



## ENVIRONMENTAL POLLUTION AND WASTE MANAGEMENT

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### Abstract

This paper will address the issue of environmental pollution and waste management. Every aspect of our lives is intricately linked to the environment. Various factors, including human activities and natural phenomena like volcanic eruptions and earthquakes, contribute to environmental pollution. Environmental pollution has been a persistent issue since the dawn of time, but in our modern era, it has become a grave concern that poses a significant threat to the existence of humanity. While conducting our scientific research, we encountered a significant issue: "What impact does waste management have on the environment?" Today, people all around the world are deeply concerned about the issue of environmental pollution. The consequences of this problem are felt in our daily lives, affecting the quality of the air we breathe, the food and water we consume, and our exposure to pollution and radiation. In addition, the impacts of environmental issues can be seen in the depletion of natural resources, the loss of plant and animal species, and the disruptions to global ecosystems and biochemical processes. Considering the research problem, it can be hypothesized that waste management significantly affects the environment.

**Keywords :** environmental pollution, environment, recycling, natural resources ecology, ecosystems, waste management

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### Introduction

Since the beginning of time, humans and all other living things have been deeply connected to nature. This connection underpins the modern environmental movement. Through his own evolution, the man became fascinated in aligning with nature to generate ideal survival circumstances. Humanity has made many advances, from ancient tools to current technologies, to work with nature and suit its requirements. Humanity has benefited from urban, industrial, economic, and technical advances. Air and water pollution, unchecked deforestation for agriculture, ozone layer depletion, global warming, climate change, and trash accumulation, including radioactive elements, have resulted. Additionally, certain plant and animal species are being exterminated, threatening our survival. Protecting the environment is key to resolving these issues. Protecting the environment requires international, national, and local cooperation. The normative framework must be implemented at all levels—universal, national, regional, and local—to succeed. Today, trash is a major issue. Waste transported to landfills is rising due to population growth and productivity, harming the environment. Rural and agricultural regions create a lot of rubbish daily. About 10 million tons of oil and 500 billion tons of industrial waste pollute rivers and seas annually. One billion tons of aerosols and ash are released by industry and transportation. Landfills gather waste for a long time. In nature, landfills account for up to 70% of garbage. The biological processes of garbage degradation harm the ecosystem. Environmental pollution from municipal garbage must be addressed. Excess trash pollutes soil, vegetation, air, groundwater, and surface water. This pollution breeds rats, mice, and insects, spreading illnesses. This new condition

raises concerns for current and future generations' well-being. This presents the issue of environmental protection through garbage management. Municipal solid garbage, industrial waste, agricultural waste, medical waste, electronic waste, and other miscellaneous wastes make up the waste. Hazardous waste—chemicals, biological, and nuclear—is a worry. This garbage increases pollution and presents health and environmental dangers. Developing countries had to manage a lot of solid trash per person in the early 1990s. The average in the EU was 100-330kg, whereas in North America it reached 720kg. All nations are concerned about increased trash generation and per-person waste. Without adequate waste processing, it is dumped in enormous landfills near cities, polluting the air, water, and land.

### Environmental pollution

Increased climatic warming, ozone layer depletion, and desertification are the results of environmental degradation in many nations and areas. According to UN definition, pollution is external chemical substances found in a specific location, at the right time, and in insufficient amounts.<sup>1</sup> Early 20th-century analysis found that the atmosphere and hydrosphere are the most polluted. The status of cosmic space surrounding Earth is problematic. To comprehend the ecosystem, one must investigate the basic ecological unit that follows its own rules. This unit has several complex living and non-living elements. This is an ecosystem. Individuals have a big environmental influence. World Health Organization methodology identifies 26 health risks. Environmental factors contribute to the development of many disorders in children aged 0–19. Economics and other activities can have direct or indirect synergy on the

environment. Pollution usually causes deterioration, damage, and environmental endangerment over time. Pollution affects air, water, soil, wildlife, and human health. We can examine long-term and short-term pollution consequences. Understanding the working environment is vital for environmental management and protection conversations. This can happen for several reasons. The working environment is intimately linked to the broader environment. Environmental functioning and influence depend on many linkages and processes. Numerous laws and regulations govern workplace safety and health. These requirements are essential for comprehending the workplace-environment relationship. This law defines the work environment as the conditions, procedures, and relationships in the workplace. It's important to understand the working environment and terms like "hazardous materials," "danger," "dangerous phenomenon," "risk," and "risk assessment." Human-caused environmental changes have altered energy input and radiation levels. Physicochemical and microbiological features can reveal environmental contamination composition. Pollution harms biological systems' delicate anatomical and morphological features, metabolic processes, and growth patterns. These impacts are seen at every level of cellular structure, from molecules to cells to organisms, populations, and ecosystems.

#### **Waste Management**

Food waste on the streets in the Middle Ages spread infectious illnesses and rodent and bug plagues. Insufficient waste treatment may exacerbate infectious illnesses nowadays. According to the Law on Waste Management, our society prioritizes waste management. This law aims to develop and ensure waste management conditions that preserve human health and the environment. The following concepts underpin waste management law:

1. Choosing the finest environmental alternatives
2. Proximity and regional waste management
3. Hierarchical waste management
4. Accountability
5. Environmental accountability for responsible parties.

Efficient waste management prevents waste, promotes reuse and recycling, separates recyclables, and uses waste as energy. This involves resolving uncontrolled landfills, establishing proper trash disposal, and boosting waste management awareness. Waste management includes collecting, transporting, sorting, recycling, dumping, tracking, and monitoring. Waste collection for recycling is a serious issue. Manual work is needed for certain garbage processing, which raises recycling expenses. But sorting rubbish is difficult. For instance, PET bottles and PVC containers cannot be recycled together. Use biodegradable, non-toxic goods and packaging to safeguard the environment. You may choose your product as a consumer. Overpackaging hurts the environment and raises product prices. Also, packaging that makes a tiny amount of product look bigger might be deceiving. Japan established 44 trash types in 1997 after passing recycling laws. Every Japanese citizen receives a 27-page rubbish sorting handbook. Process categories are specified. Combustible garbage includes lipstick you no longer require. After removing the packaging and disposing of the plastic, it becomes 'small plastic and metal' garbage. Japan is recognized for its high population density, with 336 people per km<sup>2</sup>. This makes it a distinct demographic country. Japan must rationally reduce land disposal. Global cities create 3.5 kilograms of garbage per person everyday. Waste increases as population and living standards improve.

Basel Convention estimates worldwide hazardous waste output at 400,000,000 tons per year. Military trash and the radiochemical industry, which uses hazardous compounds, are abundant. Combat, chemical plant destruction, transportation and storage mishaps, natural catastrophes, and other events can generate hazardous waste. Physical and chemical pollutants include solid trash, dust, noise, vibrations, aerosols, gasses, vapors, fumes, and garbage pollute the workplace. Radiation sources include ionizing, UV, oils, infrared, radar, laser, ultrasonic, and x-ray. Finally, biological threats include viruses, bacteria, mold, fungus, parasites, insects, and rodents. Different methods transfer compounds into the environment. Surface and subsurface streams and basins receive wastewater. Solid waste is carefully stored in landfills and disposed of in abandoned mines. The agriculture business uses fertilizers and insecticides, which include many dangerous chemicals. New words are added annually to this list of compounds. Created unique PVC-decomposing chemicals that are rare in nature and life. Our seas and oceans contain 40 million plastic bottles and bags, lost fishing nets, nylon, and other trash (scribd).

#### **Landfill solid waste management**

Solid garbage is disposed of at landfills. Waste disposal and air and groundwater pollution prevention are handled differently in different landfills. The atmosphere and hydrosphere are polluted by inappropriate rubbish dumping in open locations without protective measures. Sanitary landfills keep solid waste out of the air. Alternatives to landfills include subsurface garbage disposal. This method reduces air pollution and animal spread. There are limitations to this trash disposal method:

1. Groundwater contamination might result from choosing the improper subterranean landfill.
2. Buried garbage in the midst of the country lacks oxygen, preventing decomposition. Biogas is a hydrocarbon mixture, mostly methane. Biogas may spread horizontally into basements. It can ignite and explode if exposed to fire.
3. Because garbage decomposes, places that were once favorable for construction now droop.

Effective landfill construction and management

#### **Landfill construction has three primary methods:**

1. The trash is placed on ground that can self-purify, preventing pollution. Land is the only barrier to pollutant dispersion. It's crucial to choose land with precise biological and chemical properties like clay content and grain size distribution.
2. Limiting pollutant infiltration can reduce landfill contamination. Water-impermeable landfill covering material reduces air and surface water penetration and soil contamination. To avoid water intrusion, insulate the landfill bottom. Water that passes through the upper cover can be collected by a drainage system. Water is purified again or thrown to landfill.
3. Current thinking sees landfills as chemical reactors. The modern technique uses limitation methodically to construct a controlled chemical reactor (Kolomeiceva-Jovanovic L 2010).

#### **Effective industrial waste management**

Technology generates many trash, yet metal, plastic, paper, and glass may be repurposed. Reusing materials is a major environmental issue. This reduces resource consumption and water and soil contamination. Different types of industrial waste:

Get rid of, discarded wood, waste plastics and other materials - **Industrial waste.**

Cutting-edge technologies are being developed to minimize primary production and improve the environment.

**Technological efficiency should offer:**

Reusability-focused product development and manufacture;

Creating new items from manufacturing and trash;

Closure of industrial water supply systems.

Managing hazardous trash effectively

The US Environmental Protection Agency defines hazardous waste as combustible, corrosive, reactive, or poisonous waste. Our environment is full of dangerous trash. Research shows that the main sources of this waste are:

Chemical industry waste accounts for 60% of industrial hazardous waste, About 20% of the market is metal, Military, industry; The pharmaceutical business; Medical facilities; Household and Small firms.

**Dangerous medical and veterinary waste**

Medical-veterinary waste is any waste produced in health and veterinary facilities. This includes municipal trash, infectious and laboratory waste, packaging, pharmaceuticals, and pharmaceutical and chemical waste. Hazardous medical waste, 14% of overall medical waste, includes the following:

1. Waste from microbiology lab equipment, supplies, and accessories that touched blood or infected patients during surgery, hemodialysis, contaminated gloves, and experimental animals.

2. Sharp tools including needles, syringes, scalpels, and others can cause damage.

3. Disgusting: black and gray human body parts (tissues, organs removed before surgery), experimental animals, animal anatomy.

4. Proper disposal of returned or expired medications and chemicals is pharmaceutical industrial waste.

5. Chemical waste includes solid, liquid, and gaseous chemicals. Medical, experimental, and cleaning/disinfection processes employ these substances.

6. Radioactive black and gray materials, equipment, solutions, and animal carcasses disposal.

7. Mercury, lead, and arsenic, as well as thermometers and blood pressure monitors, are in the garbage (Kolomeiceva-Jovanovic L. 2010).

**Veterinary medical facilities create waste:**

Veterinary clinics, Institute research laboratories, vet, Veterinary clinics, Many farms grow herds and flocks.

**Biodegradation**

Biodegrading or composting municipal waste organics is a huge potential. One ton of organic waste produces 500 m<sup>3</sup> of biogas with up to 70% methane and carbon dioxide. Its remarkable thermal capacity of 24,000 KJ/m<sup>3</sup> allows this. Bacteria and other biota depend on it. Bacteria dominate microorganisms in number and variety. Nitrogen fixation by bacteria is necessary for biological activity and soil fertility. Food scraps make up a lot of municipal garbage. Their density and humidity are high. To reduce trash, biodegradation is used. Small farms and greenhouses in medium-sized towns and rural locations can biodegrade. The decomposition of organic fertilizer produces biogas (energy) and water for business and home usage. Biodegradation improves environmental cleanliness. Many countries employ this biodegradation process to produce electricity and high-quality organic fertilizer. It also reduces municipal solid waste processing on landfills, protecting arable land and wildlife.

**Organic waste biodegradation technology**

Biosphere microorganisms provide massive amounts of oxygen that support life on Earth. Throughout history, bacteria have broken down organic waste. People are now proficient at constructing focused microbe collections. Understanding the chemical makeup of vegetable and animal waste is essential for microbial decomposition. Waste

structure depends on food product content. The processing sector, agricultural producers, and some institutions generate most organic food waste. "How leftover food and industrial waste from plants or animals are used:

Other municipal and industrial solid waste must be properly disposed of in the landfill;

Utilize organic waste as farm fertilizer.

- Properly dispose of domestic animal corpses;

- City sewer disposal of industrial trash;

- Environmental protection requires proper garbage disposal.

The significant proportion of municipal waste in the overall volume of solid waste necessitates its proper management through processing, incineration, or compaction, rather than disposing it in landfills. This approach is not justified from both environmental and economic perspectives. There are always efficient methods of waste treatment that are both environmentally friendly and economically viable. Introducing biodegradation technology is the solution to these problems. Biodegradation is extensively utilized in the economic practices of European countries. A number of farms in Western Europe rely on this method to fulfill their energy and organic fertilizer requirements. Biodegradation of organic waste is widely practiced in both Norway and Canada, both in individual households and in industry. It is also widely prevalent in China. The method of biodegradation is highly cost-effective, leading to a clear conclusion. The application has the potential to generate a profit through the sale of fertilizer, a highly valuable product.

**Recycling**

Recycling is the collection, separation, processing, and manufacturing of new products from used materials. Reusing items instead of discarding them is a responsible practice. Recycling centers around the world efficiently recycle waste.

Recycling helps fulfill these strategic goals:

- Conservation (all materials are natural and scarce).

- Energy efficiency (minimizing energy loss in primary, transportation, and later operations and generating energy from non-recycled materials).

- Waste materials decay over time, therefore recycling is essential to environmental conservation.

- Recycling materials takes investment expertise and labor, which creates jobs (Jovanovic L. 2000).

**Recyclable materials**

"When considering exploitation return, materials are categorized:

- Recaptures the production process after recycling, making it green.

- Non-recyclable objects are burned for energy or carefully disposed of in landfills.

Hazardous compounds that harm humans and the environment

Safe (human- and environmentally-safe materials). Recycling involves reusing materials.

Using appropriately prepared resources to make the same product is primary recycling.

Advanced technology is used to treat recyclable materials for optimal efficiency in secondary recycling (Jovanovic L. 2000).

**Waste plastic recycling**

Plastic waste is difficult to decompose, but reusing packaging waste can reduce waste and environmental pollution and conserve valuable raw materials and energy. The main problem is the excessive use and improper disposal of plastic products.

1. Efficient trash pickup,
2. Selection, identification
3. Expert milling,
4. Thoroughly clean
5. Rotating,
6. Drying materials
7. Storage

The household plastic waste is mixed with other waste, which poses an additional challenge. Containers are introduced to solve this problem, depending on the type (glass, paper, plastic...). This method of collecting and sorting is already widely implemented in most EU countries. During the first decade of the 21st century, approximately 30 million tons of plastic waste were collected in the United States. Given the issue of waste disposal, the significance of reusing items is increasingly emphasized. Each year, Americans consume a staggering 86 kg of plastic, with a significant portion of 27 kg being attributed to packaging. Germany is highly efficient in recycling plastic waste, with an impressive annual volume of 800 tons, accounting for a remarkable 80% of the total plastic waste generated. The amount of plastic recycled in the UK is relatively small compared to the total amount. Since 2000, there have been advancements in the processing of plastic that allow it to break down under the action of microorganisms. These plastics are often referred to as biodegradable. According to a study on recycling, it is not possible to replace all plastic products with biodegradable plastic. We need to improve our plastic waste processing methods to fully utilize our potential. This involves the handling of waste that is clearly identified in terms of its composition and source. Capacities that handle processing are also quite limited.

#### **Car Battery Recycling**

Batteries are often thrown in landfills without treatment, contaminating soil with lead, acids, and other inorganic chemicals (Jovanovic L 2010). To effectively recycle old batteries, assign and recycle particular components and safely dispose of trash leftovers. Despite its economic and environmental benefits, reviving old batteries is not commonly accepted. Selecting outdated batteries from enormous dumps full of diverse garbage is difficult. Few firms have taken this on. Many batteries are thrown without being used, according to data. Lead from recovered batteries is essential.

#### **Vehicle recycling after use**

The car's engineering and design are complex. Most of the car's materials are cast iron and steel. About 80% of the car's weight. Car recycling is complicated owing to the variety of materials utilized. However, existing recycling systems can manage this complexity and recycle automobiles. Glass, which makes up just 3% of the car's weight, is treated in factories differently due to its complicated chemical makeup. More plastic is being shipped to landfills, while glass recycling has increased. Unprocessable residue. Development of polymers as concrete additives is prioritized. Vehicle fluids—fuel, oil, and coolant—make up around 2% of their weight. The chemical composition and toxicity of automotive recycling fluids can be problematic. Industrial processing uses rubber, which makes about 5% of the car's weight, to make flooring, protective fence, and asphalt additives (Jovanovic L 2010). The disposal of used vehicle batteries and the effects of filters on our quality of life are environmental concerns. Each automotive item must be

handled carefully. Two processes are employed to recycle automobiles, each separating their materials differently. The first approach uses optical separation, whereas the second uses mulching, gravitational, and special ways (Jovanovic L2010).

#### **Strategy for Waste Management**

"The collection, transport, storage, and treatment of waste pose various safety and health risks to employees in the waste industry" (cpc-serbia). Waste management includes system and population waste avoidance, packaging reduction, and trash sorting. The Waste Management Strategy lists activities:

Implementing formal legal systems and acquiring waste management skills.

Enhancing waste management staff education and training

The creation of a national organization to advance waste management education and training can improve waste utilization, processed material quality, and recycling participation, improving environmental protection. Many nations support the EU's efforts to develop innovative recycling technology, improve trash collecting and sorting systems, and reduce waste reuse costs.

Computerized waste management,

Exchange and selling of scrap.

#### **Conclusion**

Industrialization and fossil fuel use are changing the environment. Since preventing future environmental damage from industry expansion is vital, people are increasingly worried about this issue. This approach led to sustainable development. This idea prioritizes industry progress and environmental sustainability. Due to environmental contaminants, changing the ecosystem's quality can worsen human health in many ways. Industrial production, which was meant to establish humankind as the dominating power over nature, threatens people and the environment. Air, water, and land contamination is alarming. Untouched landscapes and regions exist. People legally safeguard these natural resources. The man spends most of his time in cities and factories, with rare breaks in natural settings. Certain wastes are harmful to the environment and humans. Company failed to recognize this risk quickly and thoroughly. Waste management is unregulated in many nations. Due to agricultural pesticides and toxic and cancer-causing industrial waste, hazardous trash has increased significantly. Environmental degradation in many countries and areas has exacerbated the global environmental catastrophe. Global warming, ozone layer depletion, acid rain, deforestation, soil degradation, biodiversity loss, and clean drinking water depletion are all part of this dilemma. Sustainable waste management must reduce pollution. Saving energy and raw materials from garbage through recycling is beneficial. Many governments promote recycling because it reduces trash and boosts the economy. Recycling saves energy and materials. Discarded and obsolete items might provide raw materials instead of natural resources. Population growth and landfill trash are threatening the ecosystem. Landfills, especially unmanaged ones, occupy enormous swaths of productive ground and might cause unforeseen events. Taking these dumps down may be expensive. Waste management must be improved to decrease waste. This involves reducing waste at its source, encouraging secondary raw resources, and improving recycling and disposal.

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