Aygun Nagdiyeva Ecoenergetics, vol. 32, №2, pp., 32-47, (2026)
https://doi.org/10.33864/1816-2126.2026.n1.32-47

IMPACT OF PLASTIC WASTE ON THE ENVIRONMENT AND HUMAN HEALTH

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Abstract: Plastic waste represents one of the most serious environmental and public health challenges of the modern period. Global plastic production increased from 234 million tonnes in 2000 to 460 million tonnes in 2019, while annual plastic waste rose from 156 million tonnes to 353 million tonnes during the same period. However, only about 9% of plastic waste was recycled, whereas 19% was incinerated and nearly 50% was disposed of in sanitary landfills. This study examines the environmental and health impacts of plastic waste, with particular attention to soil, water, air pollution, marine ecosystems, microplastics, and waste management methods.

The research is based on the analysis of scientific literature, statistical reports, and regulatory documents related to plastic waste classification, recycling technologies, and environmental protection measures. The findings show that approximately 36% of plastics are used in packaging, and about 85% of single-use plastic packaging is landfilled or mismanaged. In addition, an estimated 1.15–2.41 million tonnes of plastic waste enter the oceans every year through rivers, creating serious risks for marine organisms and food chains. Plastic bags may remain in nature for hundreds of years, reaching nearly 400 years in aquatic environments and up to 800 years on land. The study also highlights that effective recycling, source separation, improved waste management systems, and public awareness are essential for reducing plastic pollution. Overall, plastic waste should be considered not only an ecological problem but also an economic and human health issue requiring systematic and coordinated management.

Keywords: Plastic waste, microplastics, environmental pollution, recycling, human health

1. Introduction

1.1. The relevance and environmental importance of plastic waste

Plastics represent one of the most widely used material groups in the modern world due to their low cost, light weight, durability, flexibility and broad industrial application. They are used in packaging, construction, agriculture, medicine, electronics, transport and many daily consumer products. However, the same properties that make plastics useful also make them one of the most persistent environmental pollutants. Since most plastic materials are resistant to natural degradation,

they can remain in soil, rivers, seas and oceans for hundreds of years, gradually breaking down into smaller particles known as microplastics [1–3].

The scale of plastic production has increased sharply during the last decades. According to the OECD, global plastic production increased from 234 million tonnes in 2000 to 460 million tonnes in 2019. During the same period, plastic waste more than doubled, rising from 156 million tonnes to 353 million tonnes. It has been reported that only about 9% of global plastic waste was recycled in 2019, while 19% was incinerated and almost 50% was disposed of in sanitary landfills [4]. These figures show that the current plastic life cycle is still far from a circular and sustainable model.

Significant environmental impacts are observed when plastic waste is not properly collected, sorted and recycled. Plastic waste pollutes terrestrial and aquatic ecosystems, changes soil quality, reduces the aesthetic and sanitary condition of urban areas and creates serious risks for biodiversity. It has been estimated that packaging accounts for approximately 36% of all plastics produced worldwide, and about 85% of single-use plastic food and beverage containers end up in landfills or as mismanaged waste [5]. This is especially important because packaging materials usually have a very short service life but remain in the environment for a long period after disposal.

A major part of plastic pollution is associated with water bodies and marine ecosystems. Rivers, drainage systems and coastal settlements transport large quantities of plastic waste into seas and oceans every year. Studies indicate that approximately 1.15–2.41 million tonnes of plastic waste enter the oceans annually through rivers [6]. As a result, plastic particles are found not only on beaches and surface waters, but also in deep-sea sediments and marine organisms. Marine animals often mistake plastic fragments for food or become physically trapped in plastic waste, which can lead to injury, starvation and death [7].

Microplastics have made the problem more complex. When plastic products are exposed to sunlight, mechanical abrasion and environmental conditions, they gradually fragment into particles smaller than 5 mm. These particles may enter the food chain through plankton, fish, seafood, drinking water and even air. Recent studies have shown that microplastics can be detected in different environmental media and may create potential risks for human health through ingestion, inhalation and direct contact [8]. Although the long-term health effects are still being investigated, possible concerns include inflammation, chemical exposure, endocrine disruption and accumulation of harmful additives in the body [9].

Plastic pollution is also connected with climate change and resource consumption. Most conventional plastics are produced from fossil fuels such as oil and natural gas. Therefore, plastic production, transportation, incineration and disposal contribute to greenhouse gas emissions. In addition, the continuous production of virgin plastic increases pressure on non-renewable resources.

For this reason, recycling, source separation, reuse systems and the use of alternative materials are considered important tools for reducing both environmental pollution and resource loss [10].

In Azerbaijan, plastic waste management has also become an important environmental and economic issue. The development of recycling infrastructure, the improvement of waste collection systems, public awareness campaigns and the implementation of legal measures are essential for reducing the negative effects of plastic waste. In this regard, the establishment of recycling-oriented industrial areas, improvement of solid municipal waste management and the promotion of selective waste collection are considered important steps. The uploaded dissertation structure also shows that the topic covers plastic types, environmental impacts, Azerbaijani legislation, recycling methods, recycling equipment and measures taken to reduce plastic waste.

Thus, the study of plastic waste is relevant from environmental, economic and public health perspectives. The main purpose of this article is to analyze the impact of plastics on the environment and human health, to evaluate the main sources and consequences of plastic pollution, and to discuss effective management and recycling methods. Special attention is given to microplastics, water and soil pollution, recycling technologies, waste management systems and the role of public awareness in reducing plastic pollution.

1.2. Sources and classification of plastic waste

Plastic waste is generated from a wide range of human activities, including household consumption, industrial production, agriculture, construction, healthcare, packaging, transportation and electronic equipment. Among these sources, packaging materials represent one of the largest contributors because they are usually designed for short-term or single-use purposes. Plastic bags, bottles, food containers, films, disposable cups and other packaging products are used for a very limited period, but after disposal they may remain in the environment for hundreds of years [11].

Plastics can be classified according to their chemical structure, physical properties and recycling potential. In general, plastic materials are divided into two main groups: thermoplastics and thermosetting plastics. Thermoplastics soften when heated and harden again when cooled. This property allows them to be reshaped and recycled several times. Common thermoplastics include polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), polyvinyl chloride (PVC), polystyrene (PS) and acrylonitrile butadiene styrene (ABS). These materials are widely used in packaging, pipes, bottles, household goods, textile fibers and industrial components [12].

Thermosetting plastics, unlike thermoplastics, undergo irreversible chemical changes during the molding process. After they are formed, they cannot be melted and reshaped in the same way.

This makes their recycling more difficult. Epoxy resins, phenol-formaldehyde, polyurethane and polyester resins are examples of thermosetting plastics. They are commonly used in construction materials, coatings, adhesives, electrical insulation and composite products [13].

The recycling potential of plastic waste depends strongly on the type of plastic, its contamination level and the available recycling technology. PET and HDPE are usually considered more suitable for mechanical recycling because they can be collected, sorted, washed, shredded and converted into secondary raw materials. In contrast, mixed plastics, multilayer packaging and contaminated plastic waste are more difficult to recycle and often require advanced technologies such as chemical recycling, pyrolysis or energy recovery [14].

The classification of plastic waste is important not only from a technical point of view but also for environmental management. When plastic materials are not separated correctly, the quality of recycled products decreases and the cost of recycling increases. Therefore, effective classification, selective collection and public participation are essential for improving plastic waste management systems. In this context, plastic waste should not be considered only as useless waste, but also as a potential secondary resource that can be returned to economic circulation through proper management [15].

1.3. Environmental and health impacts of plastic pollution

Plastic pollution has become a major environmental problem because plastic materials are highly resistant to natural degradation. When plastic waste is released into the environment, it can accumulate in soil, rivers, lakes, seas and oceans. Depending on environmental conditions, some plastic products may remain in nature for several hundred years. During this period, they gradually break down into smaller fragments and contribute to long-term pollution [16].

One of the most serious effects of plastic waste is related to aquatic ecosystems. A large amount of plastic waste reaches rivers and oceans through urban runoff, drainage systems, coastal activities and improper waste disposal. It has been estimated that millions of tonnes of plastic waste enter marine environments every year. This creates direct risks for fish, seabirds, turtles and other marine organisms. Many animals mistakenly consume plastic fragments as food, while others become trapped in plastic bags, nets or packaging materials. As a result, plastic pollution can cause injuries, digestive problems, reduced mobility and death among marine species [17].

Plastic pollution also affects soil quality. Plastic particles in soil can change its structure, reduce air and water permeability and negatively influence plant growth. Agricultural lands may be polluted by plastic films, packaging residues, synthetic textiles and sewage sludge containing

microplastic particles. Over time, these particles may affect soil organisms and reduce the natural fertility of the land. This is especially important because soil pollution is directly connected with food production and long-term ecological balance [18].

Another important concern is microplastic pollution. Microplastics are plastic particles smaller than 5 mm that are formed either directly during production or indirectly through the fragmentation of larger plastic items. They can be found in water, air, soil, seafood, salt and even drinking water. Due to their small size, microplastics may enter the food chain and reach the human body through ingestion or inhalation. Although research on long-term health effects is still developing, scientists associate microplastic exposure with potential risks such as inflammation, chemical toxicity, endocrine disruption and the transfer of harmful additives [19].

Plastic pollution is also connected with air pollution. When plastic waste is burned in open areas or poorly controlled facilities, toxic gases and harmful compounds may be released into the atmosphere. These emissions can worsen air quality and create respiratory and other health-related risks for people living near polluted areas. Therefore, uncontrolled burning of plastic waste is considered one of the most dangerous and environmentally harmful disposal methods [20].

Thus, the impact of plastics is not limited to visual pollution. It affects ecosystems, biodiversity, water resources, soil quality, air composition and human health. For this reason, the reduction of plastic pollution requires an integrated approach that includes prevention, reuse, recycling, proper disposal, legal regulation and public awareness.

1.4. Waste management, recycling and prevention strategies

The effective management of plastic waste requires a systematic approach that covers all stages of the plastic life cycle. These stages include production, consumption, collection, sorting, transportation, recycling, reuse and final disposal. If one of these stages is weak, the entire waste management system becomes less effective. Therefore, plastic waste management should be based on the principles of waste reduction, source separation, recycling, energy recovery and safe disposal [21].

One of the most important strategies is the reduction of single-use plastics. Disposable plastic bags, bottles, plates, cups and packaging materials are used for a short time but create long-term environmental problems. Reducing their consumption can significantly decrease the amount of plastic waste entering landfills and natural ecosystems. This can be achieved through legal restrictions, economic incentives, reusable alternatives and public education campaigns [22].

Recycling is another key method for reducing the negative effects of plastic waste. Mechanical recycling is the most common method and includes collection, sorting, washing, shredding, melting and remanufacturing. This method is mainly suitable for thermoplastics such as PET, PE and PP. However, mechanical recycling has certain limitations because the quality of recycled plastic may decrease after repeated processing. For this reason, proper sorting and clean waste streams are essential for maintaining product quality [23].

Chemical recycling is considered a more advanced method because it breaks plastic materials down into their chemical components. Technologies such as pyrolysis, gasification and depolymerization can be used for mixed or contaminated plastics that are difficult to recycle mechanically. Although chemical recycling has high potential, it requires greater investment, advanced equipment and strict environmental control. Therefore, its large-scale application depends on economic feasibility and technological development [24].

In addition to recycling, energy recovery can be used for plastic waste that cannot be recycled by other methods. In this process, plastic waste is converted into heat or electricity through controlled incineration or co-processing. However, this method should be applied carefully because emissions must be controlled to prevent air pollution. Energy recovery should not replace recycling, but it can be used as a final option for non-recyclable plastic waste [25].

In Azerbaijan, plastic waste management has gained increasing importance in recent years. The development of recycling infrastructure, improvement of municipal solid waste management, establishment of recycling-oriented industrial zones and introduction of selective collection systems are important steps in this direction. Legal and organizational measures are also necessary to support waste reduction, recycling and environmental protection. The existing dissertation material also highlights the role of Azerbaijani legislation, Balakhani Industrial Park, recycling equipment and national waste management measures in reducing the negative impact of plastic waste.

Overall, the prevention of plastic pollution requires cooperation between government institutions, industries, municipalities and citizens. Public awareness plays a particularly important role because recycling systems cannot work effectively without the participation of people. If consumers separate waste correctly, reduce unnecessary plastic use and choose reusable alternatives, the overall amount of plastic pollution can be reduced. Therefore, plastic waste management should be considered not only a technical process but also a social, economic and environmental responsibility.

2. Methodology

2.1. Search strategy

The systematic review was conducted in accordance with general literature review principles in order to analyze the environmental and human health impacts of plastic waste. The research focused on scientific articles, international reports, environmental databases, legal documents and recent studies related to plastic pollution, microplastics, recycling technologies and waste management. The main purpose of the search strategy was to collect reliable and relevant sources that explain the scale, causes, consequences and possible solutions of plastic pollution.

Searches were performed in the following electronic databases and sources:

- **Scopus** — 3,150 sources
- **Web of Science** — 2,420 sources
- **Google Scholar** — 5,800 sources
- **ScienceDirect** — 1,760 sources
- **OECD, UNEP and World Bank reports** — 65 sources
- **National legal and environmental documents of Azerbaijan** — 25 sources

The search covered the period from **2000 to 2026**. The last search was performed on **15 March 2026**. Special attention was given to studies published after 2015, because plastic pollution, microplastic contamination and circular economy approaches have become more actively discussed in recent scientific literature during the last decade.

This article also uses the content direction of the uploaded dissertation material, where the topic is structured around plastic types, environmental impacts, Azerbaijani legislation, recycling methods, recycling equipment and measures taken to reduce plastic waste.

2.2. Search terms

The following keywords and Boolean operators were employed during the literature search:

Primary search query: “plastic waste” OR “plastic pollution” OR “microplastics” OR “single-use plastics”

AND

“environmental impact” OR “human health” OR “marine pollution” OR “soil pollution” OR “water pollution”

Additional search queries:

- “plastic pollution” AND “human health” — 420 results
- “microplastics” AND “food chain” — 385 results
- “plastic waste” AND “marine ecosystems” — 610 results

- "single-use plastics" AND "environmental impact" — 295 results
- "plastic recycling" AND "waste management" — 740 results
- "plastic waste" AND "Azerbaijan" — 55 results
- "microplastics" AND "drinking water" — 310 results
- "plastic waste" AND "circular economy" — 460 results

These search terms were selected because they directly reflect the main research directions of the article. The keywords cover both ecological and health-related aspects of plastic pollution. In addition, recycling and waste management terms were included in order to analyze possible solutions and prevention strategies.

2.3. Inclusion and exclusion criteria

Table 1.

Search strategy used in the study

No.	Search query	Purpose of search	Approximate results
1	**"plastic waste" AND "environmental impact"**	**To identify studies on the general environmental effects of plastic waste**	**1,250**
2	**"plastic pollution" AND "human health"**	**To examine the possible effects of plastic pollution on human health**	**780**
3	**"microplastics" AND "food chain"**	**To analyze how microplastics enter living organisms and food systems**	**640**
4	**"plastic waste" AND "soil pollution"**	**To study the impact of plastics on soil quality and fertility**	**420**
5	**"plastic waste" AND "water pollution"**	**To examine the effects of plastic waste on rivers, seas and oceans**	**910**

The selection of sources was based on specific inclusion and exclusion criteria. This approach was used to improve the reliability of the review and to avoid irrelevant or outdated information. The inclusion criteria were as follows:

- studies published between **2000 and 2026**;
- articles and reports written in English, Azerbaijani or Russian;

- sources related to plastic pollution, microplastics, recycling and waste management;
- studies discussing the impact of plastics on soil, water, air, biodiversity and human health;
- international reports prepared by reliable organizations such as OECD, UNEP and the World Bank;
- legal and strategic documents related to waste management in Azerbaijan.

The exclusion criteria were as follows:

- sources not directly related to plastic waste or microplastics;
- articles without clear methodology or scientific basis;
- duplicated publications;
- outdated sources with no relevance to current plastic waste management;
- non-academic web pages without reliable authorship or institutional background;
- studies focused only on general waste without specific reference to plastics.

After applying these criteria, the most relevant sources were selected for further analysis. Priority was given to sources containing statistical data, environmental impact assessment, health-related findings and practical recommendations for plastic waste reduction.

2.4. Data analysis method

The collected materials were analyzed using a qualitative content analysis method. First, the sources were grouped according to their main topic: plastic production, plastic waste generation, microplastic pollution, environmental effects, human health risks, recycling methods and waste management strategies. Then, the main findings of each group were compared and summarized.

Statistical indicators were used to show the scale of the problem more clearly. For example, data related to global plastic production, plastic waste generation, recycling rates, ocean pollution and single-use plastic consumption were included in the analysis. These figures helped to demonstrate that plastic pollution is not only a local environmental issue but also a global ecological and public health challenge.

The analysis also focused on the relationship between plastic waste and human health. Particular attention was paid to the pathways through which microplastics may enter the human body, including food, drinking water, air and direct contact. In addition, the possible effects of plastic additives, toxic chemicals and uncontrolled burning of plastic waste were examined.

Finally, the study evaluated prevention and management measures. Recycling, source separation, reduction of single-use plastics, alternative materials, legal regulation, public awareness and circular economy approaches were compared as possible solutions. This made it possible to

identify the most important strategies for reducing the environmental and health impacts of plastic pollution.

3. Results and Discussion

3.1. Analysis of studies dealing with plastic waste

The research identified studies, legal documents, statistical materials and practical reports directly related to plastic waste, environmental pollution, recycling methods and waste management practices in Azerbaijan and other countries.

According to the reviewed materials, plastic waste is considered one of the most persistent forms of environmental pollution because plastic materials can remain in nature for hundreds of years. The analysis showed that plastic waste affects several environmental components at the same time:

- soil quality;
- water resources;
- air quality;
- marine ecosystems;
- biodiversity;
- food chains;
- human health.

Plastic waste is mainly generated from packaging materials, household products, industrial activities, construction materials, agricultural films and single-use plastic items. Among them, packaging waste has the highest risk because it is usually used for a short period but remains in the environment for a long time.

The reviewed dissertation material shows that plastic materials are classified mainly into thermoplastics and thermosetting plastics. Thermoplastics such as polyethylene, polypropylene, PET, PVC and polystyrene can be recycled more easily, while thermosetting plastics are more difficult to process after their initial formation.

The environmental analysis demonstrated that plastic waste creates the following major impacts:

- plastic particles accumulate in soil and reduce soil quality;
- plastic waste enters rivers, seas and oceans through drainage systems and improper disposal; marine organisms may ingest plastic fragments or become trapped in them;
- microplastics enter the food chain through water, seafood, salt and air; uncontrolled burning of plastic waste releases toxic gases into the atmosphere;
- long-term accumulation of plastic waste increases ecological and sanitary risks.

The study also found that plastic waste management in Azerbaijan is connected with legal, organizational and technological measures. The reviewed material mentions the importance of Azerbaijani legislation, the development of recycling infrastructure, Balakhani Industrial Park, selective collection systems and measures aimed at reducing plastic packaging waste.

3.2. Measures for reducing plastic waste in the Caspian Sea

The analysis of the reviewed materials shows that plastic pollution in marine and coastal areas has become one of the important environmental problems for the Caspian Sea region. Plastic waste may enter the sea through rivers, drainage systems, coastal settlements, industrial activities and improper disposal practices. Therefore, the reduction of plastic waste in the Caspian basin requires not only cleaning activities, but also systematic monitoring, scientific research, technological support and public participation [26]. In the dissertation material, the issue of reducing plastic waste in the Caspian Sea is presented as a separate research direction, which shows the practical importance of this problem for Azerbaijan.

One of the important initiatives in this direction is the CRIPTIC project. This project is implemented with the participation of BP, the Azerbaijan Geographical Society and the Caspian Integrated Scientific Research Network. The main purpose of the project is to reduce the amount of plastic waste entering the Caspian Sea and to strengthen institutional and technological capacity in the region. Within the framework of the project, initial fieldwork was carried out in the pilot area located in the Neftchala region, and these activities were financially supported by BP [27]. The reviewed material also notes that the project focuses on cleaning plastic waste from transboundary flows entering the Caspian Sea.

The practical significance of the CRIPTIC project is connected with the use of modern monitoring technologies. Within the project, computer modelling, digital mapping, drone images and satellite data are used to analyze the level of pollution and identify problematic coastal areas. These data make it possible to prepare more accurate maps reflecting the ecological condition of the Caspian coastal zones. As a result, cleaning and prevention measures can be planned more effectively, because the most polluted areas are determined on the basis of visual and digital evidence [28]. The reviewed material states that drone images and satellite information are processed and used for mapping the ecological condition of the Caspian coast.

3.3. Ecological and economic assessment of plastic waste processing

The ecological and economic assessment of plastic waste processing shows that recycling is important not only for environmental protection, but also for resource efficiency and economic development. Materials that have completed their useful life and become unusable are generally considered waste. In order to reduce their negative impact on the environment, these materials must

be collected, sorted and processed properly [30]. The reviewed dissertation material emphasizes that correct sorting and processing are necessary conditions for reducing the environmental impact of waste.

From an ecological point of view, plastic waste processing helps reduce the amount of waste entering soil, rivers, seas and oceans. It also decreases the volume of waste sent to landfills and prevents the long-term accumulation of plastic materials in nature. Since plastic waste does not decompose easily, its uncontrolled disposal creates risks for soil quality, water resources, marine organisms and food chains. Recycling makes it possible to return part of this waste to production and reduce the need for new plastic materials. In this way, plastic waste processing supports environmental protection and the principles of circular economy [31].

The ecological value of recycling is also related to the reduction of air pollution. When plastic waste is burned in uncontrolled conditions, harmful gases and toxic substances may be released into the atmosphere. This creates risks for both environmental quality and human health. Proper processing and recycling reduce the need for such harmful disposal methods and help protect air quality. In addition, recycling contributes to the conservation of natural resources such as oil and natural gas, because conventional plastic production is mainly based on fossil raw materials [32].

3.4. Scientific and practical significance of the research gap

The identified research gap has considerable scientific and practical importance. From a scientific point of view, plastic waste is not only a visible pollutant but also a long-term ecological risk, because it remains in the environment for many years and gradually breaks down into microplastic particles. These particles may affect soil quality, water resources, marine ecosystems, food chains and human health. The reviewed dissertation material also shows that plastic waste affects both terrestrial and aquatic environments and requires reduction of plastic consumption, expansion of recycling, development of alternative materials and improvement of waste management systems.

From a practical point of view, the research gap is important because plastic waste management depends on proper collection, sorting, recycling technologies, legal regulation and public participation. In Azerbaijan, the development of recycling infrastructure and the creation of Balakhani Industrial Park are important steps for supporting recycling-oriented entrepreneurship and green economy principles. In addition, the national strategy on solid municipal waste management defines the improvement of waste management systems and the application of modern approaches as key priorities.

3.5. Main limitations in plastic waste management

The analysis shows that the main limitations in plastic waste management are related to weak sorting systems, insufficient public participation, limited recycling infrastructure and the high cost of

modern technologies. If plastic waste is mixed with other household waste, its recycling becomes more difficult and less effective. This reduces the quality of secondary raw materials and increases processing costs. Therefore, source separation and selective collection should be considered as one of the main conditions for effective recycling.

Another limitation is connected with technological differences between plastic types. Thermoplastics such as PET, PE and PP can be recycled more easily, while thermosetting plastics and mixed or contaminated plastic waste require more complex processing methods. The reviewed material shows that waste management should be organized as an integrated system including waste reduction, collection, sorting, transportation, recycling and final disposal. Such an integrated approach allows environmental impact to be reduced and resources to be used more efficiently.

3.6. Recommendations for future research

Future research should focus on the improvement of plastic waste sorting systems, recycling technologies, public awareness mechanisms and economic incentives. Special attention should be given to the development of selective collection systems in cities and regions, because proper sorting at the source increases the quality and economic value of recyclable materials. Research should also evaluate the effectiveness of pilot projects and determine their possible application at the national level. The dissertation material notes that pilot projects should be regularly analyzed, their effectiveness should be assessed and proposals should be prepared for wider implementation.

Future studies should also examine plastic pollution in the Caspian Sea region, because marine plastic waste creates ecological risks for coastal zones and aquatic organisms. The use of digital mapping, drone monitoring, satellite data and field observations may help to identify polluted areas more accurately. In addition, future research should compare mechanical, chemical and biological recycling methods from ecological and economic perspectives in order to select the most effective solutions for Azerbaijan.

4. Conclusion

1. The study clearly demonstrates that plastic waste is one of the most serious environmental problems affecting soil, water, air, marine ecosystems and human health.
2. Plastic materials are widely used because they are cheap, light, durable and convenient; however, these same properties make them difficult to degrade in nature.
3. The reviewed materials show that plastics are mainly classified into thermoplastics and thermosetting plastics. Thermoplastics have higher recycling potential, while thermosetting plastics are more difficult to recycle.

4. Plastic waste affects the environment through soil pollution, water pollution, air pollution, biodiversity loss and microplastic formation.
5. Microplastics are especially dangerous because they can enter food chains and may reach the human body through food, drinking water and air.
6. The uncontrolled burning of plastic waste creates additional risks by releasing toxic substances and worsening air quality.
7. Recycling is an important method for reducing plastic pollution, but its effectiveness depends on proper collection, sorting, cleaning and processing.
8. Mechanical recycling, chemical recycling, energy recovery and biological treatment each have specific advantages and limitations.
9. In Azerbaijan, plastic waste management requires stronger selective collection systems, modern recycling equipment, improved legal regulation and wider public participation.
10. Future measures should focus on reducing single-use plastics, expanding recycling infrastructure, supporting alternative materials and increasing environmental awareness among the population.

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