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Case Study

A STUDY TO ASSESS THE ENVIRONMENTAL IMPACT OF HOUSEHOLD WASTE RECYCLED AND FINALLY NEGLECT BY LANDFILL OR INCINERATION

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ABSTRACT
The research contend 100 questionnaire included number of family, average weekly consumer of guns (metals, plastic, glass), average weekly consumer of plastic bages, no. of disposal waste, no. of phone cards monthly, disposal of electrical and electronic waste, and study the effect on environment.

KEYWORDS: metals, plastic, glass, waste, bages.

INTRODUCTION

Every production process generates some form of waste and all material placed on the market is destined to become waste at one time or another. This has already resulted in ever growing waste mountains waste represents an enormous loss of resources in the form of both materials and energy. In addition, waste management itself creates environmental damage. Waste is not just a serious problem; it's also a growing problem [1]. The mass of waste produced globally has been growing for many decades, especially in affluent countries and there is a link between gross domestic product and waste generation per person [2]. In the UK we produce about 430 million tones of waste a year, of which about 7% (29 million tones) is municipal solid waste .The UK definition of municipal solid waste as used up to 2010/2011 included the waste materials generated in the home, and by schools, shops and small businesses; provided it was collected by the local authority (or companies working for the local authority). It excluded similar waste collected from commerce and industry handled by the private sector which amounted to an additional 30 million tones per annum at that time. The European Commission considered this definition of municipal solid waste too restrictive in the context of the European Waste Framework Directive (2008/98/EC) and specifically the definition of municipal solid waste included in landfill directive (1999/31/EC). As a consequence, from 2011, now reports Local Authority Collected Municipal Waste separately but the definition are basically the same as previously used for municipal solid waste. Commercial and Industrial waste flows continue to be separately reported as before but the commercial element will be included in the MSW data sent to Europe for statistical/compliance purposes. As this new definition has only just been introduced, all referenced research into health and municipal solid waste in the UK refers to Local Authority Collected Municipal Waste but for the purposes of this report, we use the term municipal solid waste in its old, more restrictive definition [3].

Municipal solid waste (now Local Authority Collected Municipal Waste) comprises the following list of materials, in decreasing order of proportion:

1-Recyclable/paper, Garden waste, other plastics, Compostable food waste, Unclassified fines, Card, paper, packaging.
2-Non-compostable organics, Textiles and shows, glass bottles, jars ,Other paper and card ,Nappies, Steel guns, other metals, Plastic bottles, Wood, Aluminum , Other glass .

Various Directives have set targets for the reduction in the amount of biodegradable waste sent to landfill and also stipulated that governments should draw up plans to:

- Prevent or reduce waste production and its harmfulness.
- Recover waste by means of recycling, re-use or reclamation.
- Use waste as a source of energy [2].
- Ensure that waste is recovered or disposed of without endangering human health [4].

One of the environmentally harmful consequences of unsanitary waste disposal is the emission of green house gases (methane, carbon dioxide, etc.)[5]. This high green house gases emission potential indicates the necessity of proper waste management and disposal system along with the prospect of trading the reduction of green house gases emission with developed countries. In most developed and developing countries with increasing population, prosperity and urbanization, it remains a major challenge for municipalities to collect, recycle, treat and dispose of increasing quantities of solid waste and wastewater. It is

important to emphasize that post-consumer waste is a significant renewable energy resource through thermal processes (incineration and industrial co-combustion), landfill gas utilization and the use of anaerobic digester biogas. Waste has an economic advantage in comparison with many biomass resources because it is regularly collected at public expense. The energy content of waste can be more efficiently exploited using thermal processes than with the production of biogas: during combustion, energy is directly derived both from biomass (paper products, wood, natural textiles, food) and fossil carbon sources (plastics, synthetic textiles). For the many countries that continue to rely on land filling, increased utilization of landfill CH_4 can provide a cost-effective mitigation strategy. The combination of gas utilization for energy with bio covers to increase CH_4 oxidation can largely mitigate site-specific CH_4 emissions[6]. These technologies are simple (low technology) and can be readily deployed at any site. Moreover to improve gas-collection efficiency, design biogas engines and turbines with higher efficiency, and develop more cost-effective gas purification technologies are underway. These improvements will be largely incremental but will increase options, decrease costs, and remove existing barriers for expanded applications of these technologies. Another study found that the composition of the entire waste stream was about 74.4% organic matter, 9.1% paper, 3.5% plastic, 1.9% textile and wood, 0.8% leather and rubber, 1.5% metal, 0.8% glass and 8% other waste in six major cities[7].The per capita generation of municipal solid waste was ranged from 0.325 to 0.485 kg/cap/day while the average rate was 0.387 kg/cap/day. PREGA made a feasibility study report in Khulna and found major portion of solid waste consists of green vegetables and fruit residues [8].

Solid waste management

Solid Waste means any garbage, refuge, sludge, or other discarded material, including solid, liquid, semisolid or contained gaseous material resulting from industrial, commercial mining or agriculture operations of from community activities. One study found that in some countries the solid waste management system also handles human wastes such as night soil ashes from incinerators, septic tank sludge and sludge from sewerage treatment plants. If these wastes manifest hazardous characteristics they should be treated as hazardous wastes[9].Waste management means collection of resources from different sources including recycling and re-use of materials.

Hazardous Household Waste

Although hazardous household waste makes up less than 1% of our waste, it threatens our health and that of the environment. Remember just one liter of oil discharged into nature or the sewer can contaminate one million liters of drinking water! And don't forget that hazardous products used and improperly thrown into nature today can be found on our plates tomorrow[10].

The Life Cycle

The food we buy at the grocery store, the electricity we use to operate our made, all consumer goods require raw materials, water and energy to exist and to be disposed of Like a living thing a waste product has its own life and we can talk about its life cycle (figure (1).

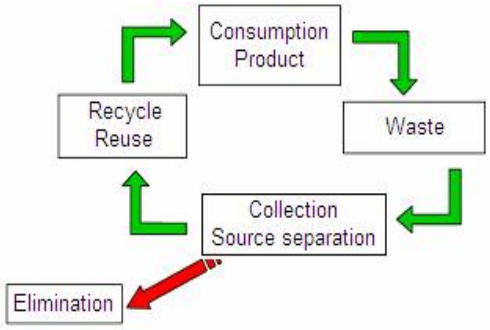

FIGURE 1: the major stages of life cycle

Man intervenes at each stage in the cycle. We therefore have a great responsibility in the management of a waste product. A new kind of analysis is being developed in universities around the world: life-cycle analysis. This is "a method for evaluating the environmental impact of a product, process or service, from the extraction of natural resources to the elimination of waste, including fabrication, delivery, product use and dismantlement of the product at the end of its life cycle. Life-cycle management has several advantages for industries, companies and service providers, advantages that benefit the environment and its resources, health and us, the clients! In particular, considering the life cycle helps:

1-To significantly reduce production costs by reducing the use of energy and the consumption of raw materials.

2-To reduce polluting emissions

Environmental Impact of Solid Waste Disposal on Land

When solid waste is disposed off on land in open dumps or in improperly designed landfills (e.g. in low lying areas), it causes the following impact on the environment.

(a) Ground water contamination by the leach ate generated by the waste dump
(b) Surface water contamination by the run-off from the waste dump
(c) Bad odor, pests, rodents and wind-blown litter in and around the waste dump
(d) Generation of inflammable gas (e.g. methane) within the waste dump
(e) Bird menace above the waste dump which affects flight of aircraft
(f) Fires within the waste dump

(g) Erosion and stability problems relating to slopes of the waste dump
(h) Epidemics through stray animals
(i) Acidity to surrounding soil and release of green house gas [11].

Waste Classification and Terminology

Solid waste is classified into three main types by making reference to the sources of waste and the institutional arrangements for waste collection and disposal. These three types of solid waste are municipal solid waste, overall construction waste and special waste. The detailed interpretations of some commonly used terms are described below.

Municipal solid waste

Includes domestic waste, commercial waste and industrial waste.

1-**Domestic waste**: refers to household waste, waste generated from daily activities in institutional premises and refuse collected from public cleansing services. Public cleansing waste includes dirt and litter collected by the Food and Environmental Hygiene Department, marine refuse collected by the Marine Department and waste from country parks collected by the Agriculture, Fisheries and Conservation Department (see figure 2).

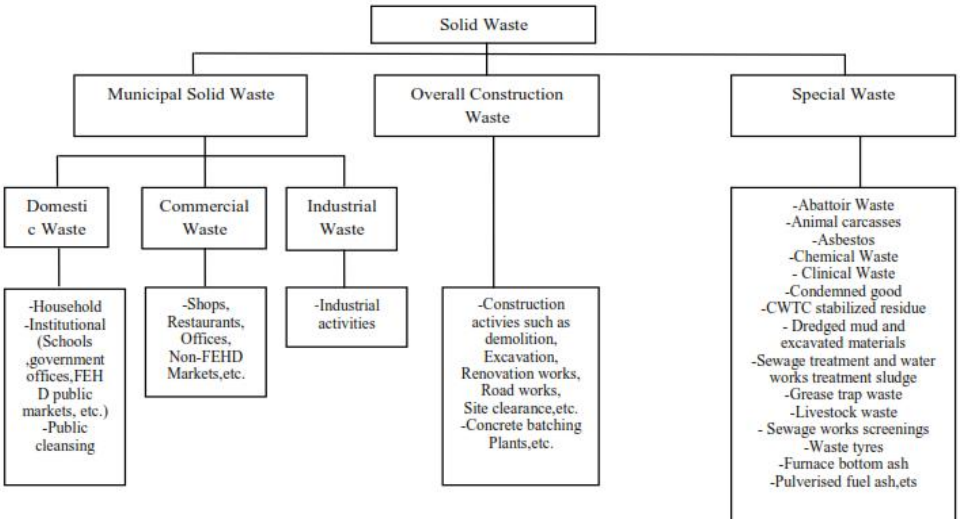

FIGURE 2: Classification of solid waste

2-**Commercial waste** is waste arising from commercial activities taking place in shops, restaurants, hotels, offices, markets in private housing estates, etc. It is collected mainly by private waste collectors.

3-**Industrial waste** is waste arising from industrial activities and does not include construction waste and chemical waste. It is usually collected by private waste collectors. However, some industries may deliver their industrial waste directly to landfills for disposal.

4-**Municipal solid** waste contains a small portion of bulky items like furniture and domestic appliances which cannot be handled by conventional compactor type refuse collection vehicles. These items are regarded as bulky waste and are usually collected separately.

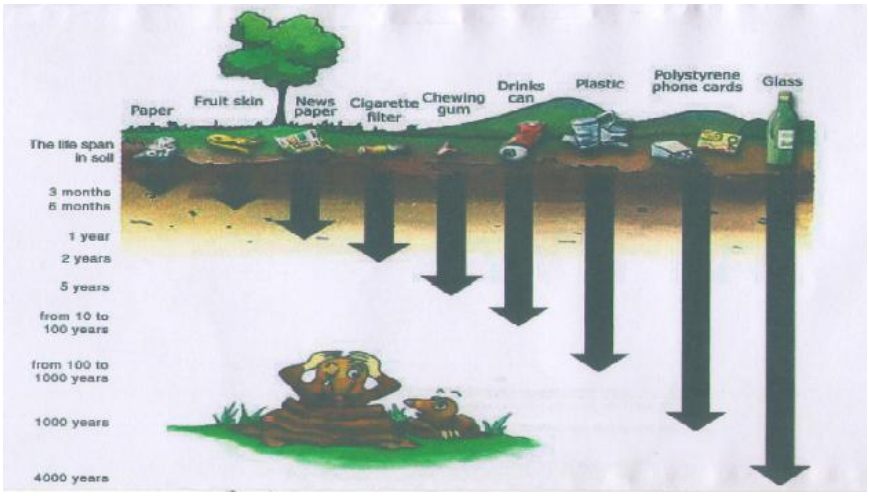

FIGURE 3: explain the years of decomposition

Overall construction waste

Is a mixture of waste or surplus materials arising from construction activities such as site clearance, excavation, refurbishment, renovation, demolition and road works. It also includes waste concrete that is generated from concrete batching plants and cement, plaste, mortar

manufacturing plants not set up inside construction sites. Overall construction waste may comprise a fraction of inert materials such as debris, rubble, earth and concrete, which, after proper sorting, can be recycled for use in site formation, land reclamation and construction.

Special waste is waste that requires special disposal arrangement. It includes abattoir waste, animal carcasses, asbestos, chemical waste, clinical waste, condemned goods, stabilized residue, dredged mud and excavated materials, sewage treatment and waterworks treatment sludge, grease trap waste, livestock waste, sewage works screenings, waste tyres,furnace bottom ash, pulverized fuel ash, *etc*.

Chemical waste is defined in the Waste Disposal (Chemical Waste) (General) Regulation under the Waste Disposal Ordinance .Chemical waste can be any substance arising from any process or trade activity which contains chemical in such form, quantity or concentration that can cause pollution to the environment or become a risk health[11]. Same thing with your cigarette butts—they take two to five years to decompose (figure (3).

EMISSIONS FROM WASTE INCINERATION

Incineration of waste produces emissions of CO_2, CH_4 and N_2O. Emissions of CH_4 are not likely to be significant because of the combustion conditions in incinerators (*e.g.* high temperatures and long residence times). Normally, emissions of CO_2 from waste incineration are significantly greater than N_2Oemissions. Currently, waste incineration is more common in developed countries, although it is common for both developed and developing countries to incinerate clinical waste. The methodology described here applies to incineration with and without energy recovery. Emissions from waste incineration without energy recovery have to be reported in the Waste Sector, while emissions from incineration with energy recovery should be reported in the Energy Sector. Consistent with the IPCC Guidelines, only CO_2emissions resulting from the incineration of carbon in waste of fossil origin (e.g. plastics, certain textiles, rubber, liquid solvents, and waste oil) should be included in emissions estimates. The carbon fraction that is derived from biomass materials (*e.g.* paper, food waste, and wooden material) is not included [12].

Sources and quantity of Municipal solid waste

The organic fraction is made up of kitchen waste including food leftovers, rotten fruits, vegetables, leaves, crop residues, animal excreta and bones. Plastics, glass, metals, and paper account for less than 15 percent of the total waste. In low income households, solid waste is stored in open baskets and any available cans which do not meet hygienic standards. Component of Municipal Solid Waste founded to be bio-degradable, non-biodegradable (plastic, glass and metal etc.), Inert material (bricks, stones and ashes etc.) indicates the construction and demolishes activities in the city. The amount and components of solid waste generated in this city varies with income levels (see table (1)).

TABLE 1: solid waste generated with income level

Categories	Approx precipitate waste generation (g/day)	Waste generation (In %)
Low income group	172.89	27
Middle income group	162.67	32
High income group	221.21	40

This is the fact that low income groups generate less waste per capita than middle and high income groups. The specific waste generation rate in low income areas is low at 172.89 g per capita per day. Middle income areas show a specific waste generation rate of 162.67 g per capita per day and high income residential areas range with 221.21g per capita per day. Packaged products and empty cans form a significant part of the waste in high income areas. In many low income areas people dump waste in unauthorized places where cattle founded eating food material [13].

Waste Incineration

In all waste incineration plant must comply with the waste incineration directive. This Directive sets the most stringent emissions controls for any thermal processes regulated .The objectives of this method are to minimize the impact from emissions to air, soil, surface and ground water on the environment and human health resulting from the incineration and co-incineration of waste.

At a European level, the Waste Incineration Directive in corporate and extends the requirements of the 1989 Municipal Waste Incineration Directives and the Hazardous Waste Incineration Directive forms a single Directive on waste incineration and has repealed those three Directives since late 2005.The requirements of the Directive have been translated into the UK through The Waste Incineration (England and Wales) Regulations 20028 which came into force on 28 December 2002.The enforcement of the Waste Incineration Directive is through the Pollution Prevention and Control regime, which provides the mechanism by which all major industrial processes are permitted and regulated, with respect to their environmental performance. The key requirements in the Waste Incineration Directive for the operation of an incineration plant are as follows:

• a minimum combustion temperature and residence time of the resulting combustion products. For Municipal Solid Waste this is a minimum requirement of 850C for 2 seconds specific emission limits for the release to atmosphere of the following:

Sulphur Dioxide SO_2, Nitrogen Oxides (NO_x), Hydrogen Chloride (HCl),Volatile Organic Compounds VOC_S, Carbon Monoxide (CO), Particulate (fly ash), Heavy Metals, Dioxins.

-a requirement that the resulting bottom ash that is produced has a total organic carbon content of less than 3%. The combustion conditions are required to ensure complete burnout of the waste is achieved. Emission limits to atmosphere are set to minimize environmental and health impacts. The carbon content in the ash represents

minimization of the combustible material and destruction of the waste. Further information on environmental compliance for incineration plant can be obtained from the Integrated Pollution Prevention and Control Reference Document on the Best Available Techniques for Waste Incineration, published by the European Commission in August 2006[14]. Incineration involves the combustion of typically unprepared (raw or residual) Municipal solid waste. To allow the combustion to take place a sufficient quantity of oxygen is required to fully oxidize the fuel. Incineration plant combustion temperatures are in excess of 850C and the waste is mostly converted into carbon dioxide and water and any noncombustible materials (*e.g.* metals, glass, stones) remain as a solid, known as Incinerator Bottom Ash that always contains a small amount of residual carbon. The direct combustion of a waste usually releases more of the available energy compared to pyrolysis and gasification [15].

Recycled material types

1- glass, Metal, Paper & Card, Plastics
2- Compostable (excluding wood)
3- Electrical Goods
4- Construction, Demolition and Excavation
5- Plasterboard, rubble and soil.
6- Textiles
7- Wood
8- Unclassified: Derived category including all other recycled material collected not included in the main categories.

Waste collected for disposal to landfill

1-Household civic amenity waste
2-Household civic amenity collection
3-Regular residual household waste
4-Household regular collection
5-Land filled non household waste
6-Asbestos, beach cleansing, civic amenity sites waste, fly-tipped materials, gully emptying, commercial & industrial, construction and demolition, grounds waste, highways waste, other collected Waste and other
7-Other household waste
8-Healthcare waste, bulky waste, street cleaning and other Household [16].

Recycling saves raw materials

Recycling reduces the need for raw materials such as metals, forests and oil and so reduces our impact on the environment. The level of our consumption in the UK is already having a significant impact on the environment and communities across the world, and was consuming an increasing quantity of raw materials. Extracting virgin materials is a key cause of global habitat loss. For example, demand for paper and cardboard is threatening ancient woodlands. Virgin materials need to be refined and processed to create products, requiring vast amounts of energy and the use of polluting chemicals further causing the destruction of habitats. For example, making one tone of aluminum needs 4 tones of chemicals and 8 tones of bauxite (the mineral ore), and it takes 95 per cent less energy[17] to make a recycled aluminum can than it does to make one from virgin materials. On top of materials needed, the creation of waste slag and the large areas of land required for industrial smelting cause considerable environmental problems.

Recycling reduces our impact on climate change

Although recycling uses energy, overall it reduces climate emissions, as recycling a material generally uses far less energy than manufacturing from virgin materials [18,19]. This conclusion is confirmed by many studies, including a recent study done for the Government by the consultants ERM [18] and a study carried out for the government-funded Waste and Resources Action Programmed [13].The WRAP study assessed the relative greenhouse gas savings associated with current UK levels of recycling for paper/cardboard, glass, plastics, aluminum and steel, and concluded:

"The UK"s current recycling of those materials saves between 10-15 million tones of CO_2 equivalents per year compared to applying the current mix of landfill and incineration with energy recovery to the same materials. This is equivalent to about 10 per cent of the annual CO_2 emissions from the transport sector, and equates to taking 3.5 million cars off UK roads.

For example, if you recycle waste paper you save three times as much energy as is produced by burning it to produce energy (13) Recycling plastic saves five times the energy created by burning it.

Recycling costs less

The costs of different waste management techniques are subject to many variables making it difficult to distinguish between them in purely economic terms. However, when comparing landfill, incineration and recycling, recycling has considerable economic merit[20].Recycling instead of sending waste to landfill avoids the payment of landfill tax and potential LATS fines. Incineration is expensive - it is not a low cost alternative for meeting LATS targets [21].

Glass

In order to re-melt glass into new containers, it requires a high level of purity and to have been sorted by colour. Mixed or crushed glass, such as that separated in MRFs, is of no use for re-melting and is usually sold much cheaper for use as aggregate. There is a big environmental benefit to recycling glass - each tone of glass re-melted in the UK saves 314kg CO2. However last year 280,000 tones of glass collected for recycling was not suitable for re-melting [20]. Unfortunately there is no environmental benefit from using glass to make aggregate as it creates 2kg of CO2 per tone of glass collected[21]. Therefore to be of benefit to the environment, glass should be separated by colour as it is collected.

Plastic

Plastic is light, but bulky to collect and store. As a result, some local authorities avoid collecting it, even though plastic collections are extremely popular with residents. Many other local authorities do collect plastic bottles (usually made of PET or HDPE), for which there are strong markets, but will not collect other plastics. However, a recent report from WRAP has found that it is environmentally and economically viable to recycle mixed plastic waste. WRAP has set itself a target to help develop 500,000 tones of mixed plastics reprocessing capacity in the UK by 2018 - starting by funding a 40,000 tone capacity plant [22].

Bulky and other wastes

A free service for the collection, reuse and recycling of large electrical goods, furniture and other bulky wastes should be introduced. Councils can also promote exchange schemes, such as „Free cycle" and „Bring and Take" markets. Civic amenity sites should be organized to ensure very high levels of reuse, recycling and composting. Local authorities should also remove recyclable materials from street waste [17].

RESULTS

The result as shown in figure below:

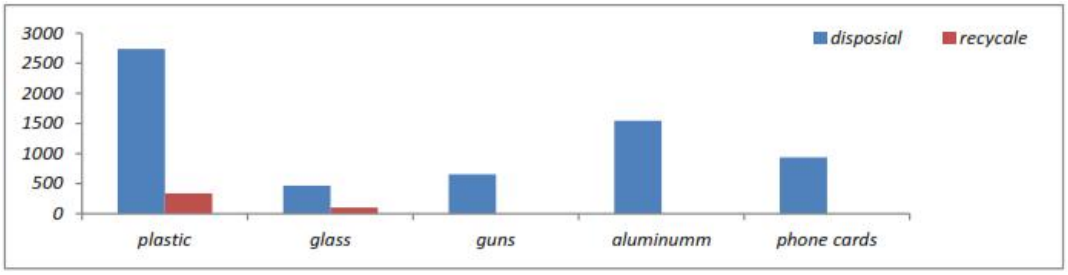

FIGURE 1: waste discharge

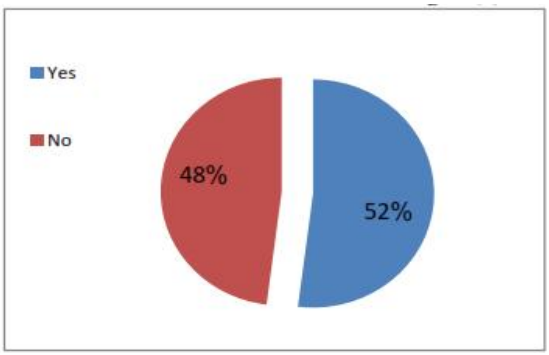

FIGURE 2: Recycle waste

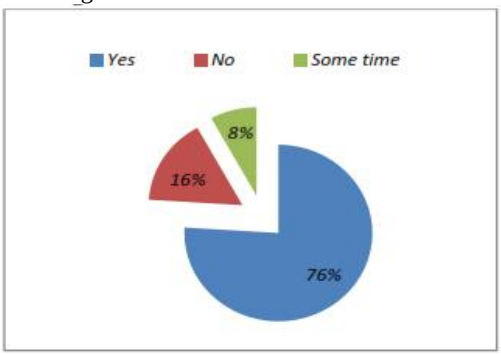

FIGURE 3: Disposal of Electrical waste

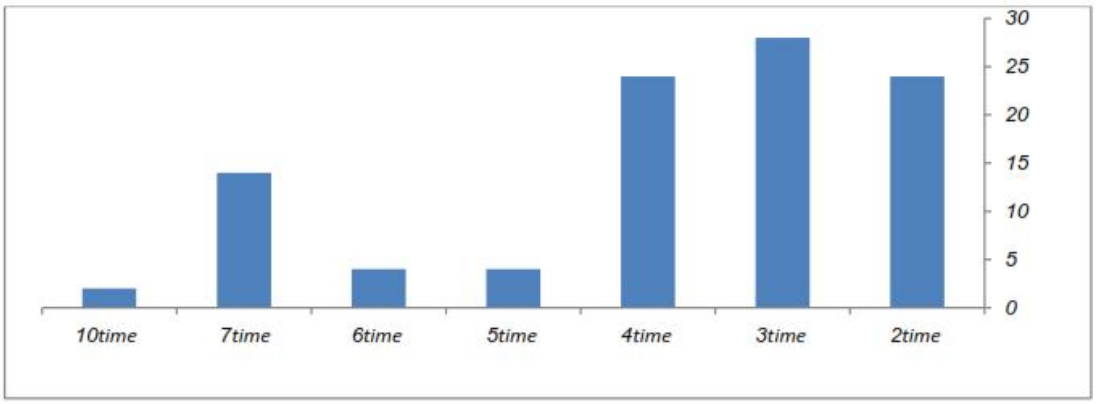

FIGURE 2: No. of waste discharge

DISCUSSION

From the result all waste go to incineration or land full and a few material recycle as in figure (1), the consumer discharge different waste in single box and there is no significant of it, there is 48% know about what's the mining of recycle as in figure (2) and 76% of consumers disposal of electrical and electronic material in waste as in figure (3).

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