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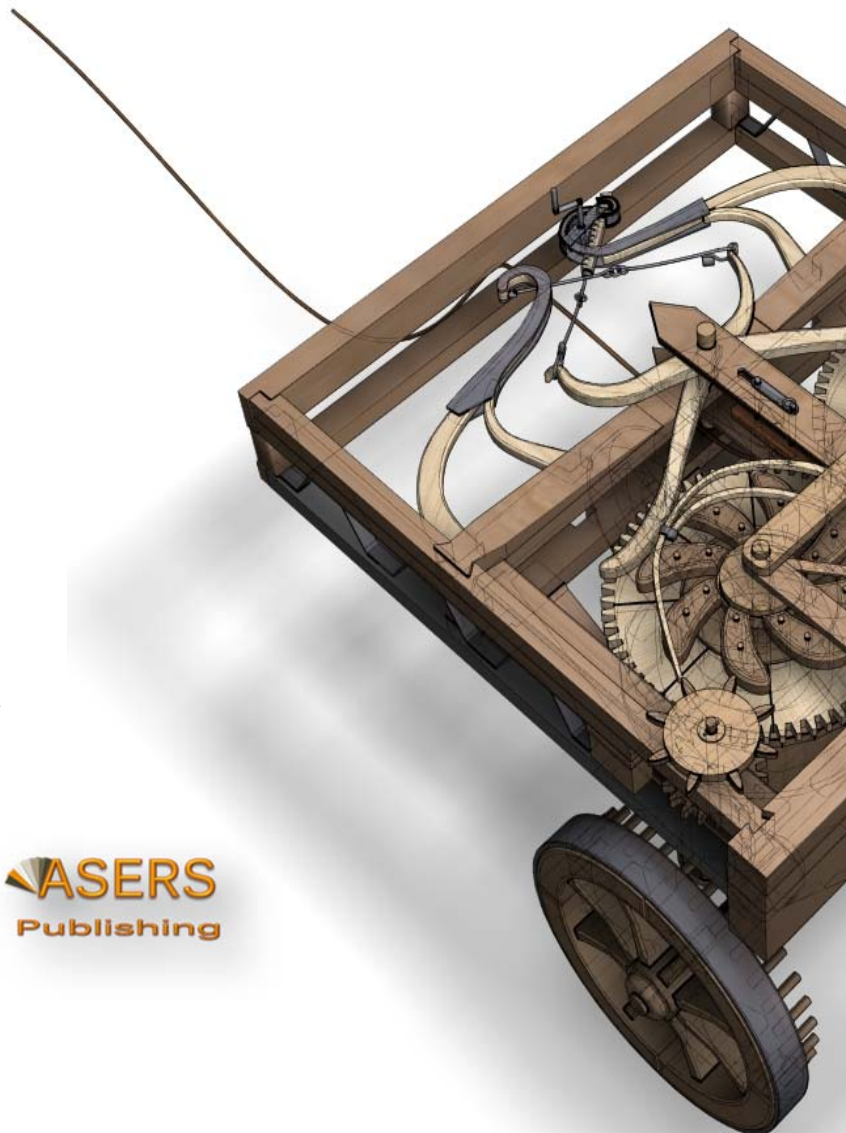
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Journal of Environmental Management and Tourism is an interdisciplinary research journal, aimed to publish articles and original research papers that should contribute to the development of both experimental and theoretical nature in the field of Environmental Management and Tourism Sciences.

Journal will publish original research and seeks to cover a wide range of topics regarding environmental management and engineering, environmental management and health, environmental chemistry, environmental protection technologies (water, air, soil), pollution reduction at source and waste minimization, energy and environment, modeling, simulation and optimization for environmental protection; environmental biotechnology, environmental education and sustainable development, environmental strategies and policies, etc. This topic may include the fields indicated above, but are not limited to these.

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Economic and Environmental Benefits of Using Waste Potential as a Valuable Secondary and Energy Resource

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Abstract:

The article is devoted to solving the problems of recycling in Ukraine, as the accumulation of waste every year becomes more and more threatening. Waste accumulated in landfills occupies 7 percent of the territory of Ukraine (more than 43 thousand km²), which simultaneously leads to pollution of water, soil, air and the deterioration of the ecological and economic situation in general. The experience of European countries in dealing with waste indicates the complexity and effectiveness of measures for their effective management, which is not currently available in Ukraine. The main objective of the article is to provide proposals on improving the processes of safe waste management in Ukraine, taking into account the EU experience and identifying a number of measures that will facilitate the effective management of solid household waste in Ukraine. The object of the research is municipal solid waste as a source of valuable secondary raw materials, as well as an energy resource. The research methodology includes the application of the dialectical approach and the methods of economic analysis: abstract-logical, statistical-economic, tabular and graphic, monographic, economic-mathematical (extrapolation method). The article highlights the ecological and energy efficiency of the secondary use of a valuable resource of solid household wastes. A scheme for organizing the effective utilization of solid household waste is proposed, the implementation of which is of practical importance in the implementation both at the level of individual communities and the state as a whole.

Keywords: household waste; solid waste; bio-waste; waste treatment; recycling; alternative energy.

JEL Classification: O13; Q20.

Introduction

Improving the quality of life of the population and the growth of its well-being is accompanied by an increase in the amount of waste it produces and leads to the contamination of a significant part of the landfills. Both solid domestic waste and organic agriculture constitute a significant threat to the environment and population. In

Ukraine, according to the Ministry of Ecology and Natural Resources, about 35 billion tons of waste is accumulated each year, of which 2.6 billion tons are highly toxic waste. The imperfection of scientifically substantiated mechanisms for processing, cleaning, disinfection and utilization of solid domestic wastes, as well as low efficiency of technological schemes for the transportation of solid waste with the coordination of the interests of all stakeholders in the area of dealing with them today is one of the main causes of the environmentally dangerous situation in a number of regions of Ukraine and in the world as a whole.

The sphere of solid domestic waste management in Ukraine is in a crisis situation. This crisis has several aspects, the main of which is the accumulation of solid domestic wastes, which are growing continuously, both in absolute terms and per capita. The composition of municipal solid waste is changing, adding to the increasing number of environmentally hazardous components. The population has a negative attitude to unconventional waste disposal methods at landfills, which complicates waste management and increases the cost of processing and disposal of waste.

Modern waste management requires large investments and constant adaptation to the growth of their number and diversity. If Ukraine intends to become a full member of the EU, today it is necessary to make changes in waste management in accordance with European practices. In particular, it is necessary to take into account the provisions of the Common Waste Management Strategy of the EU, the Framework Directive 2008/98 / EC of the European Parliament and of the Council of 19 November 2008 "On waste and abolition of certain directives" and the UN Framework Convention on Climate Change.

The agreement on the association of Ukraine with the EU provides for the implementation in the national legislation of the Waste Directive, which specifies a number of requirements for household waste management: by 2020, the preparation for reuse and recycling of waste, at least such as paper, metal, plastic and glass, from households and, if possible, from other sources, if their waste streams are similar to household waste, should be increased to at least 50% by weight.

The results of the study of the useful potential of solid household waste will be consistent with the goals of Ukraine's sustainable development, presented on September 15, 2017, by the Government of Ukraine in the National Report "Sustainable Development Goals: Ukraine", which defines the basic indicators for achievement. In particular, the following indicators are defined: available and clean energy (to ensure diversification of supply of primary energy resources, increase the share of renewable energy in the national energy balance, in particular through the introduction of a bioreactor that produces energy from renewable sources, to increase energy efficiency of the economy); Sustainable development of cities and communities (to reduce the negative impact of pollutants, including on the environment of cities, in particular through the use of innovative technologies, reduce the volume of waste generation and increase the amount of their processing and reuse on the basis of innovative technologies and productions).

1. Literature Review

The basis for waste management in the EU is laid down in the Waste Management Strategy (1996) and EU Directive 2008/98 / EC on waste. Publication of the European Circular Economy Package by the EU Commission in December 2015 opened the way for a resource-efficient society and sustainable recycling industry in the EU. In addition to the presentation of the Action Plan, the Package also included proposals for a change to the EU's main waste recycling legislation with a view to re-utilizing and recycling more waste in the future and increasing their use in renewable energy.

The work of scientists in which the utilization and recycling of waste associated with the production of alternative fuels deserves attention. Geletukha G. *et al.* (2018) presented an analysis of the potential of biofuel production from biomass derived from tree trimming and tree eradication in the EU. The place of wood biomass in the energy potential of biomass and its practical use in Ukraine have been analyzed. Waste from agricultural production is a real component of the potential that is already used for energy production. Trofimov I. (2014) analyzed the shortcomings of the existing methods of disposal of solid household waste and justified the methods of recycling household waste in order to obtain alternative energy sources. Zulauf *et al.* (2018) noted that biofuel production is important for Ukraine, since 11.5% of primary energy supply should be from biomass, biofuels and waste, as defined in the Energy Strategy of Ukraine for the period up to 2035. Cremiato, R. *et al.* (2018) compared the environmental impact of the four different scenarios of separation and waste treatment [5]. The most important result is that the increased separation of secondary materials used as raw material substitutes and biowaste used for renewable energy production helps to reduce direct and indirect loads associated with the overall life cycle of production.

The introduction of world experience in recycling and disposal methods can significantly improve the

recycling of waste in Ukraine. Berezyuk O. (2017) determined the parameters on which the prevalence of solid household waste burning using energy depends. These parameters include: the population density of the country; GDP per capita; the human development index and the average geographical latitude of the country allows us to compare countries with different levels of economic development and human potential, population, territory and climatic conditions.

Particularly noteworthy are works, which analyze the institutional framework and legislative framework governing waste management in Ukraine. Gorobets, O. (2013) analyzed the mechanisms of state regulation in the field of waste management and outlined the main directions of its improvement. The conclusion is made about the need for a balanced combination of structural and structureless management methods. Kaletnik, H. (2018) notes that the regulatory framework in the field of waste management requires improvement and consistency in terms of government decisions.

The purpose of this study is to conduct an analysis of the current state of waste management in Ukraine (1); to analyse the features of the management of the solid household waste in the EU (2); to provide suggestions for improving the processes of safe waste management in Ukraine, taking into account European experience (3), which will significantly reduce the anthropogenic pressures on cities and generally improve the environmental situation; identification of a number of activities that contribute to the efficient handling of solid household waste in Ukraine (4).

2. Methodology

In the process of research, the dialectical method of cognition was taken as the basis, it can be traced in the following relationship: the volume of domestic solid waste generation → recycling of solid household wastes → the environment. Methods of economic analysis, which were used in the course of the study: abstract-logical method, providing theoretical generalizations, the formation of conclusions; statistical and economic method, in particular, comparison and comparison of quantitative and qualitative indicators of education and waste management, tabular and graphical – to reflect the analytical and statistical information and individual processes of the mechanism of waste use; monographic – development of the work of scientists from different countries on waste management; economic-mathematical method – to determine the trends in waste management in EU countries (extrapolation method).

3. Case Studies

The waste means any substances, materials and objects that were formed in the process of production or consumption, as well as goods (products), that completely or partially lost their consumer properties and have no further use at the place of their formation or identification and from which their owner disposes, intends or should be disposed of by disposal or disposal (Law of Ukraine "On Waste"). According to the State Statistics Committee of Ukraine, this group of waste accounts for 90% of the volume of solid waste (Trofimov 2014). The remaining 10% is municipal solid waste.

Municipal solid waste is generated in the process of human life and accumulates in residential buildings and social institutions and has no further use at the place of their formation. This is food waste, household items, garbage, fallen leaves, paper, glass, plastics, polymers and the like.

According to the Ministry of Ecology and Natural Resources of Ukraine, the structure of municipal solid waste in Ukraine corresponds to the category of transition countries:

- "dry" secondary resources suitable for industrial processing (plastics, glass, metals, paper and textiles), which make up 35-45% of the total mass;
- "wet" biodegradable products for composting (kitchen, food, garden waste, as well as wet and contaminated paper waste) – 25-35%;
- other waste that is not recycled. In each case, waste that is potentially recyclable can be attributed to them, but there are no economically sound recycling technologies for this region (for example, disposable diapers or composite packaging).

According to the Sixth national Ukrainian report on climate change (2014), the composition of solid waste includes food waste – 35-50%, paper and cardboard - 10-15%, secondary polymers - 9-13%, glass – 8-10%, metals – 2%, textiles – 4-6%, construction waste – 5%, wood – 1% and other waste – 10%.

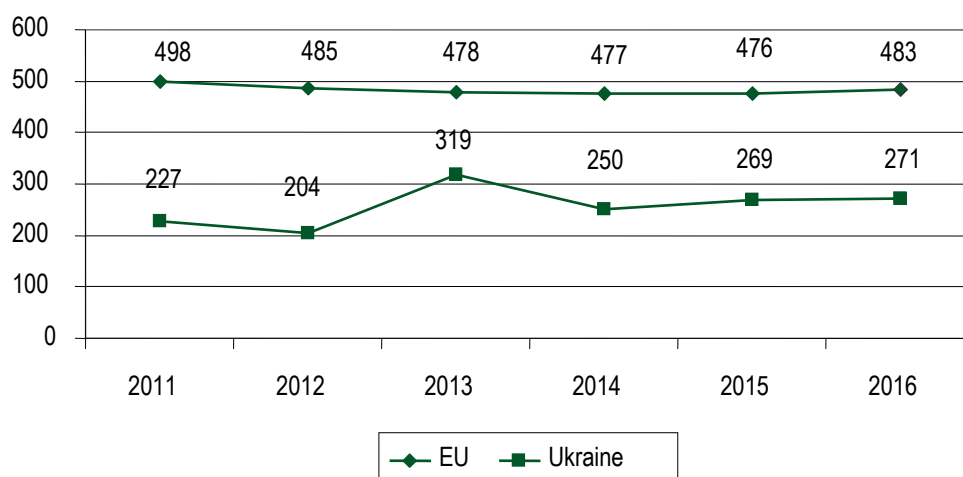
Household waste is one of the most important factors of environmental pollution and negative impact on virtually all its components. Infiltration of storages, burning of waste heaps, dust formation, other factors that cause the migration of toxic substances, lead to pollution of underground and surface waters, deterioration of

atmospheric air, land resources, etc.

Ensuring a clean environment is among the priorities identified by the UN Sustainable Development Goals, which Ukraine has recently joined. One of the factors contributing to the achievement of this goal is to reduce the generation of household waste and increase the proportion of their recycling and reuse.

According to the State Statistics Committee of Ukraine, in 2016, 11.6 million tons of household waste was generated in Ukraine, or 271 kg per capita (Figure 1). In the EU, the amount of domestic waste generated is much higher than in Ukraine, but in the dynamics it is constantly decreasing and the level of waste processing is much higher, as evidenced by European statistics (2018).

Figure1. Dynamics of generated household waste, kg per capita



Source: Developed by the authors using the data from the State Statistics Committee of Ukraine and Eurostat

There are differences between countries of the EU regarding the waste generation volumes. Municipal waste statistics of the EU show that the largest amount of the waste generation per capita was recorded in Denmark (789 kg), Cyprus (638), Germany (625 kg), Luxembourg (625 kg) and Malta (624 kg). The least amount of household waste was generated by Poles and Romanians – less than 300 kg per capita (Table 1).

Table 1. Household waste treatment in EU and Ukraine, 2016 (kg per capita)

Countries	Generated	Treated	%	including:			
				landfilled	incinerated	recycled	composted
Czech Republic	316	316	100	166	56	81	13
Denmark	789	789	100	9	415	215	150
Germany	625	610	98	1	196	299	114
Estonia	359	313	87	26	185	89	13
Greece	485	485	100	409	2	62	12
Spain	434	434	100	239	50	73	71
France	501	501	100	129	174	112	87
Italy	486	432	89	129	92	126	86
Latvia	404	366	91	250	0	92	24
Lithuania	448	442	99	242	52	103	46
Hungary	377	377	100	202	53	98	23
Netherlands	523	523	100	7	245	129	142
Austria	560	548	98	17	212	144	175
Poland	286	286	100	127	38	75	46
Romania	247	216	87	178	6	14	18
Sweden	447	447	100	4	229	145	70
UK	485	472	97	109	152	132	79
EU-28	476	462	97	122	126	136	78
Ukraine	271	142,7	53	98,6	0,05	0,2	0

Source: Developed by the authors using Municipal waste statistics of EU, the data from the State Statistics Committee of Ukraine

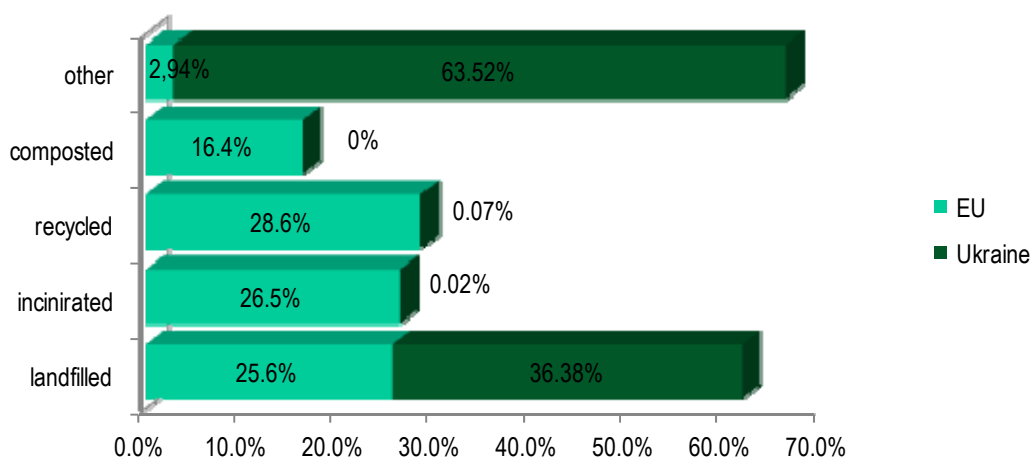
Only 53% of waste generation totals was treated in Ukraine by 2016, which is 1 percentage point less than a year before (see Table 1). Almost 70% of the treated waste was exported to specially equipped landfills,

4% was incinerated and only 0.1% was recycled.

Nowadays there are different ways of recycling of secondary raw materials: combustion for energy; thermal decomposition (pyrolysis, destruction, decomposition to output monomers, etc.); recycle; recycling.

97% of the household waste totals generated in the EU is treated. At the same time, in 11 EU countries the share of treated household waste is 100%. The structure of waste treatment in the European Union in general is as follows: 29% of waste was recycled, 26% was taken to landfills, 26% was incinerated and 16% was composted (figure 2).

Figure 2. The structure of waste management in the EU and Ukraine, 2016



Source: Developed by the authors using Municipal waste statistics of EU and the data from Ministry of Ecology and Natural Resources of Ukraine

According to Eurostat 58 million tonnes of waste were landfilled in the EU-28 by 2017, 68 mln t were incinerated, 74 mln t – were recycled, 43 mln t – were composted, 6 million tons were treated for other purposes.

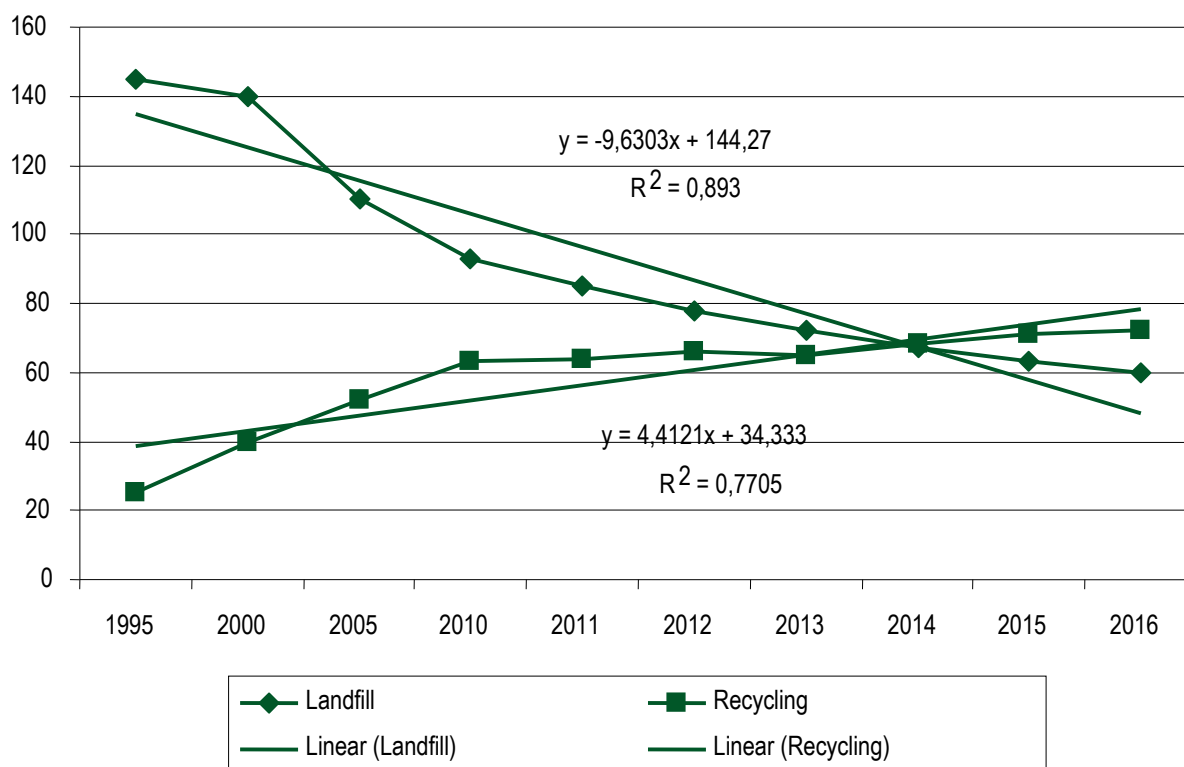
Table 2. Household waste by treatment categories in the EU-28

Treatment category	Year											change (%) 1995-2017
	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	
	million tonnes											
Landfill	145	140	110	93	85	78	72	67	63	60	58	-60
Incineration	32	39	44	57	60	59	62	64	65	68	68	111
Recycling	25	40	52	63	64	66	65	68	71	72	74	196
Composting	14	24	29	35	35	36	37	38	39	40	43	205
Other	10	11	16	6	6	6	6	6	7	7	6	-43

Source: Developed by the authors using Eurostat (<https://ec.europa.eu/eurostat/statistics-explained/index.php>)

The total amount of waste recycling is growing significantly in the dynamics in EU. Calculations based on Eurostat data (for the period 1995 to 2016) showed that the waste recycling totals are increasing with an average increase of 4.4 mln.t, and the landfilling rate is decreasing with an average decline of 4.4 mln.t in the EU-28 (Figure 3).

Figure 3. The dynamics of the main trends of waste treatment in the EU-28, million tonnes



Source: Developed by the authors using Eurostat (<https://ec.europa.eu/eurostat/statistics-explained/index.php>)

The European Union legislation demands to achieve an indicator of 65% recycling waste rate and 10% - the permissible amount of waste landfill. By 2030, Europe is proposing an increase in recycling rates up to 70%, recycling packaging waste rates up to 80%, and waste landfill – up to 5%. Unfortunately, Ukraine lags behind these indicators. The National Waste Management Strategy, adopted by the Government in implementation of the EU Directives, provides reduction in the household waste landfill rate from 95% up to 30%, the total amount of waste landfill rate should be reduced from 50% up to 35%.

The main indicators characterizing waste include morphological composition, humidity and the ratio of organic and inorganic substances. The morphological composition of household waste will be changing constantly, as the amount of polymers (PET, cardboard) increases significantly and the amount of food waste significantly reduces. In correspondence with this trend, the need for separate collection of different components of household waste both by population and trade, industrial and other enterprises arises.

Scientists have calculated that 80% of waste can be recycled when separate waste collection is provided. Only 10-15% from mixed waste can be removed for treating. Therefore, the basis of any treatment is sorting.

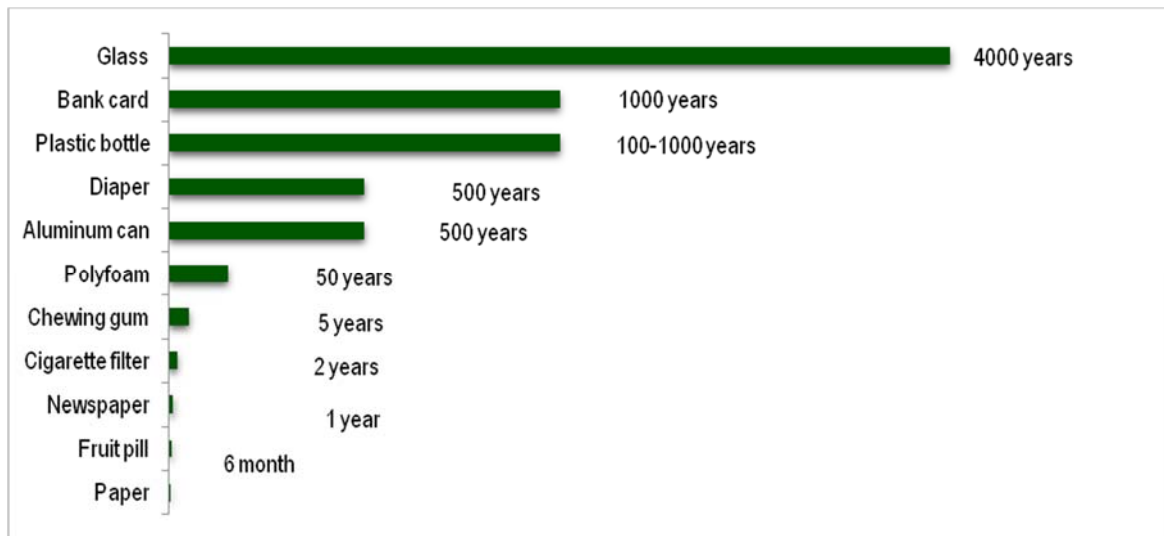
According to the Ministry of Regional Development, Construction and Utilities of Ukraine, 575 settlements were collecting waste separately, there were 22 waste sorting lines in Ukraine, 1 incinerator plant and 3 incinerator settings by 2016.

From January 1, 2018, an amendment to the law "On Waste" came into force in Ukraine, which prohibits the landfilling of untreated wastes. According to the changes that came into force in 2018, local governments are prohibited from taking untreated household waste at landfills, therefore cities and villages should provide waste sorting by types for treating and further recycling. Unfortunately, the envisaged legislative measures are not always fully implemented in practice.

In order to create an effective waste management system, it is necessary to consider and adapt the best international experience, for example, of those European countries that have already harmonized their legal framework with the EU legislation and brought it into line with applicable directives.

Part of the solid household waste can be recycled, thus reducing the appearance of waste that does not decompose at all or decompose for a long time. For example, the time of decomposition of foam is about 50 years, aluminium banks – about 500 years (Figure 4).

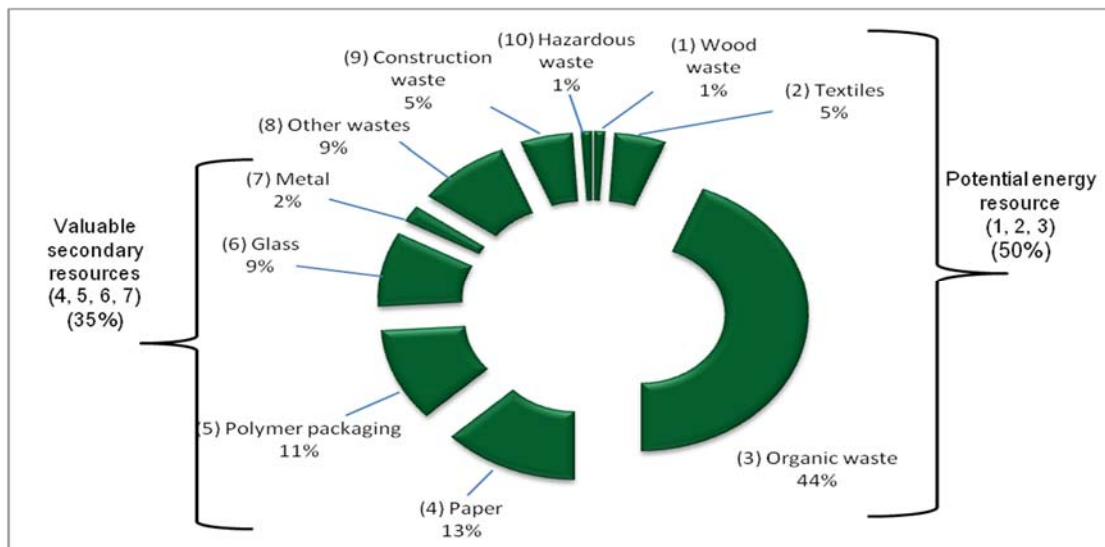
Figure 4. Time of decomposition of waste in nature



Source: Developed by the authors using the data from Ministry of Ecology and Natural Resources of Ukraine and Report in the EU Tacis

Cardboard, paper, leather, rubber, wood, metals and glass can be recycled. The content of valuable raw materials in household waste, depending on the type of waste and type of collection, can vary significantly (Figure 5).

Figure 5. Content of valuable secondary raw materials in household waste in Ukraine



Source: Developed by the authors using the data from Report in the EU Tacis, The sixth national communication of Ukraine on climate change ra Ministry of Ecology and Natural Resources of Ukraine

Recycling of certain categories of solid household waste is economically profitable, since it is possible to obtain a valuable secondary product, the cost of which is much less than in the production of similar products from primary raw materials (Table 3).

Secondary usage of a valuable resource of solid waste enables us to obtain economic benefit in the form of cheaper secondary products, the production of which saves primary resources, electricity, water, as well as it has the environmental impact of waste and environmental pollution reducing.

Table 3. Efficiency of secondary use of valuable resource of solid household waste

Valuable resource from solid household waste	Products	Effects in comparison with the production of similar products from primary raw materials	
		ecological	economic
Paper	Newsprint, toilet paper, cloth, roofing felt, cardboard	Reducing of air pollution by 74%, water pollution – by 35%. 1 ton of waste paper keeps from cutting 17 trees	Water saving reaches 60%, energy savings - 40%. The cost is reduced by 42-53%
Aluminum cans	Aluminum cans, other types of aluminum products	Aluminum is a component of clays and rocks, and is difficult to extract. The load on the environment decreases. 1 ton of recycled aluminum saves 4 tons of bauxite	Energy savings for aluminum production reach 86%, water savings - 50%. The cost is reduced by an average of 37%
Plastic	Household items, household appliances frames, pipes, toys, materials for 3D printers, and others.	Decreasing of emissions of heavy particles into the atmosphere by 25%; pollution of the environment decreases; 1 t of plastic saves 750 kilograms of oil	Recycling of 1 ton of plastic saves 5774 kW / year, or 100 million kilojoules per year, the cost of finished products reduces by 35-40%
Glass	Glass containers; usage of bricks, tiles, water filters, ceramics in the production	Reduction of the release of carbon dioxide into the atmosphere during production; 1 t of barrel saves 600 kg of sand, 170 kg of limestone, 190 kg of soda ash and 70 kg of feldspar	The production of new glass from the secondary glass reduces energy consumption by 6%, the usage of water reduces by 50%. the cost of finished goods reduces by 45-63%
Non-ferrous metal scrap	Melted metal that does not lose its quality	Reduction of depletion of non-ferrous metal ores, preservation of ecosystems; 1 ton of scrap saves an average of 1.5 tons of ore, 0.5 tons of coke	The energy usage reduces by 70% and water usage by 40%, the cost of finished products reduces by 75-83%
Food waste	Compost, biohumus, biogas	Reducing of methane emissions into the atmosphere - reducing of the risks of greenhouse effect.	The cost of energy on biogas basis is 10 times less than of traditional sources

Source: developed by authors

The proposed measures concerning improving of the efficiency of waste utilization and recycling at the state level are complex and include financial and economic, market, socio-cultural, regulatory-institutional, technological and informational components (Table 4).

Table 4. Measures to improve the efficiency of waste utilization and recycling

Direction	Measures
Financial and economic	<ul style="list-style-type: none"> ▪ Priority financing of environmental programs and environmental measures; ▪ attraction of investments in the sphere of solid waste treatment, including public, private, and foreign; ▪ providing of affordable loans for the construction of waste processing plants; ▪ the formation of a payment system aimed at implementing of the principles of minimizing of creation, maximum utilization and safe removal of solid waste; ▪ stimulating of participants of collecting, transporting and processing solid waste; ▪ reduction of tax burden, preferential rates, or non-taxation of income derived from the usage of waste or secondary resources in the production process.
Market	<ul style="list-style-type: none"> ▪ development of local markets for technologies and raw materials by attracting private investors to the agricultural biofuel production sector in rural areas; ▪ the emergence of competitors in the market, which will reduce the cost and improve the quality of services.
Socio-cultural	<ul style="list-style-type: none"> ▪ increasing the level of environmental consciousness of the population; ▪ ecological education, which will become an effective preventive measure for environmental

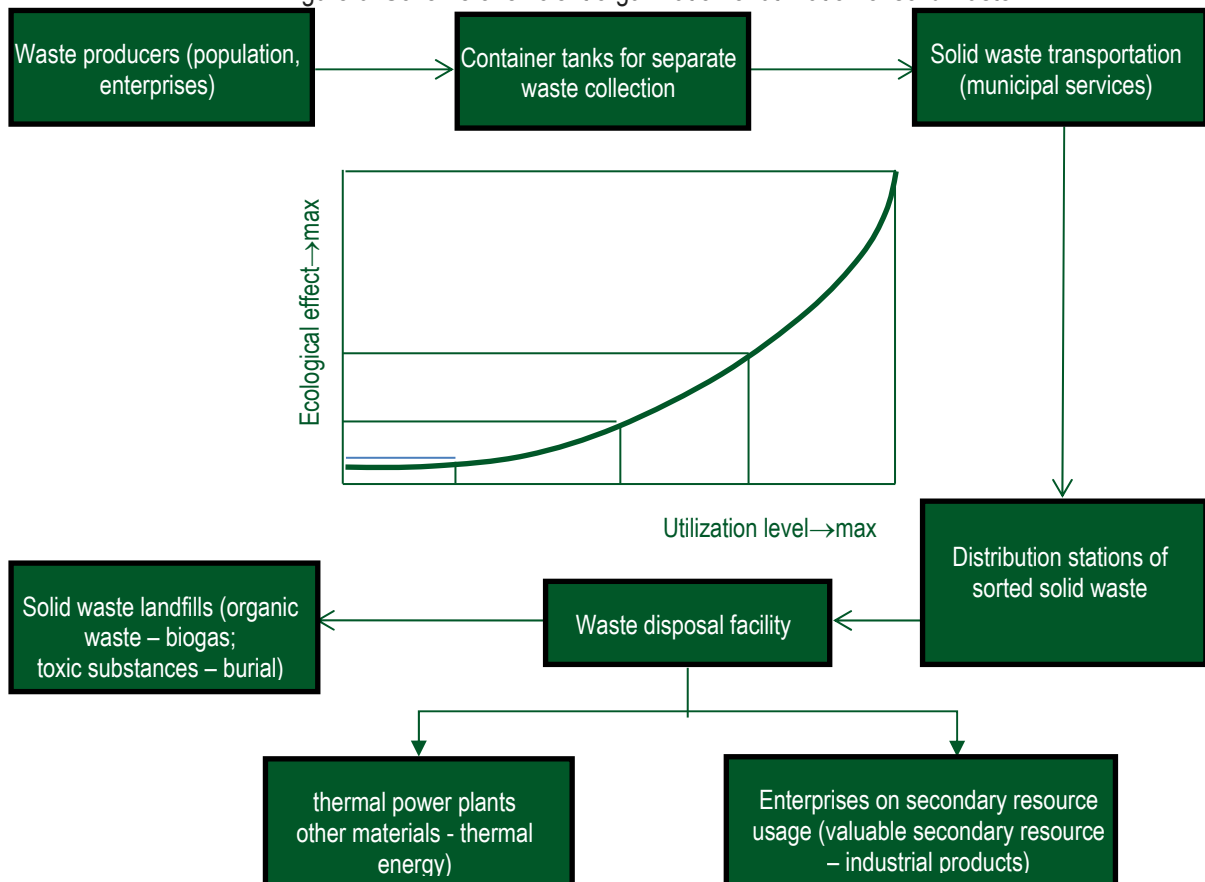
Direction	Measures
	offenses; <ul style="list-style-type: none"> raising of awareness of short-term and long-term environmental impacts associated with air and environmental pollution caused by wrong waste management, also people informing about the benefits of waste recycling and environmentally friendly energy for the environment and health.
Regulatory-institutional	<ul style="list-style-type: none"> harmonization of Ukrainian and European legislation in the field of waste management; development and implementation of programs of state financial support for the construction of enterprises that will process waste; improvement of the system of state financial support for waste treatment by taking into account the socio-economic characteristics of individual regions regarding the waste generation; reation of a system of economic mechanisms oriented on the development of regional markets for secondary resources and goods produced from secondary resources.
Technological	<ul style="list-style-type: none"> creation of the system of innovative management of material and energy cyclic-locked streams; improvement of the system of collecting and provision of secondary raw materials; using of effective modern technologies of waste processing; decreasing of technology cost for the construction of garbage processing plants and biofuel production plants through the usage of more affordable materials for construction (for example, polyethylene).
Informational	<ul style="list-style-type: none"> introduction of demonstration objects and pilot projects; introduction of trainings for local specialists on waste sorting and recycling.

Source: developed by authors

Complex implementation of these measures is a real ground for improvement in the field of waste management in Ukraine and the effective usage of the potential of a valuable resource of solid waste and, accordingly, reducing negative anthropogenic impact on the natural environment.

We propose a scheme for the efficient organization of utilization of solid waste at the level of individual communities, which purpose is to maximize the recycling and reusage of waste to obtain valuable raw materials and energy (Figure 6).

Figure 6. Scheme of efficient organization of utilization of solid waste



Source: developed by authors

To create an effective mechanism for the disposal of solid waste in Ukraine, according to the proposed scheme, incentives are needed at all levels:

- households, enterprises – to separate collection of waste;
- municipal authorities – to effectively organization of the transportation of sorted solid waste;
- stations for the distribution of sorted solid waste – to the qualitative distribution of waste for its intended purpose (for the enterprises of secondary resources usage – for corresponding products production, thermal power plants
- waste incineration for the purpose of energy recovery, solid waste polygons – for the production of biogas from organic materials and dumping of toxic substances).

The usage of organic solids as a power source is actively developing in the EU. According to the Eurostat, 31.3% of biogas produced in the European Community is obtained at solid waste landfills. The production of biogas at landfills is most developed in Great Britain, France, Italy and Spain. According to the Ministry of Ecology and Natural Resources in Ukraine, there are currently 22 acting biogas plants on the basis of solid waste landfills that does not accords the existing potential.

Discussion

The agreement on the association of Ukraine with the EU and the goals of sustainable development of Ukraine provide the adoption of an effective and integrated approach to waste management as soon as possible.

An analysis of the content of valuable secondary raw materials in domestic waste in Ukraine allowed us to state that we have significant potential for its usage for the production of industrial products and energy. The energy usage of organic waste is very popular in EU countries; however, it is practically not implemented in Ukraine. The author's approach to the treatment of waste as a valuable secondary raw material and potential energy source meets the progressive European vision.

The approaches of native scientists to waste management improving often do not take into account the need to implement measures of a different nature at the macro level – from financial-economic to socio-cultural, but focus on insufficient financing of measures for recycling or ineffective legislative support. The measures of a complex nature are offered in the article, their combined implementation will have a synergistic effect in ensuring the economic and ecological efficiency of waste management.

The proposed scheme for efficient waste management organization takes into account all aspects of efficient waste management, and also emphasizes the need to stimulate waste recycling at the level of individual process participants: households, enterprises for transportation, distribution of sorted solid waste and its useful use.

Conclusion

Municipal solid waste is predominantly a valuable secondary and potential energy resource. Trends in waste management in EU countries show a decrease in landfill in favor of recycling. In Ukraine it is advisable to take the best practices and harmonize the legislation on waste management with the European.

The current situation in Ukraine can be characterized as following: increasing of volumes of solid waste generation despite the population decreasing; low waste recycling (less than 8%) despite the rapid growth of the cities in which their separate collection is being implemented; increasing of solid waste export to landfills and unauthorized landfills

Despite the fact that the situation with recycling in Ukraine is developing, market conditions have contributed to an increase in the scope of waste and waste processing, which currently has more than 1,500 enterprises. In essence, a new branch is being formed and the development of new resource sources and cheap raw materials is taking place.

Implementation of the proposed measures (financial, economic, market, socio-cultural, regulatory-institutional, technological and informational) will contribute to the construction of a comprehensive system of effective waste management in Ukraine taking into account the interests of all participants in the process of creation, sorting, transportation and wasteful use of waste.

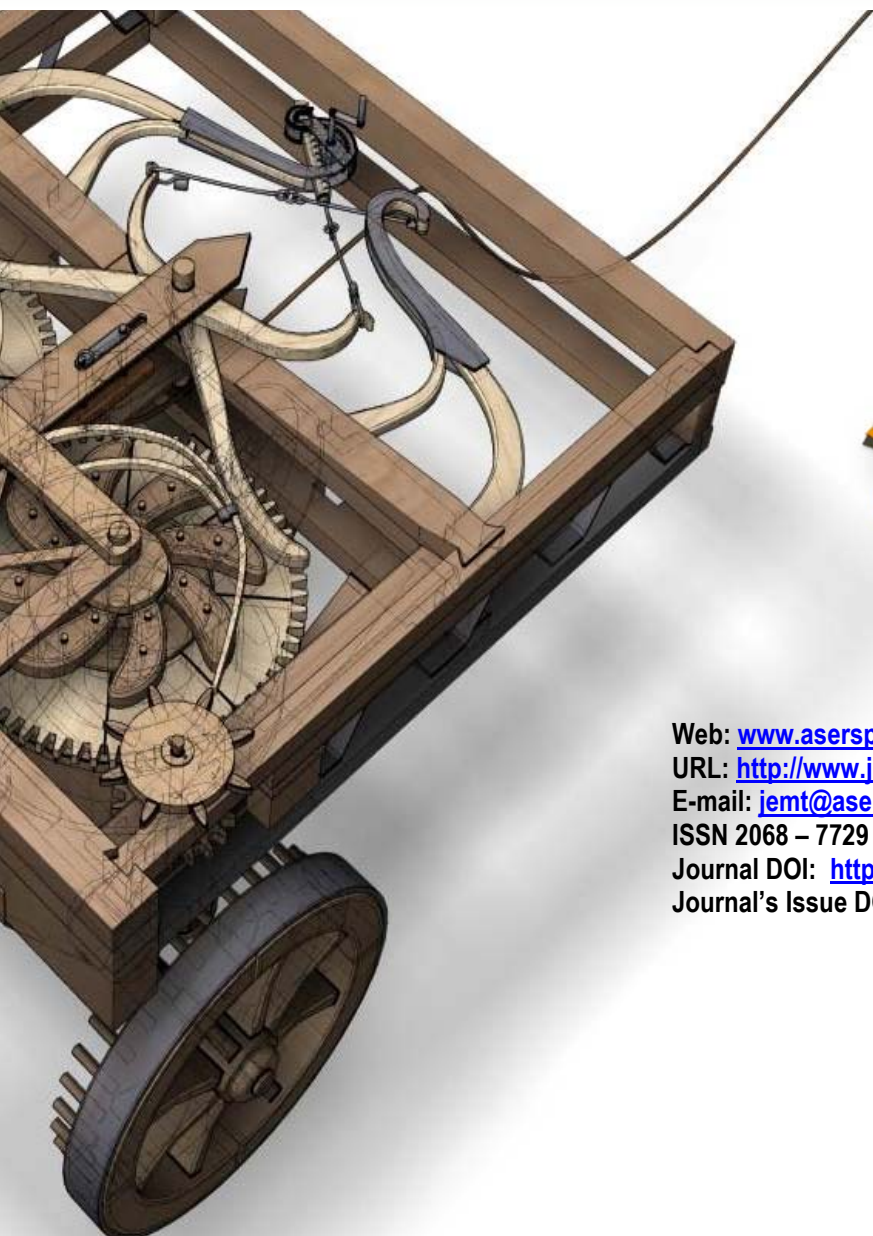
The best stimulating factors for investors in Ukraine intending to invest in waste processing plants are the providing of preferential lending and tax holidays for 3-5 years, a transparent and simplified mechanism for obtaining permits. At the state level, businesses need to be encouraged to invest in environmentally friendly technologies on waste recycling and utilization.

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