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Electronic Waste Classification in Vietnam and Some Solutions to Protect Clean and Green Environment

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Abstract **-** Our living environment is increasingly polluted, not only by the amount of resources being increasingly exploited indiscriminately, excessively, there are still many types of production that pollute the environment, discharge chemicals, toxic substances are difficult to decompose into the environment, but also because human consciousness is not good in protecting the environment. The collection and treatment of daily-life waste is not in compliance with regulations; waste is not collected, classified and disposed appropriately. The collection of waste into the prescribed places has not been well implemented; there is still the situation of uncontrolled waste disposal and forming many places causing serious environmental pollution. This not only creates agricultural products that do not meet the safety and hygiene requirements, but also pollutes the land, groundwater and surface water of these agricultural production areas. Polluted clean water, lack of clean water will cause unexpected consequences such as diseases, epidemics and reduce the quality of life. However, this article addresses a more detailed situation, related to e-waste in Vietnam, the harmful effects and solutions to help our perception of waste classification**.**

Keywords **-** Electronic waste, Environment, Harm, Life.

INTRODUCTION

Electronic waste is a major concern around the globe, especially as information technology is increasingly developing and the speed of product release is increasing rapidly. Without control, toxins in electronic waste can seep into soil or groundwater, damaging the environment and human health [1].

Each year the world emits 20 million to 50 million tons of electronic waste, accounting for more than 5% of the amount of solid waste in urban areas worldwide. In the European Union, the volume of electronic waste is expected to increase by 3-5% per year. In 2014, about 41.8 million tons of e-waste was generated worldwide, including 12.8 million tons of small equipment, 11.8 million tons of large equipment, 7 million tons of equipment awarded, 6.3 million tons of screens and display devices, 3 million tons of small information technology equipment and 1 million tons of lights. The amount of e-waste worldwide is estimated to reach a record high of 49.8 million tons in 2018, with an annual growth of 4-5%. In discarded computers, televisions, radios, batteries, mobile phones, cameras and countless other electronic products, toxic metals and chemicals such as lead, mercury, cadmium and chromium are thrown away, bromine and decomposition agents [2].

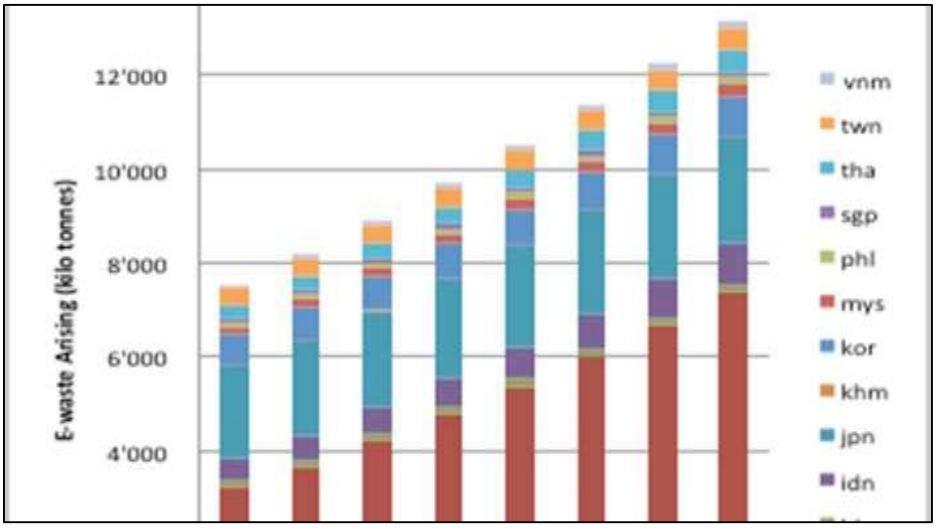

FIGURE 1

E-WASTE IN EAST AND SOUTHEAST ASIA (SOURCE: UNITED NATIONS UNIVERSITY)

We can see the number in the figure above and understand that e-waste is really on the alert (Figure 1). Of the 41.8 million tons of electronic waste listed above, the US alone was 11.7 million tons, while in 2014 only about 6.5 million tons were handled by the national electronics collection system. Currently only 40% of electronic waste is recycled, the remaining 60% ends up in landfills.

In 2018, the global amount of electronic waste is expected to reach nearly 50 million tons, not stopping there, this number is expected to increase 4-5% / year. However, not many countries are well equipped to treat and recycle this electronic waste [3].

Of the electronic waste that is recycled, 80% is exported to poor countries, coming from second-hand shops where poor workers have direct exposure to odours and toxic chemicals during extraction.

In some countries around the world, waste disposal is on the rise, especially in developing countries in Asia, Africa and South America, where waste is treated in this way and is still being applied. Usually, people collect old computers, printers, refrigerators and store them in the yard. These people make money by removing them, recovering components and removing precious metals. However, due to lack of skills and equipment in the course of their practice, they harmed themselves and the local environment.

ELECTRONIC WASTE AND HARMFUL

Electronic waste contains more than 1,000 different compounds, mainly heavy metal components, precious metals, other high-molecular organic substances, etc. which contain many toxic substances that cause serious environmental pollution and affect human health [4].

Electronic waste is a specific category of waste, which includes any product that uses batteries and electrical wires, often containing hazardous materials for humans and the environment. When the expiry date comes, the old fashioned and broken things are no longer able to be recovered; they will be discarded and become electronic waste [5]. Among the current waste lines, e-waste is paid the most attention because it is a waste line with a 3 times faster growth rate than other types of waste.

In Vietnam, electronic waste is also concerned by the limited infrastructure for recycling and disposal of this type of waste, as well as the vague distinction between one type of hazardous waste and one type.

FIGURE 2

EXTRACTING LEAD FROM OLD BATTERIES BY WORKERS IN VIETNAM (SOURCE: VIETNAM NEWS)

Electronic waste is electrical or electronic products in the end-of-life cycle such as damaged, obsolete, etc. and these items can be recycled such as DVD players, printers, TVs, phones, laptops, etc. In this type of waste, there are many toxic substances that are harmful to human health such as cadium in resistors, lead, mercury, etc. Electronic waste contains extremely toxic waste and currently the amount of garbage. This is increasing, especially in developing and developing countries, which threaten the environment and human health (Figure 2).

Electronic waste such as phones, refrigerators, etc. on the outside, it is completely harmless, but the substances that make it really toxic. These types of waste are usually made up of heavy metals and chemical compounds that easily penetrate soil and water. In Vietnam, bottle stores often purchase this type of waste and they disassemble internal components for resale. Because of this inadvertence, toxic substances clung to the soil and gradually absorbed into the groundwater. Not only that, but their hands and feet are also covered with those heavy metals, even though washed with soap, they will still cling to and cause them to suffer from respiratory illness, even cancer, and cognitive impairment [6].

In addition, the toxins present in old electronics when being released into the environment will be difficult to identify, easily subjective psychological with the harm that these toxins can cause, these chemicals are potential hiding the risk of causing diseases that are difficult to treat and have long-lasting effects on human health such as cancer, respiratory diseases, cardiovascular and neurological diseases, etc.

FIGURE 3

LIVING WITH ELECTRICAL WASTE AND HARMFUL RISKS TO PEOPLE'S HEALTH

In this situation, many countries around the world now require electronic companies to be responsible for recycling their products. Japan, South Korea and most European countries now force manufacturers to pay and manage product recycling programs. However, computer garbage is one thing. Activists are now concerned about TVs, items that have caused an increase in the amount of electronic waste in the world over the years. Because more and more people use flat-screen TVs and they mercilessly discard outdated machines [7].

Many electronic waste treatment plants are still rudimentary and cannot be operated safely. Ignite the electronic waste indiscriminately, making toxic gas mixed with the air polluting the air, including dioxin waste which is very likely to cause teratogenicity and birth defects [8].

Electronic waste is television, cameras, computer screens often have cathode ray tubes inside, tubes containing substances such as lead and baric easily seep into the soil and groundwater where recycling, easily affecting the health of people in the area. Then when using water for cooking, bathing (Figure 3).

INCORRECT WASTE COLLECTION

Electronic waste is being mainly discharged from households, offices and most of it is collected by second-hand product stores. Improper handling of this particular type of waste will cause adverse environmental impacts. Electronic devices are indispensable items in households. These include television screens, computers, printers, fax machines, mobile phones, tablets, cameras, batteries, information technology related components, etc. Each year in the world generates about 50 million tons of electronic waste, but less than 20% of this is recycled.

In 2015, the Prime Minister issued Decision No. 16/2015 / QD-TTg stipulating the recall and disposal of discarded products. This decision clearly states the responsibility of the manufacturer to organize the recall of discarded products sold to Vietnam market, through points of recall, then handle or export them to foreign countries for handling.

By 2017, the Ministry of Natural Resources and Environment has issued Circular No. 34/2017 / TT-BTNMT detailing Clause 13, Article 5 and Clause 1, Article 9 of Decision No. 16/2015 / QD-TTg. Accordingly, manufacturers must organize the recall of discarded products they have sold to Vietnam market, setting up points or system of points of recalled discarded products.

The point of recall for discarded equipment must be clearly stated, such as the point of recalling discarded batteries, points for recalling discarded batteries, points for recovery of discarded electric equipment and electronics, etc. However, most people do not know or do not pay attention to this regulation. Even if we want, we do not know where the points of recall are to be brought. On the other hand, the sale of electronic waste to second-hand product collectors is still the most convenient [9].

Electronic waste in the second-hand product stores is often disassembled to get copper and iron components for sale. The rest of the worthless items are often burned or garbage.

WORLD STRICT REGULATIONS ON ELECTRONIC COLLECTION AND RECYCLING

In Sweden, electronic waste generating units, including brand owners and manufacturers, must pledge that their products will be collected and recycled. Large retail chains of businesses all have second hand stores and offer one-on-one services once customers buy a product. In addition, businesses also have to pay an environmental fee to recycling companies to fund their services.

In Korea, the cobalt and lithium mining industry from electronic waste is making money. This source of raw materials is mainly used in making batteries and electric cars. Large amounts of lithium-ion are found from discarded cell phone and laptop batteries. These substances will be reclaimed into a powder form, and put into production in the luxury battery manufacturing industry. In

2016 alone, the electronic waste mining industry provided 22% of the materials for domestic battery production, equivalent to a revenue of US $ 18 billion [10].

In Japan, electronic waste collection is strictly regulated, that is, companies have to set up or hire recycling plants, the collection and transportation of these devices to the recycling plant of about the responsibility of the product distributors. However, consumers are responsible for paying for these two jobs. In the US, customers will have to pay for electronic waste (about $ 2-3). Indiscriminate disposal of electronic waste will be punished severely, even many times the value of discarded equipment. Recycling can create jobs and the recycling process properly implemented can generate profits for businesses. The best way to keep the environment clean is to keep resources in the loop, which also benefits the society [11].

SOME SOLUTIONS TO PROTECT OUR ENVIRONMENT

1. Raise People's Awareness about Environmental Protection

This is the most important factor in protecting the living environment, throwing garbage in the prescribed places, saying no to indiscriminate littering into the surrounding environment, especially in public places such as parks, hospitals, schools, workplaces, resorts, festivals, etc. We should focus on education to raise awareness for children about environmental protection right where they live and study. Maintaining general sanitation, cleaning village roads, alleys, clearing ditches, flowing sewers must have lids, not discharging sewage, untreated daily-life waste into ponds and lakes without drains should be paid more attention. Each household needs to have a separate garbage bin with separate lid and collect domestic waste at the prescribed place [12].

We need to step up scavenging projects, raise people's awareness about not littering, and the group will also have events at condominiums and residential areas to help people understand the serious harm if leaving electronic waste with household waste, encouraging people to bring electronic waste to a safe collection place [13].

In the campus of universities and crowded areas such as apartments, supermarkets, we need electronic waste bins. Students and everyone join the movement of garbage collection and classification. Therefore, if taking advantage of the power from social networks, activities of waste classification and electronic waste collection will be spread, helping to raise awareness of more people.

2. Using a Water Filter to Clean out the Heavy Metals Contained in the Water

Currently, not many families use groundwater instead of running tap water, but if they continue to discharge garbage, not only groundwater sources, but also sea and river water are full of heavy metals. Tap water also cannot completely remove the heavy metal contained in it. The best way to protect the health of us and our family is to use a water filter to clean heavy metals, to ensure your family has clean, safe drinking water for your health [14].

Water purifiers not only clean heavy metals, pure water, but also add many beneficial minerals to your body such as creating alkaline water to neutralize acids in water, supplementing with antioxidant hydrogen, etc.

3. Recycling Electronic Devices

We need to emphasize that if recovered properly, the metal, plastic and glass in these electronic devices can be fully reused, saving resources, and hazardous waste. Electronic waste recycling allows the recovery of valuable metals and other materials from electronic devices, saving natural resources, reducing pollution, preserving landfill space and create jobs. Electronic recycling can be challenging because discarded electronics are sophisticated devices made from different proportions of glass, metal and plastic. The recycling process may vary, depending on the materials being recycled and the technologies used, but here is a general overview recycling process [15]. We need to pay attention to collection and transportation, which are two of the early stages of recycling, including electronic waste. Recyclers place collection bins or electronic waste storage areas in specific locations and transport collected electronic waste from these locations to recycling plants and facilities.

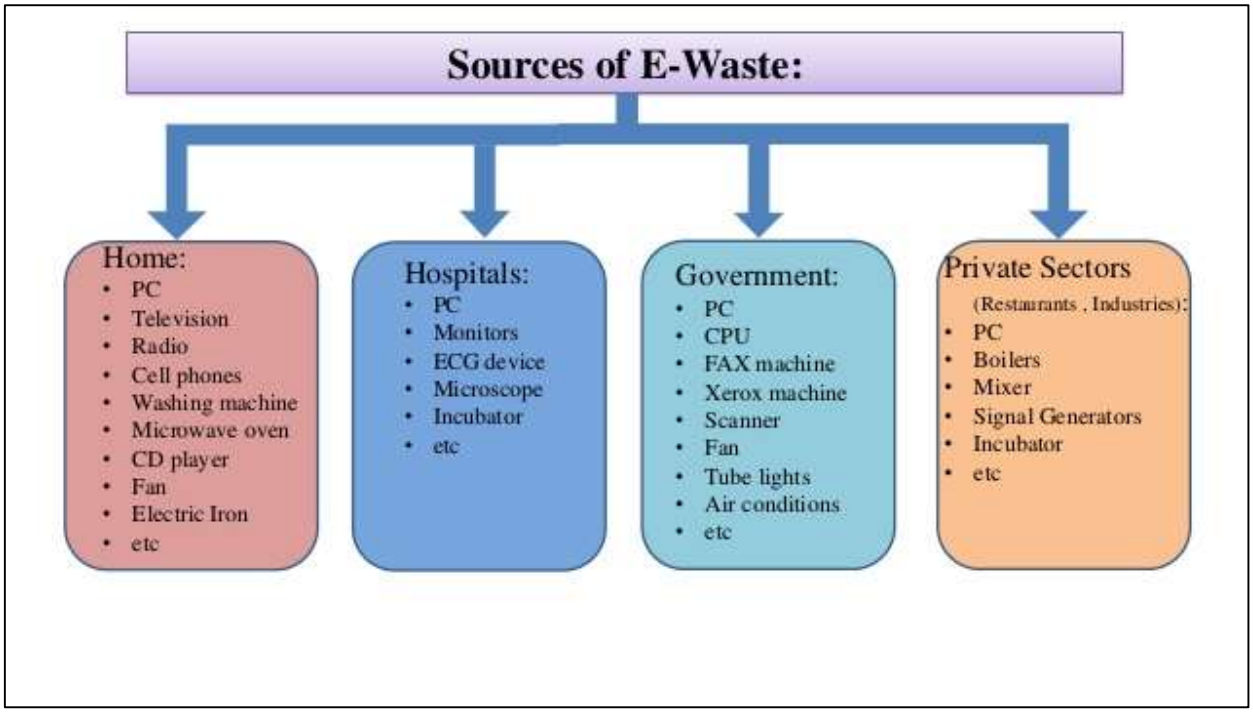

FIGURE 4

CLASSIFICATION OF E-WASTE (SOURCE: E-WASTE)

After collection and transportation to recycling facilities, materials in e-waste must be disposed of and separated into clean materials that can be used to produce new products (Figure 4). Material separation performance is the cornerstone of electronic recycling. The crushing of electronic waste facilitates the separation and separation of plastic from the metal and internal circuitry, and the waste is cut into pieces as small as 100 mm in preparation for further classification [16]. A powerful overhead magnet separates iron and steel from the waste stream on the conveyor belt and then sells it as recycled steel. Further mechanical treatment separates aluminum, copper and circuit boards from materials that are now mostly plastic. The water separation technology is then used to separate the glass from the plastic. The final step in the separation process is to locate and extract any remaining metal residues from the plastic to purify the waste stream further.

CONCLUSION

In Vietnam, most of the electronic waste comes through informal collection sources, which are collectors, spontaneous collection facilities and are gathered to craft villages for recycling. These recycling facilities are small in the household model, most of them are polluted, unsanitary, do not have modern equipment, affect the health of workers and the environment. Therefore, it is necessary to have investment policies, incentives and incentives on loans and technologies for official dismantling and recycling establishments with full recovery and recycling capacity. To solve the problem on the key issue now is to create a global framework for hazardous waste treatment, including the management and monitoring of waste transportation activities to know the source and destination of sources of hazardous waste.

CONFLICT OF INTEREST

No conflict of interest is noted in the paper.

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