



Hazards of Unattended Waste: A Review of Developing Countries

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ABSTRACT:

Plans need to be made to lessen the damage that people do to the environment so that the world can enjoy both economic growth and long-term development. Changing how things and resources are thrown away and how trash is made is called this. Over time, it has become harder to follow rules in a way that is good for the environment because developing countries' effects have grown as their living standards have gone up. In order to make towns better places to live, fight poverty, promote social equality, and clean up the environment, the Sustainable Development Goals (SDGs) were created. These 17 goals cover all the ideas behind sustainable development. For a greener world, the global waste management goals are to make sure that everyone can get enough, safe, and affordable Municipal Solid Waste (MSW) collection services by 2020; to stop people from throwing away or burning trash in public without permission; and by 2030, to handle all solid waste, especially hazardous waste, in a way that is environmentally friendly and will last.

Introduction

Mismanagement of Municipal Solid Waste (MSW) has become a worldwide problem for the environment, for integrating people into society, and for the long-term health of the economy. To solve it, we need to use integrated assessment and whole-person methods. It has been pointed out that as big cities grow, management problems are different in rural areas, especially when it comes to the amount of trash that needs to be thrown away and the facilities that are provided for managing solid waste (MSW). At the moment, these are limited by bad economic laws, politics, technology, and operations.

Heavy metals pollute the water, land, and plants all over the world when trash is thrown away without being controlled. When agricultural and industrial waste is burned outside, CO, CO₂, SO, NO, PM₁₀, and other pollutants are released into the air. Picking through trash at open dump sites also puts people's health at great risk. Putting MSW into waterways has greatly increased the amount of trash in the oceans around the world, making the environment more polluted. So, poor handling of MSW has had very bad effects on the environment and on people's lives.

Cutting down on our impact on the environment can help the economy grow and lead to long-term development. Most developing countries' material footprints are growing too fast. To stop this, they need to change how they make, use, and throw away things and resources.

Reviewing Sustainable Solutions and Practices

Many studies have reported about the possible solutions for improving the SWM in developing countries, like:

- (i) Programmes that buy back organic waste
 - (ii) That make compost or biogas
 - (iii) That put waste-to-energy plans and technologies into action
 - (iv) That recycle glass, metals, and other inert materials along with waste-to-energy
 - (v) That make fuel from biomass waste by making briquettes
 - (vi) That give legal incentives to people who pick up trash
- (i) There are still some problems that need to be fixed before MSW can be properly collected, treated, and thrown away [Srivastava, Krishna, Sonkar 2014]. Pollution of the environment is still a big problem around the world, and there aren't any standard methods for SWM patterns



that work in all situations. A lot of research has been done on SWM in both developed and developing countries. Some of the topics that have been looked at are environmental pollution from waste like making char fuel [Dasgupta, Yadav, Mondal 2013], managing waste electrical and electronic equipment (WEEE) [CPCB, 2000], food waste management [Rushton, 2003], treatment, recycling of used batteries, including the informal sector and the risks that this poses for vulnerable informal workers, pollution in the air due to SWM, and housing Concentrations of pollution in water, air, and soil are caused by dumping large amounts of trash in developing towns or recycling it by people who don't work for the government. Huge amounts of solid trash are made by businesses and homes around the world. Because of the growing world population and the stockpiling of food and other necessities for survival. Policies made by the government have tried to achieve long-term social growth. There is a plan to make sure that sustainable solid waste management methods are used so that the Sustainable Development Goals (SDGs) of the United Nations can be reached. Some of these goals are;

- (ii) "Ensure access to water and sanitation for all" (SDG 11)
- (iii) Ensuring "Sustainable cities and communities" [un, 2023], (SDG 13)
- (iv) "Take urgent action to combat climate change" [UN, 2023], (SDG 15)
- (v) "Life on land protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation, and halt biodiversity loss" [Globalgoals, 2023] and (SDG 12)
- (vi) "Ensuring sustainable consumption and production patterns, which is key to sustain the livelihoods of current and future generations" [UN, 2023].

Paradigm Shift in MSW Strategies

Global population is expected to reach 8 billion by 2025 and 9 billion by 2050, with about 70% of those people living in cities [OECD, 2003]. Urbanisation and increased industrialization are expected to make each person create more municipal solid waste [PPCB, 2010]. Regarding their solid waste management methods, many developing countries have stayed underdeveloped. About 90% of leftover trash in cities is dumped instead of being landfilled properly.

Within India in the 21st century, the Ministry of Environment and Forests (MoEF) released solid garbage management and handling guidelines that could be used to properly handle waste [MoEF, 2015]. As a result of the rules, the government was able to plan and build a system that could gather, store, sort, transport, process, and get rid of solid waste [Rana, Ganguly, Gupta, 2015]. According to research, most developing countries spend between twenty and fifty percent of their budget on transportation and garbage collection, but only fifty to eighty percent of general waste is collected [Guerrero, Maas, Hogland, 2013]. Figure 1 shows the steps of solid trash management that people like and don't like the most.

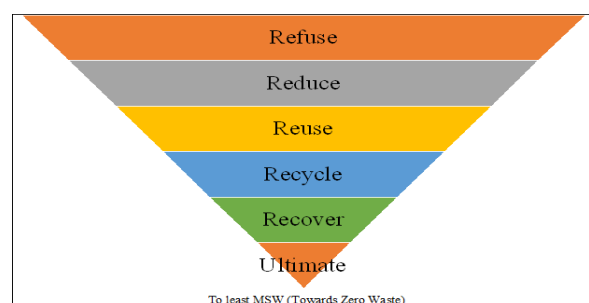


Figure 1: Towards Zero Waste

Preventing the buildup of trash is the most favoured step in the solid waste management order. The world will be clean and safe because the smallest amount of materials and resources will be used in production and design, and the smallest amount of waste will be created. Following steps include throwing away and reducing, as well as refurbishing, cleaning, checking, and fixing any parts or whole things that are found. By taking this step, the disposal system can't take in any trash that isn't needed. As a result, less garbage is made because waste is collected during the interim process



production and then sent back to the source to help with the end production processes. After this, things can be taken out and used again through recycling. Composting organic garbage can make the soil more fertile.

Although efforts have been made in recent years to better handle trash by using municipal trash collecting centres and dumping and landfills, solid trash still has direct and indirect negative effects on the health of people, animals, plants, and the environment as a whole. It's especially common in poor countries. This study tries to find out how bad waste handling in the 21st century affects people's health.

Impact of Hazardous Waste During in Developing Nations

In poor countries, managing MSW is made worse by practices that can't last and make the environment dirtier and diseases more likely to spread. The main problems that can be seen are open dumping in places that aren't managed, burning different types of waste in open areas, and the careless handling of leachates that are made in final disposal sites. The situation is worse in poor areas, where there are a lot of people living in a small space, lots of traffic, and pollution in the air and water. A lot of trash is dumped without being checked in open spaces near bodies of water in these places, which raises a number of public health concerns. The biggest effects on the environment that can be seen in developing countries are:

- Pollution of the air
- Smells
- Emissions of greenhouse gases (GHG)
- Things that spread disease,
- Unclean water on the surface Pollution of groundwater

- (i) There are a lot of people in the region around the Banjul, Gambia, landfill, so the locals can see it. Those who live there and those who travel there are obviously negatively impacted. The most significant issue is the smoke that results from rubbish burning. It engulfs some residential areas, reducing the standard of living for those who reside there. The locals are indeed impacted by the stench of

decomposing garbage and the smoke that results from its combustion. Runoff from the landfill combines with water to introduce pollution, and leachate contaminates both surface and underground water sources.

- (ii) In 2008 and 2015, families in Phnom Penh, Cambodia's capital, burned, buried, or dumped an average of 361,000 and 635,000 tonnes of municipal solid waste, respectively, due to the lack of regulations for this waste management. Over 60% of the SW that was ultimately removed from Thailand was dumped openly. Open dumps accounted for 330 of the 425 disposal sites in 2004. The majority of them received approximately 25 metric tonnes of garbage daily, whereas the dumps in Bangkok received approximately 4,500 metric tonnes.

- (iii) In 2005, daily MSW generation in the West Bank and Palestinian territories was approximately 2,728 t. There were 133 municipal solid waste dumpsites in 2001, including 116 sites for open burning and 13 sites for burying. Some 41.6 percent of locals believed they were experiencing health issues related to the final disposal sites, and 64.9 percent were aware of the environmental issues and consequences of open dumpsites. In 2010, the capital city of Nigeria, Abuja, produced over 250,000 tonnes of waste annually. In 2005, four large dumps that it oversaw were closed due to their unpleasant odours, air pollution, and rubbish burning. In addition, the subsurface garbage eventually leaked to the surface, particularly during rainstorms.

- (iv) The city's official dumpsite, which has been in operation for over 40 years, is transported with the MSW. About 1,200,000 people call Maputo, Mozambique's administrative capital, home. About half a kilogramme of garbage is produced daily by every individual. With a height of 15 metres, the dumpsite occupies an area of around 17 hectares. Even though over 500 people work there to gather recyclable rubbish, the usual issues, such as open fires and self-igniting trash, are exacerbated.



This makes it quite evident that SWM issues endanger both humans and the ecosystem on a global scale. The leachate from open dumps contains elevated concentrations of fluoride, chloride, ammonium-nitrogen, BOD, and COD. Heavy metals, chloride, organic carbons, and ammonia are all present in high concentrations.

The Indian Scenario: MSW Practices

The addition of MSW to the Mathkal dump site in Kolkata, India, is causing the nearby water quality to decline. Leachate contains metals such as Cd and Ni, which contaminate groundwater even more. Drinking water is known to be harmed by Pb, Cd, Cr, and Ni, and these metals are known to be highly dangerous when they are concentrated next to a filthy waste. The amount of Cr, Cd, and Mn in the groundwater reportedly increased as a result of leachate, which had an adverse effect on the environment and public health.

Chennai, Tamil Nadu produces more than 3200 t d⁻¹ of MSW each day. People's health is seriously at risk due to heavy metals seeping into the water. The concentrations of heavy metals in soil samples vary depending on the depth, ranging from 3.78 mg kg⁻¹ to 0.59 mg kg⁻¹ at 2.5 to 5.5 m. The top 5.5 metres of soil have the greatest levels (sandy clay layer). Thus, the effect of the dumping activities was evident as the concentration of heavy metals decreased as soil depth increased.

Boreholes and water from Thailand's Nonthaburi dumpsite were discovered to contain high levels of heavy metals. The World Health Organization's (WHO) recommended drinking water is never 10 times as high as the amounts of chrome, cadmium, lead, nickel, and mercury found in waste and groundwater.

India's Tiruchirappalli district produces 400–600 tonnes of MSW each day, which are then disposed of in an open space 12 km outside the city. The COD levels in the wastewater were found to range from 29,880 to 45,120 mg L⁻¹, and the ratio of BOD₅ to COD was found to be less than 0.1. Lead and cadmium concentrations in the soil were, on average, five and eleven times higher than the recommended levels of contamination, according to the average concentration.

In the soil sample, heavy metals such as Pb, Cu, Mn, and Cd were detected, albeit not in the surrounding areas. This indicates a significant level of soil contamination due to leachate migration.

Waste Dumping Hazardous

Over two billion tonnes of urban solid waste are produced annually; this waste needs to be disposed of appropriately to protect public health. Regretfully, this is due to extreme pollution of the land, water, and air that affects people's health, both adults and children. Dangerous waste or improper methods of disposing of it, such as open burning, might harm surrounding residents and employees. Water drain obstructions are one of the many negative consequences of improper waste collection, which also negatively impacts the ecosystem and contributes to sea pollution. When floods occur in certain areas, mosquitoes that carry the plague can disperse illnesses like dengue and malaria [WHO, 2023]. According to a 2019 World Health Organisation research, almost 54 million tonnes of electronic trash are produced annually. There were TVs, phones, and PCs among the gadgets. By 2030, it is anticipated that this would increase to 75 million tonnes.

Contaminants' concentration in soil, runoff and groundwater due to open dumping in eight case studies, compared with international standard of soil contamination limits and drinking water.

Ref.	City/Region	Country	Environment Polluted	Pollutant	Concentrations	Limits
[48]	Chennai city	India	Soil (mg kg ⁻¹)	Zn	0.27–0.48	50
				Cu	3.78–0.59	100
				Fe		
				Mn	171.16	500
[50]	Tiruchirappalli	India	Soil (mg kg ⁻¹)	Pb	291.3>	50
				Cd	47.7>	4
				Cobalt	8.4	20
[51]	Havana	Cuba	Soil (mg kg ⁻¹)	Ni	50>	30
				Cu	252>	100
				Zn	489>	50
				Pb	276>	50
				Pb	9.9–11.8	50
[52]	Uyo	Nigeria	Soil (mg kg ⁻¹)	Zn	137–146>	50
				Ni	11.8–12.6	30
				Cr	3.6–4.1>	1

A spread of infections and diseases due to Contaminants

When people don't pick up their trash along the sides of the road and it piles up, it can be very bad because rats, mosquitoes, and bugs will start to live there. Rats and mice are known to spread diseases like food poisoning, Dengue, and Malaria. So, it is very important to get rid of solid waste the right way to cut down on the number



of pests that spread disease and on people's exposure to extreme conditions. People who work for the government and people who pick through trash are most at risk when solid waste is not thrown away properly using scientific methods. This includes times when people have been around pollution and dangerous chemicals, which can cause blood infections and skin irritation.

Pollution Due to Chemicals

People are using packaged goods more and more often these days. Items such as paper, metal, glass, and plastic are examples of them. Changing the composition of waste is the only way to alter how it is managed [Sridevi, Modi, Lakshmi, Kesavarao, 2012]. Certain types of waste are deemed hazardous, such as medications, insecticides, and batteries that are disposed of with ordinary waste. Vegetables and fruits are also organic trash. Municipal solid garbage and biomedical waste—such as used syringes, sanitary items, and bloody clothes—should not be combined [Bhalla, Saini, Jha, 2013]. This is due to the possibility that it could contaminate things and spread illnesses. However, the majority of organic waste originates from residential areas. On the other hand, road sweeping and demolition debris are examples of inert rubbish. There are several forms of municipal solid trash in different locations, both rural and urban [Rawat, Ramanathan, and Kuriakose, 2013].

Junkyards have harmed people's health and the environment [Somani, Navaneethan, and Thangaiyan, 2021]. Anaerobic conditions develop in open dumps, leading to the emission of methane during the breakdown of biodegradable waste. Methane gas contributes significantly to global warming and facilitates explosions and flames [Somani, 2021]. Leachates that accumulate in water tanks and the production of unpleasant odours are two additional issues that have a detrimental impact on health [Srivastava, Krishna, Sonkar, 2014]. In underdeveloped nations like India, where temperatures can reach 45°C, this is particularly apparent [Dasgupta, Yadav, Mondal, 2013]. Inadequate trash burning limitations have exacerbated respiratory illnesses as well. As a result, minute particles have developed, leading to respiratory illnesses and haze [Somani, Navaneethan, Thangaiyan,

2021]. Poor waste management has a significant negative impact on public health and has increased the rate of infections in cities like Delhi and Gurgaon. Bacterial infections, nasal and throat sores, asthma, allergies, respiratory issues, and compromised immune systems are a few of the possible outcomes [CPCB, 2000].

Impact of Plastic Waste and Respiratory Diseases: Water Pollution Due to Open Dumping

In suburban regions, about 10% of the garbage generated by individuals is gathered and disposed of appropriately. doing so enhancing both the environment and public health. Given this information, children who live close to rubbish dumps are more likely to suffer from severe respiratory illnesses. Additional problems from some included experiencing increased diarrhoea. Solid waste management requires well-organized resource abstraction in order to recover valuable resources from the rubbish in a systematic manner. This can be accomplished by investing in solid waste management, which will facilitate the creation and execution of new R&D initiatives and the identification of recyclable materials.

Uncovered dumping pollutes surface water. An obvious problem that affects the lakes and seas around the world is marine littering, which is mostly caused by plastic trash. Marine trash is any industrial or municipal solid waste that ends up in the ocean, no matter where it came from. Marine trash has a wide range of effects on ecosystems, including:

- Environmental (ingestion, poisoning, blockage of filter, physical damage of reefs and mangroves, among others),
- Social (loss of visual amenity, loss of indigenous values, risks to health and safety),
- Economic (cost to tourism, cost to vessel operators, losses to fishery, costs for cleanup, endangered animal, animal rescue operations, recovery and disposal),
- Public safety (navigational hazards, hazards to swimmers and divers, cuts, abrasion and stick injuries, leaching of poisonous chemicals, explosive risk).



About 80% of the trash in the ocean comes from the land and the rivers that flow into the ocean. Since this is the case, open dumping can be seen as the main cause of ocean pollution. The production of microplastics is even more dangerous: When plastics get into the ocean, they tend to stay at or near the top. There, photochemical, mechanical, and biological processes break down bigger pieces into microplastics, which are less than 5 mm in size. When microplastics are in the ocean, they might be eaten, and they tend to float to the surface. A lot of different kinds of living things can eat them there, either quietly or actively.

According to a 2019 study, microplastics make up 94.6% of all plastics in the Mediterranean Sea and weigh 55% of all plastics. Mesoplastics, on the other hand, make up 5.3% of all plastics and weigh 45% of all plastics. In other words, the amount of microplastics is growing, which changes the risks of both direct and secondary intake in the eco-chain.

Conclusion

India is one example of a growing country that doesn't have a well-organized system for sorting trash from community or household use. Solid waste is thrown away and managed by the people who make it, or by unorganised areas. Their lack of processes makes sorting and division less effective, which leads to security issues and poor resource abstraction processes. Because it's more profitable to get only valuable waste goods out, this is what happens.

Key parts of any answer are putting in place good waste collection and disposal methods, getting manufacturers involved, and changing people's behaviour. In the middle stage, where litter is made, new ideas are needed: upstream, redesigning goods to make less litter; and downstream, making collection and treatment methods better. Finally, low- to middle-income countries should be given extra attention because they are the main sources of pollution even though they have the lowest rates of generation.

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