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Financial Component of the Waste Management System

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Abstract. *The article summarizes the arguments and counterarguments within the scientific debate on the development of the waste management system in the context of financial impact. The main goal of the research is to determine the impact of the financial component on the waste management system in Ukraine and the world. The systematization of literary sources and approaches to solving the problem in the waste management system proved that a specific number of publications is published in the subject area - natural sciences. At the same time, it is necessary to pay attention to the fact that the interest in the research topic is constantly growing, especially actively since 2018, which indicates the intensification of the implementation of the Sustainable Development Goals in the world. The urgency of solving this scientific problem lies in the fact that the improvement of the waste management system, the search and implementation of ecologically and economically effective solutions in waste processing require significant financial investments. The study of the issue of the financial component in the waste management system in the article is carried out in the following logical sequence: the first stage – analysis of research relevance based on statistical data; the second stage is a comparative analysis of the dynamics of searches for the keyword "waste management" in the Google search engine using the Google Trends toolkit, in the period from 2004 to 2022 worldwide; the third stage – formation and processing of the research base based on data from the scientometric databases Google Scholar, Scopus and Web of Science; the fourth stage is bibliometric analysis using VOSviewer software version 1.6.19. Systematic, comparative and bibliometric analysis methods became the methodical tools of the conducted research, 2004-2022 was chosen as the research period. Ukraine and other countries of the world were chosen as the object of the study. The article presents the results of a bibliometric analysis on the researched topic, which testified that the dynamics of publishing activity is increasing, the scientific alliances of authors are expanding, which indicates a global level of interest in the search for the most ecologically and economically effective solutions in the waste management system. The study empirically confirms and theoretically proves that the financial component in the waste management system is an integral determinant of influence, which must be taken into account when determining strategic directions for improvement. The results of the conducted research can be useful for further scientific activity on the chosen topic.*

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Introduction

Waste management in Ukraine and in the world has been a problematic issue for decades. At the same time, new difficulties and challenges arise related to this. This is primarily provoked by the constant economic and

technological development of countries, and secondly by insufficient funding and support of this issue at the state level and from the point of view of investment attractiveness.

According to the Sustainable Development Goal No. 12 "Responsible consumption and production", one of the main points is to reduce the volume of generated waste and increase the volume of its processing and reuse based on innovative technologies and production (United Nations, 2023). Today, this goal is becoming quite difficult for Ukraine, given the negative impact of the war. At the same time, constant shelling of the country, mining of territories, reorientation of the economy to a military regime significantly increases the amount of hazardous waste. Table 1 presents the dynamics of hazardous waste generation per capita in the period 2004-2022. It should be noted that the disposal of hazardous waste requires technical and environmentally efficient equipment.

Table 1. Generated hazardous waste, per capita (kg), 2004-2022

	Country	2004	2006	2008	2010	2012	2014	2016	2018	2020	2022
1	Austria	123,37	116,1	159,44	175,13	125,37	147,68	144,15	147,8	151,45	155,10
2	Belgium	495,94	380,34	549,12	435,82	251,3	263,89	335,81	303,94	272,07	240,20
3	Bulgaria	1536,27	1775,84	1733,46	1825,38	1828,07	1684,62	1863,61	1904,82	1946,03	1987,24
4	China	7,66	7,52	8,1	10,03	11,59	25,03	25,96	36,91	52,32	64,76
5	Croatia	25,84	176,43	50,81	16,76	28,26	30,6	41,42	41,95	42,48	43,01
6	Czechia	141,22	126,92	144,89	129,35	139,99	109,75	102,53	158,46	126,49	125,35
7	Denmark	59,17	68,49	76,33	220,49	216,88	302,94	352,06	363,68	400,30	430,67
8	Estonia	5377,99	4905,1	5625,31	6727,49	6922,15	7908,94	7354,43	8224,49	8144,84	8302,61
9	Finland	410,73	513,68	406,67	476,99	305,45	365,97	434,45	343,94	345,24	331,46
10	France	144,39	144,51	175,1	183,5	177,82	167,98	170,26	186,15	176,46	176,24
11	Germany	244,96	266,41	275,37	246,59	271,5	267,8	280,3	291,06	289,12	293,82
12	Greece	29,91	24,58	22,91	26,8	27,58	20,66	47,51	59,22	70,93	82,64
13	Hungary	134,9	129,29	67,12	54,46	70,99	60,84	46,87	55,92	49,62	47,16
14	Ireland	178,49	167,54	168,35	433,04	103,88	104,37	113,72	130,85	114,83	101,46
15	Italy	105,86	127,51	116,73	144,01	150,09	146,95	160,01	167,22	174,43	181,64
16	Latvia	7,44	29,36	31,07	32,05	45,97	51,52	33,54	40,1	30,30	24,59
17	Lithuania	26,52	28,81	36,02	33,72	44,91	55,69	60,89	68,85	76,81	84,77
18	Luxembourg	274,12	502,34	410,21	748,34	593,54	427,73	615,53	712,62	604,72	599,77
19	Moldova	0,55	0,46	0,41	0,36	0,22	0,95	0,31	1,5	2,71	3,91
20	Netherlands	131,17	312,39	268,83	268,93	289,15	286,06	302,34	302,39	302,44	302,49
21	Norway	145,71	260,61	303,43	360,84	270,68	309,65	308,72	306,22	303,72	301,22
22	Poland	41,99	62,07	38,28	38,92	45,44	44,13	50,47	100,33	72,76	77,22
23	Portugal	216,14	575,09	53,31	64,29	69,72	70,86	80,83	108,68	116,53	104,38
24	Romania	106,29	49,65	25,48	33,98	34,08	29,46	31,57	37,78	36,53	37,85
25	Slovakia	78,21	98,72	97,64	76,88	68,37	68,38	91,17	82,55	77,19	75,95
26	Slovenia	54,22	58,13	75,5	57,35	64,79	75,08	59,6	62,07	67,01	67,83
27	Spain	71,95	90,06	79,2	63,74	66,17	63,8	68,27	69,05	70,10	71,41
28	Sweden	180,72	291,78	223,4	269,19	282,59	264,97	241,89	289,03	290,10	297,80
29	Turkey	14,89	0,16	14,46	44,6	53,42	44,44	69,53	181,17	139,06	158,22
30	Ukraine	36,03	51,26	50,87	49,86	36,25	30,1	16,4	13,89	14,18	12,57
31	United Kingdom	133,17	138,91	117,23	82,62	89,59	85,7	91,08	92,27	70,98	63,68

Sources: systematized by the authors based on Our World in Data (Our World in Data, 2023).

In retrospect of the dynamics of waste generation, we can state that the amount of hazardous waste increases accordingly with the development of industry. At the same time, in Ukraine we can observe a fairly positive trend in the reduction of hazardous waste since 2014, but this primarily indicates the stoppage of industrial giants in the temporarily occupied territories of the country. Therefore, today there is an acute problem regarding the modernization of the waste management system at all stages. In particular, not only at the stage of disposal or processing, but also at the time of designing the production capacities of enterprises, organization of production, etc.

Literature Review

During the bibliometric analysis, more than 500,000 publications were found on the key term “waste management” in the scientific databases Scopus, Web of Science, and Google Scholar. This testifies to the relevance and interest of the scientific community in this field of research. At the same time, only in the scientometric database Scopus if the term “waste management” is present in the title of the publication and

such terms in keywords, or in the name of the study, or in the abstract – "financing" or "funding" or "financial" were obtained more 800 publications. Table 2 shows the top 5 most cited publications.

Table 2. TOP-5 most cited publications by the keywords "waste management", "funding" and "financial" in the scientometric database Scopus

Title of the article	The authors	Journal	Year of publication	Number of citations	FWCI
Municipal solid waste management from a systems perspective	Eriksson, O., Reich, M.C., Frostell, B., (...), Baky, A., Thyselius, L.	Journal of Cleaner Production	2005	332	11.48
Economic assessment of municipal waste management systems - Case studies using a combination of life cycle assessment (LCA) and life cycle costing (LCC)	Reich, M.C.	Journal of Cleaner Production	2005	208	9.18
Solid waste management in municipalities in Mexico: Goals and perspectives	Buenrostro, O., Bocco, G.	Resources, Conservation and Recycling	2003	123	1.21
Environmental and economic modelling: A case study of municipal solid waste management scenarios in Wales	Emery, A., Davies, A., Griffiths, A., Williams, K.	Resources, Conservation and Recycling	2007	115	2.96
Multicriteria decision making in selecting best solid waste management scenario: A municipal case study from Bosnia and Herzegovina	Vučijak, B., Kurtagić, S.M., Silajdžić, I.	Journal of Cleaner Production	2016	111	4.59

Note: *FWCI – Field-Weighted Citation Impact.*

Source: developed by the authors based on Scopus.

For a more detailed literature review of the research topic, the VOSviewer software toolkit version 1.6.19 was used. On the basis of the formed sample of the scientometric database Scopus, a visualization map was built according to the following parameters: the minimum number of author citations for a given research topic is 20. As a result of the selection of 30,044 authors, 148 meet the specified threshold (Fig. 1). The constructed map shows 6 clusters with a total number of connections – 50915. The largest red cluster unites 39 authors, while scientist Christensen T.H. has 75 citations. It is worth noting that the author with the largest number of citations is Wilson D.C. (263 citations) belongs to the blue cluster, which has 25 authors and ranks third in size. Taking into account the compact placement of clusters and their layering one on top of another (green, purple, yellow and blue clusters), it can be concluded that scientific developments arouse interest and are relevant for further research.

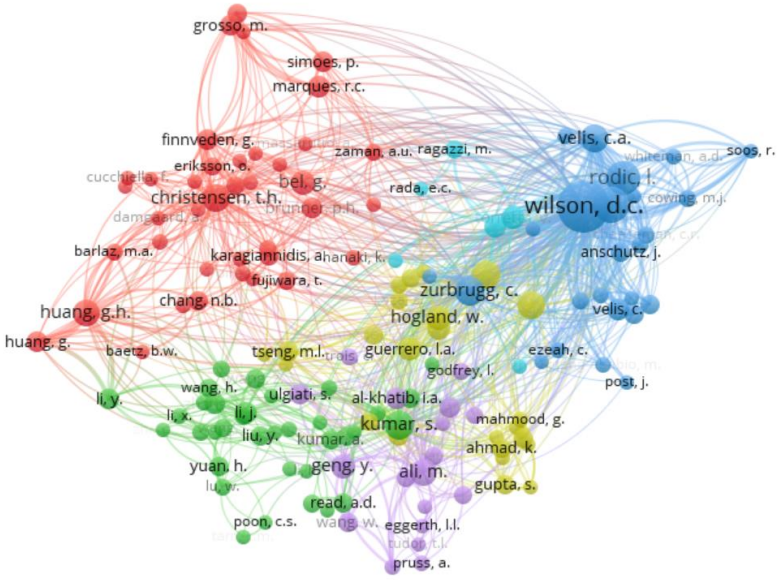

Figure 1. Bibliometric map of co-citations of authors by researched articles, 2003-2022

Source: developed by the authors based on VOSviewer (2023)

In the publication (Eriksson et al., 2005), which has the largest number of citations by research topic in the scientometric database Scopus, the results of a systematic analysis of the efficiency of waste processing are presented. The authors used a calculation model (Orware) based on the life cycle assessment methodology (LCA). The results of the study indicate the expediency of waste processing, which has a positive effect on the environment, but at the same time requires additional investments for the development of the recycling infrastructure.

The second in the ranking by the number of citations is the publication (Reich, 2005), in which a new model of evaluation of the waste management system is tested, taking into account the financial factor. At the same time in the article (Buenrostro & Bocco, 2003) perspectives of waste management are considered on the example of Mexican municipalities. The authors (Emery et al., 2007) investigate several methods of waste processing, taking into account the impact on the environment and financial regional aspects. The results indicate the need to use complex methods to solve such problems. In particular, the authors (Vučijak et al., 2015) investigate another approach to the waste management system - the multi-criteria decision-making method. The authors, on the basis of an empirical study using the example of the business sector of the Czech Republic (and a number of other countries), determined the directions and tools for the development and promotion of a multifunctional application in the field of waste management in other countries of Central Europe (Svetlik & Lastuvka, 2022).

The paper (Frolov & Bilopilska 2013) presents the theoretical justification of the phase model of waste management development. The studied model is derived on the basis of the analysis of European waste management systems using 12 indicators that characterize the economic, social, legal and ecological state of the country at each phase of the system's development. The purpose of the article is to conduct an assessment of the waste management system of Ukraine based on the studied model, to build an assessment profile of the system. In the article (Mishenin & Mishenina, 2014) formulated methodological provisions that determine the organizational and innovative basis for the formation of cluster structures in the field of waste management. The structural and functional scheme of the creation and functioning of the ecological resource cluster of waste management is substantiated. At the same time, the authors (Mishenin et al., 2020) defined the main principles that determine the importance of cluster structures in the field of waste management for the prevention of diseases in the region.

The authors (Brauweiler et al., 2017) analyzed the existing problems of the waste management system in Ukraine. The essence of the economic and legal mechanism of management in the field of waste management from the position of a systemic approach is determined. The methods of waste management have been investigated and, based on the analysis of the system of legal norms, directions for their improvement have been proposed. Also, research into ways of ecological modernization of the management system in the field of solid household waste management is relevant. (Boronos et al., 2016). In more detail in the works of domestic and foreign scientists (Chupryna, 2015; Chygryn & Krasniak, 2015; Dehtyarova & Kubatko, 2013; Dzwigol et al., 2023; Hitka et al., 2019; Kwilinski et al., 2023; Lesakova, 2019; Letunovska et al., 2021; Melnyk, 2016; Michalkova et al., 2022; Potapenko et al., 2017; Tambovceva et al., 2020; Wołowiec et al., 2022) investigate the influence of the waste management system on the level of morbidity of the population, the green development of the country, the formation of a green brand, etc.

Methodology and research methods

The first stage of the research is the relevance analysis based on the statistical data of the scientific online publication Our World in Data (Our World in Data, 2023). The second stage is based on a comparative analysis of the dynamics of searches for the keyword "waste management" in the Google search engine using the Google Trends toolkit, in the period from 2004 to 2022 worldwide. The third stage of the work is based on the formation and processing of the research base based on data from the scientometric databases Google Scholar, Scopus and Web of Science. The fourth stage is a bibliometric analysis based on a sample of the Scopus scientometric database, publications with the term “waste management” in the title of the publication and such terms in keywords, or in the title of the study, in the abstract – “financing” or “funding” ", "or" "financial". Based on the results of the search, a sample of more than 800 scientific publications was formed. Visualization maps were constructed using the VOSviewer version 1.6.19 software (VOSviewer, 2023), subject to the identification of 480 of 4915 keywords, which corresponds to the threshold and the minimum number of repetitions in the title, keywords and abstract - 5.

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Results

World statistics show that every year the level of generated waste from all spheres grows, as does the world population. As part of the research, it turned out that the level of interest in the topic of waste management has been quite stable for many years and corresponds to not such great indicators. Confirmation of this is shown in Figure 2, namely, the number of queries in the Google search engine on the topic "waste management" in Ukraine and in the world in the period 2004-2022.

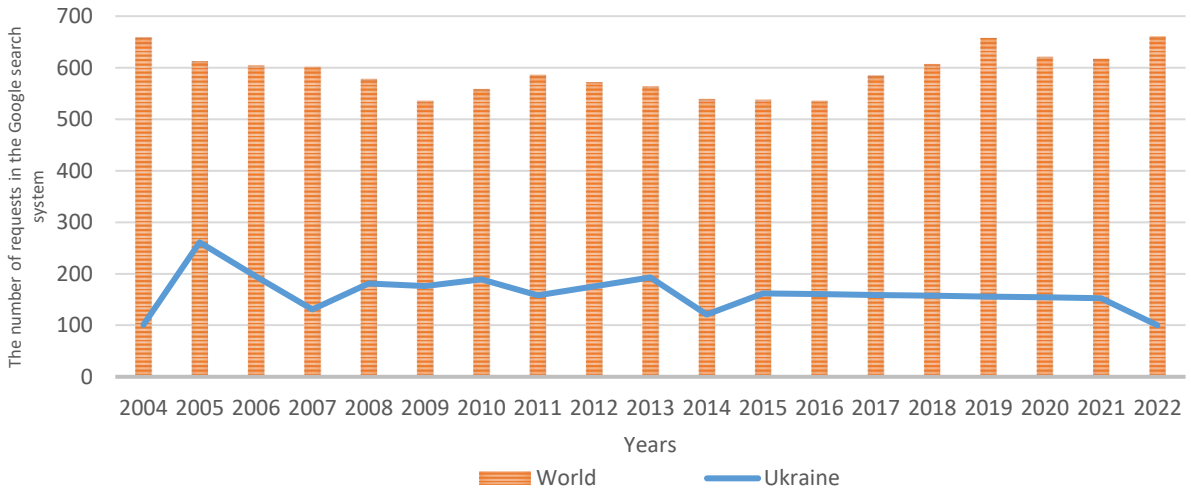

Figure 2. Dynamics of search activity on the topic "waste management" in the Google search engine using the Google Trends toolkit, 2004-2022.

Sources: built by the authors based on Google Trends data

At the same time, the results of the analysis of publication activity differ significantly from the dynamics of search queries in Google for the search term "waste management". According to Figure 3, which reflects the dynamics of published documents in the scientometric databases Scopus and Web of Science, we can draw a conclusion regarding the increase in publication activity on the topic under study.

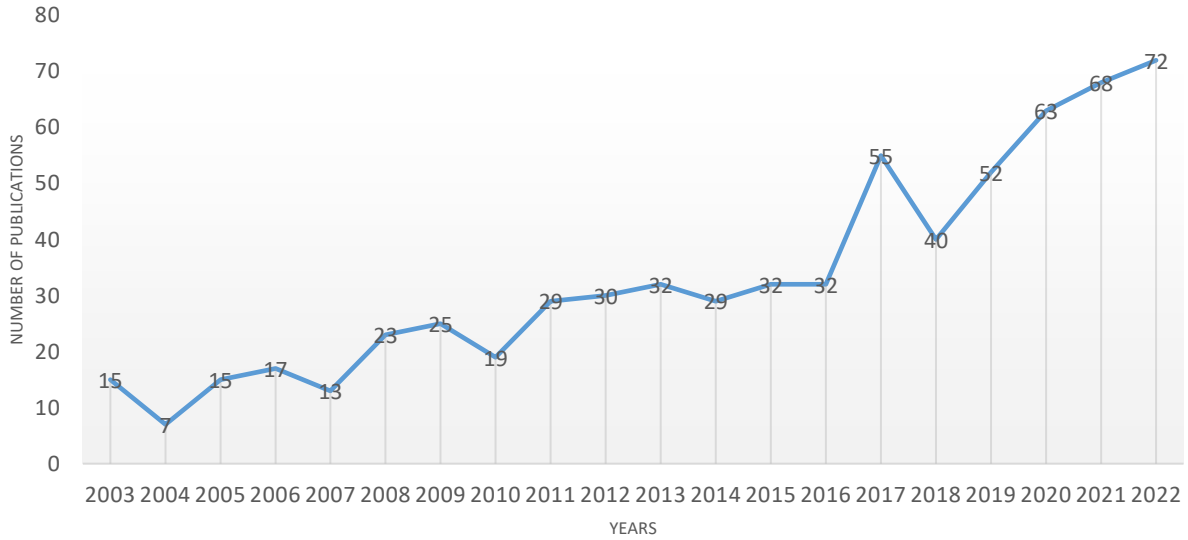

Figure 3. Dynamics of published documents in the period 2003-2022

Sources: developed by the authors based on Scopus (2023).

It should be noted that the first publications on the researched topic date back to 1973. Accordingly, the active transition of most of the world's leading countries to sustainable integration processes provokes the scientific community to investigate in more detail new ways of improvement, modernization and renovation in the waste management system. After all, the waste management system is a key segment in all production cycles, and

not only in the industrial sphere. As part of the formation of the research base, it was found that the specific weight is occupied by publications in the following subject areas: "Environmental Science" - 516 publications, “Engineering” - 184 publications, “Social Sciences” - 147 publications, “Energy” - 105 publications, “Business, Management and Accounting” - 80 publications, “Medicine” - 60 publications, “Earth and Planetary Sciences” - 56 publications, “Economics, Econometrics and Finances” - 52 publications, “Computer Science” - 31 publications, "Agricultural and Biological Sciences ” – 26 publications. This testifies to the extensive field of research and the multidisciplinary nature of the subject.

The multidisciplinarity of the researched topic can also be traced in the analysis of scientific resources. In particular, a map of co-citations of scientific resources was built using the VOSviewer software (Fig. 4). Within the framework of clustering, 75 scientific journals were singled out from 12,679 resources with a minimum number of citations – 20.

According to the results of the study, the resource "Waste management journal" can be called the leader in the volume of citations in the researched topic among all scientific journals - 922 citations, while the total strength of connection with other journals is 10,396. It should be noted that the topic of most of the sample of scientific resources is aimed at actualizing the problems of the environment, sustainable development, and the waste management system.

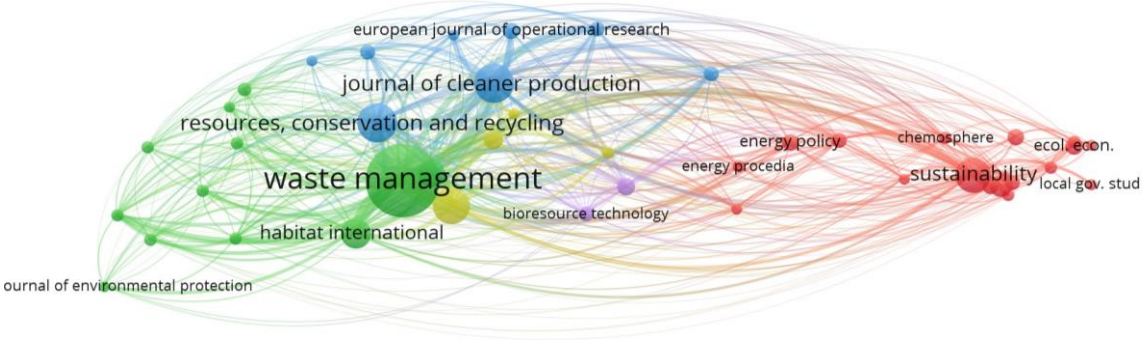

Figure 4. Bibliometric map of co-citations of scientific resources by researched articles, 2003-2022
Source: developed by the authors based on VOSviewer (2023)

As part of the study, a cluster analysis of the geographic structure of publishing activity was also conducted. The visualization map (Figure 5) was built according to the main parameter - the minimum number of documents from the country - 5 publications. As a result, we received 10 clusters formed from 62 countries of the world, which published articles on the researched topic. The largest clusters are red and green, they united nine countries each and have a fairly wide geography. As for Ukraine, it is part of the scientific alliance with such countries as Israel, Poland, Sweden and Lithuania. It should also be noted that the largest number of publications on the study of the financial component in the waste management system falls on the following countries: United States of America, Great Britain, India, China, Brazil, Italy, Japan and Germany.

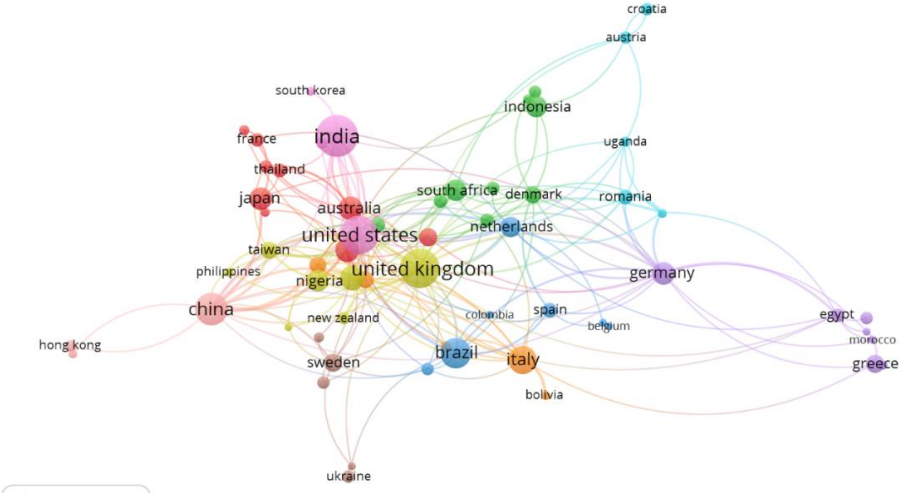

Figure 5. Bibliometric map of the analyzed documents by country, published in 2003-2022
Source: developed by the authors based on VOSviewer (2023)

Based on the formed sample, using VOSviewer version 1.6.19 software, under the condition of identifying 480 out of 4915 keywords, which corresponds to the threshold and the minimum number of repetitions in the title, keywords and annotation - 5, a visualization map of keywords was built within the framework of the study topics (Figure 6).

There are a total of 316 keywords and 6 clusters, while the number of links (links) is 15,664, the total link strength between keywords is 42,020. Let's take a closer look at the formed clusters:

- the first cluster is red in color and has the largest number of keywords – 90. It is appropriate to single out the most popular keywords of the first cluster: "recycling" (links: 290; total link strength: 2316; occurrences: 178); "landfill" (links: 260; total link strength: 1395; occurrences: 92); "waste treatment" (links: 253; total link strength: 1004; occurrences: 75); "environmental impact" (links: 228; total link strength: 883; occurrences: 63); "incineration" (links: 214; total link strength: 828; occurrences: 54);

- the second green cluster unites 69 keywords, the main ones of which are: "human" (links: 267; total link strength: 1607; occurrences: 105); "public health" (links: 178; total link strength: 533; occurrences: 32); "hazardous waste" (links: 176; total link strength: 509; occurrences: 32); "hospital waste" (links: 163; total link strength: 550; occurrences: 36); "environmental health" (links: 112; total link strength: 252; occurrences: 20);

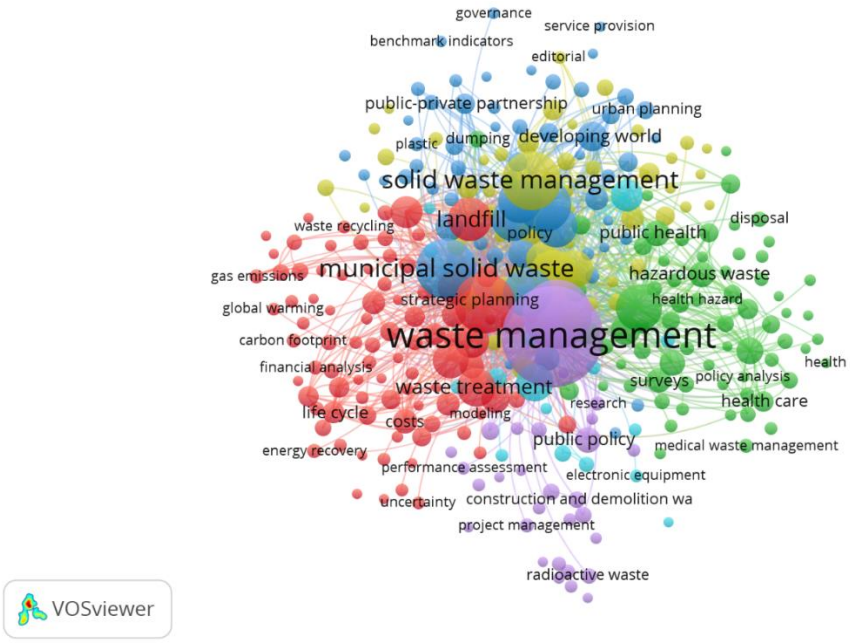

Figure 6. Bibliometric map of keywords in the researched articles, 2003-2022

Source: developed by the authors based on VOSviewer (2023)

- the third blue cluster has 56 keywords. The main indicators of this cluster are the following keywords: "municipal solid waste" (links: 284; total link strength: 2056; occurrences: 174); "solid waste" (links: 278; total link strength: 1901; occurrences: 142); "sustainable development" (links: 273; total link strength: 1349; occurrences: 115); "refuse disposal" (links: 269; total link strength: 1587; occurrences: 93); "developing countries" (links: 258; total link strength: 1237; occurrences: 90); "developing world" (links: 204; total link strength: 703; occurrences: 45);

- the fourth yellow cluster includes 50 terms, key of which are: "solid waste management" (links: 285; total link strength: 2219; occurrences: 166); "financial management" (links: 261; total link strength: 1215; occurrences: 73); "environmental protection" (links: 218; total link strength: 684; occurrences: 55); "economic aspect" (links: 197; total link strength: 581; occurrences: 32); "economic and social effects" (links: 156; total link strength: 391; occurrences: 28); "policy" (links: 143; total link strength: 359; occurrences: 26);

- the fifth purple cluster consists of 31 terms. Specific gravity is the following keywords: "waste management" (links: 311; total link strength: 4791; occurrences: 496); "waste disposal" (links: 309; total link strength: 2897; occurrences: 230); "public policy" (links: 159; total link strength: 451; occurrences: 34); "financial resources"

(links: 71; total link strength: 106; occurrences: 13); "waste management practices" (links: 128; total link strength: 274; occurrences: 17);

- the sixth cluster of light blue color has 16 terms and is characterized by the following terms: "decision making" (links: 242; total link strength: 855; occurrences: 69); "government" (links: 203; total link strength: 745; occurrences: 51); "environmental policy" (links: 121; total link strength: 267; occurrences: 22); "industry" (links: 100; total link strength: 148; occurrences: 10); "barriers" (links: 69; total link strength: 102; occurrences: 11).

Summarizing the results of building a visualization map of keywords, several points should be noted: firstly, all clusters are placed quite densely, which indicates the multidisciplinary nature of the research topic, secondly, taking into account the size of the clusters, the largest number of studies is devoted to the topic of recycling and finding effective ways to recycle and dispose of waste.

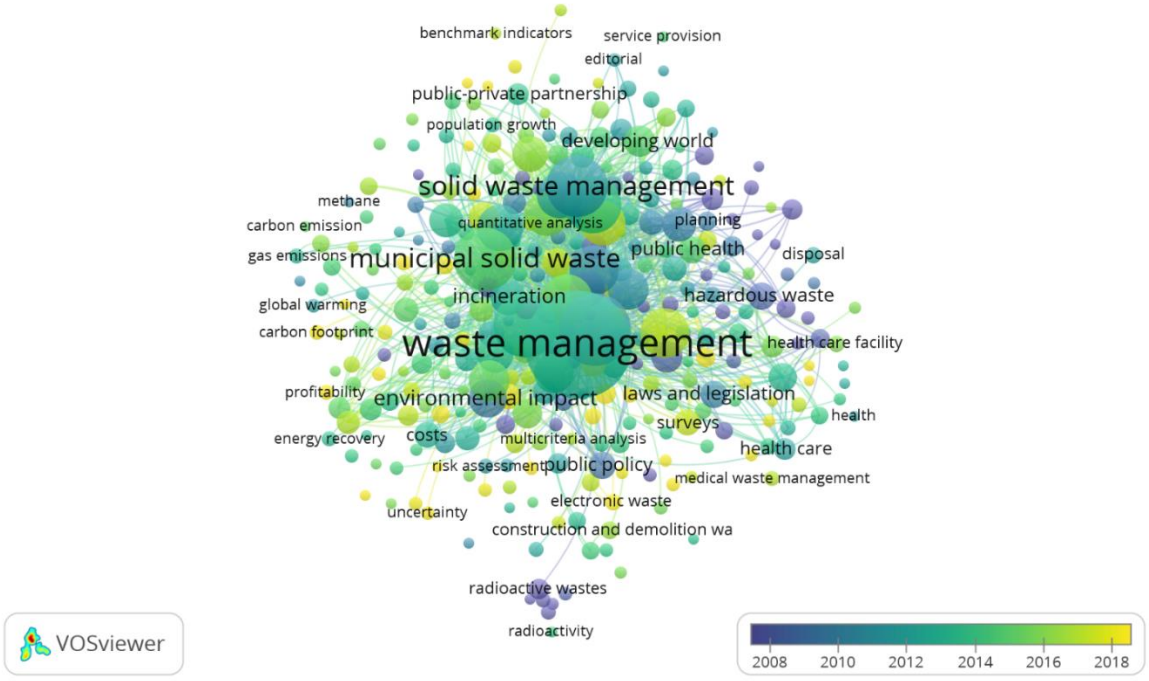

Figure 7. Bibliometric map of the evolution of keywords in the researched articles, 2003-2022.

Source: developed by the authors based on VOSviewer (2023)

It is important to note the issue of the evolution of scientific views in the study of the waste management system in the context of the financial component (Fig. 7). The research results show the following:

- in the period until 2008, the issue of waste management was considered from the standpoint of environmental protection within the framework of industrial development and urbanization processes;
- in the period from 2008 to 2014, the waste management system was considered more actively in the context of all spheres of activity, taking into account interfunctional connections;
- in the period from 2014 to today, the analysis of new systems and models of waste management is gaining relevance, as well as the development of new, more detailed waste classifications for their further effective management.

The map of the evolution of keywords clearly demonstrates the intensification of research in the field of waste management, the development of the terminological base, which characterizes the constant work on solving global problems of humanity.

Conclusions

Today, the development of the green economy depends not only on the development of the energy sector within the framework of alternative energy sources, which is quite a promising path, but also on an efficient

waste management system. As part of the research, it was found that, in general, the topic of waste management has a stable-medium level of interest, which primarily indicates the lack of active popularization of rational waste management. At the same time, the results of the bibliometric analysis demonstrate, on the contrary, positive dynamics of publishing activity, in particular, taking into account the financial component in the waste management system. This is primarily related to the calculations of effective financial models of investment in the recycling industry and the study of effective business stimulation models. It is appropriate to pay attention to the multidisciplinary nature of the topic, because more than ten different research areas with a significant number of publications were identified not at the stage of forming the research sample, in particular – "Environmental Science" - 516 publications, "Engineering" - 184 publications, "Social Sciences" - 147 publications, "Energy" - 105 publications, "Business, Management and Accounting" - 80 publications, and others. In further studies, it is planned to conduct an analysis of accidental impacts in the chain "waste management system - energy balance of the country - population health - environmental impacts".

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References

1. Emery, A., Davies, A., Griffiths, A., Williams, K. (2007). Environmental and economic modelling: A case study of municipal solid waste management scenarios in Wales., *49*(3), 244–263. [Link]
2. Boronos, V., Shkarupa O. & Konovalov, M. (2016). Ecological modernization of management of municipal solid waste in Ukraine on the basis of the experience of the EU and Norway. *Marketing and Management of Innovations*, 2, 222-234. [CrossRef]
3. Brauweiler, H., Shkola V. & Markova, O. (2017). Economic and legal mechanisms of waste management in Ukraine. *Marketing and Management of Innovations*, 2, 359-368. [CrossRef]
4. Chupryna, N. (2015). Eco-marketing in industrial enterprise activities. *Marketing and Management of Innovations*, 1, 231-239. [CrossRef]
5. Chygryn O. & Krasniak, V. (2015). Theoretical and applied aspects of the development of environmental investment in Ukraine. *Marketing and Management of Innovations*, 3, 226-234. [CrossRef]
6. Dehtyarova, I.B., Kubatko O.V. (2013). Green Economy and Sustainable Development: The Vision of Economists. *Mechanism of economic regulation*, 2, 106-112. [Link]
7. Dzwigol, H., Kwilinski, A., Lyulyov, O., & Pimonenko, T. (2023). The Role of Environmental Regulations, Renewable Energy, and Energy Efficiency in Finding the Path to Green Economic Growth. *Energies*, *16*(7), 3090. [Link]
8. Frolov S. & Bilopilska, O. (2013). Assessment profile of waste management system in Ukraine based on the stage model of development. *Marketing and Management of Innovations*, 2, 220-229. [CrossRef]
9. Google Scholar (2023). [Link]
10. Hitka, M., Pajtinkova-Bartakova, G., Lorincova, S., Palus, H., Pinak, A., Lipoldova, M., Krahulcova, M., Slastanova, N., Gubiniova, K. & Klaric, K. (2019). Sustainability in marketing through customer relationship management in a telecommunication company. *Marketing and Management of Innovations*, 4, 194-215. [CrossRef]
11. Kwilinski, A., Lyulyov, O., & Pimonenko, T. (2023). Greenfield Investment as a Catalyst of Green Economic Growth. *Energies*, *16*(5), 2372.
12. Lesakova, Ľ. (2019). Small and medium enterprises and eco-innovations: empirical study of Slovak SME´s. *Marketing and Management of Innovations*, 3, 89-97. [CrossRef]
13. Letunovska, N., Kwilinski, A., Dzwigol, H., Lyulyov, O., & Pimonenko, T. (2021). Sustainable Tourism for the Green Economy. *Virtual Economics*, *4*(4), 33-51. [CrossRef]

14. Marcus Carlsson Reich (2005). Economic assessment of municipal waste management systems—case studies using a combination of life cycle assessment (LCA) and life cycle costing (LCC), *13*(3), 253–263. [Link]
15. Melnyk, L. (2016). Innovative horizons of the Third industrial revolution: economy, power sector, ecology. *Marketing and Management of Innovations*, 4, 342-352. [CrossRef]
16. Michalkova, L., Stehel, V., Nica, E., & Durana, P. (2022). Consumer Approach to the Food Waste in Selected EU Countries. *Marketing and Management of Innovations*, 3, 264-275. [CrossRef]
17. Mishenin, Ye. & Mishenina, N. (2014). Development of cluster structures in the field of waste management. *Marketing and Management of Innovations*, 4, 163-172. [CrossRef]
18. Mishenin, Ye., Klisinski, J., Yarova, I., & Rak, A. (2020). Ensuring healthy environment: mechanisms of cluster structures development in the field of waste management. *Health Economics and Management Review*, *1*(2), 78-90. [CrossRef]
19. O. Eriksson; M. Carlsson Reich; B. Frostell; A. Björklund; G. Assefa; J.-O. Sundqvist; J. Granath; A. Baky; L. Thyselius (2005). Municipal solid waste management from a systems perspective. *Journal of cleaner production*, *13*(3), 241–252. [Link]
20. Buenrostro, O., Bocco, G. (2003). Solid waste management in municipalities in Mexico: goals and perspectives. *Resources, Conservation and Recycling*, *39*(3), 251–263. [Link]
21. Our World in Data (2023). [Link]
22. Potapenko, V., Kornatovskyy R. & Shylkina, A. (2017). "Green" economy modernization of Ukraine. *Marketing and Management of Innovations*, 2, 344-358. [CrossRef]
23. VOSviewer. (2023). [Link]
24. Scopus (2023). [Link]
25. Svetlik, J., & Lastuvka, I (2022). B2B Communication Strategy: Introducing a New Multifunctional Application for the Waste Management Industry. *Marketing and Management of Innovations*, 3, 159-171. [CrossRef]
26. Tambovceva, T., Urbane, V., & Levins, J. (2020). Innovations in construction waste management: case of Latvia. *Marketing and Management of Innovations*, 3, 234-248. [CrossRef]
27. United Nations (2023). [Link]
28. Vučijak, Branko; Kurtagić, Sanda Midžić; Silajdžić, Irem (2015). Multicriteria decision making in selecting best solid waste management scenario: a municipal case study from Bosnia and Herzegovina. *Journal of Cleaner Production*, S0959652615016698. [Link]
29. Web of Science (2023). [Link]
30. Wołowiec, T., Kolosok, S., Vasylieva, T., Artyukhov, A., Skowron, Ł., Dluhopolskyi, O., & Sergiienko, L. (2022). Sustainable Governance, Energy Security, and Energy Losses of Europe in Turbulent Times. *Energies*, *15*(23), 8857. [Link]