# JOURNAL OF CONTEMPORARY WORLD STUDIES

VOLUME | 3 ISSUE | 7 DECEMBER 2025


AN ACADEMIC PLATFORM FOR IN-DEPTH ANALYSIS OF THE CONTEMPORARY WORLD

www.d-pressa.com

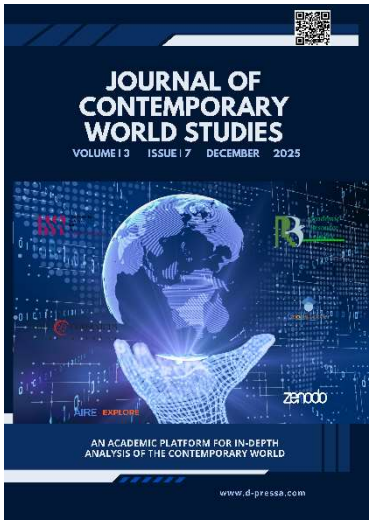
VOLUME | 3 ISSUE | 7 |DECEMBER |2025

JCWS

# CHALLENGES OF WASTE RECYCLING IN THE DEVELOPMENT OF A GREEN ECONOMY

*[1] Zulfakarova Liliya Faridovna, [2] Tuychieva Nodira Gulomovna*

[1] Associate professor of the Department of Management, Economics and Finance Institute, theory of Economics and econometrics, Kazan (Volga region) Federal University
[2] Jizzakh Branch of the National University of Uzbekistan, Department of Economics and Tourism
*e-mail: tuychiyevanodira.@gmail.com*




**Accepted Date:**
December 15, 2025,
**Published Date:**
December 25, 2025

**Journal Website:** https://d-pressa.com/index.php/jcws/

**License**

**This work is licensed under a** Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.

## ANNOTATION:

The transition toward a green economy places increasing emphasis on sustainable waste management and recycling systems. Selecting effective waste management strategies is crucial for minimizing environmental impacts, conserving natural resources, and generating socio-economic benefits for local communities. Decision-making in this field depends on multiple factors, including the type and volume of waste generated, available technologies and financial resources, existing and future policy frameworks, and environmental, social, and economic considerations. This study analyzes key challenges associated with waste recycling within the framework of green economic development. By comparing international policy approaches and technological solutions, including waste prevention, recycling, waste-to-energy systems, and anaerobic digestion, the paper highlights their relative effectiveness in achieving sustainability goals. The findings underline the importance of adopting a territorially adapted, integrated waste management strategy aligned with circular economy principles.

## KEYWORDS:

*green economy, waste recycling, circular economy, energy efficiency, waste management strategy.*

## Introduction

The concept of the green economy has gained global importance as countries seek to decouple economic growth from environmental degradation. One of the core components of this transition is sustainable waste management, which plays a vital role in reducing pollution, conserving resources, and mitigating climate change. Traditional linear production models—based on "take, make, and dispose"—have led to excessive waste generation and inefficient resource use. In contrast, green and circular economy approaches emphasize waste prevention, reuse, recycling, and energy recovery.

Policy and regulatory frameworks strongly influence waste management outcomes. While some regions have developed comprehensive and binding legislation, others rely on fragmented or region-specific regulations. As a result, waste recycling performance and environmental impacts vary significantly across countries. Understanding these differences and identifying effective strategies is essential for advancing green economic development.

## Methods

This study adopts a qualitative comparative analysis approach based on a review of international policy documents, academic literature, and empirical case studies. The analysis focuses on:

-waste hierarchy principles and their environmental implications,

-national and regional waste management policies,

-technological pathways for recycling and energy recovery.

Two illustrative case studies are examined:

-the application of waste-to-energy (WtE) technologies in Ireland, and

-the use of anaerobic digestion for food waste management in the United States. These cases are evaluated from environmental, economic, and social perspectives to assess their contribution to green economy objectives.

## Results

### Policy and Regulatory Approaches

Strong policy instruments are essential for promoting effective waste management and circular economy strategies. In the European Union, the Waste Framework Directive and the European Green Deal provide a unified policy foundation that prioritizes waste prevention, reuse, recycling, and energy recovery over landfilling. Tools such as landfill directives, recycling targets, and waste hierarchy enforcement support the transition toward circular economic models.

In contrast, the United States lacks a single national waste management law. Instead, waste policies are implemented at the state and local levels. For example, in Illinois and the city of Chicago, the Solid Waste Planning and Recycling Act serves as the primary legal framework guiding waste management strategies. Despite institutional differences, both the EU and US systems prioritize waste prevention, reuse, recycling, energy recovery, and, as a last resort, landfilling.

### Waste Prevention and Reduction

Waste prevention and reduction represent the most preferred strategies within the waste hierarchy, offering substantial environmental benefits. Circular economy models aim to extend the lifecycle of products and materials, thereby reducing waste generation at the source. Lower waste volumes decrease the need for raw material extraction and reduce greenhouse gas (GHG) emissions associated with production, transportation, and disposal processes.

Empirical studies demonstrate that food waste prevention strategies outperform landfilling, composting, incineration, and anaerobic digestion in terms of reducing

GHG emissions, eutrophication, and acidification impacts. Research conducted in southern Sweden indicates that preventing food waste achieves significantly greater emission reductions than both incineration and anaerobic digestion.

**Reuse and Recycling**.

Reuse and recycling are central pillars of the circular economy. By maintaining materials and products within the economic system for longer periods, these strategies reduce dependence on virgin raw materials and lower environmental burdens. Recycling, in particular, contributes to energy savings and emission reductions by substituting primary resource extraction.

For instance, studies in China reveal that recycling metal, plastic, and paper waste between 2005 and 2017 resulted in substantial energy savings and prevented large volumes of $CO_2$ emissions. In the context of plastic waste, chemical recycling technologies—such as pyrolysis and gasification—are gaining attention as complementary solutions to conventional mechanical recycling, especially for mixed or contaminated plastics.

Chemical recycling through pyrolysis enables waste plastics to be broken down into monomers that can be used to produce high-quality plastics, often with lower GHG emissions compared to virgin fossil-based plastics. However, higher energy demand and potential environmental trade-offs highlight the need for careful assessment based on local energy mixes and technological efficiency.

**Energy Recovery**

Energy recovery encompasses processes that convert waste into usable energy products, including electricity, heat, biogas, and biofuels. Common technologies include thermal treatments (incineration, pyrolysis, gasification), biological processes (anaerobic digestion), and landfill gas recovery.

Waste-to-energy systems offer several advantages, such as significant waste volume reduction, energy generation, reduced methane emissions compared to landfilling, and lower risks of soil and water contamination. In Ireland, WtE facilities have been introduced to reduce reliance on landfills in line with EU directives, prioritizing energy recovery over disposal.

Anaerobic digestion of organic waste represents a multifunctional solution that supports green economy objectives by producing biogas, biomethane, and nutrient-rich digestate. When digestate meets regulatory standards, it can be used as agricultural fertilizer, closing material loops and reinforcing circular resource flows. According to the European Commission, such applications qualify anaerobic digestion as a form of recycling.

**Discussion**

The comparative analysis demonstrates that no single waste management strategy is universally optimal. Instead, environmental effectiveness depends on local conditions, waste composition, technological capacity, policy frameworks, and socio-economic factors. While waste prevention delivers the highest environmental benefits, recycling and energy recovery play critical roles in managing unavoidable waste streams.

Integrating advanced technologies—such as chemical recycling and carbon capture, utilization, and storage (CCUS)—can further enhance the sustainability of waste-to-energy systems. However, policymakers must carefully balance environmental gains against potential trade-offs to ensure alignment with long-term green economy goals.

**Conclusion**

Prioritizing sustainable waste management strategies is essential for the

successful development of a green economy. By emphasizing waste prevention, reuse, recycling, and environmentally sound energy recovery, governments and industries can significantly reduce environmental impacts, improve ecosystem health, and mitigate climate change. An integrated, territorially adapted approach grounded in circular economy principles offers the most effective pathway toward sustainable economic development.

**REFERENCES:**

1. Communication from the Commission to the European Parliament, The European Council, The Council, The European Economic and Social Committee and The Committee of the Regions The European Green Deal. Brussels, Brussels, European Commission, Official Journal of the European Union 2019.
2. Identifying Member States at risk of not meeting the 2025 preparing for re -use and recycling target for municipal waste, the 2025 recycling target for packaging waste and the 2035 municipal waste landfilling reduction target, Luxembourg European Commission, Official Journal of the European Union 2023.
3. Waste Framework Directive [Online]. European Commission, https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framewok directive_en. Available: European Commission, https://environment.ec.europa.eu/topics/waste-and-recycling/waste
4. Nodira, T., and X. Jushkunbek. "The role and place of international economic organizations in solving global issues." *Web of Scientist: International Scientific Research Journal* 3.11 (2022): 1176-1190.
5. Ireland, 2025 EU waste recycling targets: state of play, Luxemburg, European Commission, Publications Office of the European Union. 2023
6. Mixed plastic waste: Sustainable valorisation solutions for material & energy recovery. IEA Bioenergy: Task 36 Webinar Report. IEA Bioenergy, https://task36.ieabioenergy.com/wp content/uploads/sites/34/2024/11/IEABioT36-workshop-report-Mixed-plastic-waste-20241118_final.pdf. ENVIRONMENTAL 2024
7. Nodira T. Innovative management in the development of the higher education system //Journal of Academic Research and Trends in Educational Sciences. – 2022. – T. 1. – №. 10. – C. 346-351.
8. Khudoyarov R., Kamolov D., Azamatov B. Economic growth, business circulation and economic development //Science technology&Digital finance. – 2024. – T. 2. – №. 2. – C. 21-24.
9. Nodira T., Rashid X. Problems of innovation management in the higher education system //Web of scientist: International scientific research journal. – 2022. – T. 3. – №. 11. – C. 155-164.
10. Kamolov D., Ismoilova D. RAQAMLASHTIRISHNING O ‘ZBEKISTON IQTISODIYOTIGA TA’SIRI //Science technology&Digital finance. – 2023. – T. 1. – №. 4. – C. 301-306.
11. Khaydarov B., Tuychieva N. INNOVATIVE TEACHING METHODS FOR COMPUTER SCIENCE AND EDUCATIONAL ROBOTICS //Science technology&Digital finance. – 2023. – T. 1. – №. 2. – C. 14-19.
12. Tuychieva N., Saitov S. Bank resources in the modernization of the economy //Science technology&Digital finance. – 2023. – T. 1. – №. 4. – C. 41-52.
13. Kamolov D. VIRTUAL TURIZM (VR) XIZMATLARINING RIVOJLANISH ISTIQBOLLARI

//Scientific practical conference. – 2025. – Т. 1. – №. 1. – С. 372-374.
14. Хайдаров Б., Туйчиева Н. Инновационные методы обучения информатике и образовательной робототехнике //Информатика и инженерные технологии. – 2023. – Т. 1. – №. 1. – С. 200-204.
15. Kamolov D., Asrayev S. STATE POLICY FOR THE DEVELOPMENT OF COMPETITION IN UZBEKISTAN //Science technology&Digital Finance. – 2023. – Т. 1. – №. 4. – С. 353-361.
16. Норбеков Х., Туйчиева Н. Формирование конкурентных преимуществ компании //Zamonaviy innovatsion tadqiqotlarning dolzarb muammolari va rivojlanish tendensiyalari: yechimlar va istiqbollar. – 2022. – Т. 1. – №. 1. – С. 589-592.
17. Saitov S., Tuychieva N. Main factors affecting economic growth in the country and their dynamics //Science technology&Digital finance. – 2023. – Т. 1. – №. 4. – С. 53-64.
18. Sirojiddin S., Nodira T., Dinora S. Characteristics of price and formation //Journal of Academic Research and Trends in Educational Sciences. – 2022. – Т. 1. – №. 11. – С. 265-270.
19. Nodira T., Xaydarov B., Zafar Q. The role and significance of competition and monopoly in the economy //Journal of Academic Research and Trends in Educational Sciences. – 2022. – Т. 1. – №. 11. – С. 241-245.
20. Kamolov D., Ismoilova D. THE IMPACT OF DIGITALIZATION ON THE ECONOMY OF UZBEKISTAN //Science technology&Digital Finance. – 2023. – Т. 1. – №. 4. – С. 301-306.
21. Tuychieva N., Xaydarov B., Rashidova G. Money-credit system in uzbekistan //Journal of Academic Research and Trends in Educational Sciences. – 2022. – Т. 1. – №. 11. – С. 246-250.
22. Nodira T., Sirojiddin S., Azizbek Z. Socio-economic systemS //Journal of Academic Research and Trends in Educational Sciences. – 2022. – Т. 1. – №. 11. – С. 260-264.
23. Цой М. П., Худояров Р. Т. Рашидов АР ПРОДВИЖЕНИЕ ЦИФРОВОЙ ТРАНСФОРМАЦИИ В УЗБЕКИСТАНЕ //Kompyuter ilmlari va muhandislik texnologiyalari. Xalqaro miqyosidagi ilmiy-texnik anjuman materiallari to‘plami–Jizzax: O‘zMU Jizzax filiali. – 2022.
24. Kamolov D. JIZZAX VILOYATIDA TURIZM KLASTERI RIVOJLANISHINING HUDUDNING IJTIMOIY-IQTISODIY SALOHIYATIGA TA’SIRINI BAHOLASH: STRATEGIK YONDASHUV VA RIVOJLANISH ISTIQBOLLARI //Scientific practical conference. – 2025. – Т. 1. – №. 1. – С. 48-52.
25. Абсалямова С., Зульфакарова Л., Цой М. ИНВЕСТИЦИИ В УСТОЙЧИВЫЕ ПРОЕКТЫ КАК СОВРЕМЕННЫЙ ТРЕНД МЕЖДУНАРОДНОГО ИНВЕСТИЦИОННОГО ПРОЦЕССА: https://doi. org/10.5281/zenodo. 14540147//International scientific and practical conference.–2024 //Т. – Т. 1. – №. 2. – С. 194-198.
26. Цой М., Зульфакарова Л., Наджмиддинов Д. РОЛЬ ПОДГОТОВКИ КАДРОВ ДЛЯ ТУРИСТИЧЕСКОЙ ОТРАСЛИ В РАЗВИТИИ НАЦИОНАЛЬНОЙ ЭКОНОМИКИ //Scientific practical conference. – 2025. – Т. 1. – №. 1. – С. 85-89.
27. Цой М. П., Рашидов А. Р. ДОХОДНОСТЬ И РИСКИ ФИНАНСОВЫХ ВЛОЖЕНИЙ //MODERN SCIENTIFIC CHALLENGES AND TRENDS. – 2021. – С. 44.