied with alliances, cooperation, involvement and responsibility (Figure 10), that all or the majority of social actors involved in the E-waste chain (manufacturer, exporter, importer, carrier, retailer, consumer, recycler and agent) conduct the correct final disposal

Among priority measures to carry by municipal governments are:

- ✓ To be the agent and coordinator in the process of the E-waste Management Plan, trying to propose strategies and be the coordinator of alliances in the adequate management and disposal of E-waste, both from the population and public and private entities within the community,
- ✓ It is recommended to avoid publishing municipal laws that are more strict or against those dictated at the national legislature,
- ✓ To establish policies for education, health and the environment, in coordination with the private sector and civil organizations,
- ✓ To develop actions for environmental awareness within the population,
- ✓ To promote creation and formal installation of businesses and entities dedicated to reconditioning, recycling and final disposal of E-waste, through streaming of proceedings authorizing their work,
- ✓ To establish communication channels and cooperation with the private sector and civil organizations to establish joint parameters for a comprehensive management of E-waste,
- ✓ To adopt a management policy regarding the Electric/Electronic Appliance equipment used by the government and public agencies, through implementation of mechanisms of green purchases that have environmental standards in their products, as well as other actions that can be developed in this field,
- ✓ To promote the integration of informal sectors, ensuring the management of E-waste to be developed in an adequate environmental way, using good practices and training.

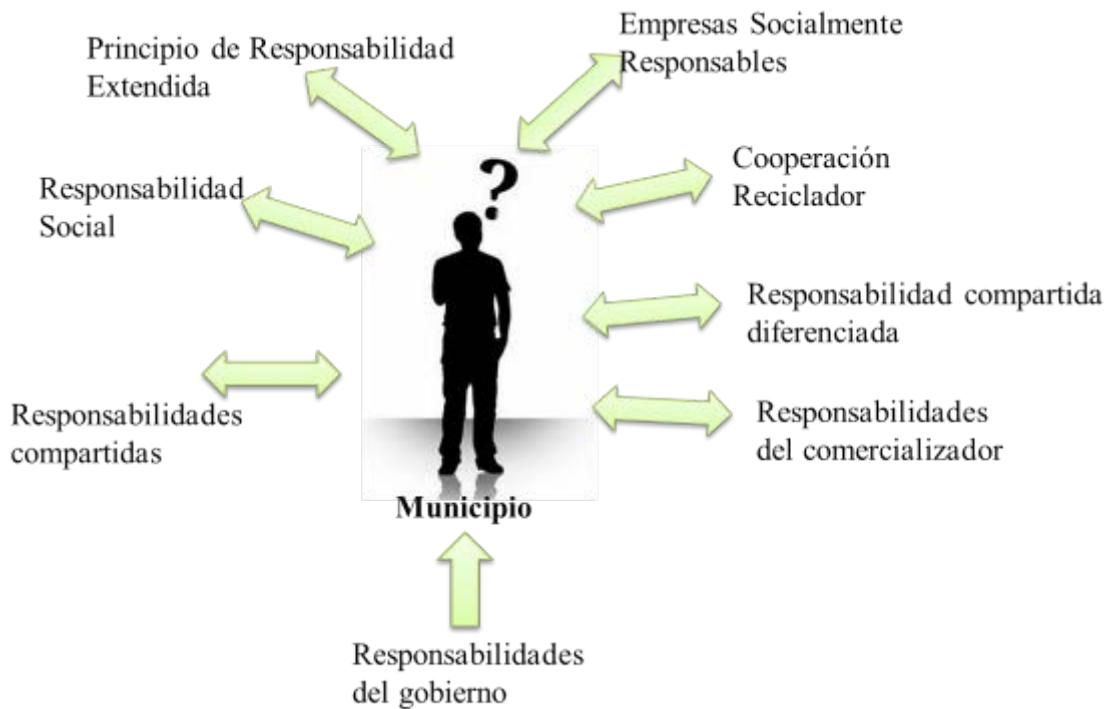


Figure 10. Support tools for cost assessment for a municipal GIRAEE Plan

Other proposals for social actors and responsibilities

Consumer Responsibilities

- It is suggested to the consumer to assume a responsible consumption, in balance with the environment, through the purchase of equipments that include complete programs until the end of their life cycle.
- The consumer must participate in the management system with their own responsibilities, while they are owners of RAEE.
- Final consumer should enter E-waste at sites designated for post-consumption, and not to dispose of in the stream of household solid waste or public streets.
- It is the consumer's responsibility to destroy any saved information of data in E-waste containers.
- It is recommended that donation centers report final destination and use of received units from donations. E-waste generated by these centers for reconditioning must be treated and recycled adequately.
- A donation center becomes a manufacturer per se, at the moment of developing activities; it introduces for the first time a used electronic/electric appliance to the market.
- Donee (receiving equipment) should consider as consumer of electronic/electric appliance, with same obligations and responsibilities.

Responsibilities of recycler

It is recommended that disassembly and recycling companies:

- Are established officially, authorized and registered, as requirement to participate in the E-waste management system.
- Comply with technical, environmental and quality standards established for E-waste management.
- Assure adequate procedure in reconditioning of equipment, keeping criteria of quality of the original product at moment of payment, sales via internet, saved amounts for operation, initial financing of proposed management system for E-waste; and ensure transparency in management costs.

Manufacturers Responsibilities

- To be able to comply with REP's principle, each manufacturer should be responsible of financing management of their E-waste, for which each manufacturer could opt to comply with such obligation individually or join a collective system. Any financial mechanism of the system should ensure equal participation of all Electronic/Electric Appliance manufacturers present in the market, as well as comprehensive management of all their E-waste that fall under the categories described in this document.

With all above mentioned responsibilities, municipal agent should keep all social actors involved, committed and informed at all times, with the purpose of having permanent cooperative alliances that allow the Plan to be sustainable both economically and socially.

8. How can the municipality establish and operate a Comprehensive Management Plan for E-waste?

Currently, we all are consumers and generators of E-waste, some more than others, like in the case of businesses, organizations and public administrations where IT equipment are a vital part for their daily operation. The problem comes up when it is unknown what measures or actions to take with these residues. This takes many E-waste generators to discard them without being aware of dealing with E-waste, and mixing them with household residues or even worse, throwing them on the streets or any site. Therefore, it is wrongfully assumed that responsibility falls only in the municipal waste collection system and not in the rest of social actors generating from Electronic/electric appliances to E-waste.

Due to this situation and according to responsibilities held by municipalities, it will be the latter responsible for collecting materials and its disposal at safe sites. Thus, here are some proposed alternatives and preventive actions for municipal governments to face adequate management and disposal of E-waste.

First-hand Tools

1. To establish an initial or preventive plan to decrease historical and orphaned E-waste, currently collected by Solid Waste Collection Service.
2. Identify main social actors generating E-waste which can be accounted for so this action can be successful.
3. Inform and create awareness within population about participating in separation and disposal of E-waste in adequate sites, established by public or private authorities, designated by the municipality. This will allow at the beginning, to reduce E-waste being collected by municipal authorities.
4. Create alliances with large manufacturers of electronic/electric appliances, so they assume social responsibility with what will become E-waste.
5. Inform the population about Socially Responsible Enterprises (ESR in Spanish) that collect E-waste as part of a cost paid by the consumer (Example: Philips, Toshiba, Sony, etc.) and those that manufacture electronics with recyclable materials or use measures toward decreasing Green House Gases. As well as those that take obsolete electronic/electric appliances for them to dispose and manage.

From an initial or preventive plan, a Comprehensive Management Pilot Plan for E-waste can be established, now a municipal plan for E-waste, structured and select type of plan to be carried by the city, these are some types:

- a) **GIRAE-Municipal**, the municipal government will assume entirely the complete process (collection, storage, transportation, treatment and final disposal), the city will assume costs via taxes, however, it has some advantages and disadvantages to be considered.
- b) **GIRAE-Alliance**, municipal government and private company/foundation form an association to establish a Comprehensive Plan with several phases (Figure 11) or by capacities or convenience for each participant. Costs can be assumed by action, according with financial sources being tax, sale of recyclable material, donations, etc.
- c) **GIRAE-Private**, in other words, have a specialized private company assuming all actions per phases in the municipal plan (Figure 11). This implying the municipality, via population plus electronic manufacturing companies will assume the cost of management and disposal of private company
- d) **GIRAE-Mixed**, municipal government and one/several companies manufacturing electronic/electric appliances, will assume responsibility of collection, temporary storage and transportation to a recycling company. Among the first two will assume costs of all phases including final disposal

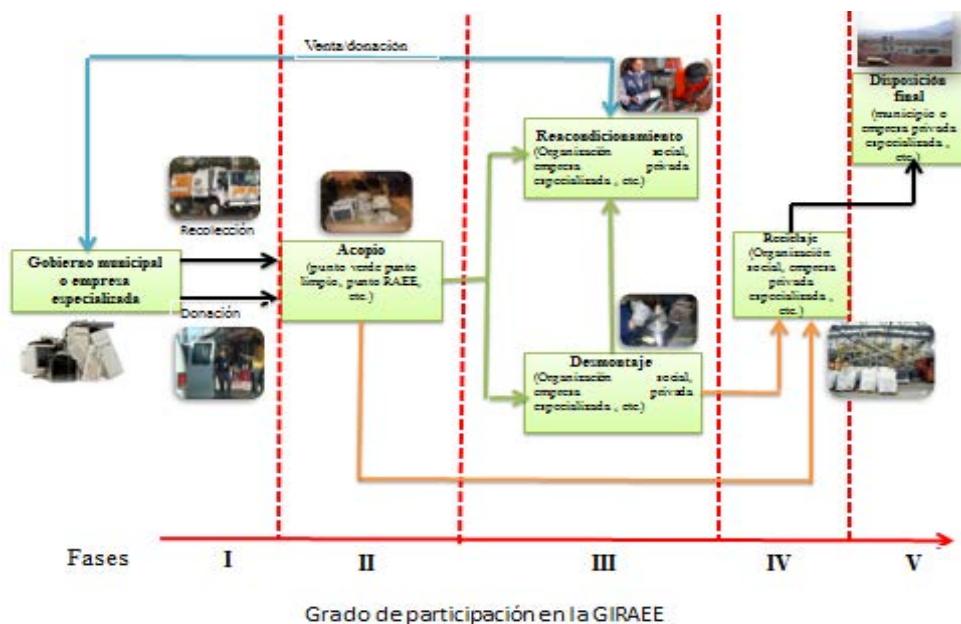


Figure 11. E-waste Comprehensive Management Phases.

a) Plan GIRAEE-Municipal (management and disposal will be performed solely by the municipality)

A public or municipal plan GIRAEE will consider initially two alternatives:

1.-Direct collection, it will be carried through household waste collection, which will entail training staff and have a special vehicle, and establish collection times. In addition, it will need infrastructure for temporary storage, followed by collection, recycling, dismantling, etc. This must also have account implicit infrastructure throughout all phases until final disposal at a landfill.

2.- Indirect collection or at established sites for that purpose, what includes establishing key sites as green place or clean sites, where population will deposit their E-waste. The above will have previous outreach and adaptation work at collection temp sites.

The aforementioned is not impossible but requires detailed planning, what implies alliances and participation from all social actors. Since it means to have funds and human resources, in other words, must generate job positions or relocating staff to be trained on the topic, as well as creating a special department or area in charge for this type of residues and keep records of collected materials being collected, refurbished, recycled and disposed at a Certified Landfill.

Another less viable option is to annex, within the municipal waste area, a department to be in charge of E-waste, this will not prevent from having staff trained, get transportation vehicle and collection infrastructure, recycling, reconditioning, etc., until sending non-recyclable parts to the landfill and comply with necessary authorizations regarding Dangerous Waste requested by environmental authorities.

The aforementioned can be financially supported if it achieves to decrease the amount of E-waste generated by population, via environmental education, awareness or economic fines in extreme cases and collection services costs, as well as transportation of the original E-waste generator through temp collection sites (clean sites, green places, R sites, E-waste sites or any other names) to continue with Phases II, III and IV to be able to reach Phase V. During final phase, municipality should have permits and process paper work established by environmental authorities regarding Dangerous Waste built inside E-waste.

Summary of actions by GIRAEE-Municipal:

- Design a zone or space for temporary storage for E-waste within the company which presents adequate conditions like being covered and free of humidity.
- Have wood boxes, cardboard or plastic where E-waste can be placed, facilitating loading at moment of transportation to collection center. It is recommended to mark recipients indicating which type of waste is inside.
- To classify per category and type of device, to facilitate its further delivery or collection.
- To register quantity, type and state of equipment storage.
- Determine time limits for E-waste storage
- Delegate in one person to be in charge of coordinating removal of E-waste, which should contact with responsible company for final disposal and have all permits established by environmental authority

b) Plan GIRAEE-Alliance (Municipal Government + Private Business)

A GIRAEE Public-Private Plan should establish level of responsibilities and participation per phase (Figure 12); In order to minimize costs and allow its sustainability.

-If the municipal government participates during PHASE I, following considerations must be taken:

- To establish location for disposal that can be named as “clean site, green site, R site, E-waste site” or any other name that population will relate as material to be collected and where trained staff will take to specialized companies. It will also perform a record of type of material, quantities and origin to help the company.
- Design an awareness and information campaign to explain the population about reasons and sites to deposit their E-waste. This campaign will have as goal to make a real and measurable impact within local inhabitants.
- It should have a special vehicle to transport E-waste to allied company’s collection center.
- Rest of Phases II, III, IV and V will be assumed by specialized company

c) GIRAEE-Private Plan (private company specialized in E-waste, will be in charge of all phases)

Once the option more suitable for the municipality has been chosen, and where the private company has committed legally to perform the complete process from management to final disposal of E-waste. Municipality should be supervising compliance of contract and follow up with staff responsible of this Plan, at the same time it facilitates and supervises the company complying with signed agreement and has the necessary infrastructure to do so. This is because it is required to have a registry control of E-waste materials coming in, being disposed, recycled, etc., to prevent being in violation of environmental laws.

It should be mentioned this management option requires the municipality and inhabitants assuming costs and responsibilities, otherwise it will have low viability of success, even though is managed by a private company.

d) GIRAAE-Mixed (the municipality and manufacturing companies will assume collection, temporary collection and transportation to recycling company, whom will dispose of E-waste adequately)

This option is perhaps the most viable in operations and costs, being that, both municipal government and manufacturing businesses, will assume responsibility Phases I and II; and will fund Phases III and IV, that will be conducted by a specialized recycling company that must make sure E-waste will be disposed at a Certified Landfill.

Summary of operational activities of GIRAAE

- a) GIRAAE municipal =all five Phases assumed by municipality
- b) GIRAAE Alliances= Phase I and II municipality and Phases III to V, specialized recycling company
- c) GIRAAE Private= All five Phases assumed by private company
- d) GIRAAE Mixed= Phase I and II municipality and manufacturing companies; Phases II to V, specialized recycling company

An important point in the GIRAAE process is without doubt, the cost implicit in all involved activities. Therefore, in next lines are some proposed alternatives for management that could be applied by municipalities up to consumers, specialized recycling companies and manufacturers, which should consider awareness and environmental education as base for the population, since it is more inexpensive to not pollute than pay for contamination.

9. ¿Cómo se pagaría dicho Plan GIRAE?

Authors like (2004) identify a new opportunity, both financially as environmental, during E-waste management, for which participation from all actors is needed, government, industry, education and individuals.

Although it should clarify that there are no magic formulas to fund a GIRAE plan, since it will depend on its own management, planning, efficiency, perseverance, talent and involvement from all social local actors in order to achieve a goal.

According to existent environmental regulation in Mexico, municipalities have the obligation to provide the Service, which is why strategies will be proposed that can be from simple to drastic, to reduce costs:

- ✓ Planning of project and involvement from all social actors within the municipality, trying to make them each one aware of their responsibility in the value chain of E-waste.
- ✓ Dissemination of the project and awareness in consuming this type of appliances, among different educational levels and meeting places in the city about benefits of correct E-waste disposal, this will reduce waste needing transportation to special recycling companies and end in the landfill.
- ✓ Inform the community about companies that included recycling cost in acquired electronic/electric appliances; this may need a telephone information center to answer questions and inform about business locations.
- ✓ Promote Alliance and cooperation within manufacturing companies to assume their responsibility in the value chain; this can facilitate outreach aspects on municipality's website as "socially responsible companies" and even some stimulus, convenient for all social actors.
- ✓ Have alliances with recycling companies or companies that call for "recyclathons", and assume collection, as well as E-waste correct disposal, having previously signed an agreement regarding obligations assumed by municipality and company.
- ✓ Initially, the project can be a pilot program, where it does not invest much in infrastructure (containers, signals, etc.), but it should have a collection center, well known and set up for people to take their E-waste. Municipality will designate a specific vehicle with trained staff to transport E-waste periodically to the recycling company. This will require a previous alliance with the company as of what will be assumed by the municipality and how much the company will gain from treating materials.

Alternatives to financial costs:

- ✓ Alliances between municipality, society and recyclers, where municipality will only assumes transportation of materials collected at collection centers, the population will dispose of their E-

waste. Treatment cost can be negotiated with recycling company; for which it can assume part of the cost and the company will obtain profits through extraction of valuable/recyclable metals. Also, it is possible to incentive the company with tax discounts and facilitation of process/paper work.

✓ The Alliance can be between municipality and civil associations, that by reconditioning viable equipment either for donation to schools, elderly houses or any other charity purpose. This will decrease the volume of E-waste that will be taken to a recycling company and will assume related costs.

Other stricter alternatives to pay for costs:

- ✓ This measure is probably the least popular, being that after informed and created awareness about hazards to the environment and human health, fines or other economic sanctions will be set both to individuals or companies that mix their household waste with E-waste. However, this requires creating a code of rules and surveillance. Additionally, establishing amount of fines and sanctions according to magnitude of waste deposited in public areas.
- ✓ Establish and define financial types for waste denominated as historic and no-historic.
- ✓ Propose tax incentives or other financial instruments destined to those committing to assume costs in managing historic and orphan equipments
- ✓ Definition of responsibility quotas in financing E-waste through value chain, according to magnitude of generated residues
- ✓ Extend the cost of E-waste for consumers (social responsibility) and manufacturing companies (extended responsibility)
- ✓ Establish a local registry in order to be prepared for a National registry and regulations

Summary – GIRAEE Costs

- a) GIRAEE municipal = municipality assumes 100% of the cost which will be raised through taxes
- b) GIRAEE multiple = all social parties assume the cost
- c) GIRAEE municipal-social = municipality and foundations or local social organizations
- d) GIRAEE-municipal-manufacturer = municipality and manufacturing companies assume the costs of all phases

10. Final conclusions

- ❖ Due to the complexity and multi-dimensional aspects of the E-waste issue, it is recommended to design and implement proposals trans-disciplinary, based on the ACV model for E-waste, including design of methodologies with a multi-sector perspective and articulate them on a National E-waste Network, that allows exchange of information and experiences in the topic, through a system in the Management Plan posted on a webpage handled by SEMARNAT, both regional and national.
- ❖ It is important to promote developing municipal responsibilities that encourage the Comprehensive E-waste Management Plan concept, including possibilities of grants for adequate technologies in recycling, as well as an orderly structure of the recycling sector, that guarantees correct disposal of E-waste and compliance with current laws. Also avoid creating new laws in contradiction with regulations developing currently.
- ❖ Our country requires to expedite the proposal and regulations that become effective to be applied in the Comprehensive Management Plan for E-waste, not only at the regional level but nationally, and base don the three main pillars of sustainability: environment, economy and society, trying that any effects on each one are the least possible. Therefore, at the environmental level, should establish a reference framework to evaluate environmental impact of E-waste and reduce its impact in health and eco-systems. On the economy aspect, management costs and disposal; present the possibility of a tax for manufacturing companies and sanctions in case on non-compliance. At the same time compliance of regulations is promoted within local recyclers and organizing those recycling informally to have them do their work correctly. Also, there should be a specific registry of Electronic/electric appliances imports and exports; and possible e-waste reported on forms from a Comprehensive Management System, coordinated in a transparent way and electronically to sent to SEMARNAT.
- ❖ It is important to consider within the GIRAE scenarios, options of management municipal-private company, either with participation from both in variable proportions according to municipality's consideration and their human resources and economic capabilities; however, it is not recommendable to leave total management of the system in the hands of private companies, because they can be non-compliant with the law or have omissions; which makes necessary to have supervision in the process to assure it is working according to contract.

- ❖ Privatization should not be considered as something against society , in some cases it generates fear of letting go of the power in key areas like: a) assign responsibilities; b) creating additional workloads for manufacturers and parties in the process; c) high demands and complexity in the process; d) infrastructure costs; e) determine delivery forms of different residues from their manufacturing context; and f) determine treatment operations that guarantee its correct management and requirements of installations where these operations take place. If it has to be considered as an alternate management form by local governments where it can even propose and follow up to improvements and the population has better life conditions at a certain cost that can be subsided if a solid frame of management is created.
- ❖ An optimum measure would be to establish that costs for e-waste treatment be incorporated in new product prices and shown to the consumer; while other collection and recycling programs can be funded through an imposed tax to each product, this secures the manufacturer or distributor will try it in each program. In other countries it has been achieved that purchased equipments, after some time, the consumers are who pay separately for recycling costs, previous information provided; which has resulted in awareness and assuming responsibility from both consumers and manufacturers.
- ❖ Finally, is indispensable to design and implement a comprehensive and sustainable system of e-waste indicators that allow to monitor progress and achievements in this topic. Also, must not forget that coordinated and responsible work among all involved social parties will result in develop or E-waste Comprehensive Management Plan in the Northeast Region of Mexico.

Glossary

- **Electronic and Electric Appliances (AEE):** appliances that require electrical power or electromagnetic fields to function, dedicated to be used with no less than 1.000 V in alternate current and 1.500 V in continuous current; and all necessary equipment to generate, transmit and measure those currents and fields;
- **AEE Consumer:** an individual or organization demanding goods or services, in this case electric or electronic appliances provided by manufacturer or provider. In other words, an economic agent with a series of needs and wishes with available income to satisfy its needs through market mechanisms.
- **AEE Distributor:** any legal or individual person that provides electric or electronic appliances in commercial conditions to another person or entity, independent of used sales technique.
- **Final disposal:** final destination –environmentally safe– of residual elements emerging as remaining items from E-waste treatment.
- **Generator:** Any person, legal or individual with an activity producing waste or electronic/electric waste. Can be an importer, manufacturer, retailer, distributor or consumer.
- **Comprehensive Management of Electronic/Electric Waste (E-waste) (GIRAE in Spanish).** Series of actions, operations or dispositions oriented to provide electronic/electric residues, its best adequate destination from an environmental point of view, considering its characteristics, volume, origin, treatment cost, and possibilities of recovering, use, commercialization and final disposal.
- **E-waste management:** series of activities dedicated to reduce, collect, transport, treat and dispose of E-waste, considering environmental and human health protection actions;
- **E-waste manager:** any person, legal or individual, that within legal framework, conducts collection, transportation, storage, appreciation, treatment or final disposal for E-waste;
- **RAEE Generator:** any legal or individual person, public or private, producing e-waste. Due to amount of e-waste, generators are classified as:
 - Small generators
 - Large generatorsAmount and/or volume from which e-waste generators will be classified as large generators will be determined by proper authorities in each jurisdiction.

- **Importer:** Individual or legal person acquiring in foreign markets electronic/electric appliances with the purpose of selling, distribute or transform within the national territory.
- **Comprehensive Management:** Reduction at the source, separate, reuse, recycle, co-process, treatment, collection, storage, transportation and final disposal of residues with the purpose of appreciation, health, environmental, technological, economic and socially objectives.
- **Management Plan:** Instrument to minimize generation and maximize appreciation of residues under environmental, technological, economic and social criteria, under principles of shared responsibility and comprehensive management.
- **Prevention:** Group of measures, operations and actions oriented to avoid production of risks to the environment and human health, by consuming electric/electronic appliances, as well as their effects.
- **AEE Manufacturer:** any individual or legal person manufacturing and selling electric/electronic appliances with their own brand, placing in the market their own brands in appliances build by third parties and those imported.
- **Refurbishing:** technical procedure which re-establishes functional and aesthetic conditions on an electronic/electric appliance and allow its use for a new life cycle.
- **Recovering:** any activity involved in rescuing discarded E-waste by their generators with the purpose of appreciation, treatment or final disposal.
- **Residue:** matter or product discarded by its owner, in containers or recipients, which can be appreciated or requires treatment of final disposal.
- **Reuse:** any operation that allows prolonging the life of e-waste, or some of its components.
- **Recycling:** any process for extraction and transformation of materials and/or components in E-waste for its application as productive consumables.
- **Electronic/Electric Residues (E-waste or RAEE in Spanish):** electric and electronic appliances, its materials, components, consumables, and sub-groups part of the appliance, that its owner decided to discard or has the legal obligation to do so.
- **Special Management Residues:** those generated in productive processes that are not dangerous nor urban solids, or produced by large generators.
- **Dangerous Residues/Waste, RP in Spanish:** those with some characteristics CRETIB, its containers, recipients, packaging and contaminated soil being transferred to another site.
- **Urban Solid Waste/Residues, RSU in Spanish:** generators in households by elimination of used materials used in domestic activities of consumed products and containers, packaging; and any other establishment or public streets or by cleaning, with household characteristics.

- **Manufacturer's Individual Extended Responsibility:** is the extension in the scope of responsibilities of each one of the electric and electronic appliance manufacturers until the post-consumption phase of Electronic/Electric Appliances produced and commercialized, including management of respective e-waste.
- **Shared Responsibility:** comprehensive management of residues is a social co-responsibility, requires joint actions, coordinated and differentiated by all manufacturers, importers, distributors, consumers, waste managers, both public and private.
- **Extended Responsibility:** It is the responsibility by the manufacturer of electric and electronic appliances due to its environmental impact generated by their products during their life cycle, from fabrication to final disposal.
- **Electronic/Electric Residues/Waste:** all electronic or electric appliances with materials, components, consumables and sub-groups that become waste.
- **Collection:** established procedure by manufacturer through return or by the collector to collect electronic/electric appliances after their life cycle.
- **Reuse:** it means using more than once and after another user, an electronic/electric appliance.
- **Treatment:** all activities to clean, dismantle, break in pieces, disassembly, shredding, appreciation or preparation for final disposal and any other operation conducted for that purpose.
- **Appreciation:** all action or process that allows use of E-waste, as well as its materials, considering environmental and human health protection conditions. These are considered in appreciation of reuse and recycling processes.
- **National E-waste Management System:** it is the group of institutions, actors, actions and related task that integrate different phases in the E-waste environmental sustainable management that will make sub-systems within geographical regions, categories, types of electronic/electric appliances and/or other specifics.
- **Contaminated site (Brownfield):** location, space, soil, body of water, facility or any combination of the aforementioned that has been contaminated with materials or residues that for its characteristics and quantities can represent risks to human health, living organisms, use of goods or property of individuals.
- **User:** natural or legal individual, for who is built an electronic/electric appliance and uses it personally or as work tool.

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