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Urban Solid Waste Management Practices and its Impact on Rural Ecosystem/Natural Resources

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Abstract

Due to the large variety of items that are considered solid waste, this term paper is demonstrate how solid waste affect rural ecosystem/natural resources. As a result, the important goal of this term paper is to identify the impact of solid waste and illustrate the cause and effect in different exposed area for solid waste such as soil, animals & ecosystems, water, construction and etc.

Keywords: Pollution; Solid Waste Management

Introduction

To maintain healthy and sanitary living conditions, urban families and companies generate significant amounts of solid waste, which must be collected on a regular basis, recycled or treated, and properly disposed. Rapid urbanization, a lack of technical and financial capacity, and a low policy priority are all contributing to solid waste management challenges in many cities. By 2025, it is expected that municipal solid waste generation will have doubled due to continued urbanization and population growth. In addition, the higher a city's income level is, the more solid waste it produces. As a result, the economic expansion that is expected in developing and rising countries will present increasing solid waste management difficulties to local governments in the next decades [1].

Poverty and social marginalization are accelerated by poor waste management. Waste pickers or scavengers often collect recyclables in an open dump site with no safeguards in place. These waste pickers laboring on the pile of waste are frequently killed by explosions or landslides in open dumpsites. Certain types of garbage can take an extraordinarily long time to decompose, depending on the type of material, thickness, and environmental conditions. A glass bottle, for example, can take up to 4000 years to decompose.

Waste poses a major threat to both fauna and flora. A magnifying effect on a piece of glass, for example, can start a fire, or small creatures can become trapped in bottles. Because the compounds present inside batteries contaminate groundwater, they pose a health danger. For all of these reasons, it's critical that we manage our garbage carefully. We can greatly reduce the volume of landfilled materials by recovering recyclable items and reusing organic waste, hence lowering the negative environmental effects. Recycling reduces the amount of garbage sent to landfills while also minimizing the usage of natural resources in the production of other products.

Literature Review

Solid Waste

"Solid waste" is defined as any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material resulting from industrial, commercial, mining, and agricultural operations, as well as community activities, according to the Resource Conservation and Recovery Act (RCRA). In other words, solid waste refers to a wide range of unwanted and unproductive waste products that are discarded as a result of animal and human activities. Solid waste is generated in a given area as a result of industrial, residential, and commercial activities, and it can be handled in a variety of ways. Almost everything we do generates some sort of waste [2].

It is important to note that the definition of solid waste is not limited to wastes that are physically solid. Many solid wastes are liquid, semi-solid, or contained gaseous material.

A solid waste is any material that is discarded by being:

- Abandoned: The term abandoned means thrown away. A material is abandoned if it is disposed of, burned, incinerated, or sham recycled.
- Inherently Waste-Like: Some materials pose such a threat to human health and the environment that they are always considered solid wastes; these materials are considered to be inherently waste-like. Examples of inherently waste-like materials include certain dioxin-containing wastes.
- A Discarded Military Munition: Military munitions are all ammunition products and components produced for or used by the U.S. Department of Defense (DOD) or U.S. Armed Services for national defense and security. Unused or defective munitions are solid wastes when:
- abandoned (i.e., disposed of, burned, incinerated) or treated prior to disposal;
- rendered non-recyclable or non-usable through deterioration; or
- Declared a waste by an authorized military official.

Used (i.e., fired or detonated) munitions may also be solid wastes if collected for storage, recycling, treatment, or disposal.

- Recycled in Certain Ways: A material is recycled if it is used or reused (e.g., as an ingredient in a process), reclaimed, or used in certain ways (used in or on the land in a manner constituting disposal, burned for energy recovery, or accumulated speculatively). Specific exclusions to the definition of solid waste are listed in the Code of Federal Regulations (CFR) at 40 CFR section 261.4(a). Many of these exclusion are related to recycling.

Types of Solid waste in urban centers

Adverse environmental impact of uncollected waste in a city

is significant. Uncollected solid waste can end up in drains leading to the blockage of drainage systems and cause unsanitary conditions that have a direct health impact on residents. Open burning of uncollected waste produces pollutants that are highly damaging locally and globally. Vectors such as mosquitos usually breed in blocked drainages and blocked drainages also contribute to flooding. In 2015, the Global Waste Management Outlook estimated that at least 2 billion people do not have access to regular waste collection. This is particularly worse in informal settlements.

UN-Habitat's report on Solid Waste Management in World Cities Report published in 2010 estimated that only 5% of waste in squatter areas is regularly collected. Even when solid waste is collected, it is not uncommon that recycling and treatment facilities or landfill sites are not operated in an environmental sound manner, especially when lacking a pollution control system. Particularly in developing countries lacking technical and financial capacity, open dumping or uncontrolled landfill is the common way of disposal. Leachate generated in dumping sites pollutes surface and groundwater. Frequent fire and explosions caused by the high temperature inside the accumulated waste is a source of air pollution. Composting and recycling facilities and incineration plants lacking pollution control systems are one of the largest pollution sources. Open dumpsites are major source of greenhouse gasses (GHG) emission in urban settings, and if the situation remains unchanged in conjunction with rapid urbanization, dumpsites will account for 8-10% of the global anthropogenic GHG emission by 2025.

Throughout the region, the principal sources of solid waste are residential households and the agricultural, commercial, construction, industrial and institutional sectors.

Harmful Effect of Solid Waste

Solid waste are creating serious negative impacts on the environment in everywhere in the world. Following negative impacts are being observed in many dump sites due to open dumping of solid waste:

Dust and Filthy Dirt: Strong winds and storms are blowing dust and filth from open solid waste dumps onto neighboring areas.

Source	Typical waste generators	Types of solid wastes
Residential	Single and multifamily dwellings	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g. bulky items, consumer electronics, white goods, batteries, oil, tires), and household hazardous wastes
Industrial	Light and heavy manufacturing, fabrication, construction sites, power and chemical plants	Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes
Commercial	Stores, hotels, restaurants, markets, office buildings, etc	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
Institutional	Schools, hospitals, prisons, government centers	Same as commercial
Construction and demolition	New construction sites, road repair, renovation sites, demolition of buildings	Wood, steel, concrete, dirt, etc.
Municipal services	Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants	Street sweepings, landscape and tree trimmings, general wastes from parks, beaches, and other recreational area, sludge
Process	Heavy and light manufacturing, efineries, chemical plants, power plants, mineral extraction and processing	Industrial process wastes, scrap materials, off-specification products, slag, tailing
All of the above should be included as "municipal solid waste."		
Agriculture	Crops, orchards, vineyards, dairies, feedlots, farms	Spoiled food wastes, agricultural wastes, hazardous wastes (e.g. pesticides)

Table 1: Sources and Types of Solid Wastes

Odor: The odor emitted by open dump sites has a negative impact on the surrounding areas.

Rats and other Vermin: Rats and other vermin find open dumps of municipal solid waste to be an appealing environment.

Toxic Gases: Toxic gases are constantly released into the atmosphere. Methanogenic breakdown in landfills produces gases, the most common of which are methane and carbon dioxide (up to 90%), as well as carbon monoxide (CO), nitrogen (N2), and others.

Leachate: Rainwater percolates through the open dump, damaging ground water resources.

Health and Sanitation: Open solid waste dumps pose a major hazard to human health and sanitation.

Radiation: A sort of hazardous waste that contains radioactive substances is radioactive waste.

Radiation-emitting materials are widely employed in medical, agriculture, research, manufacturing, non-destructive testing, and mineral exploration. Unlike other hazardous industrial products, the level of hazard – its radioactivity – of all radioactive waste decreases over time. All toxic waste, not just radioactive waste, must be safely disposed of, and in nations with nuclear power, radioactive waste accounts for a relatively small proportion of overall industrial hazardous waste generated [3].

Solid waste management

Solid waste management is defined as the discipline that deals with the generation, storage, collection, transport or transfer, processing, and disposal of solid waste materials in a way that takes into account a variety of public health, conservation, economic, aesthetic, engineering, and other environmental concerns. (Sustainability, pallet, & LeBlanc)

Planning, administrative, financial, engineering, and legal activities are all part of solid waste management. Complex inter-disciplinary relationships between areas including public health, city and regional planning, political science, geography, sociology, economics, communication and conservation, demography, engineering, and material sciences might be used to find solutions.

Residential and industrial producers, urban and rural locations, and developed and developing countries all have different solid waste management strategies. Local governments are responsible for the management of non-hazardous garbage in urban regions. Hazardous waste management, on the other hand, is generally the duty of those who create it, and it is regulated by local, national, and even worldwide authorities [2].

Objectives of Waste Management

To promote economic growth and a higher quality of life, solid waste management aims to reduce and eliminate the negative effects of waste products on human health and the environment. To keep costs low and waste from accumulating, this must be done in the most efficient manner possible.

Functional Elements of the Waste Management System

The waste management system is made up of six functional components, as listed below:

Waste generation: Any operations involving identifying materials that are no longer useable and are either gathered for systematic disposal or thrown away are included in this category.

Onsite handling, storage, and processing: This refers to efforts that take place at the point of waste generation to make collection easier. Waste bins, for example, are put at locations where waste is generated in sufficient quantities.

Waste collection: Placement of garbage collection containers, collection of waste from those bins, and accumulation of trash in the place where collection vehicles are emptied are all important aspects of waste management. Although transportation is included in the collecting process, it is not the primary mode of trash transportation.

Waste transfer and transport: These are the activities involved in transporting waste in large waste transport vehicles from local waste collection locations to regional waste disposal sites.

Waste processing and recovery: This term refers to the facilities, equipment, and techniques used to recover reusable or recyclable materials from waste streams and to improve the efficiency of other waste management functions.

Disposal: The final stage of waste management. It involves the activities aimed at the systematic disposal of waste materials in locations such as landfills or waste-to-energy facilities.

Characteristics of waste management

The majority of municipal solid waste produced around the world (70%) is still dumped in landfills and garbage dumps, while 19% is officially recycled or treated with mechanical or biological treatments, and a small fraction (11%) is burnt. Open dumping to sanitary dumps with methane collection are all examples of landfill technologies. Waste is frequently burned, especially in and around informal communities and rural areas. Although several countries throughout the world are converting their landfills to sanitary landfills, as South Africa, Uganda, Ghana, and Egypt did a decade ago, there was worry at the time that most African landfills are "owned and maintained by the very authority that is intended to enforce standards." (sustainability, pallet, & LeBlanc) The underlying consideration of these authorities appears to be keeping garbage out of sight and, as a consequence, out of mind." As a result, the majority of scarce resources are spent solely on waste pickup, particularly in formal areas, with little investment in infrastructure for more sustainable waste management [4].

Some cities in the global South also use costly waste management strategies, such as mechanical recycling separation systems or high-tech waste to energy burning. These trash management methods provide very little employment and are not financially viable; they frequently bind governments to long-term waste management contracts, preventing the adoption of more suited technology. Nonetheless, policymakers are becoming more concerned with the social aspects of waste. They've learned the hard way that ignoring the social aspects of waste affects the implementation of their policy aims and frequently leads in negative and costly social consequences, especially for disadvantaged social groups.

Informal collection of recyclable and reusable products is prevalent in the global South, and significant quantities are recovered. Formal recycling programs, on the other hand, are still uncommon and, in most cases, ineffective in terms of materials recovered. Informally collecting, sorting, diverting, and recycling waste goods has different degrees of environmental (and health) costs as well as advantages. Organized door-to-door selective collection of recyclable materials, in particular, embodies opportunities for community environmental education, assisting in shifting attitudes and values away from current wasteful consumption patterns and habits and toward reuse and informed, educated consumption and disposal.

In Brazil, for example, 80 percent of residential waste is collected on a regular basis, with sanitary landfills (58.1 %) and controlled landfills serving as the primary destinations (24.2 &). The rest is deposited in unprotected landfills (17.7 %). In 2016, just 927 municipalities (17%) in Brazil have any type of systematic selective garbage collection system. As in other nations in the global South, informal garbage collectors are primarily responsible for selective rubbish collection. They have been demonized and denied epistemic agency in the past. It is critical to investigate how advances in trash and recycling systems may impact how society sees waste pickers, as well as how waste pickers build themselves and their profession, in order to establish an efficient and inclusive waste management system [5].

Challenges and Opportunities

Recycling, cost recovery, energy choices, waste separation, and composting are just a few of the financial concerns. Some of the societal difficulties that have been encountered include a lack of public awareness, illegal dumping, poor working conditions for garbage workers, and a lack of private sector and community participation. Incompetence of companies in terms of equipment required for operation, manpower/staff qualifications, training and human resource development, and unreliable service are among the urban institutional issues in this area [6].

Figure 1: Collecting of plastic bottles & Reformed Large metal containers

Impact of solid waste in ecosystem or natural resource

Solid waste and its management are considered significant contributors to climate change, according to the Intergovernmental Panel on Climate Change (IPCC). In the upstream and downstream stages of municipal solid waste management systems' life cycles, greenhouse gases are emitted or prevented. In the manufacturing of metal, glass, plastic, and paper goods, upstream emissions can be reduced by using recycled materials instead of virgin resources. Other upstream consequences minimized by recycling include landfill gas (CH4) and deforestation Recycling processes, of course, are connected with fossil fuel greenhouse gas emissions, since energy and certain virgin resources are required during material collection and transportation, processing, and remanufacturing. However, by diverting resources from landfills, resource recovery and recycling of paper, cardboard, and other biodegradable materials, and lowering the quantity of trash to be deposited at landfills, both methane (CH4) and carbon dioxide (CO2) emissions are avoided.

According to research, clean development mechanisms (CDMs) must be redefined to include resource recovery for reuse and recycling as ways to decrease GHG emissions, conserve natural resources, and save energy. Recycling has not yet been classified as a Clean Development Mechanism (CDM), although initiatives involving waste to energy and methane to energy, both of which are linked to landfills, have already been supported under this method. These flaws must be addressed by including a social development objective into CDM policy frameworks. From a social standpoint, the consequence of thermal treatment of solid waste is exacerbated by the fact that this method of waste management destroys the resources in trash, as well as the source of revenue for waste pickers and recyclers.

Governments should discuss and act on the challenges and limitations of recycling (down- cycling and up-cycling). For many waste materials and waste flows, there are often insufficient down-cycling options. Cities can also act as catalysts for new reuse and recycling methods. Not to mention the fact that the collecting, transportation, and processing of garbage and recyclables generates fossil-derived carbon dioxide and other pollutants from the transportation fuel, which must be factored into the equation as well. To make a living, millions of informal rubbish pickers collect domestic waste every day in cities all over the world. As a result, they help cities reduce their carbon footprint, recover resources, and improve the city's environmental and health conditions. They work for steady state growth, embracing deceleration, stability, sufficiency, and sustainability. Recovering materials for reuse or recycling is a step in the right direction and helps to avoid the extraction of natural resources.

Recycling that is inclusive addresses concerns of poverty and unemployment. Informal recyclers' work as resource re-claimers for recycling and reuse, as well as their role as environmental educators, can be expanded to gradually recover more of the materials that are still thrown away in dumpsites, resulting in more resilient and healthy communities; this requires a new, participatory waste governance. Waste management is a crucial aspect of city governance.

"The success or failure of governments is linked to how they deal with waste and with the responses society is already producing." [7] Waste governance entails more than enacting the appropriate laws and policies and having institutions enforce them. It's also about addressing bigger social, political, cultural, and economic challenges that influence urban settlements by increasing democratic involvement, acknowledging various forms of knowledge, and comprehending the links between trash, value, and society. Waste management that is inclusive has the potential to bridge a social divide. Finally, poor urban governance (administration that lacks participation, democracy, openness, equity, and integration) is likely the most experience poor to effective solid waste management. Increased food waste can lead to more than one, which can subsequently make the latter out of balance in the chain. The systems in the chain are fragile and even the smaller changes can affect the biodiversity of an environment [8].

The impact of solid waste on animals

There are physical and toxicological impacts on animals from waste dumps. Wild animals use plastic garbage, cause fatal injury and damage to the digestive tract resulting in famine, stomach ulcers, poor fitness, growth and earlier mortality. Studies have found that fruit and vegetables form the majority of the food wastage. Food waste attracts wildlife that these declining products may affect. This impacts their numbers, reproductive habits and connections between predators and prey. Studies have indicated that fruit and vegetables constitute the majority of the food wastage. Food waste attracts wildlife that these declining products may affect. This impacts their numbers, reproductive habits and connections between predators and prey [9].

Figure 2: Effect of waste on animals

The impact of solid waste on ecosystem/natural resources

Even when a site is closed, solid waste emits toxins into the soil, water, and air. Depending on the pollutants present, landfill stabilization might take anywhere from decades to millennia. Landfills are environmentally harmful and contribute to biodiversity loss in two ways:

1. They necessitate the clearance of wild areas and pollute nearby habitats via leachates, resulting in habitat loss and deterioration.

Leachate occurs when surface water, such as rain, runs through garbage and removes harmful solutes. Leachate can run along the ground surface far from the dump, contaminating ponds and lakes and harming the habitat of organisms that rely on the water source, as well as poisoning drinking ground water for human consumption. Many of the toxins discovered in leachate are the result of inappropriate disposal of home items including pesticides, solvents, oil, lubricants, and cooling fluids, and polystyrene, which is commonly found in disposable cups, is also harmful.

2. They emit gas from solid waste, which contributes to climate change.

Even though the present total rate of methane emission is less than that of carbon dioxide, it is increasing four times faster, owing in part to landfill emissions. Carbon dioxide and methane both retain thermal energy in the atmosphere, raising temperatures at the Earth's surface and in the atmosphere. Finally, a landfill's potential for landfill gas production is governed by the quality and quantity of waste it holds [10].

Conclusion and Recommendation

Conclusions

Waste poses a significant issue to city officials and the general public. However, waste is not yet considered a "issue." Waste is treated from an engineering standpoint rather than an interdisciplinary one. We need to move away from considering trash as a purely technological problem and toward a more complex socio-environmental-technical understanding. Learning from the experiences of a broader range of stakeholders (such as waste pickers, elected officials, waste managers, private

Figure 3: Effect of waste in Ecosystem

firms, and intermediaries or scrap dealers) is crucial to helping or inhibiting waste and recycling system reforms.

Urban communities have a voice in how their trash is disposed of and who has access to it. They must have a say in whether to invest in costly waste management technologies without putting job creation first, or whether to promote labor-intensive, inclusive waste management and resource reclamation methods. Cities can help to promote waste reduction and waste recycling. Decisions on waste governance must also be founded on "good governance" values, such as democracy and general agreement, participation, accountability, transparency, responsiveness, equity, and inclusivity, as well as being effective and efficient and adhering to the rule of law. These guidelines should be applied to trash management as well as to waste management in particular.

Recommendation

One method to improve things would be to make governmental institutions more efficient. Another crucial step towards addressing the situation is to make better use of the private sector's comparative advantage of providing solid waste collection services. The private sector's potential participation in solid waste management (SWM) is widely accepted and is often proposed as a solution of the municipal 'high cost and low level of service.' But the government must remain responsible in general. Private/public sector collaborations should be encouraged through promotional tools and publications on the operational aspects of private sector participation. However, the participation of the private sector itself does not ensure greater effectiveness. In order for an efficient private sector service to flourish, the following requirements must be achieved.

A competitive atmosphere and competitive bidding is needed to ensure that private companies are able to take advantage effectively and preserve their market positions. Private monopoly will not reach optimum efficiency without opposing competitive power.

It is vital to evaluate if there are companies with appropriate technical and organizational capability to achieve the desired objectives when choosing the options of private sector participation.

Clear requirements on the output to be delivered must be determined by public authorities. Government agencies move from service supply to regulation with private sector involvement. They thus require the establishment of a legal and regulatory framework for performance monitoring and monitoring (by-laws and regulations) and appropriate procedures for ensuring the proper service.

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