

The history of solid and hazardous waste environmental sciences essay



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Introduction Some of the major environmental problems in Malaysia are solid and hazardous waste. It has been studied that over 23 000 tonnes of waste are produced per day in Malaysia. However, it is expected to increase to 30 000 tonnes by the year 2020. The amount of waste generated in Malaysia has been increased due to the rapid growth of population and development. Currently, only less than 5% of waste is being recycled and it has targeted 22% of waste to be recycled by 2020. It has been stated that out of 30 000 tonnes of waste produced in Malaysian in a day, 2% of it is hazardous waste. It is equal to 600 tonnes which is equivalent to the weight of 48 garbage trucks is thrown daily. Out of this 600 tonnes of hazardous waste, 7% is e-waste which is mostly contributed by electrical and electronic industries. Despite the massive amount and complexity of waste produced, the standards of waste management in Malaysia are still in the lower level.. These include superannuated and poor documentation of waste generation rates and its composition, ineffective storage and collection systems, disposal of municipal wastes with toxic and hazardous waste, indiscriminate disposal or dumping of waste and inefficient utilization of disposal site space.

Types of Waste Waste can be divided into two types which are solid waste and hazardous waste. Solid waste is defined as any unwanted or discarded materials that are not a liquid or a gas. While hazardous waste or scheduled waste is any discarded solid or liquid that is toxic, ignitable, corrosive or reactive enough to explode or release toxic fumes which are harmful to human health and the environment. Both of these are harmful to human health and cause up environmental pollution. Categories of solid waste Solid waste can be categorized by the sector of the economy that responsible them to produce such as agriculture, industry, municipalities and

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manufacturing. Industrial wastes are mostly generated from the construction, renovation and demolition of buildings, roads, and bridges. These wastes typically include bricks, concretes, woods, asbestos and metals such as iron, lead, copper and zinc. Agricultural activities, wastes are basically produced by the raising animals, harvesting and processing of crops and trees, and also the processing operations of peelings, seeds, stems, sludge, and other similar materials. Most of the agricultural wastes are organic. 90 % is used as fertilizer and the rest are burnt as a source of energy. Municipal waste can be defined as the materials that people in a region no longer want because they are broken, spoiled or have no more use. It includes the waste from households, commercial establishment, institutions, and some other industrial sources. On average, municipal waste composes of 40% organic waste, 14% paper, 15% plastic and others. Types and characteristics of hazardous waste

Hazardous waste has properties that make it dangerous or potentially harmful to human health or the environment. It can be either solids or liquids containing gases or sludges. Hazardous waste can be a by-product of manufacturing processes or simply discarded commercial products such as cleaning fluids or pesticides. There are 77 categories of scheduled waste listed under the First Schedule of The Environmental Quality (Scheduled Wastes) Regulations 2005. They are grouped into 5 types which are metal and metal-bearing waste (SW 101-110), 7 categories of wastes containing principally inorganic constituents which may contain metal or organic materials (SW 201-207), 27 categories of wastes containing principally organic constituents which may contain metal or organic materials (aw 301-327) , 32 categories of wastes which may contain either inorganic or organic constituents (SW 401-432) and 1

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category of other waste (SW 501). Hazardous waste can be known based on four characteristics which are ignitability, corrosiveness, reactivity, and toxicity. Ignitability is also known as highly flammable describes materials that pose a fire hazard during routine management. Common examples are gasoline, alcohol, and paint thinner. Corrosive characteristic describes materials requiring special containers because of their ability to corrode standard materials. The examples are strong acids and bases. The materials are also required segregation from other materials due to their ability to dissolve toxic contaminants. While reactivity or explosiveness defines the materials that during the routine management, they tend to react spontaneously and vigorously with water being unstable by shock or heat generating toxic gases or to explode. Sodium metal reacts vigorously with water cause explosion to occur. The fourth characteristic of hazardous waste is toxicity which describes materials that when improperly managed, it may release toxicants or poison in sufficient quantities to pose a substantial hazard to human health or the environment. As for example, a high level of carbon dioxide is considered toxic. Methods of removing hazardous wastelt has been studied that there are three methods to remove or detoxify the hazardous waste which are chemical, physical and biological methods. As be known, chemical methods are divided into three processes that are oxidation, reduction and also a neutralization process. As an example, in the oxidation process, cyanide waste is oxidized and being stored in a slurry storage tank. For reduction, chromate waste is reduced and being stored in a slurry storage tank. While in neutralization process, both acid and alkaline are neutralized and also being stored in a slurry storage. Besides the chemical method, filtration, mixing, and solidification which is under physical

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methods can also be used to remove hazardous waste. In waste treatment plants, the slurry from the process of oxidation, reduction, and neutralization is filtered in the filter press. Both of the filtrate and the solids are then being sent to the solidification plant. This is known as filtration process. In mixing, the waste of filtration process is loaded into the waste hopper before being transferred into the mixer. Once in the mixer, the waste is carefully mixed with consumables such as lime, sand, and water. This process occurs at the solidification plant. During the solidification process, the heavy metals become insoluble and the waste will appear as a solid mixture. The mixture is then disposed of in the secured landfill for the final curing over a few days. The overall process is to fix the heavy metals in the inorganic solid waste into a concrete or silica matrix for a long-term disposal in the secured landfill. As a result, the hazardous heavy metals will not leach out into the environment. In addition to the removing methods of hazardous waste, biological methods can be used. This method is considered as the wave of the future for cleaning up some types of toxic and hazardous waste.

Biological methods are divided into two approaches which are bioremediation and phytoremediation. Approaches of bioremediation is by using bacteria and enzymes to help destroying toxic and hazardous substances or converting them into harmless compounds. While phytoremediation involves the use of natural or genetically engineered plants to absorb, filter, and remove contaminants from polluted soil and water. Examples of phytoremediation are rhizofiltration, phytostabilization, phytodegradation, and Phyto extraction. Rhizofiltration is when the roots of plants such as sunflowers with dangling roots on ponds or in a greenhouse can absorb pollutants such radioactive strontium-90 and cesium-137. In <https://assignbuster.com/the-history-of-solid-and-hazardous-waste-environmental-sciences-essay/>

phytostabilization, plants such as willow trees and poplars can absorb chemicals and keep them from reaching groundwater or nearby surface water. In photodegradation, plants such as poplars can absorb toxic chemicals and break them down into less harmful compounds which they store or release slowly into the air. While in phytoextraction, the roots of plants can absorb toxic metals such as lead and arsenic has stored them in their leaves. Plants can then be recycled and harvested or incinerated.

Sources of solid and hazardous waste in Malaysia

Mining processThe process of mining is defined as the process of extraction the earth materials. It can be generated in three ways which are from the mining process, milling process and drain of water. In most of the mining process, a large amounts of rock and soil are being removed in order to get the valuable ore. The rock and soil now have turned to be waste materials and being left on the surface of the mine site. During milling operations, various technologies have been used to extract the needed materials from the extracted ore. Regardless of the techniques involved, when the needed materials are discovered, the remaining solid waste or tailings need to be disposed of. Solid materials are typically dumped on the surface near the milling site and the liquid wastes are stored in ponds. Besides that, the water that drains or is pumped from mines or that flows from piles of rock waste or tailings often contain hazardous materials that highly toxic. The examples of waste of mining process are asbestos, arsenic, lead and radioactive metals which cause pollution to the environment.

Industrial processIndustrial wastes are generally composed of materials from demolition waste, foundry sand, scraps manufacturing processes, sludge and ash from combustion.

Agricultural process Agricultural process such as the raising of animals as well as harvesting and processing crops and trees are contributing to the production of solid and hazardous waste into the environment. Besides, the process of process of peeling, seeds, straws, stem and sludge also contributes to the agricultural waste production. Municipal process Municipal waste consists of the materials that people no longer want as they are broken, spoiled or have no more use. It includes the waste from households, commercial establishment, institutions, and some industrial sources. The country with the highest of living standard tends to have more municipal waste per capita compared to developing countries. As been studied, the current municipal solid waste in Malaysia has reached 1.3 kg per cap per day. On average, it composes of 40% organic waste, 14% paper, 15% plastics and others. Out of the waste, about 2% is hazardous materials.

Effect of solid and hazardous waste

Air pollution Malaysia has risen in the globalization of technologies and become one of the developing country in the world. Industrial sectors have played an important role of globalization in Malaysia. This is proven as many industrial zones have been approved by the government to be built up in forest land and uninhabited areas such as the industrial zones in Shah Alam, Selangor and Tanjung Malim, Perak. As a result, deforestation occurred. The deforestation has caused the decrease in Oxygen supply to the atmosphere and increase in greenhouse effects. While, the factories of the industrial sectors contribute much to cause air pollution in the atmosphere. Air pollution is the addition of harmful substance to the atmosphere resulting in damage to the environment, human health, and the quality of life. The

factories are spewing out poisonous and toxic gases during their production process. Such the gases are sulfur dioxide, carbon monoxide and ammonia which is under the primary pollutant. While under the secondary pollutant, the gases are nitrogen dioxide, peroxyacyl nitrates and ozone. All the gases are very harmful as they will affect the human health and ecosystem. As an example, the reaction of sulfur dioxide and nitrogen dioxide forms acid rain which is also one of the pollutant causes air pollution. Acid rain will cause skin cancer, eye irritation as well as corrosion to the buildings. Air pollution is also contribute by the open burning of household waste. Once the wastes are being burnt, they will release smoke, heavy metals and poisonous gases into the air.

Soil Pollution Soil or land pollution is one of the serious environmental problems in Malaysia. It will cause the land to be infertile and this will effect the ecosystem's sustainability. One of the cause of soil pollution is the agricultural sector. The ferlizers used for agriculture activities contain of the poisonous chemicals which will be absorbed by the soil and be polluted.

Water pollution Pollution of water occurs when there is contamination of water bodies such as lakes, rivers, oceans, and groundwater which is due to anthropogenic activities that badly affected the human health, animals and plants. Water pollution is a serious problem in Malaysia and it impacts negatively on the sustainability of water resources. It has been stated that the major sources of water pollution in Malaysia are domestic waste from urban and rural areas, and industrial wastes which are discharged into natural water bodies. There are few types of pollutants that caused the water pollution which are synthetic organic, elemental pollutants, and other inorganic pollutants. Heavy metals such as Cadmium, Lead and Copper are released into the water bodies from the industrial sectors. These metal

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wastes are poisonous and high in toxicity. Once they entered the water bodies, it will pollute the water. The water pollution will cause death of aquatic life and decreased or limited the clean water supply to the human and agricultural use.

Prevention and control of solid and hazardous waste in Malaysia

Restrictions on Transboundary Movement In prevention and controlling of solid and hazardous waste, the amendment to the Basel Convention (Decision III/1) has been implemented in Malaysia. Some of them are as follow: Restriction on export for final disposal: Malaysia restricts the export of hazardous wastes and other wastes for final disposal. By implementing The Environmental Quality Act 1974, (Amendment 1996) Section 34B; and the Customs (Prohibition of Export) Order 1998 Amendment 2006. These acts have been used worldwide. The export of hazardous wastes for final disposal is not allowed if it can be treated in local. Restriction on export for recovery: In Malaysia, the hazardous wastes to be exported and destined for recovery are subject to the export guidelines on the minimum percentage for recoverable. As there is no information concerning restrictions on the import of hazardous wastes and other wastes for final disposal provided for Malaysia, The Environmental Quality Act 1974, (Amendment 1996) Section 34B; and the Customs (Prohibition of Export) Order 1998 Amendment 2006 have been implemented. These restrictions however cover all the countries in the world. Restriction on import for final disposal: Malaysia has restricted the import of hazardous wastes and other wastes for final disposal. The Environmental Quality Act 1974, (Amendment 1996) Section 34B; and the

Customs (Prohibition of Import) Order 1998 Amendment 2006 have been implemented and been covered all the countries. Import of hazardous wastes for final disposal from non-Organization for Economic Co-operation and development (OECD) countries requires a special permission and total prohibition for hazardous wastes from OECD. Restriction on import for recovery The Environmental Quality Act 1974, (Amendment 1996) Section 34B; and the Customs (Prohibition of Export) Order 1993 Amendment 1998 have been implemented in Malaysia in order to prevent and minimize the imported of hazardous wastes and other wastes for recovery. Yet, hazardous wastes can only be imported by the written approval from the government.

Reduction and/or Elimination of Hazardous Waste Generation In order to eliminate and reduce the hazardous waste in Malaysia, the government has introduced Malaysian Agenda for Waste Reduction (MAWAR) and a promotion of a cleaner production which is under national strategies and policies. Currently, Malaysia is in the preparation of legislation, regulation and guidelines to enhance existing provision in the Environmental Quality (Scheduled Wastes) Regulations 2005 to reduce wastes using the best practicable means. Besides, the government has also prepared a special capital allowance incentive to the companies which generate wastes and intend to set up facilities to treat their own wastes covering all capital expenditure incurred in order to reduce the hazardous waste in the environment.

Transboundary Movement Reduction Measures In the national strategies and policies, the industries have been encouraged to use locally produced wastes as raw materials. So that, the wastes can be reduced from polluting the environment.

Case Study of Incineration in Malaysia

Defines incineration process Incineration is a controlled combustion process for reducing or removing solid, liquid, or gaseous combustible wastes primarily to water vapor, carbon dioxide, other gases and a relatively small noncombustible residue that can be further processed or land-filled in an environmentally acceptable ways. The incineration of solid waste involves a sequence of steps in the primary process, which includes drying, volatilization, combustion of fixed carbon, and burnout of the char of the solids. It is followed by a secondary process which is the combustion of the vapors, gases, and particulates produced during the primary process. The primary combustion process of incineration is the thermal destruction of waste which is accomplished in four phases. The first phase is the drying which occurs in the initial heating of the materials. Moisture present once the materials are heated over the vaporization temperature of water. This phase is completed usually over 300°F. The second phase is the volatilization. Water vapor and gases being volatilized and diffused out at a fixed temperature. Next is the phase of burning down of solids. It involves the oxidation of the burnable solids left after the volatilization of water vapors and gases. The last phase is the final burn-down of char, consolidation and cooling of the inert residues which is known as bottom ash. The second combustion process is also known as the final destruction process which requires a specific conditions to occur. The secondary combustion zone must meet the desired temperature, turbulence, and excess air. Advantages and disadvantages of incineration Process of incineration in advance helps to produce the electricity to be supplied or used by the factories and others. As the combustion process occur over a <https://assignbuster.com/the-history-of-solid-and-hazardous-waste-environmental-sciences-essay/>

high temperature, it released heat which is then being trapped and converted into steam to generate electricity. It is also help to reduce the amount of waste up to 90% by volume and 75% by weight. Despite of the advantages, the process also gives the disadvantages to the environmental condition. The burning of waste will contribute to the pollution of air, water and soil. The bottom ash will be dumped in landfill and cause the soil pollution. The ash which is toxic then will contribute to the air pollution as well. Case study - biomedical waste incineration plant in Malaysia

Incineration process problems: Rather than making waste disappear, incineration process also cause problems to the environment. During the process, more toxic waste are being created and released. This pose a significant threat to the health and environment. The incinerator ashes are contaminated with heavy metals, incomplete combustion of waste or chemicals and also new chemicals formed during the burning process. These ashes then being dumped in landfill or the environment. This will cause the land to be polluted. The burning of hazardous waste by incinerators will release three types of dangerous pollutants which are unburned toxic chemicals, heavy metals and new chemicals. Metals which are not fully destroyed during the process will be released into the environment in more concentrated and toxic form. Such the heavy metals are cadmium, lead, mercury and arsenic. They are released in the form of tiny particles which increase the risk of inhalation. This leads to the air pollution. Once people inhale the oxygen from the atmosphere, the contaminated air will also be inhaled. Technology's control of incineration process: Scrubbers are used to remove acidic gases such as hydrochloric acid and sulfur dioxide. There are two scrubbing process which are dry and

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wet scrubber. In wet scrubbing process, the flue gas is sprayed with an aqueous mixture of lime and water. The gaseous acidic pollutants then react with the liquid to form gypsum which can be removed from the waste water to produce drywalls. The cleaned flue gas is passed via demister unit for removing droplets. It is being re-heated to eliminate any visible plume before being discharged to atmosphere. While in the dry scrubbing process, the aqueous solution is replaced by a paste mixture of lime and water or lime powder. Dry sorbent material is sprayed into the flue gas for removing the acidic gases in a combination of adsorption and neutralization process. Flue gas then passed through filter to remove the sorbent materials and particulates solids collected at the bottom of filter unit and the flue gas is being discharged into atmosphere through stack. Standard emission regulation:-Air pollution : Clean Air Act Regulations 1978-International standard under Department of Environment (DOE): United States Environment Protection Agency (USEPA) and European Standards.- Installation of incinerators in Malaysia has been approved by an Environmental Impact Assessment (EIA) Others solid and hazardous waste management techniques (alternatives) Instead of incineration, there are other ways in the management of solid and hazardous waste. There are landfills, source reduction, composting and recycling. Landfills have been the primary method of waste disposal. Historically, it is said to be the cheapest and most convenient. A modern landfill is constructed above an impermeable clay that is lined with an impermeable membrane. It includes the mechanisms for dealing with liquids and gas materials generated by the wastes of the landfills. The garbage was covered with a layer of soil to prevent it from blowing around and avoid the animals from scavenging for

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food. The second management of waste is source reduction. Source reduction is a practice of designing, manufacturing, purchasing, using and reusing materials in order to reduce the amount of waste and its toxicity. Composting is a process of allowing the natural process of decomposition to transform biodegradable organic materials. It is a way of producing plant nutrients that can be recycled into the soil. The compost can be used to help restore eroded soil, overgrazed areas and eroded cropland. While recycling conserves the natural resources. It is a substitute scrap for virgin materials. Recycling reduces the amount of waste that must be burnt or buried. It contributes to the less pollution and demand for energy. Recycling is better than burying and burning of waste. Opinion Individual Community Government