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THE ROLE AND ENVIRONMENTAL SIGNIFICANCE OF THE WASTE RECYCLING INDUSTRY IN UZBEKISTAN'S GREEN ECONOMY: THE CASE OF GERMANY'S EXPERIENCE

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Abstract: This article analyzes the role and ecological significance of the waste recycling industry in the development of Uzbekistan's green economy. Using Germany's experience as a case study, the research examines effective waste management practices, the development of recycling systems, and their environmental and economic benefits. The paper also discusses the current situation in Uzbekistan, identifies existing problems and future prospects, and offers practical recommendations based on lessons learned from Germany's experience.

Keywords: green economy, waste recycling, environmental sustainability, German experience, environment.

Introduction

In recent years, the Government of Uzbekistan has been actively introducing the principles of the green economy to reduce environmental problems and ensure sustainable economic growth. Within this transition, the waste recycling industry plays a particularly important role. Due to population growth, urbanization, and industrial expansion, the amount of waste generated in the country has been increasing every year.

According to official data, over 14 million tons of household waste are produced annually in Uzbekistan, of which only 4–6% is recycled (UzDaily.uz, 2023). This figure is far lower than in developed countries such as Germany, where the recycling rate reaches 60–70%.

Therefore, studying Germany's advanced experience in waste management and recycling has great practical significance for Uzbekistan.

Literature Review

The concept of a **green economy** is defined as an economic model aimed at efficient use of resources, reduction of waste, mitigation of carbon emissions, and wider use of renewable energy sources (UNEP, 2011).

Waste recycling is a core component of this model, serving the following key purposes:

Reintroduction of materials into the production cycle;

Reduction of environmental pollution;

Creation of new employment opportunities;

Harmonization of economic growth with ecological sustainability.

Germany's Experience

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Germany is one of the leading countries in Europe in terms of waste recycling. According to data from 2022 (EEA, 2023):

69% of waste is recycled;

Less than 1% is sent to landfills;

68.5% of plastic waste is processed through the "Yellow Bag" system.

These results have been achieved through a combination of legislation, advanced technologies, public awareness, and market mechanisms. The **Kreislaufwirtschaftsgesetz** (Circular Economy Act) obliges producers to take responsibility for the collection and recycling of their products, promoting a sustainable and closed-loop economy.

Analysis

1. The Current State of Waste Management in Uzbekistan

Indicator	Value	Source
Annual household waste volume	14 million tons	UzDaily.uz
Share of plastic waste	10% (≈249,000 tons)	live.kun.uz
Recycling rate	4–6%	UzDaily.uz
Number of recycling enterprises	290	UzDaily.uz
Planned waste-to-energy plants	11 plants (2.1 billion kWh)	UzDaily.uz
Expected GHG reduction by 2027	2.4 million tons	UzDaily.uz

These figures show that the waste recycling industry in Uzbekistan is still in its early development stage.

Key challenges include:

Lack of waste separation at source;

Weak recycling infrastructure;

Low domestic demand for recycled products;

Insufficient environmental awareness among citizens.

Legal and institutional framework:
Uzbekistan is implementing several national strategies to promote a green economy, such as the Strategy for the Transition to a Green Economy until 2030. Decisions have also been adopted to introduce "zero waste" principles.

A notable step was taken on **December 26, 2023**, when the Ministry of Ecology, Environmental Protection, and Climate Change of Uzbekistan signed a **grant agreement** with the **European Union (EU)** and the **FAO** (Food and Agriculture Organization of the United Nations) on the project "Safe Management of Hazardous Chemicals."

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The project, valued at **€4 million**, is to be implemented between 2023 and 2027. Its main goal is to strengthen national capacity in hazardous waste management and to develop a national strategy for hazardous chemical waste.

2. Lessons from Germany's Experience

Area	German Practice	Opportunities for Uzbekistan
Legislation	Kreislaufwirtschaftsgesetz — extended producer responsibility	Introduce producer obligations for recycling
Waste sorting	Household waste separation (plastic, glass, organic)	Implement a two-bin collection system
Technology	Advanced chemical and mechanical recycling plants	Attract innovative technologies
Market mechanism	Strong market demand for recycled products	Stimulate demand through tax incentives
Public participation	"Pfand" deposit-return system	Organize public information and awareness campaigns

In Germany, waste sorting is based on active public participation. Every household separates its waste into categories such as plastic, organic, paper, glass, and residual waste. This is implemented through the **"Gelber Sack" (Yellow Bag)** system.

According to the Federal Ministry for the Environment (Bundesumweltministerium), as a result of this system, **67–70%** of waste is recycled, and less than **1%** is sent to landfills.

For Uzbekistan, this experience demonstrates that recycling success depends not only on technical infrastructure but also on public awareness and involvement. Therefore, developing environmental education, information campaigns, and incentive systems is essential to encourage household-level waste separation.

3. Environmental and Economic Benefits

The development of the waste recycling industry can bring significant benefits, including:

Reduced environmental damage: less waste is disposed of in landfills.

Lower greenhouse gas emissions: waste-to-energy projects reduce fossil fuel use.

Employment generation: new jobs in collection, sorting, recycling, and logistics sectors.

Economic advantages: production of goods from recycled materials can reduce imports and stimulate local manufacturing.

Conclusion

In Uzbekistan's strategy for transitioning to a green economy, the waste recycling sector occupies a key position. Germany's experience demonstrates that success in this field depends on several critical factors:

Strengthening legislation and enforcement mechanisms;

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Introducing waste separation at the source;

Attracting technological innovations and investments;

Raising public environmental awareness;

Developing markets for recycled products.

By adapting Germany's best practices in these areas, Uzbekistan can establish a sustainable waste recycling system that contributes to its broader green economy objectives and environmental well-being.

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