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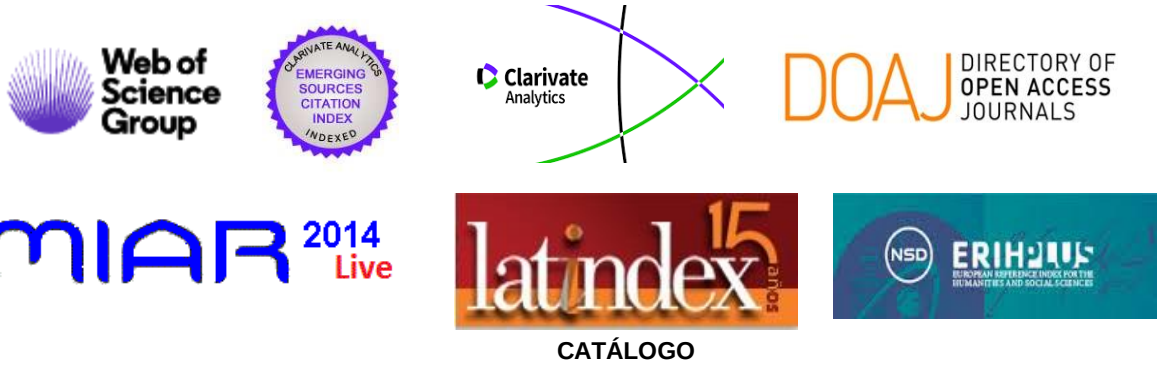

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METROPOLIS MANAGEMENT: RUSSIAN AND INTERNATIONAL PRACTICE IN WASTE MANAGEMENT REGULATION

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Abstract

The article presents the issues of organizational and legal maintenance of waste management in large cities. Today the problem of municipal and commercial waste becomes especially important; particularly, it concerns large cities — metropolises. The objective of this study is a systematic analysis of waste management in large cities with the identification of problems and the proposal of organizational and legal mechanisms to solve them. The topical issues of removal and recycling of municipal solid waste are considered in the article. Systems of collection and transport support used for transportation of domestic and industrial waste, as well as subsequent recycling and processing, are analyzed. Examples of Russian and global experience in creating and operating such systems are presented. It is concluded that the system of waste management in metropolises of the Russian Federation, according to many indicators, does not meet the requirements adopted in developed countries and needs to be improved, both in technical terms and in organizational and legal support. The authors have proposed several regulatory and legal measures for large-scale technical re-equipment and development of a fundamentally new attitude to the environment among the population, primarily in large cities. These measures include, along with bans and regulations, economic incentives for the organization of modern waste collection methods. The results of the study can be used as a recommendation to the legislative bodies of the constituent entities of the Russian Federation — metropolises and municipalities in large cities, their administrations, and business representatives in the field of waste management, as well as elements of environmental education of metropolis citizens.

Keywords

Metropolis – Waste management system – Collection – Transportation

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Introduction

The world population is projected to increase from the current 6 billion to 9 billion by 2050, which will also entail a sharp increase in the urban waste generation[1]. The development of social and productive activities of the population also contributes to their steady quantitative growth, which is confirmed by the projected data[2]. If currently, the annual volume of municipal solid waste (MSW) is 1.3 billion tons, it is expected to grow to 2.2 billion tons by 2025, which will be accompanied by a significant increase in the rate of waste production from 1.2 to 1.42 kg per person a day[3]. Over the past 16 years, the Russian Federation has also seen an almost double increase in the volume of MSW formation from 151.5 million m3 in 2000 to 268.8 million m3 in 2016[4]. The volume of recycling of MSW forms a very insignificant part of the total volume of formation, and 93% of waste is taken to dumps and landfills, which, naturally, is accompanied by both environmental degradation and significant economic losses from lost opportunities to process secondary material resources extracted from waste.

Modern large cities have faced a global environmental problem — the continuous growth of municipal and industrial waste. Numerous landfills surround cities resulting in environmental problems: liquid products of decomposition, getting into the soil, pollute it, and landfills are sources of breeding pathogenic bacteria, insects, and rodents. The decomposition of waste leads to the formation of explosive gas and, consequently, to combustion and release of poisonous substances into the atmosphere[5].

The garbage problem has recently come to the forefront in terms of references in the mass media and is one of the most disturbing issues in Russian society, as it is related to the unfavourable environmental situation in the country[6]. In several regions, active, responsible, and concerned residents of many Russian cities have begun to take to the streets to protest against the construction of incineration plants and landfills near their homes to halt the development of the global catastrophe and to draw the attention of local communities to the problem of preservation and protection of the environment and health of

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[2] Climate Investment Opportunities in South Asia An IFC Analysis. Retrieved from: https://www.ifc.org/wps/wcm/connect/fa3bea68-20f1-4cb4-90b9-3e812d38067f/Climate+Investment+Opportunities+in+South+Asia+-+An+IFC+Analysis.pdf?MOD=AJPERES&CVID=l.raVua y L. S. Dyshlyuk; S. Y. Noskova; L. K. Asyakina y O. O. Babich, “Upgrading Experimental Technological Lines for Obtaining Bio-Fertilizers from Poultry Biowaste”, ARPN Journal of Engineering and Applied Sciences Vol: 12 num 23 (2017): 6732-6740.

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Russian citizens. Besides government officials, politicians, and the media, the problem of recycling garbage produced in large cities attracts the attention of many scientists. Various problems related to waste disposal in metropolises have been analyzed by such scientists as I.A. Solomin[7], N.L. Lisina[8], K.A. Trushnikova[9], I. Bamatov[10], V. Gilmundinov[11], and M.N. Dudin[12]. At the same time, the solution to the urban waste problem requires a systematic approach that considers technological, organizational, and legal aspects. This work is devoted to the analysis of the possibilities of the system approach for solving the garbage problem of large cities. The hypothesis of the study: the system approach will allow effectively combating the garbage pollution of large cities.

Methods

The dialectical method of cognition of the essence of the considered phenomena has been used in the given study. Along with it, the method of system analysis was applied, which allowed presenting the system of metropolis waste utilization as a set of technical, organizational, legal, and economic measures. The use of the statistical method allowed showing the scale of the problems of metropolis waste utilization, thus, justifying the necessity of forming the integral system of waste management. The comparative analysis, in particular, has allowed studying doctrinal approaches to waste management on the international scale, to consider the effective positive experience of some countries, and to estimate the possibility of its use in Russian conditions.

The formal legal method allowed identifying concepts that need to be included in the projected regulatory framework. The information basis for proving the hypothesis of the research was the documents of normative regulation, works of Russian and foreign scientists devoted to the problems of waste disposal in large cities, and statistics data presented in free access on Internet resources.

Results

The Russian statistical base on MSW in cities is limited by the indicator on the centers of the subjects of the Russian Federation "municipal waste removal by special transport in thousands of cubic meters". Considering the absolute indicator of waste removal, Moscow (about 20 million m3) and other cities with the population of millions are naturally highlighted: (St. Petersburg — 7.9 million m3, Ekaterinburg — 4.8 million m3),

[7] I. A. Solomin, Razrabotka gorodskoi sistemy upravleniya…

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because there is a direct dependence of waste removal on the number of citizens in the city[13].

Naturally, the most serious problems with municipal waste disposal exist in Moscow. Up to 2010, waste disposal in Moscow was carried out at landfills near Moscow, where it was dumped, practically without any pre-sorting and processing. Almost all garbage dumps near Moscow were overcrowded and there was nowhere to send Moscow waste for recycling[14].

Therefore, some regions close to Moscow were chosen as new landfills. The removal of Moscow garbage to these regions is met with mass protests by their citizens[15], and, thus, is not a successful solution to the problem.

According to the Federal Law of 25.12.2018 №483-FL "On amendments to Article 29.1 of the Federal Law "On production and consumption waste"[16], subjects of the Russian Federation — cities of federal importance are entitled until January 1, 2022 not to apply the provisions of the federal legislation on the collection, accumulation, transportation, processing, disposal, decontamination, storage, and burial of MSW in the territory of the Russian Federation by regional operators. This law allows for a smooth transition to new rules for the management of MSW in the subjects of the Russian Federation — cities of federal importance and to put into operation modern high-tech waste management facilities. Thus, several metropolises — cities of federal importance are given broader powers in the field of waste management than other regions of Russia, which, in turn, allows forming effective systems.

The current territorial scheme of Moscow waste management approved by the Decree of the Moscow Government of 09.08.2016 № 492-GD[17] is one of the main legal acts of Moscow in the field of waste management, including MSW. Based on this scheme, among other things, strategic planning of activities on waste management, formed in Moscow, including MSW, the definition of target indicators of the prospective development of the waste management industry for the period until the end of 2025 is carried out.

Moscow authorities have prepared a new territorial scheme of municipal waste management until 2029. According to it, almost 60 million tons of garbage are expected to be sent to the Kaluga and Vladimir regions, as well as to Moscow Oblast within a decade[18]. It seems that such measures are not a good option for solving the garbage problem in Moscow and can lead to negative social consequences in the regions.

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[16] Vlasti Moskvy opredelilis s regionami dlya vyvoza stolichnogo musora…

[17] Territorialnaya skhema obrashcheniya s otkhodami goroda Moskvy, utverzhdennaya Postanovleniem Pravitelstva Moskvy № 492-PP. August 9, 2016. Retrieved from: https://www.mos.ru/upload/documents/files/1934/1

[18] Vlasti Moskvy opredelilis s regionami dlya vyvoza stolichnogo musora…

Modern industrial methods of municipal waste recycling should provide for its sorting into fractions with subsequent separate utilization. Mechanized waste separation is based on gravity, aerodynamic, electromagnetic, and ballistic methods known in the technics. Construction of such plants allows preserving land plots allocated for landfills, and the remoteness of waste removal is reduced[19]. At the same time, the equipment used at garbage sorting and recycling plants is very expensive, and, therefore, the widespread introduction of these technologies in the near future is still unlikely. In July 2011, the authorities of Moscow and Moscow Oblast signed an agreement on production and consumption waste management, which considered the location of inter-regional waste recycling complexes. From January 1, 2017, it is prohibited to dispose of waste containing useful fractions (plastic, glass, ferrous metal scrap, waste paper), which, according to experts, make up 60% of MSW[20]. The territorial scheme of Moscow Oblast until 2019 assumes the creation of facilities allowing to extract useful fractions from waste, but so far, they are practically absent[21].

The environmental consequences will depend on two main factors: the presence or absence of separate waste collection and the temperature of thermal decontamination. In the world practice, high-temperature incineration (more than 2,000°C) and pyrolysis (high-temperature cleavage without oxygen access) at the temperature about 3,000°C are considered relatively harmless[22]. However, if an unsorted waste stream is incinerated at low temperature, the negative expectations of nature protection organizations, which fear that, in this case, the main negative consequence will be emissions into the atmosphere of both fine ash, metal dust, and the detected carcinogen — dioxin, will be met. Considering the radius of the toxic impact of the incineration plant, which can reach 25 km (with an account of wind rise)[23], the territories of both Moscow Oblast and New Moscow enter the potential zone of impact. According to the new version of the Federal Law of 24.06.1998 N89-FL "On production and consumption waste" and "Rules for the management of MSW"[24], consumers are required to carry out the separation of MSW by type of waste and storage of sorted MSW in separate containers for the corresponding types of MSW. If these innovations, which are still prescribed only on paper, will become a reality, then from 2020 in several regions of Russia will start a system of separate waste collection. First of all, it will have to provide for a completely new approach to municipal waste disposal. According to the Decree of the Government of Moscow № 734-GD of June 18, 2019 "On the implementation of measures for separate collection (accumulation) of MSW in Moscow"[25], it is planned to introduce the first stage of the mentioned measures from January 1, 2020. However, the mentioned

[19] I. A. Solomin, Razrabotka gorodskoi sistemy upravleniya…

[20] E. M. Bukreev y V. G. Korneev, “Tverdye bytovye otkhody – vtorichnye resursy dlya promyshlennosti”, Ekologiya i promyshlennost Rossii num 5 (1999): 38–41.

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[24] Postanovlenie Pravitelstva RF N 1156 "Ob obrashchenii s tverdymi kommunalnymi otkhodami i vnesenii izmeneniya v postanovlenie Pravitelstva Rossiiskoi Federatsii ot 25 avgusta 2008 g. N 641» (vmeste s «Pravilami obrashcheniya s tverdymi kommunalnymi otkhodami"). November 12, 2016. Retrieved from: www.consultant.ru/document/cons_doc_LAW_207118/

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document does not provide for measures to stimulate separate collection, which is a serious omission.

Thus, such a situation in the field of municipal waste management in Russian metropolises, and Moscow in particular, should be considered unsatisfactory at the moment. To correct the situation, a rational system for their management is required, which is an important link in the municipal economy. This sphere of management includes solutions to ecological, social, legal, technical, and economic tasks of waste collection, accumulation, and utilization.

Discussion

In the developed world, the proper organization of the waste management system, including waste sites (territories), is key to ensuring a safe waste management system. While some countries have completely abandoned waste disposal, others learn how to properly manage landfills, form sustainable operational practices, control the type of waste accepted for disposal, treat filtrate before it is discharged, collect methane, etc[26].

The complexity of waste management encourages many countries to strive for an Integrated Solid Waste Management System (ISWM) that includes legal, technical, political, environmental, socio-economic, and cultural aspects[27]. In developed countries, the waste management system is based on the principle of minimizing future risks, and, therefore, relies on preventive measures and effective management, as only effective management methods will increase demand as the population grows and industrial development accelerates. An important preventative measure of waste generation in the management system is the Waste Life Cycle Assessment (LCA), which is a holistic approach to the prevention of excessive waste generation through the product (the process of operation) life cycle analysis, which includes raw material procurement, raw material storage, production, storage of products, transportation, distribution, use, reuse, technical maintenance, waste recycling, waste storage, waste transportation, utilization, and disposal. However, experts note the problem of the objectivity of LCA reports due to economic interests (e.g., cigarettes, alcohol, crackers, etc)[28]. Besides, the implementation of the principle of "natural justice" is a preventive measure. If a violation of legal requirements in the field of waste management is identified, the violator is warned about the violation, they are allowed to correct the situation and only then criminal punishment should be imposed (it should be noted that in many countries implementing a system of effective waste management, only criminal responsibility is provided for violation of legal requirements in the field of waste management). Local authorities are actively involved in the waste management system around the world, as the level of development of the country and the city, the size of the city population, the area of the city, features of the internal organization of the city territory (for example, waste removal can be complicated in commercial areas and densely populated areas), type of waste, and volumes of waste generation are important for the waste management system, including solid waste. At the same time, municipal authorities are prohibited from participating in the management of certain types of waste (e.g. hazardous, radioactive, infectious)[29].

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[29] N. L. Lisina, “O ponyatii upravleniya…

The choice of the optimal solution will depend to a large extent on the specific social, climatic, and economic conditions of the region and the existing waste management infrastructure (vehicle fleet, types of waste collection facilities, etc.), and, thus, these waste management options, at the initial stages, should be considered on a qualitative basis[30].

The main determinants in choosing the collection, preparation, and utilization methods are the necessary level of accessibility of the considered methods for the participants of the system, the location and size of the necessary land plots for the collection and treatment, as well as environmental and economic indicators. An analysis of these factors helps determine which technologies are most appropriate, while the possible impact of the considered technologies on existing waste management systems at local and regional levels is also assessed. After selecting the methods and technologies of waste collection, processing, and disposal, the issues of their integration into the existing waste management system are considered, in particular, the issues of management (staff provision and opportunities for redistribution of personnel), economy (capital, operating and indicated costs, considering the sale of received products), and sources of financing[31].

The implementation of the considered schemes requires changes in the legislative base at the federal and regional levels.

According to Article 1 of the Federal Law "On production and consumption waste"[32], MSW is: waste which is formed in inhabited premises during the consumption by individuals; the goods which have lost the consumer properties in the course of their use by individuals in inhabited premises with a purpose of satisfaction of personal and household needs; waste which is formed in the course of activity of legal entities and individual businessmen and similar on a structure to the waste which is formed in inhabited premises during the consumption by individuals. N. L. Lisina says that the definition of MSW in the Federal Law "On waste...", despite its expansion, has its disadvantages due to the ambiguity of the phrase "in the process of consumption" and the term "consumption" as a prerequisite for recognition of MSW. It is also unclear why the legislator binds such consumption by an individual in an inhabited premise, although it is practically possible for an individual to consume in an uninhabited premise as well[33]. Loss of consumer properties of goods, as a condition of recognition of an object of technical and commercial equipment, is also questionable, because a person can throw away anything, including something that has preserved useful properties. In this regard, the concept of waste has been extended in some foreign countries, as it is impossible to foresee which physical object may be legally a waste. Thus, the Environmental Protection Act of Singapore (1968) includes in the concept of waste: a) any substance that is a waste, wastewater, or other undesirable excesses of a substance resulting from a process; b) any substance or product that needs to be disposed of as broken, worn, contaminated, or otherwise damaged; c) anything that is disposed of or treated as if it were a waste is considered waste unless proven otherwise[34]. In the MSW (Management) Regulations (India, 1999), solid waste is defined as commercial and

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[33] N. L. Lisina, “O ponyatii upravleniya…

[34] R. Chandrappa, D. Bhusan Das, Solid Waste Management…

municipal waste generated in a municipal or assigned area in solid or semi-solid form, except for industrial hazardous waste but including treated medical waste[35]. The waste management system should also contain elements of economic incentives and education for the population. For effective waste management, foreign countries pay considerable attention to environmental education, waste management training, public information in this sphere, control of activities in the sphere of waste management regulation, permitting and accounting system, stimulation of safe waste management, including the introduction of "deposit return system", and financing of projects on safe waste management (through the budget, grants, user fees, pollution fines)[36]. The main purpose of such education is to change public attitudes towards waste management, diligent fulfillment of regulations and recommendations by citizens, and intolerance towards violations. In general, it seems that the positive experience of foreign countries in the field of solid waste management deserves attention and implementation in Russian legislation.

Conclusion

Thus, to solve the problems of utilization of waste produced by a metropolis, a systematic approach is needed, which combines technical, organizational, legal, and ideological measures aimed at improving the environmental situation. Such an approach would seem to have to be in the form of a strategic regulatory document that would clearly outline: — basic principles and objectives of the metropolis policy in the field of waste management; — basic technical solutions for waste collection, sorting, removal, and subsequent processing, with a presentation of the final result of the whole process; — measures to encourage participants of the mentioned process for eco-friendly waste management, measures of responsibility for violation of the established rules of waste management; — legal terminology, clearly disclosing the content of legal terms necessary for the system of legal terms and corresponding to the federal legislation. It should also be clearly stated by whom and how the system and the achievement of target indicators will be monitored. Thus, the hypothesis of the study on the necessity of a comprehensive systematic approach to waste management in metropolis management is confirmed. A possible continuation of the above-mentioned study is seen in consideration of the prospects for the development of the separate waste collection.

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