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THE CONCEPT OF ENVIRONMENTAL SAFETY OF VINNYTSIA REGION IN THE WASTE MANAGEMENT SPHERE

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Abstract. The aim of the research is to collect the information and analyze integrated systems of municipal solid waste (MSW) management and treatment in Vinnytsia region for its further optimization.

The state of landfills and waste dump sites in Vinnytsia region, existing MSW collection system (container availability) and waste transportation system (availability and frequency of transportation) in all districts of Vinnytsia region, legal framework in the field of solid waste management, the state of public awareness and public opinion on MSW management in Vinnytsia region are analyzed; recommendations for environmental safety of Vinnytsia region in the waste management sphere are given.

Key words: municipal solid waste (MSW), waste management, waste separation, landfill, concept of environmental safety.

1. Introduction

Active movement and integration to the Europe Community have been recently declared in Ukraine. But one of the requirements to achieve this is to create an operating system for waste sorting. Currently such system does not exist.

Within the actual law on waste [1] in Ukraine, the storage of unsorted waste and toxic or harmful waste will be prohibited since January 1, 2018. The consequence of this law is a ban on usual landfill operation and its closure, which will increase the relevance of waste problem. Some local authorities prepare themselves in advance to these changes and do the preparatory work, creating the basis for waste sorting, plan budget funds and involve experts and scientists in the work, but others neglect due to the lack of funds and experience.

It is well known that one of the factors slowing down the introduction of advanced technologies of recycling and waste management is a low level of understanding of waste issues relevance by people. Also, the inertia of this process is increased by insufficient funding, unwillingness to change, incorrect tariff policy, inadequate legislation.

However, there are examples of progressive implementation of urban development programs in the field of waste management in Ukraine.

One of the important stages of the development of waste management concept is to collect detailed information on the current state of the problem [2]. For this purpose the analytical and exploratory research are conducted within Vinnytsia region about the quantity and characteristics of landfills, waste volume, lifetime, waste composition, tariffs on waste collection, quantity of available staff, availability of containers and other equipment, tariffs on secondary resources, and so on [3]. Figure 1 shows the areas of information collection for further development of the mechanisms of the existing system improvement and designing the effective concept of MSW management.

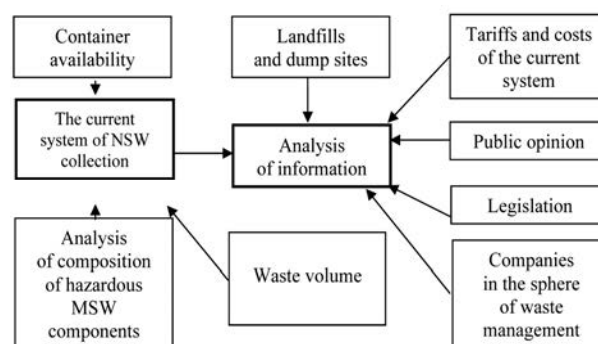


Fig. 1. Scheme of objective data collecting on the problem state

2. Experiment

There are 27 districts in Vinnytsia region, each populated by 25–55 thousand residents, about half of them live in district centers and the rest people live in villages. Also these districts have about 30–50 waste dump sites, in fact, in every village or village council (see fig. 2). Overall, Vinnytsia region has only 5–7 landfills built on relevant modern technologies. That is, 1 landfill in 3–4 districts [4, 5].

During the research we have found that the periodic waste collection is provided in about 20 % of Vinnytsia region. Other territories are not covered with systematical waste collection. This causes a large number of waste dump sites in unsettled areas.

Overall, the system of MSW management in Vinnytsia region is actually presented only by waste transportation to landfills or dump sites. Sometimes even such management is not provided.

Some municipalities in Vinnytsia region have waste sorting stations. They are in Vinnytsia, Kalynivka, Murovani-Kurylivtsi, Kryzhopil and Bar (see Fig. 3) [6]. However, almost all of them do not work due to the lack of funds for their startup or due to financial inefficiency. The real state of most of them (which cost a few million hryvnias each) is very poor, since the stations degrade when stopped. An example of the right use of waste sorting station is one in Stadnytsia village near Vinnytsia.

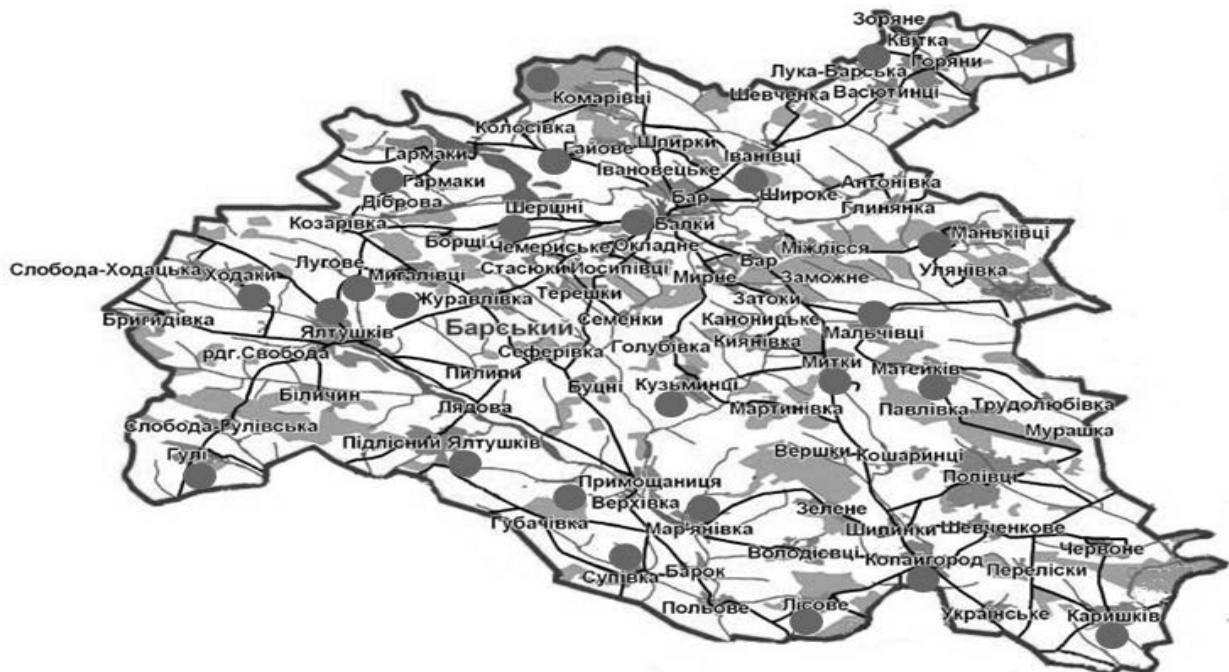


Fig. 2. Map of landfills and waste dump sites in Bar district



Fig. 3. Project of placing of inter-district waste sorting stations

To start a waste sorting station one needs about two million hryvnias. European countries' experience shows that more effective is the use of small waste sorting stations with the capacity of 20–30 cubic meters of waste per day for several towns and villages.

Ukraine plans to implement administrative reform, by which combining and amalgamation of local councils and the reducing of the power of district and regional authorities will be done. It can give an impulse to the realization and real implementation of widespread waste collection and environment friendly MSW management [7–9].

The investigation of chemical compounds content in soils near landfills and waste dump sites is also an important part of landfills analysis. We have analyzed the soils for the presence of metal cations (nickel, lead, copper, cadmium, manganese and zinc) near the next town landfills: Koziatyn, Yampil, Gnivan, Bar, Kalynivka, Haisyn, Zhmerynka, Tomashpil, Tyvriv,

Voronovytsia, Vinnytsia, Mazurivka village and others. After analyzing the data it is clear that the excess of maximum permissible concentration is observed in 4 out of 13 investigated landfills and waste dump sites. Near Bar landfill zinc concentration in soil is 10,35 mg/kg higher than the limit value, and lead concentration is 13.6 mg/kg higher (see Fig. 4). There is a slight excess of nickel content near Haisyn landfill (see Fig. 5). Zinc content in the soil near Gnivan landfill is almost 5 times higher than permissible standards, and 1.5 times higher in the soil near Yampil landfill [10].

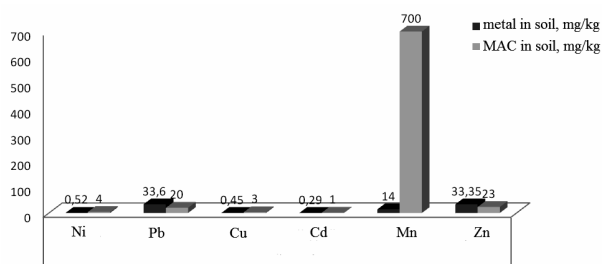


Fig. 4. Content of heavy metals in soils near Bar landfill

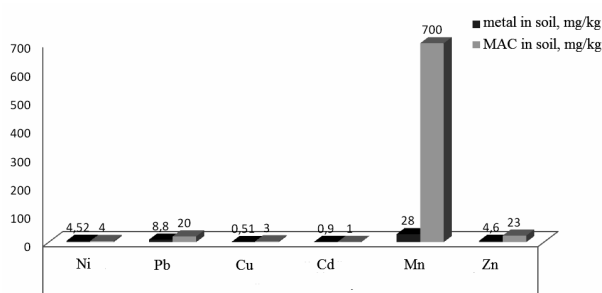


Fig. 5. Content of heavy metals in soils near Haisyn landfill

3. Results and Discussion

1. Analysis of the landfills in Vinnytsia region shows:

- the state of most landfills is unsatisfactory, a lot of them do not meet the specified requirements and need to develop measures to improve their conditions and meet the requirements;
- average percentage of landfills filling is about 25 %, that allows to use them for a long time, but usually the biggest landfills and waste dump sites in district centers are filled much more – near 80 %. This fact requires immediate actions against them. Particularly noteworthy are landfills near the following settlements: Bar, Bershad, Haisyn, Illintsi, Kryzhopil, Lypovets, Lityn, Vendychany (Mohyliv-Podilskyi district), Murovani Kurylivtsi, Bratslav (Nemyriv district), Kudlai (Nemyriv district), Ulaniv (Khmilnyk district), Sharhorod, Galzgbiiivka (Yampil district) [11];
- an average term of landfills use is about 20 years and according to landfill passports they can be

used for another 20-30 years. However, some landfills have already been used for 40–60 years, which exceeds projected term of use and requires their immediate closure or intervention. Particularly noteworthy are landfills near the following settlements: Nosivtsi (Haisyn district), Uladivka (Lityn district), Teplyk, Ulaniv (Khmilnyk district), Sharhorod;

- the majority of landfills have an area of about 0.5–1 hectares, but some have an area of 3–5 hectares, that shows the high rate of their filling or a long term of use, and therefore they require increased controlling;
- the limit exceeding of pollutants concentration in soils near some observed landfills is observed.

2. Analysis of the waste management system in Vinnytsia region shows the following key shortcomings:

- insufficient quantity of containers for waste collection (very often there are no containers even in the localities where waste is collected);
- a lot of communities are not covered with MSW management system;
- the lack of specialized vehicles for waste transportation in many communities (available only in larger districts centers), very high (more than 80 %) vehicles depreciation;
- very limited resources for the development of MSW management infrastructure;
- focusing of producers on their own economic interests associated with increased profits, and insufficient attention to the waste problem;
- very slow implementation of economic instruments to attract MSW to recycling, lack of elaborated mechanisms for their application;
- inconsistency of main directions of MSW management policy at different levels of government;
- uncertainty and merger of functions of appropriate organizations at regional, district or local level in MSW management;
- limited interaction between municipalities, small scale of the problems solved by them, which does not help to solve the waste problem as a whole;
- insufficient, incomplete, no real time information about qualitative and quantitative parameters of MSW management.

It should be noted that separate collection of MSW is introduced only fragmentally (the best examples are in the towns of Tulchyn, Mohyliv-Podilskyi, Vinnytsia) and a general system does not exist.

The problem of hazardous waste as a part of MSW is solved very slowly and its separate collection occurs only in a few places.

3. Legislation in MSW management at the national and regional levels as a whole is sufficient. There are

accepted and valid national and regional programs of MSW management. However, the main problem is the lack of effective mechanisms of implementing the thesis of these programs at a local level.

Currently there are several bills under consideration in the Parliament, regarding public commitment to sign contracts for waste management. Their adoption would give a significant impulse to solve the waste problem.

4. Contact with people during waste management has a very small scale. Mostly people do not have any information about the problems, which can occur in case of improper waste management, and the possible solutions. Solving this issue could be the key to the future introduction of effective waste management system.

The responsibilities and powers in waste management sphere are currently transferred to the local level by legislation. At the same time, local authorities have very limited financial possibilities for the implementation of these powers. Most of the rural areas are not covered with any system of MSW management and a lot of rural communities have no possibility to create their own system. Thus we have a very difficult situation for local communities and local authorities in rural areas. It requires immediate actions by communities and local authorities to develop joint local plans of MSW management, the involvement and the effective use of all possible resources to create sustainable models of MSW management. This is only possible by combining the resources of communities, including inter-municipal cooperation.

General recommendations for the concept of environmental safety in Vinnytsia region in the waste management sphere are the following:

1. The current system of MSW management in Vinnytsia region is presented only by its disposal at landfills and waste dump sites and needs radical change and improvement.

2. All state institutions, involved in waste management, as well as the media have to conduct explanatory and educational activities regarding waste management, in particular: release promotional and educational leaflets, books, brochures; significantly increase the quantity and quality of broadcasts on environmental issues, including those dedicated to the problem of waste; conduct explanatory work in kindergartens, schools and neighbourhood to inform people and fundamentally change people's conscience from the post-Soviet to eco-civilizational.

3. Public environmental organizations, students-environmentalists and others in their work with population should focus on the ideas of sustainable development: the necessity of self-limiting, ecologisation of life, transition from harmful and dangerous technologies to modern and resource-saving ecotechnologies, proper waste management.

4. It is recommended to sort the waste at the first stage of its appearance at home or at the container

places, and increase the responsibility for the waste disposal in unauthorized places and non-compliance with other requirements of legislation in waste management.

5. During the development and implementation of new landfills all necessary environmental, construction and sanitary norms and state standards should be carefully considered.

6. For appropriate state organizations and local authorities it is recommended to work out a clear scheme of the most effective use of the existing waste sorting stations, which have been purchased by several regional centers, taking into account the interests of local communities throughout Vinnytsia region.

7. State and local authorities should consider possible options of attracting investments to solve the waste problem.

8. It is necessary to revise the tariffs on waste management because their low level does not allow to solve the waste problem.

9. It is recommended to increase the number of places of the recycled materials collecting and solve the problem of separate collecting of hazardous household waste.

10. It is recommended to create ecological coordination center for waste management based on a working group and relevant experts, representatives of utility companies, local authorities and the public.

4. Conclusion

One of the main problems of the existing waste management system is the lack of financing and low tariffs on waste management. This, in turn, is caused by low incomes of the people and public misunderstanding of the problem urgency and its consequences.

To create an effective system of transportation, collection and recycling of MSW laws of Ukraine should be changed to encourage private entrepreneurs to invest money into this sphere, as well as to incinerate MSW or landfill gas and sell the electricity to the network at a favorable rate. Thus, it is possible to achieve effective waste collecting and recycling, and, most importantly, partly solve the problems of waste and overflow of landfills and waste dump sites.

The concept of waste management designed for Vinnytsia region is relevant for most regions of Ukraine as well.

Reference

- [1] Law of Ukraine "About Waste", number 187/98-VR, 03.05.1998.
- [2] Report on the research work "Collection and analysis of integrated management and treatment of solid waste in Vinnytsia region to further its optimization and development of measures for separate collection of waste", Vinnytsa, 2015, 187 p.

- [3] Integrated management and treatment of solid waste in Vinnytsia region. The monograph / Ed. VG Petruk, Ball: Universum-Vinnytsia, 2007, 160 p.
- [4] Petruk V. G., Vasytkivskiy I. V., Kvaterniuk M., Turchyk P., Ishchenko V. A., Petruk R. V. management and waste management. Part 2. Solid waste: Tutorial, Vinnitsa: NTB, 2014, 243 p.
- [5] Petruk V. G., Vasilkovsky I. V., Ishchenko V. A., Petruk R. V. Management and waste management. Part 3 landfills: a tutorial, Ball: NTB, 2014, 139 p.
- [6] Report on the research work "Development and application of models of solid waste in the city. Ladyzhin (Vinnytsia region)." Under the project "Analysis of the economic development of scenarios and models of solid waste", Vinnitsa, NTB, 2013, 70 p.
- [7] Waste Management in Poltava: monograph / Society. Ed. Golik Y. S., Illyash O. E., Poltava: Poltava writer, 2009, 292 p.
- [8] Justification of the scientific principles of safe handling and efficient transportation of solid waste (for example, m. Zhytomyr): dis. ... Candidate. Sc. Sciences: 21.06.01 / Kotsiuba Irina G.; Zhytomyr. state. techn. Univ, Zhitomir, 2013, 214 p.
- [9] Guidelines for the implementation of the monitoring system in the area of solid waste. Approved by the Ministry of Housing and Communal Services of Ukraine of 02.10.2008, **295 g**, 8 p.
- [10] Regulation for waste landfills. Approved by the Ministry of Housing and Communal Services of Ukraine of 01.12.2010, **435 p.**, 14 p.
- [11] The strategy of integrated management of solid waste (MSW) in Tulchyn region. Approved by number 35 city council session, Tulchin 6 convocation from 04.15.2013 year.