Need for Inter-Regional Cooperation in Solid Municipal Waste Management in the Regions of the Far East of Russia

R N Shpakova

1Moscow State Institute of International Relations (University), 119454 Moscow, Russian Federation

E-mail: aglaonema2012@gmail.com

Abstract. This article revises the cooperation opportunities of the regions of the Russian Far East in solid municipal waste management. Despite the federal and regional programs encouraging more rational waste management, the situation is quite tense, which sometimes results in the declaration of an emergency state. This is due to the low profitability of solid municipal waste management and, as a result, low investment activity in this sector. The authors demonstrate that inter-regional cooperation is a promising area of development for solid municipal waste management systems. This can be manifested in the distribution of deep processing facilities for household waste among regions using the transport capacities of the Trans-Siberian Railroad. The specifics of cargo turnover in this railroad shall help organize waste transportation at relatively low costs.

1. Introduction

The problem of the accumulation of solid municipal waste (SMW) in Russia remains a pressing one despite the reform of this sector that began in 2016 and has been going on up to now. SMW management in the regions of the Far East of Russia is complicated by the climate conditions, low population density, and the remoteness of many settlements from the administrative and economic centers and transport routes.

Because of this, it is important to study the factors hindering the sustainable development of SMW management systems, as well as the search for ways to improve the efficiency of this system, first of all in terms of territorial organization.

The problems of territorial organization of SMW management processes have received a lot of attention from Russian and foreign researchers recently. For instance, some authors criticized the approaches to the formation of territorial SMW management systems stipulated by Russian laws and proposed several alternatives based on the assumption that it is impossible to use the conventional transport logistics algorithms in SMW management processes. In this respect, we should note the articles of O. I. Khristodulo, A.Kh. Abdullina, and G. F. Bagamanshina [1], I. N. Volkova, etc [2]. These approaches are more complex in terms of administration, yet they can solve the problems of territorial SMW management systems more efficiently. The improvement of forecast methods for the amounts of waste produced by the territory is also crucial. In this respect, we must note the work of R. N. Shpakova [3].

Some authors focused on solid municipal waste management in the Arctic and other remote areas, e.g. P. F. Agakhanyants [4], D. N. Lyzhin [5].
The importance of the administrative-territorial factor in the SMW management system is linked to the fact that the formation, transportation, processing, and disposal of SMW are carried out within specific and often very large spaces and that SMW is assigned to a specific economic entity operating within the limited territory. This distribution may result in some problems covered, among other works, by V.A. Stolbov, Yu. O. Belonogov, and A.Z. Oshchepkova [6], O. E. Ivanova, and N. N. Gorbina [7], et al.

The research work by I. Teibe [8] focuses on the activation of feedback between municipalities and regional authorities during the adjustment of the inter-municipal SMW management system. В. Kołsut analyzes the factors of inter-municipal cooperation (geographic, historical, cultural, institutional, and economic) and concludes that institutional factors, first of all, the establishment of EU legal mandates, have a greater significance than the economic factors [9]. One of the key factors reducing the efficiency of the SMW management reform in Russia is the excessive bureaucratization of management processes in this sector [10].

A detailed analysis of inter-municipal cooperation areas and mechanisms in Japan as well as recommendations for other Asian countries were provided by A. Hiratsuka-Sasaki & M. Kojima [11]. Irawanto & M.R.K. Muluk analyze the experience of interregional cooperation in SMW management in Indonesia [12].

2. Research materials and methods

We used the Uniform Interagency Reference System as the source of integrated data on solid municipal waste management across the federal districts [13]. The data on the locations of SMW accumulation and processing facilities, as well as the key SMW transportation direction, were received from the territorial waste management systems of specific regions of the Far Eastern Federal District [14, 15, 16, 17, 18].

The planned key indicators in the solid municipal waste management sector for the approved regional projects were set according to their summaries [19, 20, 21, 22].

Reports from official and business media are another important source of data. During the analysis, we used statistical and formal logic methods. We analyzed the specifics of the transport system of the Far Eastern regions of Russia based on expert assessments. The information obtained through the processing of input data and the summary of the results of the relevant research works helped us focus on the problem areas in the SMW management in the regions of the Russian Far East and suggest solutions for them.

3. Results and discussion

Far Eastern Federal District is not one of the districts producing the most SMW. It is the last but one region in Russia in terms of waste production. Nevertheless, some of its territories, especially those near large cities, have begun to experience problems due to the overfilling of solid waste landfills. The commissioning of waste sorting plants stipulated by approved regional projects is lagging, and the existing SMW sorting and processing facilities cannot handle the increased volume of SMW. As a result, an emergency state was declared in the Vladivostok agglomeration and some regions of Primorye [23].

Some of the Far Eastern regions experienced difficulties with the selection of regional SMW management operators that would comply with the set requirements and with the attraction of investment resources for the construction of waste processing facilities [24].

Following the regional projects approved in 2018, the volume of SMW sent for disposal was supposed to increase by 9-10 times across all regions, 20 times in the Primorsky Territory, and the volume of SMW sent for recycling was supposed to increase by 8-10 times. By the end of the implementation of regional projects, the proportion of SMW sent for processing is expected to be 80-90%, and the proportion of SMW sent for disposal - 45-55% of the solid municipal waste produced annually [19, 20, 21, 22]. SMW processing stands for sorting and cleaning before further disposal:
recycling to be used in new products, services, and production cycles, as well as the use as a renewable energy source.

Despite the accepted plant, the situation with SMW disposal and processing in the regions of the Russian Far East is extremely unsatisfactory. Only in Khabarovsk Territory, the proportion of SMW sent for processing in 2020 was 35%, in the rest of the regions, this figure did not exceed 10% [13].

The key development problems of the SMW management system in the Far Eastern Federal District include low profitability of SMW management activities and, as a result, low investment activity in this sector.

To facilitate the profitability of waste processing companies, it is necessary to provide a stable flow of solid waste. If we consider the most densely populated part of the Far Eastern Federal District and exclude such regions as the Republic of Sakha (Yakutia), Chukotka Autonomous District, Kamchatka Territory, Magadan Oblast, and Sakhalin Oblast, the weighted average SMW generation value for this territory will be 4.69 m³/km² a year. To put that in perspective, in the Northwestern Federal District, excluding St Petersburg, which is not the most populated region of European Russia, the average figure is 11.00 m³/km² a year. This figure was calculated using the data from the Uniform Interagency Reference System.

The transport conditions in the regions of the Far Eastern Federal District make up another problem in SMW management. The density of the public railroad network is only 5.04 km per 1000 km², and the density of hard-surface roads is 29.97 km per 1000 km². For comparison, the same indicators in the Northwestern Federal District equal 7.58 km per 1000 km² and 60.35 km per 1000 km².

With such parameters, we believe that none of the regions of the Far Eastern Federal District can organize a complete cycle of SMW processing and disposal due to the lack of investment resources and problems with the profitable loading of processing facilities. The situation is made more difficult as different types of waste require different facilities, while the construction of processing plants for every type of wastes in every region is unfeasible due to the reasons stated above.

In this situation, cooperation and joining the efforts of different regions at all levels of management could be an efficient solution.

In reality, regions operate autonomously with the systems of SMW storage, processing, and transportation operating within just one region (Figure 1). This figure shows the situation in Amur Oblast and neighboring areas of other regions of Russia: SMW transportation flows are directed to accumulation and processing facilities within the region, and transporting wastes to other regions, even if this could be more profitable, is not considered. The planned deep processing facilities for SMW are also expected to primarily serve the region where they are located. SMW processing and disposal activities are only planned as part of regional projects.

Federal-level strategic solutions are based on the regional autonomy approach. Project activities are only developed within regions both in regional projects and in the federal project on the Complex System of Solid Municipal Waste Management [25]. The federal project on the Complex System of Solid Municipal Waste Management stipulates the analysis and adjustment of the regional systems of waste management, and the establishment of locations for interterritorial (emphasized by the authors) SMW management facilities on the federal level but there are no actions that should be taken based on their results.

Subsidies to support waste management projects are also distributed within regions of Russia in accordance with their bids [26].
Figure 1. A base map of the locations of temporary storage and sorting facilities, as well as main transportation routes, for SMW in Amur Oblast and the neighboring territories of Zabaikalye Territory, Khabarovsk Territory, and the Republic of Sakha (Yakutia).

We must note that within the regions, the locations for SMW temporary storage and processing, as well as the territories served by regional SMW management operators, may not correspond to municipal limits. For instance, municipalities and urban districts in the Primorsky Territory are united into 7 technological areas. A technological waste management area is a “territorial system with complete infrastructure facilitating coordinated interactions of entities that collect, transport, process, dispose of and dump SMW to provide environmental safety and organize a stable financial and economic system of waste management” [16]. Such areas generally have inter-municipal SMW processing facilities, temporary and permanent SMW storage locations. Such solutions are conditioned by the requirements of the rational approach to the organization of SMW management. We believe that this approach can be implemented on a higher, interregional level. Its implementation could use the body developed as part of the federal project, the Russian Environmental Operator. It must have the powers to suggest the adjustments to territorial waste management systems and federal projects, including the adjustments based on regional projects, to the Government and the Strategic Planning and National Projects Council.

Interregional cooperation will require specific efforts to be taken for the transportation of SMW between regions. To this end, it is possible to use the specifics of freight traffic in the Far East: in most cases, cargo is transported from West to East. This includes the transportation of mining products to seaports by trains and the transportation of consumer goods to remote territories by trucks.

According to experts, empty running in the Far Eastern Railroad and a part of the Trans-Siberian Railroad is between 60% and 80% due to the imbalanced foreign trade flows [27], while the empty run for the opposite direction is up to 30% of the entire car traffic volume [28]. At the same time, these transportations are regular, which is an advantage. We believe that, under these conditions, it is possible to arrange for the transportation of cleaned, sorted, and compressed SMW using saver fares.
This kind of traffic can be an alternative for empty running. Currently, carriage owners pay empty run fines to Russian Railroads. This way the company is trying to encourage the owners to use their carriages more rationally as they must be willing to reduce the amounts of fines. The organization of railroad loading and unloading infrastructure shall be funded by the Russian Environmental Operator.

The suggested system is based on the fact that SMW generation is a stable process. Therefore, SMW traffic must be regular and relatively easy to organize. The region generates a stable amount of SMW. For instance, the Primorsky Territory generates 380-385 thousand tons of SMW, and the forecast reduction of SMW generation rates for 2027 is below 3.5% [16].

With the availability of a potentially operable regular SMW traffic system, it is possible to have a more rational arrangement of large and profitable waste processing facilities with different specializations.

4. Conclusions

The regional autonomy approach to the arrangement of territorial solid municipal waste management systems does not provide for the accumulation of necessary investment resources for the creation of large and profitable waste processing facilities in some cases, which hinders the progress of the entire waste management reform.

Interregional cooperation may become a solution to the existing situation as it allows for the joining of resources and using them for the creation of specialized waste processing facilities that will be used by several regions. To develop and implement interregional projects, it is necessary to provide the main federal regulator of solid municipal waste management, the Russian Environmental Operator, with real powers to adjust the territorial SMW management systems, as well as federal and regional programs.

The Far Eastern regions of Russia can arrange interregional cooperation for SMW management by the integration of processed waste transportation flow into the system of freight traffic in the Far East. This approach is based on a specific feature of the railroad traffic in the Far East: a significant proportion of one-way empty runnings that is expected to last for many years.

5. References

[1] Khristodulo O I, Abdullin A Kh, Bagamanshina G F 2020 Algorithm of route integration for the development of an electronic model of a territorial waste management scheme Software & Systems vol 33 1 pp 076-083 DOI: 10.15827 / 0236-235X.129.076-083

[2] Volkova I, Krylov P, Semina I, Sergushko S, Sidorov V 2020 Transport and logistics justification for location of solid municipal waste management system facilities (on the example of the Primorsky krai) In: Geographical environment and living systems 2 pp 113-128 DOI: 10.18384 / 2712-7621-2020-2-113-128

[3] Shpakova R N 2019 Study of the Dependency Between the Gross Regional Product and the Production and Consumer Waste Generation Levels FarEastCon 2018 SIST 139 pp 34–41 Springer Nature Switzerland AG https://doi.org/10.1007/978-3-030-18553-4_5

[4] Agakhanyants P F, Lomtev A Yu, Primak E A, Vyucheyskaya D S 2019 Territorial waste management schemes in the Russian Arctic: a reason for discussion Russian Arctic 6 pp 48-54

[5] Lyzhin D N 2020 Prospects for solving the problems of utilization of municipal waste in small remote settlements of the Arctic: Canadian experience ARKTIKA Journal 2035: topical issues, problems, solutions pp 42-44

[6] Stolbov V A, Belonogova Yu O, Oshchepkova A Z 2018 Ecology 6 pp 78-87

[7] Ivanova O E, Gorbina N N 2020 Solid municipal waste: collection and disposal issues Russian Journal of Resources, Conservation and Recycling 1(7) Available at: https://resources.today/PDF/03ECOR120.pdf DOI: 10.15862 / 03ECOR120

[8] Teibe I 2015 Development of municipal waste management Environment Technology Resources Proceedings of the International Scientific and Practical Conference I 53 DOI: 10.17770 / etr2011vol1.924
[9] Kołsut B 2016 Inter-municipal cooperation in waste management: The case of Poland *Quaestiones Geographicae* **35**(2) (Bogucki Wydawnictwo Naukowe, Poznań) pp 91-104

[10] Agiamoh R G 2020 From Bureaucracy to Market? Ongoing Reform and Performance Challenges of Solid Waste Administration in Moscow *Public Administration Issues* **5** (Special Issue I, electronic edition) pp 149-170 DOI: 10.17323 / 1999-5431-2020-0-5-149-170

[11] Hiratsuka-Sasaki A, Kojima M 2020 Inter-Municipal Cooperation on Solid Waste Management in Japan: Its Challenges and Implications for ASEAN Countries 2020-12-Regional-Waste-Management-in-Asia. Chapter 3 https://clck.ru/WSP9T

[12] Irawanto, Muluk M R K 2016 Inter-regional cooperation on regional landfill management in urban area: a case study in Southern Kalimantan (Indonesia) *RJOAS* **11**(59) DOI https://doi.org/10.18551/rjoas.2016-11.17

[13] EMISS - State Statistics, Fedstat.ru

[14] Territorial scheme of waste management of the Amur region Official website of the Government of the Amur region, https://clck.ru/WSP5H

[15] Territorial scheme of waste management of the Trans-Baikal Territory in 2019 Electronic fund of legal and normative-technical documents, https://clck.ru/WSPFf

[16] Territorial scheme of waste management of Primorsky Krai Official website of the Government of Primorsky Krai, https://clck.ru/WSNzw

[17] Territorial waste management scheme of the Republic of Sakha (Yakutia) Official website of the Ministry of housing and communal services and energy of the Republic of Sakha (Yakutia) https://clck.ru/WSNWZ

[18] Territorial scheme of waste management of the Khabarovsk Territory Electronic fund of legal and normative-technical documents https://clck.ru/WSPj5

[19] Passport of the regional project "Integrated solid waste management system" of the Amur Region Official website of the Ministry of Natural Resources of the Amur Region, https://clck.ru/WSNZi

[20] Passport of the regional project "Integrated solid waste management system" of the Trans-Baikal Territory Official website of the Ministry of Natural Resources of the Trans-Baikal Territory, https://clck.ru/WSNeX

[21] Passport of the regional project "Integrated solid waste management system" of Primorsky Territory, https://clck.ru/WSNeX

[22] Passport of the regional project "Integrated solid waste management system" of the Khabarovsk Territory Official website of the Khabarovsk Territory, https://clck.ru/WSNfS

[23] In emergency mode: how the authorities of Primorye cope with a garbage disaster: RIA Federal Press report dated July 6, 2021, https://clck.ru/WSPj6

[24] “Lagging” regions of the Far East in 2020 will switch to a new system of MSW management: TASS report dated December 20, 2019, https://tass.ru/ekonomika/7388003

[25] Passport of the federal project "Integrated solid waste management system", Reference and legal system Consultant plus, https://clck.ru/GdsJE

[26] Decree of the Government of the Russian Federation of August 13, 2016 No. 790, Official website of the Government of the Russian Federation, https://clck.ru/WSNrM

[27] Gusachenko N 2019 What will the change in tariffs for empty run of gondola cars lead to: to an increase in the efficiency of the fleet, the cost of transportation or an increase in income? Electronic business magazine "Russian Railways-Partner" June 17, 2019, https://clck.ru/WSNIB

[28] Ivankin P 2018 How to get rid of oncoming empty runs of railway cars *Rossiyskaya Gazeta*. Electronic issue, https://clck.ru/WSNjv