The Organizational and Economic Mechanism for the Implementation of Technological Processes in the Field of Waste Management

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Abstract. The article discusses topical environmental problems that disrupt the natural balance of the environment and affect the quality of life, also highlights and structures the main problems in the management of domestic and industrial waste in the territory of most municipalities: deterioration of the sanitary condition of the territories, an increase in the number of unauthorized dumps, a low level of use of secondary resources and subsidized financing for enterprises engaged in the collection, transportation, processing and disposal of waste, inadequate study of technological and economic forecasts. The proposed organizational and economic mechanism of an effective waste management system, based on a cluster approach, includes: creating a platform for interaction and coherence among stakeholders in the implementation of non-waste production and consumption programs; stimulation of business entities to separate collection of municipal waste, engineering solutions for the construction of production facilities for processing. The authors propose the creation of a regional situational waste management center. At the inter-municipal level, it is required to establish an inter-municipal control center for video surveillance, which monitors the construction of facilities and the operation of waste recycling enterprises. An integral system in the sphere of waste management is the organization of environmental education and public control over the state of the natural environment and ensuring the quality of citizens’ residence.

1. Introduction and relevance

The current agenda at the regional and municipal levels is deterioration of the sanitary condition of the territories, an increase in the number of unauthorized landfills, a low level of use of secondary resources, subsidized financing for enterprises engaged in the collection, transportation, processing and disposal of waste. [1, 2]

The new paradigm of regional development and planning in the field of waste management requires the accelerated creation of a high-tech transfer infrastructure and their implementation in the collection, transport and utilization of solid municipal waste (SMW) systems and the transition to spatial models of "smart" development of territories. [3-5]

Successful implementation of large-scale tasks of rational management of solid municipal waste, conducted in the Russian Federation, is impossible without the creation of effective organizational and
economic mechanisms for inter-municipal, interregional and inter-level interaction between state executive level and local self-government level. At present, their formation is in its infancy, and is largely due to the lack of uniform methodologically and technologically solutions. [6, 7]

For example, in some territorial schemes there is no justification for the design technologies and main directions for the development of SMW processing, there are no information systems for collecting and analyzing data characterizing the state and dynamics of the growth of landfills, the technologies for separate collection of municipal waste are not being implemented, alternative design and technological solutions in the field of waste management are not developed, taking into account the features of the ecological situation in the territory, the population's mortality, urbanization processes, regulations for environmental protection and quality of life. [8, 9]

Along with this, some forms of cooperation and integration of municipalities in the Russian Federation at the legislative level have not received comprehensive elaboration and systematic fixing, or are not sufficiently regulated, especially with legal support for the management of urban agglomerations. [10]

2. Methods

The current agenda at the regional and municipal levels is deterioration of the sanitary condition of the territories, an increase in the number of unauthorized landfills, a low level of use of secondary resources, subsidized financing for enterprises engaged in the collection, transportation, processing and disposal of waste. [1, 2]

The choice of an action strategy includes the development of ways to introduce wastes into industrial processing, the optimal planning of the sequence of measures to scale down the waste stream that is currently being spent on disposal, reducing environmental risks and costs, modeling waste management optimization based on effective interaction of all participants in the waste management process.

Effective development of waste management can be achieved through the use of organizational and economic modeling of the life cycle of infrastructure facilities, including the stages of design, construction, operation and based on the formation of an innovative technological platform for waste management, representing a set of production modules and network interactions of entities united for joint activities to achieve the key result of the development of infrastructure system to reduce landfill volumes because of their advanced processing with the subsequent use of secondary material resources. Management of SMW processing consists of the following elements: garbage collection, export, preliminary preparation, processing, recycling, burial. All these components are separate production modules, connected in a single interacting system. [4, 11-14]

For the organization of a unified waste management system, it is necessary to be based on the principles of the subject-object-oriented approach of interaction of process participants, determined by specific features and the level of innovative technologies of production modules that implement specific functions, based on the innovation-technological platform (Figure 1).

Using the example of the construction of a plant for the thermal neutralization of SMW, the social and socio-economic efficiency of project implementation and environmental impact assessment showed the advantages of implementing such projects, which include the reduction of the disposal of SMW by 70-80%, the construction of facilities near the places of waste generation and the reduction of the transport route, the ecological safety of the plants with proper operation, the formation of a comfortable environment and improving the quality of life of the population. [15-20]
3. Results and suggestions
The success of solving problems in the sphere of rational treatment of SMW will largely depend on how the powers in this sphere will be distributed between the levels of state executive power and local self-government, how interaction between them will be established, as well as with the population and business.

In order to increase the effectiveness of the operation of production modules and monitor the efficiency of regional operators, it is proposed to establish a regional situational center for waste management.
management, including monitoring of vehicles that collect and export solid municipal wastes with the transfer of data from these vehicles to profile enterprises that are part of the production modules that operate on the territory of the region. At the municipal level, it is required to establish intermunicipal control centers for video surveillance that monitor the construction of facilities and the operation of waste recycling facilities, as shown in Figure 1.

The formation of a sustainable technological system "collection-transportation-processing-secondary use" in the form of production modules will create additional opportunities for attracting private investment.

The achievement of the organizational and economic interaction of the subjects of the waste management sphere should be ensured by state support for the implementation of major investment development projects for the construction of waste-processing and incineration plants, the use of various forms of public and municipal private partnership, and the creation of regional funds for the industrial processing of SMW.

4. Conclusions

The proposed approach to the organization of a waste management system creates the conditions for increasing the efficiency of primary and secondary waste utilization, minimizing the share of waste placed at landfills, expanding the introduction of technologies for processing secondary material resources, shortening the timeframe for the creation of regional territorial production complexes on the basis of the innovation and technological platform, providing the formation of a system of regulations, standards, rules, norms, tariffs and contractual conditions for interaction of participants in a single process in the field of waste management, the implementation of technologies that ensure sustainable development of territories on the principles of environmental safety, conservation of natural resources and quality of life environment.

5. References

[1] Kirillova A N and Musinova N N 2017 Search for rational approaches to the development of the sphere of waste management Economics and Entrepreneurship 9-3 (86-3) pp 788-791
[2] Kirsanov S A and Mustafin G V 2014 World and russian experience of utilization of solid domestic waste Bulletin of Omsk University. Series "Economics" 2 pp 114-120
[3] Aleluia J and Ferrao P 2016 Characterization of urban waste management practices in developing Asian countries: A new analytical framework based on waste characteristics and urban dimension Waste Management 58 pp 415-429
[4] Jensen M B, Moller J and Scheutz C 2016 Comparison of the organic waste management systems in the Danish-German border region using life cycle assessment (LCA) Waste Management 49 pp 491-504
[5] Askarova U B and Mustafayeva R M 2014 Problems of utilization of solid household and industrial wastes in Kazakhstan. Actual problems of humanitarian and natural sciences 8-2 pp 12-14
[6] Kirillova A N and Musinova N N 2017 Structuring problems, technologies and mechanisms for implementing strategies in the field of waste management Economics and Entrepreneurship 10-1 pp 910-914
[7] Musinova N N 2018 Regulations as an instrument for organizing inter-regional cooperation in the field of solid municipal waste management Municipal Academy 1 pp 92-96
[8] Oleynik S P 2009 Organization of construction waste processing system (Moscow: State University of Economics and Finance)
[9] Bobovich B B, Devyatkin V V 2000 Processing of production and consumption waste (Moscow: Internet Engineering Publishing House)
[10] Musinova N N 2017 Powers and interaction of the subjects of the executive power of the city of Moscow and local self-government bodies in the field of rational waste management Bulletin of the University (GUU) 2 pp 21-26
[11] Gumba H M and Prokhin E A 2015 Innovation of construction on the institutional platform: the formulation of the research problem *Economics and Entrepreneurship* **4-1** *(69-1)*

[12] Novikov M N 2017 On the need for actualization of classifiers *Solid domestic waste* **1** *(127)* pp 30-32

[13] Order of Rosprirondnadzor 22.05.2017 N 242 "On the approval of the Federal Classification of Waste" (Registered in the Ministry of Justice of Russia on 08.06.2017 N 47008)

[14] Klinkov A S and Belyayev P S, etc. 2010 *Utilization and recycling of containers and package made of polymer material* (Tambov)

[15] Lapenko A G 2007 Management of waste in the big cities *Economic sciences Vestnik VolSU* **9**

[16] Chuzhova V O 2010 *Management of investment and construction and housing and utilities complex: International Collection of Scientific Works* (Moscow: Moscow State Academy of Municipal Economy and Construction)

[17] Grazhdani D 2016 Assessing the variables affecting on the rate of solid waste generation and recycling: empirical analysis in Prespa Park *Waste Management* **48**

[18] 2010 *A complex of waste-free recycling of construction waste* (Moscow: Publishing house of LLC FPK Satori) **1** *(2004)* pp 3-13

[19] Sevastianov A A, Korovin K V, Zotova O P, Solovev D B 2018 Features of the Geological Structure and Estimation of the Extraction Potential of the Sediments of the Bazhenov Formation in the Territory of Khanty-Mansiysk Autonomous Okrug *IOP Conference Series: Materials Science and Engineering* **463** Part 1 Paper № 022004 [Online]. Available: https://doi.org/10.1088/1757-899X/463/2/022004

[20] Oleynik P P and Oleynik S P 2009 *Organization of construction waste processing system* (Moscow: Moscow State University of Economics and Finance)