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## РЕЦИКЛІНГ – ВИЗНАЧАЛЬНИЙ НАПРЯМ РОЗВИТКУ ЕКОЛОГІЧНОГО МАРКЕТИНГУ В УКРАЇНІ

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Розкрито сутність процесу рециклінгу, подано характеристику його учасників. Наведено приклади прогресивних технологій, призначених для оптимізації процесів збору і переробки сміття, а також підприємств з утилізації відходів, що діють в Україні. Розкрито європейський досвід організації процесів переробки відходів та запропоновано приклад адаптації концепції екологічного маркетингу підприємствами України для забезпечення ефективної системи утилізації відходів.

**Ключові слова:** рециклінг, утилізація відходів, екологічний маркетинг.

## RECYCLING – PRINCIPAL TENDENCY OF ENVIRONMENTAL MARKETING DEVELOPMENT IN UKRAINE

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The essence of recycling process and characteristics of its participants are exposed in this article. Examples of advanced technologies designed to optimize the process of collecting and recycling, as well as operating Ukrainian recycling enterprises are shown. The European experience of recycling processes is covered and the example of the concept of environmental marketing adaptation of Ukrainian enterprises to ensure an effective system of waste alteration is suggested.

**Key words:** recycling, waste disposal, environmental marketing.

**Problem formulation.** In countries with economic system based on the principles of economy of knowledge, garbage is considered not only as waste from production and everyday life, but also as a valuable resource for new products making or heat energy generation. However, achieving of this goal requires not only an appropriate industrial infrastructure (national or regionally differentiated), but also an update of the existing business culture that has to be directed in order to satisfy basic and consumer human needs. Practical implementation of such a task is inextricably connected with the use of relevant environmental marketing concepts by industrial objects, including organizational support, differentiated waste collection and creation of conditions for effective adjusting and subsequent operation of production reverse distribution channels. In terms of strengthening of national industrial complex dependence on external energy the issues of energy autonomy are vitally important for it.

Therefore, a solution to the problem of rational waste management in Ukraine is an important vector of innovation economic strategy development. It will provide an opportunity to implement a number of economic and environmental objectives and to gain new competitive advantages to the national economy.

**Analysis of current research outputs and publications.** The study of efficient waste management problems, that includes not only the physical destruction of waste in order to minimize environmental pollution, but also obtaining economic benefits from these processes is covered in the articles of G.O. Kavryshyna [8], L.V. Dergachova [9], R.M. Voronina [10], L. Drell [11] etc. On the other hand the study of the essence and practical value of environmental marketing is contained in the works of O.V. Sadchenko [12] etc. However, in the scientific literature there are no comprehensive approach to the issue of efficient waste management in the framework of environmental marketing.

**Article objectives.** The purpose of the article is the analysis of the current state and study of feasibility of industrial enterprises in Ukraine of concepts of environmental marketing aimed at optimizing of recycling and disposal of waste.

**Presentation of the main material.** The issue of waste management in Ukraine is regulated by a series of legal documents, including the determining Law of Ukraine “On Waste”. According to art. 5 of the Law the basic principles of the state policy on waste management is a priority of the environment and human health protection from the adverse impact of waste, ensuring economical use of raw material and energy resources, science-based coordination of environmental, economic and social interests of society for creation and use of waste to ensure its sustainable development [1].

Government policy on waste management is an extremely versatile but practical implementation of these principles is complicated because of a number of reasons particularly:

1. Inefficient investment policy in investments attracting into the development of waste facilities for recycling trash or burning it for power and lack of innovative approaches to the operation of manufacturing processes aimed at reducing of harmful emissions into the atmosphere and inverse material output
2. Improper organization of utilities for differentiated waste collection that would optimize the process of further recycling.
3. Insufficient use of the foreign countries experience in the management of household waste.

According to DSanPiN 2.2.7.029-99 “Hygienic requirements for industrial waste management and hazard class definitions for public health” waste production areas and areas of consumption in Ukraine, depending on the physical, chemical and biological characteristics of the entire mass of waste or its ingredients divided into four classes of hazard: I class – extremely dangerous materials (waste); II class – highly dangerous materials (waste); III-class – moderately hazardous materials (waste); IV class – low-risk materials (waste) [3].

The data on waste and recycling volumes in Ukraine for years 2000-2012 is presented in Table 1.

For analytical assessment of the change dynamics in the quantity specified in the Table 1 based on indexes of chained increases lets compute the geometric mean of changes over time. However, with taking into account these changes in the statistics data display for the purpose of avoiding inaccuracies lets chose the period to analyze 2000–2010, and the research base will choose waste of I-III hazard classes.

$$\bar{I}_{\text{created}} = \sqrt[10]{0.97 \times 0.68 \times 1.41 \times 0.99 \times 1 \times 0.98 \times 1.09 \times 0.89 \times 0.53 \times 1.35} = 0.95$$

$$\bar{I}_{\text{recycled}} = \sqrt[10]{1.67 \times 0.74 \times 0.7 \times 0.71 \times 1.03 \times 0.98 \times 1.22 \times 0.89 \times 0.9 \times 0.78} = 0.93$$

$$\bar{I}_{\text{burned}} = \sqrt[5]{0.87 \times 0.64 \times 0.81 \times 0.49 \times 1.04} = 0.75$$

$$\bar{I}_{\text{removed}} = \sqrt[10]{0.84 \times 1.14 \times 1.28 \times 1.18 \times 0.86 \times 1.11 \times 0.94 \times 1.08 \times 0.31 \times 0.92} = 0.91$$

$$\bar{I}_{\text{available}} = \sqrt[10]{0.88 \times 0.81 \times 1.67 \times 0.91 \times 0.76 \times 0.93 \times 1 \times 1.04 \times 0.99 \times 0.78} = 0.95$$

The content of calculations above is as follows:

1. Value of waste generation of I–III class hazard, during the period is reduced to an average of 5 %.
2. Recycling of waste of I–III class hazard during the period is reduced to an average of 7 %.
3. Amount of waste of I–III class hazard – disposed by burning during the period is reduced by 25 % on average annually.
4. The volume of waste removal of I–III class hazard in designated areas and facilities during the period is reduced by 9 % on average annually.

Table 1

**Key indicators of waste management in Ukraine for 2000–2012 years**

Year	Generated, thousand tons	Disposed, processed (recycled), thousand tons	Burned, thousand tons	Removed in designated areas and facilities, thousand tons	Available at the end of the year in designated areas or objects and in the enterprise, thousand tons
2000	2613.2	1376.2	...	760.6	26244.1
2001	2543.3	2292.0	...	640.0	23002.0
2002	1728.8	1701.2	...	726.9	18728.5
2003	2436.8	1184.2	...	931.7	31304.0
2004	2420.3	840.1	...	1102.8	28349.0
2005	2411.8	863.4	71.4	948.5	21674.0
2006	2370.9	847.9	62.1	1057.0	20121.5
2007	2585.2	1031.2	39.6	990.6	20131.8
2008	2301.2	918.9	32.2	1066.3	21017.2
2009	1230.3	825.9	15.8	333.2	20852.3
2010*	419191.7	145710.7	1058.6	336952.2	13267455.0
including waste of I–III classes of hazard	1659.8	642.4	16.5	306.3	16236.3
2011**	447641.2	153687.4	1054.5	277106.8	14422372.1
including waste of I–III classes of hazard	1434.5	597.5	15.6	138.5	15157.9
2012	450726.8	143453.5	1215.9	289627.4	14910104.7
including waste of I–III classes of hazard	1368.1	541.4	14.0	146.7	14324.8

\* For the 1994–2009 data is shown for waste of I–III class hazard; since 2010 – on waste of I–IV class hazard.

\*\* By 2010 data is shown for the economic activity of enterprises and organizations, since 2011 – including waste generated in households.

Source: [2]

5. Availability of waste of I–III class hazard in designated areas or sites and in the business at the end of the year during the period is reduced to an average of 5 % annually.

So during 2000–2010 the largest reduction was experienced by waste disposal by burning. In terms of today's burning garbage this is a promising source of high quality heat energy for the needs of industrial facilities. However, in order to make its development better in Ukraine's energy market we must clearly identify the new segment – the generation of energy from thermal waste disposal.

In the conditions of globalization greening trend begin to take more prevalent and affects not only compliance products and related manufacturing processes with environmental standards, but the very culture of carrying business.

Table 2 provides data on capital investment and ongoing costs of enterprises, organizations and institutions for the protection and sustainable use of natural resources in Ukraine for the period 2009–2012.

So, as it is shown in Table 2, the leaders in terms of investments during 2009–2012 are such conservation measures as return water purification, waste management and air protection. The decisive role in the implementation process of sustainable waste management is given to local authorities, as they determine the organizations that provide services for waste removal approve sanitation schemes settlements and implement systems for collecting waste for separate lines. However, the introduction of separate collection of waste requires appropriate organizational, technical and financial conditions, namely containers for appropriate purpose located in areas of primary collection container; sorting of waste sites and enterprises. However, implementation of these conditions in practice requires considerable effort and respective financial costs. In turn, one should remember that the introduction of such a system would not have meaning in the absence or underdevelopment of the recycling sector of secondary materials. Another problem in the issue of management of household waste is the inability of

local governments to build its own complex processes for the commercialization of waste. To solve this problem, the appropriate state legal, economic, scientific, technical and financial support is needed.

Table 2

**Capital investment and operating costs of enterprises, organizations and institutions for the protection and sustainable use of natural resources in Ukraine during 2009–2012**

Number	Referrals of capital investment and current expenditure	Year, millions of UAH							
		2009	Fraction, %	2010	Fraction, %	2011	Fraction, %	2012	Fraction, %
1	Protection of air and climate	2308.9	20.85	2454.7	18.70	4011.0	21.69	3804.2	18.54
2	Purification of wastewaters	5189	46.86	5770.1	43.95	6109.7	33.04	7042.1	34.33
3	Waste management	2328.3	21.03	3075.2	23.42	5049.8	27.31	5486.7	26.75
4	Protection and rehabilitation of soil, groundwater and surface water	641.7	5.80	796.2	6.06	1231.9	6.66	1284.0	6.26
5	Reducing noise and vibration (except for safety measures)	25.9	0.23	11.2	0.09	70.8	0.38	151.7	0.74
6	Biodiversity and habitats saving	225.9	2.04	255.9	1.95	347.3	1.88	400.4	1.95
7	Radiation safety (except for measures to prevent accidents and disasters)	101.9	0.92	459.4	3.50	1347.0	7.29	2002.7	9.76
8	Researches of environmental orientation	57	0.51	65.3	0.50	61.4	0.33	69.8	0.34
9	Other areas of environmental activities	194.7	1.76	240.0	1.83	261.6	1.42	272.4	1.33
Total:		11073.3	100	13128.0	100	18490.5	100	20514.0	100

Source: [developed by authors on basis of 4, p. 171, 5, p. 175, 6, p. 165, 7, p. 198]

Waste management is a process of its complete or component transformation into the secondary resources for future consumption in the production process. Today one of the most efficient forms of waste recycling – returning back into circulation and reuse of industrial or consumer waste. The most common are secondary, tertiary and other processing types in different scales of materials such as paper, glass, fabrics, asphalt and aluminium [8].

In turn the international practice proves not only environmental but also economic viability of the legal obligations of business entities used in economic exchange waste disposal, organize residues packaging products made of firms. This assertion is reflected in a number of benefits provided by the recycling companies, in particular [9]:

1. Decreasing the influence on the environment.
2. Maximal utilization of material resources for secondary recycling.
3. Saving of natural resources and energy.
4. Reducing the contaminating influence of human activities on the environment and prevention of further landfills spread.
5. Growth of consumer culture and the formation of appropriate environmental justice consciousness.

The complex efficient consequence of given advantages benefits not only for the improvement of the existing environmental situation in the country, but also to ensure the environmental safety [9]. Rational waste management is a complex process that requires not only an appropriate infrastructure support, but implementation of appropriate logistics solutions aimed at optimizing of the return material flows.

Construction of the logistics of waste requires appropriate planning decisions regarding the size and type of goods carriers, availability of internal assembly sites or direct waste transport from their origin places to disposal facilities. The selection of product carriers depends on the amount of waste generated

and the frequency of its acceptance. With the implementation of the physical transformation of waste processes there are four responsible groups of institutions [10]:

1. Companies that collect and transport waste and secondary raw materials purchase sites that are responsible for the accumulation of the maximum amount of waste with the greatest benefit and its subsequent tradition to recycling or sorting facilities. These firms also contribute to avoiding of industrial storage of valuable secondary raw materials in landfills.

2. Waste sorting waste facilities that are responsible for carrying out correct preparation of waste for the purpose of acquiring their suitability for further transformation.

3. Recycling facilities that are engaged in the transformation of waste as well as manufacturers that use natural and recycled materials. The scope of their responsibility is the right transformation and minimization of the side effects of waste recycling process; implementation of trade secondary recycled materials; documentation of the correctness of the processing and usefulness of the resulting products

4. Landfills of waste that are responsible for preventing storage of waste on its territory, which constitute the raw worthness of the recycling processes inputs.

In the process of recycling entities such as manufacturers, importers and trade institutions engaged in the implementation of recycling products to market participate. There are two types of recycling, material (mechanical) and raw (chemical). Material (mechanical) recycling is a process of converting waste by mechanical means only: crushing, screening and grinding. This type of recycling uses the physical properties of materials without significantly disruption of their chemical structure. Raw (chemical) recycling process performs the conversion of waste through the use of chemical reactivity of the compound – providing responses that contribute to the degradation of substances of low molecular starting compounds. Raw recycling allows to reuse a product for further manufacturing that has quality of primary raw product [10].

The rapid development of information technology affects all spheres of human activity and process of household waste management are not the exception.

Today, a number of practical applications of technologies aimed at improving the recycling process are designed and implemented, first of all [11]:

1. RFID tracking – a technology that provides data concerning solid waste and measures for their collection without human intervention. Availability of RFID tags on trash urns and RFID readers on garbage trucks allows checking where and when waste was collected in the city due to the electronic record of the route of the truck and the marks of time and its coordinates in space. At the end of the route it is possible to make a count of the number of tanks for recycled materials that are in use and the amount of waste received from each house. In such a way the information on the number of secondary raw materials, which account for one family is obtained. This information helps analysts study the demographic situation regarding public participation in the programs of recycling. In areas characterized by low participation, local authorities can begin incentive programs for the public.

2. Pay As You Throw (PAYT) – another system that can be implemented using radio tags. Garbage trucks equipped with special weights provide a mean to determine the amount of waste thrown out by each house. Payment for each pound is formed by residents of a particular building. PAYT system is most effective in areas where people have average and above average levels of prosperity.

3. WeRecycle – a strategic placement of trash urns for secondary raw materials. The technology is based on consideration of social and environmental awareness of citizens and used to analyze the phenomenon of the impact of human behaviour on the percentage of recycling, including plastic bottles – involves the use of GPS readers placed in garbage urns, which sends a signal regarding the number of discarded bottles into particular urn. The data is downloaded to the relevant website and when clicking on it on the map, you can see where all the tanks are located and view their completion percentage of recyclable materials. This data helps to determine the required capacity of the tanks in order to maximize their level of fullness and required processing speed. There is a program based on Android for WeRecycle, which helps people to find the nearest garbage urn for secondary raw materials.

4. Gasification. What appears as garbage for someone, can be viewed as a source of energy for others. In the solid waste exists a significant amount of available energy, which is thought to be used on only 2 % of its overall power capacity. Waste recycling to energy through the use of gasification technology involves the creation of a clean, sustainable and cheap synthetic gas consisting of hydrogen gas and carbon monoxide. Syngas is

characterized by a density of 50 % natural gas and can be used in several areas, namely as a means of purification of crude oil; as a catalyst for the production of ethanol or recycled in an environmentally diesel.

So, proper waste management should include collection, movement and ultimate recycling of secondary raw material into energy or a material object. Accordingly, the economic efficiency of the process is largely determined by the process of data organization in particular on the macro level of the economy. To achieve this, companies need to adapt their activities to relevant business concepts and environmental marketing in particular on fig. 1 the variety of environmental marketing concepts that can be used by business entities is shown.

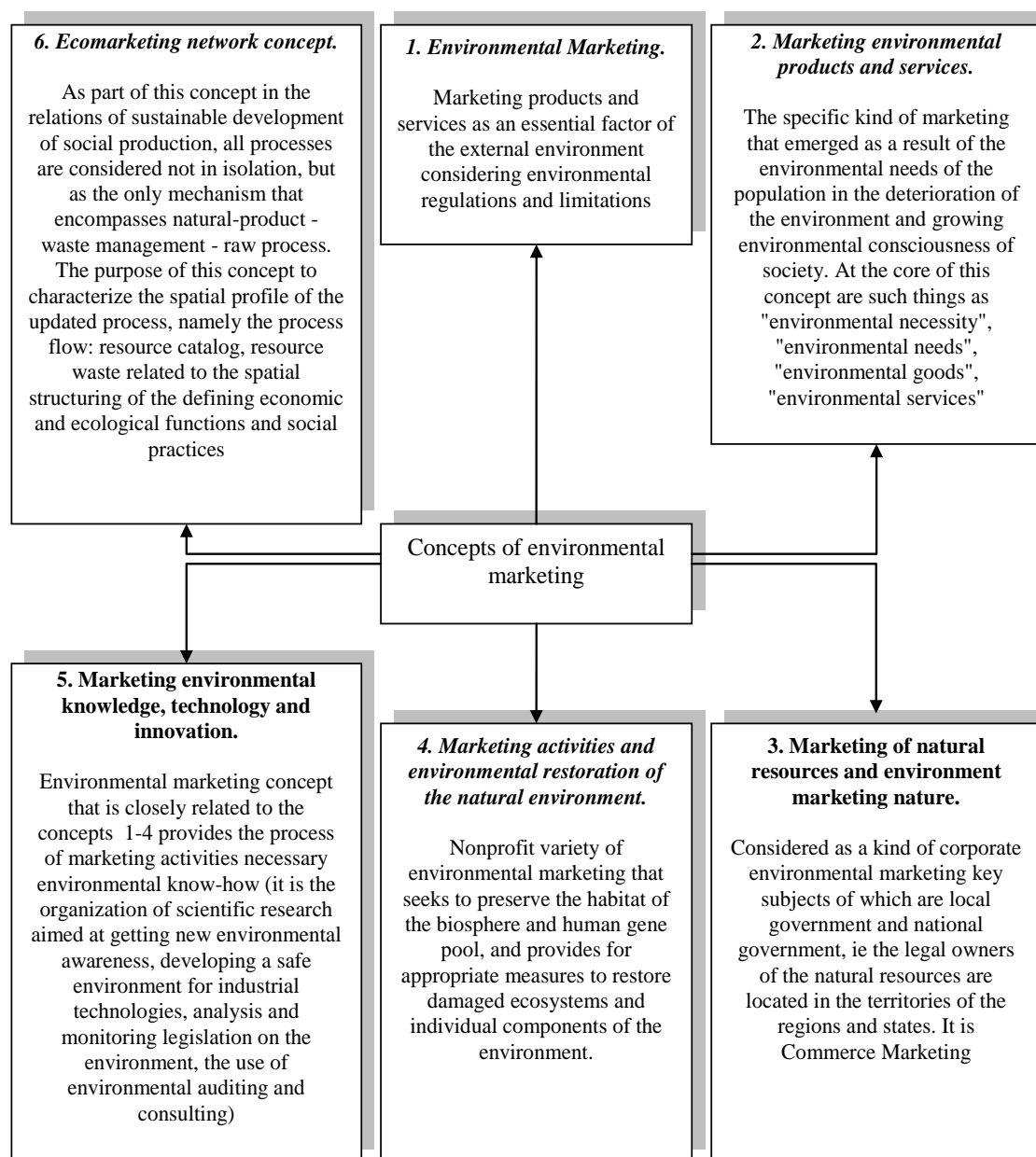


Fig. 1. Types and characteristics of environmental marketing concepts

Source: [developed by authors on basis of 12]

Thus, talking about the problem of efficient waste management, the most appropriate for the application will be the concept of ecomarketing network because it is based on an integrated approach for the organization of primary and secondary processes of material flows transformation. In turn it will be most effectively implemented as a part of the enterprises associations cluster by utilizing scale and synergies effects.

Today there are many operating waste processing companies in Ukraine that sell their work in highly innovative waste management approaches (table 3).

Table 3

**Examples of waste recycling enterprises in Ukraine**

Name	Location	Characteristics of activity
SE “Argentum”	Lviv, Ternopil	Extraction of precious metals using chemical power sources.
SE “Ukrcoresources”	Poltava	Recycling of plastic waste of high and low pressure and polypropylene in pellets that can be used for the production of street tiles, sewer pipes, technical films, garbage bags and other products analogs.
Ltd “Acros”	Brovarskyi district, Kyiv region	Transactions on handling hazardous waste of I-IV classes such as its gathering, storage of certain types of waste as secondary raw materials followed by transfer of waste according to the hazard class and physical properties by specialized enterprises and polygons that have the necessary permits, certificates and licenses for disposal, recycling, removal, disposal, destruction of compliance with applicable environmental legislation of Ukraine.
Waste burning plant “Energy”	Kyiv	The burning of solid waste in order to obtain thermal energy for human consumption and industrial facilities

Source: [developed by authors on basis of 13, 14, 15, 16]

On the basis of the secondary marketing information analysis it is revealed that the potential income that would be received from recycling of at least half of the waste in Ukraine amounts to 3.3 billion UAH. World practice shows that the business of waste disposal is a highly profitable and does not require government subsidies. Accordingly the key task of the government is to create favourable conditions for further development of the business. For example, in the EU in the process of waste disposal system establishing government and market participants are involved that are connected with

it, which allows to build not only highly efficient system recycling, but also its further distribution and targeted use derived from the utilization of financial resources. The EU operates Directive “On Packaging and Packaging Waste” which is performed by all eurozone countries, which prescribes rules for utilization of all kinds of packaging materials. In developed European countries the appropriate conditions for economic incentives to attract investment in the construction of sorting lines and processing plants are created. As for packaging manufacturers and importers, they also are granted a right for the implementation of norms for utilization, collection and recycling of packaging [17].

Today, the accumulation at domestic landfills of large amount of garbage makes a strong human impact on the environment, which is often accompanied by such negative phenomena as trash fires, soil pollution etc. So creation of the amiable environment for utilization business in Ukraine taking into account the European practice should be seen as government strategy clearly focused for business development in Ukraine, which will allow not only to ease human impact on the territory of Ukraine, but also generate additional financial streams in the state and local budgets.

**Conclusions and further research prospects.** The waste recycling is one of the strategic directions of new competitive advantages of the national economy formation for Ukraine, taking into account modern challenges of environmental and energy, resulting in reducing of anthropogenic impact of economic activity on the environment, as well as decreasing the energy dependence from energy exporting countries. A number of advanced technologies are designed in order to optimize the processes of data collection and subsequent recycling, but for its efficient use it is necessary to form an adequate system of economic relations between all players in the process of recycling. To ensure an effective system of waste management is proposed using the concept of network ecomarketing that it is advisable to implement a system of cluster associations. Prospects for future research are related to the study of foreign experience of the industry taxation to determine the appropriate tax incentives as factors influencing the development of the utilization of business in Ukraine.

1. Закон України “Про відходи” від 05.03.1998 р. № 187/98-ВР [Електронний ресурс]. – Режим доступу: <http://zakon1.rada.gov.ua/laws/show/187/98-вр>. 2. Офіційний сайт Державної служби

статистики в Україні [Електронний ресурс]. – Режим доступу: <http://www.ukrstat.gov.ua>. 3. ДСанПіН 2.2.7.029-99 “Гігієнічні вимоги щодо поводження з промисловими відходами та визначення їх класу небезпеки для здоров'я населення” [Електронний ресурс]. – Режим доступу: [www.dnopr.com.ua/dnaop/act3041.htm](http://www.dnopr.com.ua/dnaop/act3041.htm). 4. Статистичний збірник “Довкілля України” за 2009 рік / Державний комітет статистики України; за ред. Ю.М. Остапчука. – К., 2010. – 201 с. 5. Статистичний збірник “Довкілля України” за 2010 рік / Державна служба статистики України; за ред. Н.С. Власенко. – К., 2011. – 205 с. 6. Статистичний збірник “Довкілля України” за 2011 рік / Державна служба статистики України; за ред. Н.С. Власенко. – К., 2012. – 195 с. 7. Статистичний збірник “Довкілля України” за 2012 рік / Державна служба статистики України; за ред. Н.С. Власенко. – К., 2013. – 234 с. 8. Кавиришин О.Г. Проблеми використання ресурсного потенціалу відходів міста / О.Г. Кавиришин, В.О. Кавиришина // Вісник ІЕПД НАН України. – 2011. – №1. – С. 141–145. 9. Дергачова Л.В. Законодавче закріплення рециклінгу як необхідної новачки у сфері поводження з відходами / Л.В. Дергачова // [Електронний ресурс]. – Режим доступу: [http://essuir.sumdu.edu.ua/bitstream/123456789/27379/1/Dergachova\\_Zakonodavche\\_zakriplennya\\_retsiklingu.pdf](http://essuir.sumdu.edu.ua/bitstream/123456789/27379/1/Dergachova_Zakonodavche_zakriplennya_retsiklingu.pdf). 10. Вороніна Р.М. Логістика рециклінгу / Р. М. Вороніна // Вісник Нац. ун-ту “Львівська політехніка”. – № 623: Логістика. – 2008. – С. 28–33. 11. Лорен Дрелл. Майбутнє сміття: 4 технології, які покращують переробку [Електронний ресурс]. – Режим доступу: [http://nauka.in.ua/news/technology/article\\_detail/7006](http://nauka.in.ua/news/technology/article_detail/7006). 12. Садченко Е.В. Теоретико-методологические основы стратегии экологического маркетинга / Е.В. Садченко // Вісник Одеського національного університету. – 2008. – № 15. – С. 110–116. 13. ДП “Аргентум” / Бізнес-портал “Універсальний львівський довідник” // [Електронний ресурс]. – Режим доступу: <http://www.dlab.com.ua/id/994>. 14. ДП “Укресресурси” запускає нову лінію переробки відходів у вторинну сировину [Електронний ресурс]. – Режим доступу: <http://ses-help.org.ua/articles/8456>. 15. Офіційний сайт ТОВ “Акрос” [Електронний ресурс]. – Режим доступу: <http://akros.kiev.ua>. 16. Офіційний сайт ПАТ “Київенерго” [Електронний ресурс]. – Режим доступу: <http://kyivenergo.com.ua/filials/energiya>. 17. Думка експерта: Україна закопує відходи вартістю 3 мільярди. / Українська правда. Економічна правда. // [Електронний ресурс]. – Режим доступу: <http://www.epravda.com.ua/news/2013/11/1/401539>.

1. The Law of Ukraine “On Waste” from 05.03.1998 #187/98-VR. Available at: <http://zakon1.rada.gov.ua/laws/show/187/98-вр>. 2. Official website of the State Statistics Service of Ukraine. Available at: <http://www.ukrstat.gov.ua>. 3. DSanPiN 2.2.7.029-99 “Hygienic requirements for industrial waste management and hazard class definitions for public health”. Retrieved from [www.dnopr.com.ua/dnaop/act3041.htm](http://www.dnopr.com.ua/dnaop/act3041.htm). 4. Statistical Yearbook “Environment of Ukraine” 2009 (2010) . The State Statistics Committee of Ukraine. ed. Ostapchuk Y.M. Kyiv , 2010. – 201 p. 5. Statistical Yearbook “Environment of Ukraine” in 2010 (2011) State Statistics Service of Ukraine. ed. Vlasenko N.S. Kyiv, 205 p. 6. Statistical Yearbook “Environment of Ukraine” in 2011 (2012) State Statistics Service of Ukraine. ed. Vlasenko N.S. Kyiv, 195 p. 7. Statistical Yearbook “Environment of Ukraine” in 2012 (2013) State Statistics Service of Ukraine. ed. Vlasenko N.S. Kyiv, 234 p. 8. Kavyrshyn O.H. (2011) The problems of resource potential of waste the city Bulletin IEPD NAS of Ukraine. VI. p. 141 – 145. 9. Dergacheva L.V. Upholding recycling as required innovations in the field of waste management Retrieved from [http://essuir.sumdu.edu.ua/bitstream/123456789/27379/1/Dergachova\\_Zakonodavche\\_zakriplennya\\_retsiklingu.pdf](http://essuir.sumdu.edu.ua/bitstream/123456789/27379/1/Dergachova_Zakonodavche_zakriplennya_retsiklingu.pdf). 10. Voronina R.M. (2008) Logistics Recycling. Bulletin of National University “Lviv Polytechnic” “Logistics”. V623. p.28-33. 11. Drell L. The Future of Trash: 4 technologies that improve recycling. Retrieved from [http://nauka.in.ua/news/technology/article\\_detail/7006](http://nauka.in.ua/news/technology/article_detail/7006). 12. Sadchenko E.V. (2008) Theoretical and methodological bases of environmental marketing Strategy . Bulletin of the Odessa National University. V15. p. 110 – 116. 13. SE “Argentum”. Business Portal “Universal Lviv directory”. Retrieved from <http://www.dlab.com.ua/id/994>. 14. Subsidiary “Ukrekoresursy” launches a new line of recycling of secondary raw materials Retrieved from <http://ses-help.org.ua/articles/8456>. 15. The official website of “Akros” [Electronic resource]. – Available at: <http://akros.kiev.ua>. 16. The official website PJSC “Kyivenergo” [Electronic resource]. – Available at: <http://kyivenergo.com.ua/filials/energiya>. 17. Expert Opinion: Ukraine buries waste \$ 3 billion. (2013 November 1) Ukrainian Pravda. The economic truth. Retrieved from <http://www.epravda.com.ua/news/2013/11/1/401539>.