Chapter 31

# ACCOUNTING SUPPORT FOR WASTE MANAGEMENT IN THE CONTEXT OF TRANSITIONING TO A CIRCULAR ECONOMY: INTERNATIONAL EXPERIENCE AND PROSPECTS FOR UKRAINE

Zamula Iryna, Maistrenko Nataliya, Travin Vitalii
DOI https://doi.org/10.30525/978-9934-26-539-6-31

## INTRODUCTION

In recent decades, rapid economic progress has significantly impacted the state of the planet. Globalization, increasing consumption, and overpopulation have led to serious economic, environmental, and social challenges. The depletion of natural resources and the consequences of environmental disasters highlight the inefficiency of traditional methods of production, resource management, and waste management, which cause significant harm to both the environment and society.

To address these issues, a shift in societal development towards the concept of sustainable development is necessary. This involves transitioning from a "linear economy," where resources are used once and waste is discarded, to a "circular economy." The primary idea of a circular economy is to minimize waste, reuse resources, reduce environmental impact, and increase production efficiency.

The Covid-19 pandemic acted as a catalyst for the development of the circular economy on a global scale. Challenges caused by the war in Ukraine have further highlighted the need for environmentally efficient waste management methods. To rebuild the economy, it is crucial to implement strategic and sustainable business models, and the circular economy aligns with these requirements.

Today, the global circular economy market is estimated at over $1 trillion[1], [2]. However, according to Circularity Gap data, only 8.6% of the global

[1] Circularity Gap. URL: https://www.circularity-gap.world/2022 (date of access: 03.12.2024)

[2] Горбаль Н. І., Пліш І. В. Циркулярні бізнес-моделі для сталого розвитку українських підприємств. *Вісник Нац. ун-ту «Львівська політехніка». Серія «Проблеми економіки та управління»*, 2021, 5(1), С. 15–29. DOI: 10.23939/semi2021.01.015 (дата звернення: 02.12.2024)

economy adhered to circularity principles in 2022[3]. Each year, new tools, methods, and models are introduced and successfully applied in many countries. Therefore, as Ukraine rebuilds its economy post-war, it must align with the principles of circularity. By signing the Association Agreement with the EU in 2014, Ukraine declared its commitment to sustainable development.

Accounting serves as a key tool for resource management in the circular economy, evaluating financial results, and providing the information necessary to develop business strategies in line with sustainable development principles. The accounting system requires enhancement to incorporate the principles of sustainability and the circular economy.

## 1. Analysis of Recent Research and Publications

The analysis of recent research and publications underscores the relevance of studying the theoretical and methodological foundations of the circular economy as a basis for the sustainable development of enterprises. Both foreign and domestic scholars have actively explored this topic. The increasing number of publications featuring the keyword "circular economy" in journals indexed by the Scopus database highlights significant interest in this area (Figure 1).

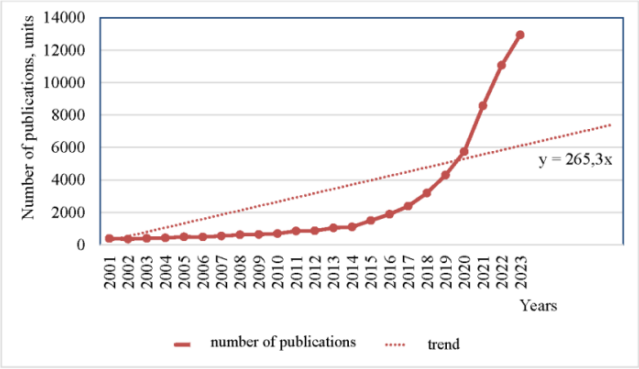


**Fig. 1. Dynamics of Publications with the Keyword "Circular Economy" in Journals Indexed by the Scopus Database**

*Source: constructed based on*[4]

[3] Circularity Gap. URL: https://www.circularity-gap.world/2022 (date of access: 03.12.2024)

[4] Пошук у наукометричній базі Scopus. URL: https://www.sciencedirect.com/search?qs=circular%20economy (дата звернення: 11.12.2024)

Research activity in this field saw notable growth starting in 2014, reaching 12,931 publications by 2023.

Studies on circular economy span various directions. Researchers such as K. Boulding[5], M. Braungart and W. McDonough[6], A. Wijkman and K. Skånberg[7,] W. Jiao and F. Boons[8], J. Korhonen, K. Nuur, and A. Feldmann[9], P. Sloan, S. Bernard, and S. Sauvage[10], W. Stahel[11], and A. Tucker[12] have examined opportunities to integrate the circular economy into enterprises across different industries.

In the Ukrainian context, authors such as M.O. Varfolomeyev[13], N.I. Horbal and I.V. Plish[14], M.M. Zalunin[15], M.L. Zlotnik and O.H. Melnyk[16],

---

[5] Boulding K. The economics of the coming spaceship earth. Environmental Quality in a Growing Economy: Essays from the Sixth RFF Forum. H. Jarrett. Baltimore, John Hopkins University Publ., 1966, p. 3-14

[6] McDonough W., Braungart M. Design for the Triple Top Line: New Tools for Sustainable Commerce. *Corporate Environmental Strategy*. 2002, Vol. 9, p. 251–258. DOI: 10.1016/S1066-7938(02)00069-6 (date of access: 20.12.2024)

[7] Війкман А., Сконберг К. Циркулярна економіка та переваги для суспільства (Дослідження щодо Чеської Республіки та Польщі). URL: http://www.clubofrome.org.ua/wp-content/uploads/2017/08/The-Circular-Economy-CoR_UA-2.pdf (дата звернення: 19.12.2024)

[8] Jiao W., Boons F. Toward a research agenda for policy intervention and facilitation to enhance industrial symbiosis based on a comprehensive literature review. *Journal of Cleaner Production*, 2014, 15, pp. 14-25. DOI: 10.1016/j.jclepro.2013.12.050 (date of access: 20.12.2024)

[9] Korhonen J., Nuur C., Feldmann A. Circular economy as an essentially contested concept. *Journal of Cleaner Production,* 2018, 175, pp. 117-125. DOI: 10.1016/j.jclepro.2017.12.111 (date of access: 18.12.2024)

[10] Sauve S., Bernard S., Sloan P. Environmental sciences, sustainable development and circular economy: alternative concepts for transdisciplinary research. *Environment,* 2016, 11, pp. 48–56. DOI: 10.4236/ojpp.2019.92012 (date of access: 24.11.2024)

[11] Stahel W.R., Reday-Mulvey G. Jobs for tomorrow: the potential for substituting manpower for energy. New York : Vantage Press, 1981, 116 p.

[12] Tukker A. Product services for a resource efficient and circular economy – a review. *Journal of Cleaner Production,* 2015, 15, pp. 76–91. DOI: 10.1016/j.jclepro.2013.11.049 (date of access: 16.11.2024)

[13] Варфоломєєв М.О. Циркулярна економіка як невід'ємний шлях українського майбутнього в аспекті глобалізації. *Ефективна економіка*, 2020, № 5. DOI: 10.32702/2307-2105-2020.5.200 (дата звернення: 15.11.2024)

[14] Горбаль Н. І., Пліш І. В. Циркулярні бізнес-моделі для сталого розвитку українських підприємств. *Вісник Нац. ун-ту "Львівська політехніка". Серія "Проблеми економіки та управління*", 2021, 5(1), С. 15–29. DOI: 10.23939/semi2021.01.015 (дата звернення: 02.12.2024)

[15] Залунін М.М. Циркулярна економіка як передумова забезпечення сталого розвитку. *Причорноморські економічні студії,* 2019, 47–1, С. 196–201. DOI: 10.32843/bses.47-69 (дата звернення: 11.12.2024)

[16] Злотнік М.Л., Мельник О.Г. Стратегічне управління впровадженням принципів циркулярної економіки на вітчизняних підприємствах. *Підприємництво та інновації*, 2020, № 12, С. 112–119. DOI: 10.37320/2415-3583/12.19 (дата звернення: 20.12.2024)

M.V. Ruda and Ya.V. Myrka[17], O.M. Chabanyuk and N.O. Loboda[18], and O.Ye. Kuzmin, O.H. Melnyk, and N.I. Horbal[19] have analyzed the application of circular economy principles and sustainable development practices within enterprises.

Specific aspects of circular economy accounting and analysis have been addressed by S. Wegera, A. Maley, I. Sapega, and V. Sushko[20], J.H. Husk[21], K. Krist and R. Barrit[22], Y. Xin, R.M.V. Horner, M.A. El-Haram, and J.A. Bebbington[23], Yu. Makovetska and T. Omelyanenko[24], N.H. Melnyk and V.Z. Semanyuk[25], P.K. Ozili[26], and L. Serhienko-Berdyukova[27].

Nevertheless, the development of accounting practices is influenced by the principles of sustainable development and the circular economy requires further investigation.

---

[17] Руда М.В., Мирка Я.В. Циркулярні бізнес-моделі в Україні. *Вісник Нац. ун-ту "Львівська політехніка". Менеджмент та підприємництво в Україні*, 2020, 2 (1), С. 107–121. DOI: 10.23939/smeu2020.01.107 (дата звернення: 19.11.2024)

[18] Чабанюк О. М., Лобода Н. О. Основні принципи концепції сталого розвитку. *Раціональне використання природних ресурсів та ресурсозбереження.* 2019. URL: https://conf.ztu.edu.ua/wp- content/uploads/2019/12/64.pdf (дата звернення: 20.12.2024)

[19] Підвищення конкурентоспроможності ЄС: циркулярна економіка: монографія. (2021). За ред. О. Є. Кузьміна, О. Г. Мельник, Н. І. Горбаль. Львів: Міські інформаційні системи, 190 с.

[20] Vegera S., Malei A., Sapeha I., Sushko V. Information support of the circular economy: the objects of accounting at recycling technological cycle stages of industrial waste. *Entrepreneurship and Sustainability Issues*. 2018, Vol. 6. Iss. 1. P. 190–210. DOI: https://doi.org/10.9770/jesi.2018.6.1(13) (date of access: 15.12.2024)

[21] Gusc J. Accounting in a Circular Economy: The Way Forward: *Master's Thesis*. 2019.

[22] Christ K. L., Burritt R. L. Material flow cost accounting: a review and agenda for future research. Journal of Cleaner Production. 2015. Vol. 108, part B, p. 1378-1389. DOI: https://doi.org/10.1016/j.jclepro.2014.09.005 (date of access: 12.11.2024)

[23] Xing Y., Horner R. M. W., El-Haram M. A., Bebbington J. A framework model for assessing sustainability impacts of urban development. *Accounting Forum*. 2009, Vol. 33. Iss. 3. P. 209–224. DOI: https://doi.org/10.1016/j.accfor.2008.09.003 (date of access: 10.12.2024)

[24] Маковецька Ю., Омельяненко Т. Формування та реалізація політики циркулярної економіки в Україні. Ефективна економіка. 2018. № 11. DOI: 10.32702/2307-2105-2018.11.86. (дата звернення: 15.12.2024)

[25] Мельник Н. Г., Семанюк В. З. Розвиток обліку в умовах циркулярної економіки. Стан і перспективи розвитку бухгалтерського і управлінського обліку в умовах глобалізації : *монографія*. Тернопіль : Університетська думка, 2020. С. 77–85.

[26] Ozili P.K. Sustainability Accounting. 2021. URL: https://ssrn.com/abstract=3803384 (date of access: 15.11.2024)

[27] Сергієнко-Бердюкова Л.В. Передумови формування та впровадження концепції циркулярної економіки. *Проблеми теорії та методології бухгалтерського обліку, контролю і аналізу* : міжнародний збірник наукових праць. 2015. Вип. 3 (33), С. 39-47.

## 2. Theoretical Aspects of Accounting in the Context of Implementing a Circular Economy as a Basis for Sustainable Enterprise Development

By 2050, the global population is expected to reach 9.6 billion, requiring the equivalent of three Earth-like planets to sustain current consumption levels of natural resources[28]. Over the past six years, half a trillion tons of primary resources have been used 70% more than the planet's regenerating capacity[29]. This scenario threatens the future development of industries, the ability to meet population needs, and quality of life. Inefficient resource utilization, increasing material intensity, and ineffective resource management lead to environmental crises, depletion of natural wealth, and reduced productivity of enterprises. This has prompted a shift from a linear to a circular economy[30],[31],[32].

The concept of the circular economy, based on the principle of "take, use, recycle," was developed in response to sustainable development challenges. This approach draws inspiration from natural ecosystems, where resources are continuously cycled. The circular economy aims to address the key issues characteristic of the linear economic model (Table 1).

Table 1

**Issues of the Linear Economy and Solutions Provided by the Circular Economy**

| Issues of the Linear Economy | Solutions of the Circular Economy |
|---|---|
| Inefficient resource utilization | Reforming business processes and adapting value chains to sustainability principles |
| Depletion of natural resources | Using renewable, secondary materials and alternative energy sources |

[28] Відповідальне державне споживання. Вокс Україна. URL: https://voxukraine.org/uk/vidpovidalne-derzhavne-spozhivannya-yak-tsirkulyarni-zakupivli-mozhut-vryatuvati-svit/ (дата звернення: 11.11.2024)

[29] Circularity Gap. URL: https://www.circularity-gap.world/2022. (date of access: 03.12.2024)

[30] Ellen MacArthur Foundation. Circular economy and the Covid-19 recovery. URL: https://www.ellenmacarthurfoundation.org/assets/downloads/The-circular-economy-a-transformative-Covid19- recovery-strategy.pdf (date of access: 11.12.2024)

[31] McLeod F. et al. Developing innovative and more sustainable approaches to reverse logistics for the collection, recycling and disposal of waste products from urban centres*: Literature review and identification of opportunities*, 2010. URL: www. greenlogistics.org (date of access: 24.11.2024)

[32] Залунін М.М. Циркулярна економіка як передумова забезпечення сталого розвитку. *Причорноморські економічні студії,* 2019, 47–1, С. 196–201. DOI: 10.32843/bses.47-69 (дата звернення: 11.12.2024)

Продовження таблиці 1

| | |
|---|---|
| Unequal access to resources | Introducing reverse logistics systems, rental services, sharing models, and promoting conscious consumption |
| Environmental pollution | Legislative regulation of environmental impacts by businesses and the development of environmental reporting |
| Large volumes of waste | Waste reduction through extending product lifecycles and reusing their components |

*Source: summarized from*[33]

Thus, implementing a circular economy is a justified response to global challenges that could lead to irreversible consequences. This model necessitates a transformation in business approaches, emphasizing the production of goods with extended lifecycles and the possibility of multiple renewals.

In addition to environmental benefits, the circular economy offers significant economic advantages, including additional revenue streams, enhanced competitiveness, market expansion, resource optimization, increased social responsibility, improved consumer loyalty, enhanced corporate culture, and the prevention of resource depletion risks at all stages of production.

This model serves as a catalyst for a new industrial revolution, aimed at achieving maximum resource efficiency and realizing the goals of sustainable development[34]. Its implementation will help reduce the negative anthropogenic impact on the environment.

The circular economy is underpinned by the principles of the 10R framework[35]:

1. Refuse – Avoid production using certain materials or technologies; propose alternative solutions.
2. Rethink – Rethink approaches to product usage.
3. Reduce – Minimize the use of natural resources.
4. Reuse – Reuse products after modification.
5. Repair – Fix defects to extend product life.

[33] Сергієнко-Бердюкова Л.В. Передумови формування та впровадження концепції циркулярної економіки. *Проблеми теорії та методології бухгалтерського обліку, контролю і аналізу* : міжнародний збірник наукових праць. 2015. Вип. 3 (33). С. 39-47.

[34] Підвищення конкурентоспроможності ЄС: циркулярна економіка: *монографія*. За ред. О.Є. Кузьміна, О.Г. Мельник, Н.І. Горбаль. Львів: Міські інформаційні системи, 2021, 190 с.

[35] The new model for consumer goods. URL: https://www.mckinsey.com/industries/consumer- packagedgoods/our-insights/the-new-model-for-consumer-goods (date of access: 11.12.2024)

6. Refurbish – Upgrade outdated products.
7. Remanufacture – Integrate components from old products into new ones.
8. Repurpose – Change the functional purpose of a product.
9. Recycle – Process materials into new products.
10. Recover – Obtain energy through material utilization.

A critical component of the circular economy is the management of various types of waste[36], [37]. The European Union applies a waste management hierarchy, depicted in Figure 2.

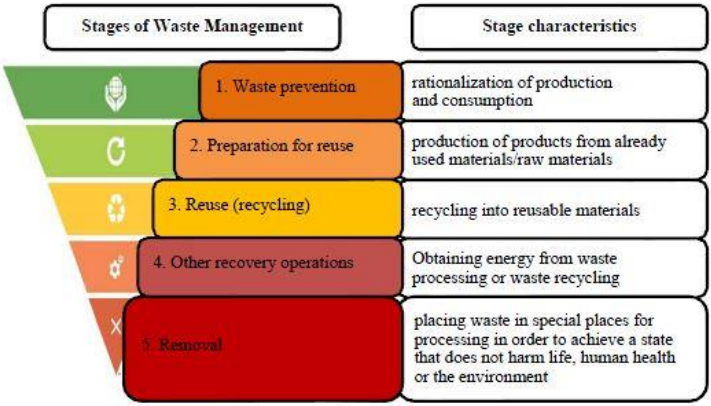


**Figure 2. Hierarchy of Waste Management Stages ()**

*Source: developed using*[38], [39]

This waste management system is based on prioritizing waste prevention, preparation for reuse, recycling, and other recovery methods. If these stages are not feasible, waste is disposed of in designated areas and subsequently

[36] McLeod F. et al. Developing innovative and more sustainable approaches to reverse logistics for the collection, recycling and disposal of waste products from urban centres*: Literature review and identification of opportunities*, 2010. URL: www. greenlogistics.org (date of access: 24.11.2024)

[37] Reverse logistics. URL: http://www.greenlogistics.org/themesandoutputs/ wm10/index.htm (date of access: 20.11.2024)

[38] Управління відходами. *Офіційний портал. Міністерство захисту довкілля та природних ресурсів України.* URL: https://mepr.gov.ua/timeline/Vidhodi-ta-nebezpechni-rechovini.html (дата звернення: 11.12.2024)

[39] Starostka-Patyk M. Reverse logistics processes in industrial waste management as an element of sustainable development. *Annales Universitatis Apulensis Series Oeconomica*, 2010, 12(2), pp. 698–707. DOI: 10.29302/oeconomica.2010.12.2.22 (date of access: 26.11.2024)

processed for neutralization, ensuring it is safe for humans and the environment.

At a global level, circular economy principles are considered tools for accelerating the transition toward more efficient resource usage–critical in addressing ecological challenges. Each year, approximately 2.3 billion tons of waste are generated within the EU, with less than half being recycled[40]. This indicates inefficient resource use, negatively affecting both the environment and public health.

The circular economy aims to address these issues through various measures:

- waste prevention,
- extending resource lifecycles,
- recycling materials,
- redesigning products and business processes,
- developing innovative solutions,
- promoting sustainable consumption models.

These measures are expected to reduce waste volumes, improve environmental conditions, and enhance living standards[41], [42].

EU countries are at the forefront of implementing circular economic principles. In 2015, the European Commission adopted the Circular Economy Action Plan (CEAP), which was successfully implemented by 2019. In March 2020, a new action plan was introduced, focusing on increasing resource reuse and recycling, reducing consumption, and stimulating economic growth[43].

Additionally, the Horizon Europe program supports innovative waste management projects, creating business opportunities and increasing job availability.

EU Waste Management Goals by 2030[44]:

- Recycling 70% of packaging materials and 65% of municipal waste,
- Reducing solid household waste sent to landfills to just 10%,
- Ensuring all plastic packaging is fully recyclable.

---

[40] Circular Economy OVERVIEW. URL: https://www.eib.org/attachments/thematic/circular_economy_overview_2021_en.pdf. (date of access: 06.12.2024)

[41] Circularity Gap. URL: https://www.circularity-gap.world/2022. (date of access: 03.12.2024)

[42] Підвищення конкурентоспроможності ЄС: циркулярна економіка: *монографія*. За ред. О.Є. Кузьміна, О. Г. Мельник, Н. І. Горбаль. Львів: Міські інформаційні системи, 2021. 190 с

[43] Нова політика ЄС з "циркулярної" економіки: можливості для України (2020). URL: https://dixigroup.org/wp-content/uploads/2020/09/dixi_pb_circular-economy_ukr_full_3.pdf (дата звернення: 12.11.2024)

[44] Нова політика управління відходами – основа економіки замкненого циклу (2018). URL: http://conference.chamber.ua/. (дата звернення: 11.11.2024)

By 2035, the EU plans to implement a "roadmap" to conserve resources through:

- Environmental taxes, subsidies, and grants,
- Financial support initiatives,

On average, EU countries allocate about 0.8% of GDP annually toward environmental protection45.

Adopting EU best practices in sustainable development and circular economy is crucial for Ukraine, especially in the context of post-war recovery and EU integration. In 2020, during the Ukraine-EU summit, the "Climate Package for a Sustainable Economy in Ukraine" agreement was signed. This agreement provides financing for projects in clean, climate-neutral economic sectors and increases investments in Ukraine's economy[46].

Despite these initiatives, the full-scale war starting on February 24, 2022, hindered Ukraine's progress, decreased investor confidence (domestic and foreign), and slower adoption of circular economy principles, as pre-war implementation rates were already lower than in developed countries. Furthermore, growing industrial production has exacerbated the depletion of natural resources, inefficient resource use, increased waste generation, and worsening environmental conditions.

As of 2020, approximately 10 million tons of municipal waste had accumulated in Ukraine, dispersed across more than 6,000 landfills and disposal sites covering a total area of 9,000 hectares[47]. The utilization and recycling of municipal waste remains critically low: only 6.3% of all municipal waste was treated, with 4.6% directed to recycling and 1.7% incinerated[48]. These figures indicate an unsatisfactory state of waste management in the country.

To accelerate the transition to a circular economy and minimize waste generation, Ukrainian producers are encouraged to adopt the best practices of enterprises in EU countries. The key principles of these practices include:

- Substituting primary raw materials with secondary materials to reduce dependency on the extraction of new resources.

---

[45] Курс на економіку замкненого циклу, ролі споживачів, бізнесу і держави, переваги та інструменти цієї моделі (2020). URL: https://ziif.in.ua/2020/11/11/kurs-na-ekonomiku-zamknenoho-tsyklu-rolspozhyvachiv- biznesu-i-derzhavy-perevahy-ta-instrumenty-tsiiei-modeli/ (дата звернення: 11.11.2024)

[46] Перший рік Green Deal: як Україна інтегрується в нову екологічну політику ЄС? (2020). *Європейська правда*. URL: https://lexinform.com.ua/v-ukraini/pershyj-rik-green-deal-yak-ukrayina-integruyetsya-v- novu-ekologichnu-polityku-yes/ (дата звернення: 10.11.2024)

[47] Стан сфери поводження з побутовими відходами в Україні (2020). Міністерство розвитку громад та територій України. URL: https://www.minregion.gov.ua/napryamki-diyalnosti/zhkh/terretory/stan-sfery- povodzhennya-z-pobutovymy-vidhodamy-v-ukrayini-za-2020-rik-2 (дата звернення: 11.12.2024)

[48] Там само.

– Improving production processes to prevent waste generation.

– Assessing energy consumption and waste generation during production optimization.

– Integrating eco-design into product policies to reduce the environmental impact of products.

– Focusing on resource productivity, rather than solely on labor productivity.

– Simplifying production processes by reducing the number of technological stages.

– Implementing circular resources to maximize the reuse of raw materials and energy in the economic cycle.

– Automating and optimizing production to enhance its efficiency.

– Assigning producer responsibility for products at all stages of their life cycle, ensuring their reusability or recyclability.

– Transitioning to a circular production system, which emphasizes maximum utilization of secondary resources.

– Establishing state regulations to incentivize entities adhering to circular economy principles and impose sanctions on those violating established environmental standards[49], [50], [51], [52], [53], [54], [55].

Implementing these measures will contribute to reducing environmental pressures and ensuring sustainable development in Ukraine.

---

[49] Circular Economy OVERVIEW. URL: https://www.eib.org/attachments/thematic/circular_economy_overview_2021_en.pdf. (date of access: 06.12.2024)

[50] Варфоломєєв М.О. Циркулярна економіка як невід'ємний шлях українського майбутнього в аспекті глобалізації. *Ефективна економіка, 2020, №* 5. DOI: 10.32702/2307-2105-2020.5.200 (дата звернення: 15.11.2024)

[51] Горбаль Н. І., Пліш І. В. Циркулярні бізнес-моделі для сталого розвитку українських підприємств. *Вісник Нац. ун-ту "Львівська політехніка". Серія "Проблеми економіки та управління"*, 2021, 5(1), С. 15–29. DOI: 10.23939/semi2021.01.015 (дата звернення: 02.12.2024)

[52] Злотнік М. Л., Мельник О. Г. Стратегічне управління впровадженням принципів циркулярної економіки на вітчизняних підприємствах. *Підприємництво та інновації*, 2020, № 12, С. 112–119. DOI: 10.37320/2415-3583/12.19 (дата звернення: 20.12.2024)

[53] Підвищення конкурентоспроможності ЄС: циркулярна економіка: *монографія*. За ред. О. Є. Кузьміна, О. Г. Мельник, Н. І. Горбаль. Львів: Міські інформаційні системи, 2021, 190 с.

[54] Руда М.В., Мирка Я.В. Циркулярні бізнес-моделі в Україні. *Вісник Нац. ун-ту "Львівська політехніка". Менеджмент та підприємництво в Україні*, 2020, 2 (1), С. 107–121. DOI: 10.23939/smeu2020.01.107 (дата звернення: 19.11.2024)

[55] Гетьман А.П. Впровадження циркулярної економіки в законодавство України відповідно до вимог ЄС: критичний аналіз. Нормативно-інституційне забезпечення сприяння господарській діяльності в інноваційному суспільстві : *монографія*. Харків : НДІ прав. забезп. інновац. розвитку НАПрН України, 2020. 312 с. URL: https://openarchive.nure.ua/server/api/core/bitstreams/2f145ecd-82ee-467a-b8c9-10fe515dbbe7/content (дата звернення: 19.11.2024)

Table 2 provides a SWOT analysis of the integration of circular economy principles into the activities of Ukrainian enterprises.

Table 2

**SWOT Analysis of Circular Economy Integration in Ukrainian Enterprises**

| Strengths | Weaknesses |
|---|---|
| – Enhanced international competitiveness, especially in EU markets. | – Difficulty in securing financing. |
| – Government support for innovations related to sustainable development. | – Necessity for modernization of production facilities and technologies. |
| – Strengthened consumer trust and loyalty. | – Insufficient consumer awareness of eco-friendly production. |
| – Increased corporate social responsibility. | – Long payback periods for investments. |
| – Reduced negative environmental impacts. | – Lack of qualified personnel in this field. |
| – Improved efficiency of business processes. | – Inadequate legislative regulation. |
| Opportunities | Threats |
| – Creation of new jobs. | – Legislative environment instability. |
| – Attraction of grant funding. | – Potential losses in the initial stages of project implementation. |
| – Partnerships with other companies in the circular economy sphere. | – Decline in product or packaging quality due to the use of recycled materials. |
| – Resource optimization. | |

*Source: compiled based on*[56]

Thus, although the implementation of the circular economy faces certain challenges and risks, its strengths and opportunities significantly outweigh them. Over time, issues such as insufficient consumer awareness or a lack of skilled professionals will be mitigated through the rapid dissemination of information about the circular economy. Adopting its principles will enable enterprises to become more competitive in both domestic and international markets.

[56] Горбаль Н. І., Ломага Ю. Р. Циркулярна економіка – основа сталого розвитку підприємств. *Вісник Національного університету "Львівська політехніка". Серія "Проблеми економіки та управління"*, 2022, № 1 (9). URL: https://science.lpnu.ua/sites/default/files/journal-paper/2022/apr/27434/220198verstka-11-26.pdf (дата звернення: 03.12.2024)

To implement the circular economy at the enterprise level, the following steps are necessary:

1. Interaction with external stakeholders.
2. Securing leadership support.
3. Formulating and aligning the circular economy concept.
4. Developing a business model that incorporates its principles.
5. Training personnel in new working methods.
6. Involving various company departments in implementing circular processes.
7. Using innovations in products, processes, and business models.
8. Collaborating with other companies for optimal resource sharing.
9. Developing key performance indicators.
10. Creating social benefits within the circular economy framework[57].

During martial law, Ukrainian enterprises are focused on survival, which slows down the implementation of circular economy models. The primary obstacles include limited resources for innovation and scientific research. However, despite these challenges, integrating the principles of the circular economy will provide long-term benefits, fostering sustainable economic development.

To ensure successful post-war recovery, it is essential to adopt new approaches to production and consumption, integrate cross-sectoral initiatives, develop recycling systems, invest in environmentally oriented projects, and reduce environmental impact. These measures will contribute to European integration, economic growth, environmental improvement, and a higher quality of life.

The key role in implementing the circular economy belongs to accounting, which ensures the following:

1. Resource monitoring – controlling the use of secondary materials and waste, as well as assessing their efficiency.
2. Financial impact assessment – tracking costs, revenues, and financial outcomes of circular processes.
3. Management information support – analyzing data to optimize activities and increase profitability.
4. Disclosure of information – reflecting economic, environmental, and social aspects of activities in reporting.

Thus, transitioning to a circular economy is essential for addressing global environmental challenges and achieving balanced development.

[57] Горбаль Н.І., Адамів М.Є., Чумак А.С. Адаптація принципів циркулярної економіки управління відходами в Україні. *Вісник Національного університету "Львівська політехніка". Серія «Проблеми економіки та управління»*. 2020. Т. 1, № 4. С. 159–166. DOI: https://doi.org/10.23939/semi2020.01.159 (дата звернення: 02.12.2024)

The EU experience demonstrates the effectiveness of this model, which positively impacts both the environment and the economy. Accounting and economic analysis play a critical role in ensuring transparent resource management and financial performance of enterprises.

## 3. Regulatory Framework for Circular Economy and its Information Support in Agricultural Enterprises

Amid global challenges and the intensification of environmental issues, the implementation of the circular economy is becoming particularly significant for agricultural enterprises. This approach allows for the organization of waste-free production, efficient resource use, and the recycling of materials, which is critically important for an industry with a significant impact on the environment.

To ensure the effective functioning of the circular economy, enterprises require an accounting system that provides comprehensive information about the status and utilization of resources at all stages. Such a system enables stakeholders to make environmentally balanced decisions, supports the implementation of resource-saving technologies, and ensures financial transparency.

Accounting in the circular economy must provide information reflecting the rational use of resources, waste reduction, and compliance with environmental standards. Its primary goal is to support sustainable development, preserve ecological balance, and increase the accountability of enterprises to society.

Despite the absence of specific legal provisions for the circular economy in Ukrainian legislation, its principles are gradually being integrated through Ukraine's commitment to harmonize its legislative framework with EU regulations[58]. Following the signing of the Association Agreement with the EU, Ukraine undertook the responsibility to implement European directives related to sustainable development and resource management into national legislation.

The EU's long-term vision in the field of environmental protection defines the timeframes and mechanisms through which the principles of the innovative circular economy are expected to become universally accepted[59].

[58] Угода про асоціацію між Україною, з однієї сторони, та Європейським Союзом, Європейським співтовариством з атомної енергії і їхніми держава- ми-членами, з іншої сторони : від 30.11.2015 № 984_011. URL: https://zakon.rada.gov.ua/laws/show/984_011# Text (дата звернення: 11.12.2024)

[59] Decision of the European Parliament and of the Council on a General Union Environment Action Programme to 2030. URL: https://ec.europa.eu/environment/ pdf/ 8EAP/2020/10/8EAP-draft.pdf (date of access: 25.11.2024)

However, Ukrainian legislation, specifically the Law on Waste[60], does not include the concept of "circular economy," indicating gaps in the regulatory framework.

A comparison of the term "waste" in the EU and Ukrainian legislation also reveals differences. Directive 2008/98/EC defines waste as any material or object from which the owner disposes or intends to dispose. In contrast, the Ukrainian Law on Waste covers not only materials that have lost their consumer properties but also those generated during production or consumption that must be disposed of or eliminated. Therefore, the Ukrainian definition is broader.

The waste management hierarchy established by Directive 2008/98/EC proposes a priority order: waste prevention, preparation for reuse, recycling, energy recovery, and, finally, disposal. To promote this hierarchy, economic instruments are suggested, which are not currently provided for in Ukrainian legislation.

Special attention should be given to the implementation of the "extended producer responsibility" principle. This principle shifts the responsibility for waste management from consumers or the state to the producers. It encourages increased environmental responsibility among enterprises, reduces negative environmental impacts, and creates an effective recycling system.

The implementation of this principle involves the following obligations for producers:

- Accepting used products and waste;
- Organizing proper waste management;
- Financing recycling activities;
- Providing information on opportunities for reuse and recycling.

The introduction of such mechanisms in Ukraine will contribute to harmonization with European standards, enhance environmental responsibility, and enable effective waste management.

The Law of Ukraine "On Waste" has a positive impact, as it supports business entities, waste owners, and consumers in implementing a system for separate waste collection (sorting). However, most of the provisions of the law apply only to household waste, leaving other types, including agricultural production waste, unaddressed.

According to V.A. Zuyev, to improve national legislation in the area of the circular economy, a comprehensive legal regulation model for waste management should be developed, covering three key aspects:

1. Preventing the generation of new waste.

[60] Про відходи: Закон України від 05.03.1998 № 187/98-ВР. URL: https://zakon.rada.gov.ua/laws/show/187/98-%D0%B2%D1%80 (дата звернення: 11.12.2024)

2. Implementing an effective management system that reduces waste generation and ensures its safe disposal.

3. Addressing issues with already accumulated waste, which is complex due to the lack of an ecological approach to its production and disposal in the past[61].

Among the most effective measures to support the circular economy are the development of strategies with clearly defined goals and support for enterprises that adhere to its principles. However, actions such as increasing environmental taxes or raising fossil fuel prices often provoke a negative response in society.

Particularly significant is the introduction of a "green" public procurement policy, which could significantly contribute to the transition to a circular economy. In the EU, public procurement accounts for approximately 20% of GDP, and European experts emphasize the importance of this tool for ecological transformations[62].

Thus, for Ukraine, it is crucial to adapt national legislation to European standards, particularly by improving the waste management system and defining the legal, organizational, and economic foundations for control. This will ensure environmental protection and public health by preventing waste generation, reducing its negative impact, and preparing for reuse and recovery as secondary raw materials or energy resources.

To ensure effective waste management, it is necessary to create a system that includes inventory and identification of waste, development of passports for each type of waste, preparation of maps of waste generation sites, calculation of norms for waste generation and allowable volumes, as well as maintaining records and continuous monitoring of all types of waste. Without such measures, proper waste management is impossible.

In Ukraine, there are a few regulatory acts that govern waste management and its accounting support. However, their effectiveness largely depends on adaptation to modern conditions, particularly the challenges posed by martial law. The regulation of accounting in the context of the circular economy encompasses both national laws and international standards, which promote the implementation of best practices in the agricultural sector.

---

[61] Зуєв В.А. Проблеми гармонізації господарсько-правового та еколого- правового регулювання у сфері поводження з відходами. Правова позиція. 2017. № 1 (18). С. 111. URL: http://biblio.umsf.dp.ua/jspui/bitstream/123456789/2910/1/11.%20%D0%97%D1%83%D1%94%D0%B2.pdf. (дата звернення: 11.12.2024)

[62] Backes C. Law for a Circular Economy. 2017, p. 61-65. URL: https://www.elevenpub.com/en/product/100-12110_Law-for-a-Circular-Economy (date of access: 19.12.2024)

National accounting standards in Ukraine define the fundamentals of accounting and financial reporting. In the context of the circular economy, their adaptation to current challenges becomes a key factor in ensuring the sustainability of agricultural enterprises. Ukrainian standards account for the specifics of biological asset accounting, expenses related to environmentally friendly technologies, and the accounting of waste suitable for reuse. Meanwhile, international financial reporting standards provide the ability to objectively assess assets and liabilities, which facilitates the adoption of environmentally responsible decisions.

The integration of ecological, economic, and social aspects into the operations of agricultural enterprises enhances their resilience and competitiveness in the face of modern environmental challenges. Companies that adhere to international standards gain greater trust from partners and investors, as well as better opportunities to enter international markets with high environmental requirements. Compliance with international waste management standards fosters effective international cooperation and sustainable development.

Adhering to legislative requirements in accounting when creating an information base for managing production waste enables enterprises to effectively control and optimize costs associated with this process. Reflecting waste management costs in accounting allows for their economic analysis and provides a basis for finding ways to reduce expenses through the implementation of more efficient management methods.

Compliance with legal requirements also contributes to increasing transparency in the enterprise's activities, which is a key factor in strengthening trust from partners, shareholders, and investors, especially in the context of environmentally responsible business practices.

## 4. Production Waste in Agricultural Enterprises as an Object of Accounting

Ukraine traditionally holds leading positions in agricultural production. However, a significant amount of waste is generated during the production process, leading to accumulation problems. In 2019, the volume of crop production waste reached 127,849.1 thousand tons, while animal production waste amounted to 49,645.6 thousand tons[63]. Currently, there is no effective mechanism that would allow enterprises to derive economic benefits from the use of such waste, for example, through its energy potential.

[63] Проєкт Національного плану управління відходами до 2033 року. Міністерство захисту довкілля та природних ресурсів України – офіційний сайт. URL: https://mepr.gov.ua/ (дата звернення: 20.11.2024).

Another significant issue is the hazardous nature of some waste for the environment. Although, according to the National Waste Management Strategy, the volume of hazardous waste classes 1–3 is relatively small, the majority of waste falls under class 4 hazard. Nevertheless, their accumulation and irrational use create ecological risks and overlook potential economic benefits.

Furthermore, the information system for waste management in agricultural enterprises is underdeveloped. Therefore, the issue of waste accounting becomes particularly relevant, as it impacts the quality of data used for decision-making.

Waste generated in agriculture can be valuable raw materials for energy and fuel production. Sources of such waste include crop production, livestock farming, agrochemicals, and aquaculture. In addition, inorganic waste, such as pesticides and agrochemicals, is also produced during activities. All this waste arises at different stages of the production cycle.

Waste from crops and livestock production can not only be disposed of but also used for various purposes. For example, it can be used to produce biofuels or biofertilizers. However, as noted by P.V. Zhuk[64], the creation of an effective agricultural resource recycling system remains a challenge. At the same time, the experience of foreign researchers indicates that the use of biofuels contributes to employment, economic development, energy security, and the diversification of agricultural enterprises' activities.

According to Ukraine's Energy Balance data, in 2020, the share of biofuels and waste in heat energy production was less than 5%, while in European countries, this figure was significantly higher: 60% in Sweden, 31% in Austria, 27% in Finland, and 15% in Latvia[65]. Ukraine has great potential for developing this direction. Crop production waste, such as stems and leaves, can be used for energy generation, while manure from livestock farming can be used for soil fertilization.

Another method of utilizing waste is its sale to other enterprises interested in such raw materials. For instance, if a plant production enterprise cannot independently use its waste, the best option may be to sell it to other businesses.

[64] Жук П. Відходи сільського господарства в Україні: обсяги утворення та питання рециклінгу. *Соціально-економічні проблеми сучасного періоду України*. 2022. № 3. URL: https://ird.gov.ua/sep/sep20223(155)/sep20223(155)_021_ZhukP.pdf (дата звернення: 11.12.2024).

[65] Біомаса – переваги та особливості – Municipal Energy Reform Project in Ukraine (MERP). *Проект USAID "Муніципальна енергетична реформа в Україні" – Municipal Energy Reform Project in Ukraine (MERP)*. URL: https://merp.org.ua/articles/167-2015-04-14-06-55-50.html (дата звернення: 09.12.2024).

Given the characteristics of agricultural production waste, it is crucial to reflect these in accounting records. The foundation for organizing accounting is the general regulatory and legal framework, with the key element being the Law of Ukraine "On Accounting and Financial Reporting in Ukraine." Additionally, other regulatory documents and National Regulations (standards), created in accordance with this law, are used. According to paragraph 1 of Article 47 of the Law of Ukraine "On Waste Management," each enterprise is required to account for waste by volume, codes, names, sources of generation, and waste management operations[66].

However, at present, accounting legislation does not regulate the organizational and methodological reflection of agricultural waste. Since some waste can be reused, i.e., is recyclable, it is considered part of the enterprise's inventory. Consequently, the general rules of accounting should apply to it, particularly regarding initial assessment, revaluation, depreciation, and evaluation upon disposal. However, the specific nature of agricultural waste necessitates the development of special organizational and methodological guidelines for its accounting.

The primary characteristic of waste lies in the loss of its original value and form. Meanwhile, inventories produced during the manufacturing process that can be reused or sold are not considered waste in accounting. In this context, proper classification of waste is essential.

Horobets O.V.[67] suggested classifying agricultural waste based on its disposal potential, which is determined by its hazard class. According to his approach, agricultural waste can be divided into organic and inorganic categories. These groups are further divided into safe and low-hazardous (class IV) and hazardous (classes I–III) waste. Additionally, the classification of waste is governed by the State Classifier of Ukraine "Waste Classifier"[68].

Waste classification is an important factor for its recognition and evaluation in accounting, as well as for its management. For example, classification by degree of hazard determines the methods of disposal, storage, and transportation. It helps identify whether specific waste requires special storage conditions or disposal methods.

---

[66] Про управління відходами: Закон України від 20.06.2022 № 2320-IX : станом на 29 черв. 2024 р. URL: https://zakon.rada.gov.ua/laws/show/2320-20#Text (дата звернення: 20.11.2024).

[67] Горобець О. Класифікація сільськогосподарських відходів і вибір технології їх утилізації. *Екологічні науки*. 2020. № 4. С. 225–229. URL: http://ecoj.dea.kiev.ua/archives/2020/4/4_2020.pdf#page=225 (дата звернення: 11.12.2024).

[68] Державний класифікатор України. Класифікатор відходів ДК 005-96 (Розділи А.1 – А.20) : від 29.02.1996 № 89. URL: https://zakon.rada.gov.ua/rada/show/v0089217-96#Text (дата звернення: 23.11.2024)

Such classification not only minimizes risks to humans and the environment but also contributes to the creation of an effective waste management mechanism at the enterprise level. It is also an important tool for developing environmentally safe and economically advantageous solutions for waste management.

Supporting the position of O.V. Horobets[69] and considering the requirements of the State Classifier of Ukraine "Waste Classifier"[70], a classification of agricultural production waste has been developed (Table 3).

Table 3

**Developed classification of agricultural production waste for accounting purposes**

| No. | Classification Group | Type of Waste |
|---|---|---|
| 1 | By type of main production | Crop production |
| | | Livestock production |
| 2 | By origin | Organic |
| | | Inorganic |
| 3 | By potential for economic gain | Recyclable |
| | | Non-recyclable |
| 4 | By hazard level | Low-hazard (Class IV waste) |
| | | Hazardous (Classes I, II, III waste) |

*Source: Own development*

The division of waste by type of main production into crop production and livestock production helps identify the industry in which the waste is generated, thus facilitating waste management. The distinction between organic and inorganic waste is important for identifying useful properties, as organic waste can be used for alternative energy production or fertilizers.

The division into recyclable and non-recyclable waste highlights those with potential for economic benefit. For example, recyclable waste can be reused, processed, or sold.

The classification by hazard level is practically important for selecting the appropriate waste management methods. Low-hazard waste (Class IV) does not require special storage or disposal conditions, while hazardous waste (Classes I–III) must comply with strict environmental standards.

[69] Горобець О. Класифікація сільськогосподарських відходів і вибір технології їх утилізації. *Екологічні науки*. 2020. № 4. С. 225–229. URL: http://ecoj.dea.kiev.ua/archives/2020/4/4_2020.pdf#page=225 (дата звернення: 11.12.2024).

[70] Державний класифікатор України. Класифікатор відходів ДК 005-96 (Розділи А.1 – А.20) : від 29.02.1996 № 89. URL: https://zakon.rada.gov.ua/rada/show/v0089217-96#Text (дата звернення: 23.11.2024)

The proposed classification forms the basis for creating a working chart of accounts for agricultural enterprises regarding the accounting of production waste. Reflecting information about waste according to these groups will improve waste management, provide data for decision-making in line with the sustainable development concept, and ensure compliance with environmental regulations.

Currently, the absence of theoretical and methodological guidelines for accounting agricultural production waste leaves enterprises to address the issue on their own. Therefore, the proposed classification could serve as the foundation for developing unified methodological approaches for waste accounting and management.

Correctly reflecting waste in accounting is an essential tool for managing waste. It will provide accurate information for optimal waste management, including determining the most efficient methods for disposal or commercialization.

## CONCLUSIONS

In the context of European integration, Ukrainian enterprises must adopt the experience of European Union countries in implementing circular economy principles. This will foster sustainable development, enhance competitiveness, and meet modern environmental standards. The circular economy model is based on reducing resource use, reusing, and recycling, which aligns with the concept of sustainable development. Implementing this model requires the improvement of accounting and economic analysis to support managerial decision-making.

Accounting in the context of a circular economy should perform the following tasks: monitoring resources; evaluating their impact on financial results; providing informational support for management; developing optimization strategies; and disclosing information. These tasks aim to ensure the sustainable development of enterprises, reduce environmental impact, and increase investment attractiveness.

Currently, Ukrainian legislation does not address all aspects of the circular economy, particularly producer responsibility, ecological design, collection, recycling, and waste disposal. Studying global best practices allows for the adaptation of these practices to optimize national legislation and harmonize it with EU norms.

The study has concluded that agricultural waste includes all materials generated from economic activities. A classification has been developed, dividing waste by the type of primary production, origin, potential for economic benefit, and hazard level. This classification could serve as a basis

for creating a working chart of accounts and improving the accounting of agricultural enterprises.

Thus, optimizing agricultural waste management will promote the sustainable development of enterprises, reduce environmental impact, and preserve natural resources. Waste management is a key factor in ensuring the economic, social, and environmental sustainability of agriculture.


## SUMMARY

Ukrainian enterprises need to consider the EU's experience in implementing the circular economy to achieve sustainable development and increase competitiveness. The circular economy is based on principles of reducing resource usage, reusing, and recycling, all aimed at fulfilling the concept of sustainable development.

The study defines the key tasks of accounting in the circular economy and outlines directions for improving current Ukrainian legislation in this field. It is established that agricultural waste consists of materials generated by agricultural enterprises. A classification of agricultural production waste has been developed to support the informational needs of enterprise management.

The proposed approaches aim to ensure the economic, social, and environmental sustainability of agriculture, which is a crucial component of sustainable development.


## Bibliography


1. Backes C. Law for a Circular Economy. 2017, p. 61-65. URL: https://www.elevenpub.com/en/product/100-12110_Law-for-a-Circular-Economy (date of access: 19.12.2024)
2. Boulding K. The economics of the coming spaceship earth. Environmental Quality in a Growing Economy: Essays from the Sixth RFF Forum. H. Jarrett. Baltimore, John Hopkins University Publ., 1966, p. 3-14
3. Christ K. L., Burritt R. L. Material flow cost accounting: a review and agenda for future research. Journal of Cleaner Production. 2015. Vol. 108, part B, p. 1378-1389. DOI: https://doi.org/10.1016/j.jclepro.2014.09.005 (date of access: 12.11.2024)
4. Circular Economy OVERVIEW. URL: https://www.eib.org/attachments/thematic/circular_economy_overview_2021_en.pdf. (date of access: 06.12.2024)
5. Circularity Gap. URL: https://www.circularity-gap.world/2022. (date of access: 03.12.2024)

6. Decision of the European Parliament and of the Council on a General Union Environment Action Programme to 2030. URL: https://ec.europa.eu/environment/pdf/8EAP/2020/10/8EAP-draft.pdf (date of access: 25.11.2024)

7. Ellen MacArthur Foundation. Circular economy and the Covid-19 recovery. URL: https://www.ellenmacarthurfoundation.org/assets/downloads/The-circular-economy-a-transformative-Covid19- recovery-strategy.pdf (date of access: 11.12.2024)

8. Gusc J. Accounting in a Circular Economy: The Way Forward: *Master's Thesis*. 2019.

9. Jiao W., Boons F. Toward a research agenda for policy intervention and facilitation to enhance industrial symbiosis based on a comprehensive literature review. *Journal of Cleaner Production*, 2014, 15, pp. 14-25. DOI: 10.1016/j.jclepro.2013.12.050 (date of access: 20.12.2024)

10. Korhonen J., Nuur C., Feldmann A. Circular economy as an essentially contested concept. *Journal of Cleaner Production*, 2018, 175, pp. 117-125. DOI: 10.1016/j.jclepro.2017.12.111 (date of access: 18.12.2024)

11. McDonough W., Braungart M. Design for the Triple Top Line: New Tools for Sustainable Commerce. *Corporate Environmental Strategy*. 2002, Vol. 9, p. 251–258. DOI: 10.1016/S1066-7938(02)00069-6 (date of access: 20.12.2024)

12. McLeod F. et al. Developing innovative and more sustainable approaches to reverse logistics for the collection, recycling and disposal of waste products from urban centres*: Literature review and identification of opportunities,* 2010. URL: www. greenlogistics.org (date of access: 24.11.2024)

13. Ozili P.K. Sustainability Accounting. 2021. URL: https://ssrn.com/abstract=3803384 (date of access: 15.11.2024)

14. Reverse logistics. URL: http://www.greenlogistics.org/themesandoutputs/wm10/index.htm (date of access: 20.11.2024)

15. Sauve S., Bernard S., Sloan P. Environmental sciences, sustainable development and circular economy: alternative concepts for transdisciplinary research. *Environment,* 2016, 11, pp. 48–56. DOI: 10.4236/ojpp.2019.92012 (date of access: 24.11.2024)

16. Stahel W.R., Reday-Mulvey, G. (1981) Jobs for tomorrow: the potential for substituting manpower for energy. New York : Vantage Press, 116 p.

17. Starostka-Patyk M. Reverse logistics processes in industrial waste management as an element of sustainable development. *Annales Universitatis Apulensis Series Oeconomica*, 2010, 12(2), pp. 698–707. DOI: 10.29302/oeconomica.2010.12.2.22 (date of access: 26.11.2024)

18. Technology projection in biofuel production using agricultural waste materials as a source of energy sustainability. A comprehensive review. Surajudeen Sikiru et al. *ScienceDirect*. URL: https://www.sciencedirect.com/science/article/abs/pii/S1364032124002582 (date of access: 11.12.2024).

19. The new model for consumer goods. URL: https://www.mckinsey.com/industries/consumer-packagedgoods/our-insights/the-new-model-for-consumer-goods (date of access: 11.12.2024)

20. Tukker A. Product services for a resource efficient and circular economy – a review. *Journal of Cleaner Production,* 2015, 15, pp. 76–91. DOI: 10.1016/j.jclepro.2013.11.049 (date of access: 16.11.2024)

21. Vegera S., Malei A., Sapeha I., Sushko V. Information support of the circular economy: the objects of accounting at recycling technological cycle stages of industrial waste. *Entrepreneurship and Sustainability Issues*. 2018, Vol. 6. Iss. 1. P. 190–210. DOI: https://doi.org/10.9770/jesi.2018.6.1(13) (date of access: 15.12.2024)

22. Xing Y., Horner R. M. W., El-Haram M. A., Bebbington J. A framework model for assessing sustainability impacts of urban development. *Accounting Forum.* 2009, Vol. 33. Iss. 3. P. 209–224. DOI: https://doi.org/10.1016/j.accfor.2008.09.003 (date of access: 10.12.2024)

23. Варфоломєєв М.О. Циркулярна економіка як невід'ємний шлях українського майбутнього в аспекті глобалізації. *Ефективна економіка, 2020, №* 5. DOI: 10.32702/2307-2105-2020.5.200 (дата звернення: 15.11.2024)

24. Відповідальне державне споживання. *Вокс Україна.* URL: https://voxukraine.org/uk/vidpovidalne-derzhavne-spozhivannya-yak-tsirkulyarni-zakupivli-mozhut-vryatuvati-svit/ (дата звернення: 11.11.2024)

25. Віймкман А., Сконберг К. Циркулярна економіка та переваги для суспільства (Дослідження щодо Чеської Республіки та Польщі). URL: http://www.clubofrome.org.ua/wp-content/uploads/2017/08/The-Circular-Economy-CoR_UA-2.pdf (дата звернення: 19.12.2024)

26. Гетьман А.П. Впровадження циркулярної економіки в законодавство України відповідно до вимог ЄС: критичний аналіз. Нормативно-інституційне забезпечення сприяння господарській діяльності в інноваційному суспільстві : *монографія*. Харків : НДІ прав. забезп. інновац. розвитку НАПрН України, 2020. 312 с. URL: https://openarchive.nure.ua/server/api/core/bitstreams/2f145ecd-82ee-467a-b8c9-10fe515dbbe7/content (дата звернення: 19.11.2024)

27. Горбаль Н. І., Ломага Ю. Р. Циркулярна економіка – основа сталого розвитку підприємств. *Вісник Національного університету "Львівська політехніка". Серія "Проблеми економіки та управління",*

2022, № 1 (9). URL: https://science.lpnu.ua/sites/default/files/journal-paper/2022/apr/27434/220198verstka-11-26.pdf (дата звернення: 03.12.2024)

28. Горбаль Н. І., Пліш І. В. Циркулярні бізнес-моделі для сталого розвитку українських підприємств. *Вісник Нац. ун-ту "Львівська політехніка". Серія "Проблеми економіки та управління"*, 2021, 5(1), С. 15–29. DOI: 10.23939/semi2021.01.015 (дата звернення: 02.12.2024)

29. Горбаль Н.І., Адамів М.Є., Чумак А.С. Адаптація принципів циркулярної економіки управління відходами в Україні. *Вісник Національного університету "Львівська політехніка". Серія «Проблеми економіки та управління»*. 2020. Т. 1, № 4. С. 159–166. DOI: https://doi.org/10.23939/semi2020.01.159 (дата звернення: 02.12.2024)

30. Горобець О. Класифікація сільськогосподарських відходів і вибір технології їх утилізації. *Екологічні науки*. 2020. № 4. С. 225–229. DOI: https://doi.org/10.32846/2306-9716/2020.eco.4-31.35 (дата звернення: 11.12.2024).

31. Державний класифікатор України. Класифікатор відходів ДК 005-96 (Розділи А.1 – А.20) : від 29.02.1996 № 89. URL: https://zakon.rada.gov.ua/rada/show/v0089217-96#Text (дата звернення: 23.11.2024)

32. Жук П. Відходи сільського господарства в Україні: обсяги утворення та питання рециклінгу. *Соціально-економічні проблеми сучасного періоду України*. 2022. № 3. DOI: https://doi.org/10.36818/2071-4653-2022-3-4 (дата звернення 11.12.2024).

33. Залунін М.М. Циркулярна економіка як передумова забезпечення сталого розвитку. *Причорноморські економічні студії*, 2019, 47–1, С. 196–201. DOI: 10.32843/bses.47-69 (дата звернення: 11.12.2024)

34. Злотнік М. Л., Мельник О. Г. Стратегічне управління впровадженням принципів циркулярної економіки на вітчизняних підприємствах. *Підприємництво та інновації*, 2020, № 12, С. 112–119. DOI: 10.37320/2415-3583/12.19 (дата звернення: 20.12.2024)

35. Зуєв В. А. Проблеми гармонізації господарсько-правового та еколого- правового регулювання у сфері поводження з відходами. Правова позиція. 2017. № 1 (18). С. 111. URL: http://biblio.umsf.dp.ua/jspui/bitstream/123456789/2910/1/11.%20%D0%97%D1%83%D1%94%D0%B2.pdf. (дата звернення: 11.12.2024)

36. Курс на економіку замкненого циклу, ролі споживачів, бізнесу і держави, переваги та інструменти цієї моделі (2020). URL: https://ziif.in.ua/2020/11/11/kurs-na-ekonomiku-zamknenoho-tsyklu-rolspozhyvachiv-biznesu-i-derzhavy-perevahy-ta-instrumenty-tsiiei-modeli/ (дата звернення: 11.11.2024)

37. Маковецька Ю., Омельяненко Т. Формування та реалізація політики циркулярної економіки в Україні. *Ефективна економіка*. 2018. № 11. DOI: 10.32702/2307-2105-2018.11.86. (дата звернення: 15.12.2024)

38. Мельник Н. Г., Семанюк В. З. Розвиток обліку в умовах циркулярної економіки. Стан і перспективи розвитку бухгалтерського і управлінського обліку в умовах глобалізації : *монографія*. Тернопіль : Університетська думка, 2020. С. 77–85.

39. Нова політика ЄС з "циркулярної" економіки: можливості для України (2020). URL: https://dixigroup.org/wp-content/uploads/2020/09/dixi_pb_circular-economy_ukr_full_3.pdf (дата звернення: 12.11.2024)

40. Нова політика управління відходами – основа економіки замкненого циклу (2018). URL: http://conference.chamber.ua/. (дата звернення: 11.11.2024)

41. Перший рік Green Deal: як Україна інтегрується в нову екологічну політику ЄС? (2020). *Європейська правда*. URL: https://lexinform.com.ua/v-ukraini/pershyj-rik-green-deal-yak-ukrayina-integruyetsya-v-novu-ekologichnu-polityku-yes/ (дата звернення: 10.11.2024)

42. Підвищення конкурентоспроможності ЄС: циркулярна економіка: *монографія*. За ред. О. Є. Кузьміна, О. Г. Мельник, Н. І. Горбаль. Львів: Міські інформаційні системи, 2021, 190 с.

43. Пошук у наукометричній базі Scopus. URL: https://www.sciencedirect.com/search?qs=circular%20economy (дата звернення: 11.12.2024)

44. Про відходи : Закон України від 05.03.1998 № 187/98-ВР. URL: https:// zakon.rada.gov.ua/laws/show/187/98-%D0%B2%D1%80 (дата звернення: 11.12.2024)

45. Про управління відходами : Закон України від 20.06.2022 № 2320-IX : станом на 29 черв. 2024 р. URL: https://zakon.rada.gov.ua/laws/show/2320-20#Text (дата звернення 20.11.2024).

46. *Проєкт Національного плану управління відходами до 2033 року. Міністерство захисту довкілля та природних ресурсів України – офіційний сайт. URL: https://mepr.gov.ua/ (дата* звернення 20.11.2024).

47. Руда М. В., Мирка Я. В. Циркулярні бізнес-моделі в Україні. *Вісник Нац. ун-ту "Львівська політехніка". Менеджмент та підприємництво в Україні*, 2020, 2 (1), С. 107–121. DOI: 10.23939/smeu2020.01.107 (дата звернення: 19.11.2024)

48. Сергієнко-Бердюкова Л.В. Передумови формування та впровадження концепції циркулярної економіки. *Проблеми теорії та методології бухгалтерського обліку, контролю і аналізу* : міжнародний збірник наукових праць. 2015. Вип. 3 (33), С. 39-47.

49. Стан сфери поводження з побутовими відходами в Україні (2020). Міністерство розвитку громад та територій України. URL: https://www.minregion.gov.ua/napryamki-diyalnosti/zhkh/terretory/stan-sfery- povodzhennya-z-pobutovymy-vidhodamy-v-ukrayini-za-2020-rik-2 (дата звернення: 11.12.2024)

50. Угода про асоціацію між Україною, з однієї сторони, та Європейським Союзом, Європейським співтовариством з атомної енергії і їхніми держава- ми-членами, з іншої сторони : від 30.11.2015 № 984_011. URL: https://zakon.rada.gov.ua/laws/show/984_011#Text (дата звернення: 11.12.2024)

51. Управління відходами. Офіційний портал. Міністерство захисту довкілля та природних ресурсів України. URL: https://mepr.gov.ua/timeline/Vidhodi-ta-nebezpechni-rechovini.html (дата звернення: 11.12.2024)

52. Чабанюк О. М., Лобода Н. О. Основні принципи концепції сталого розвитку. *Раціональне використання природних ресурсів та ресурсозбереження.* 2019. URL: https://conf.ztu.edu.ua/wp- content/uploads/2019/12/64.pdf (дата звернення: 20.12.2024)

**Information about the authors:**
**Zamula Iryna Valeriivna,**
Doctor of Economic Sciences, Professor,
Professor at the Department of Information Systems
in Management and Accounting
Zhytomyr Polytechnic State University
103, Chudnivska str., Zhytomyr, 10005, Ukraine

**Maistrenko Nataliya Mykolayivna,**
Postgraduate Student
Zhytomyr Polytechnic State University
103, Chudnivska str., Zhytomyr, 10005, Ukraine

**Travin Vitalii Viktorovych,**
Candidate of Economic Sciences, Associate Professor,
Associate Professor at the Department of Finance and Digital Economy
Zhytomyr Polytechnic State University
103, Chudnivska str., Zhytomyr, 10005, Ukraine