Problems of regulation of solid municipal waste management in the Tunka Valley

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Abstract The article provides an analysis of the problem of pollution with solid municipal waste (MSW) and proposes a solution to this problem using the example of a specially protected natural area - the Tunkinsky valley of the Republic of Buryatia. The article contains a detailed material that characterizes the nature and amount of solid waste generated in the territory of the national park. The object of the research is the system of solid municipal waste management in the Tunkinsky valley. The subject is a regional regulation in the field of MSW management in the Republic of Buryatia. As a result of the study, the article presents an analysis of statistics in the field of MSW management in comparison with the Voronezh region and the regions of the Far North of Russia, in particular, problematic issues are identified, which in turn made it possible to develop the necessary additional measures and recommendations to improve the efficiency of activities in the field of treatment with MSW.

1. Introduction

Until the recent past, most Russians, throwing out household waste, did not even wonder what happened to it later: they took the garbage to the container site, the garbage truck picks it up and after that the garbage simply disappears. According to the Federal State Statistics Service, each resident of our country throws out about 65 kg of plastic and more than 10 kg of metal, about 150 kg of organic waste, 80 kg of glass, 100 kg of paper and cardboard, and also 100 kg of various garbage (for example, old shoes, broken furniture and more) every year. It turns out that in general, every Russian emits about 500 kg of garbage, or municipal solid waste (MSW) per year. If we multiply this figure by the population of our country, which is about 146 million people, then we will see a rather impressive figure - this is about 73 million tons of MSW per year.

Society produces a huge amount of garbage; this is a problem that is global in nature. One hundred fifty years ago, the waste consisted mainly of natural products: paper, wood products, clothing made of wool and cotton, that is, the products of natural origin. Accordingly, these wastes were less toxic than now. Unfortunately, the modern lifestyle simply forces us to throw out a certain amount of garbage every day, which is more toxic than the one that our grandparents produced. The greater number of products that we use every day is not without the "participation" of plastic - we use plastic bags, plastic bottles, jars from decorative cosmetics, drinking straws and much more that we use in everyday life.

Today, 94% of the waste produced in Russia is sent to landfills. 2% go to incinerators, the remaining 4% are recycled. A landfill is a pit filled with garbage. The obvious result of landfill is environmental pollution and possibly global warming. Naturally, this cannot be called an ideal solution. In addition to the fact that waste stored at landfills can emit toxic gases, the construction of
such a solution requires a certain territory. Currently, the total area of Russian landfills and solid domestic garbage dumps is about 4 million hectares.

It is worth noting that the state is only now beginning to deal with the “garbage” issue. Since April 1, 2019, all regions of Russia have switched to a new system for regulating MSW management. For example, in the entire Republic of Buryatia, a single regional operator, LLC EcoAlliance, was elected. RO is responsible for the entire cycle of garbage removal from the moment of its loading to disposal and waste burial, must ensure the elimination of existing unauthorized landfills, prevent the emergence of new ones. In addition, in accordance with recent legislative changes, garbage must be pre-sorted before entering the landfill. Launch of waste sorting stations and their operation are also entrusted to EcoAlliance LLC.

In addition, for the implementation of the all-Russian reform in the field of MSW management in the Republic of Buryatia, in accordance with part 4 of Art. 24.7 of the Federal Law No. 89 “On Production and Consumption Wastes”, all citizens, institutions and organizations, individual entrepreneurs need to conclude an agreement on the provision of services for the treatment of MSW. That is, if earlier, before the start of the reform, you had an agreement on the collection and disposal of garbage, then these agreements were required to be valid only until the date of conclusion of the agreement with the regional operator. In Buryatia - until April 1, 2019.

But along with innovations from the state came new problems. For example, in the Tunkinsky district of the Republic of Buryatia, residents of some rural settlements refuse to enter into an agreement with a regional operator, because they already have an agreement with another waste collection company, or consider it impractical, taking them to unauthorized landfills on their own, which is also not favorable for the environment. At the same time, which is a particularly acute moment in our study, the territory of the Tunkinsky district coincides with the territory of the Tunkinsky National Park, which creates some difficulties for activities related to the disposal and storage of MSW in the territory of this region, as in accordance with Federal Law No. 89 “On Production and Consumption Wastes”, only temporary storage of waste is allowed in the national park. In this case, the regional operator LLC EcoAlliance, after collecting the waste, should temporarily place it (up to 11 months) at the waste disposal facility near the village of Galbai (this territory has an area of only 5 hectares). The study examined the problems and ways of state regulation in the field of MSW management using the example of the Tunkinsky district.

2. Research methods
When writing the work, the following research methods were used:
– analysis (regulatory documents);
– study and consolidation of information;
– method of synthesis.

The work applied the methods of systemic, integrated, functional, statistical, structural and comparative analyzes, obtaining expert and statistical forecasts.

3. Results and discussion
On the territory of the Tunkinsky National Park, 12 unauthorized landfills are officially registered that are awaiting a court decision, while, according to the local administration, there are another 26 unauthorized landfills that are not officially registered anywhere. Many villages are located 30 km, and even more, from each other, the placement of container sites is prohibited due to the status of a specially protected area, there is a huge flow of tourists; thus, residents of the Tunkinsky district face problems such as:
– environmental pollution due to the lack of organized collection and disposal of garbage by the population before the emergence of a regional operator;
– collection and disposal of the remaining garbage after tourists who come to live in tents near ponds and rivers;
– the presence of unscrupulous owners of cattle, which save on grazing. Basically, these are horses and cows, which can potentially create a huge problem with the proposed placement of container sites in the MSW handling convenient for logistics.

In general, the ecological state of the environment in the Tunkinsky district as a whole can be assessed as satisfactory. It consists of two components: nature and man. Despite the growing influence of man on the local nature, on the state of the ecology of this region, natural phenomena and processes have a prevailing effect.

Tunkinsky district is located on one of the sections of the Baikal rift zone, which is characterized by the active manifestation of both internal and external forces of the earth, which are associated with earthquakes, seismic dislocations, tectonic faults, landslides, screes, avalanches, etc. In addition, the modern climatic features of this territory (long, frosty winters, temperature inversions, maximum precipitation in the summer, etc.) also contribute to the disturbance of the ecological balance in nature, because for the indicated reasons mudflows occur in the valleys of permanent and temporary watercourses, icy phenomena on the slopes of the mountains and in the bottoms of the hollows, dust storms, floods. Ecological disasters such as steppe and forest fires, destroying vegetation and wildlife, polluting and negatively changing all geospheres of a given territory, continue to be caused by human faults. With an increase in the flow of tourists who visit nature or are located in settlements, the amount of household garbage and food waste in these places has increased, which are not always disposed of or removed. The flow of cars to the Tunkinsky district has increased markedly, so the atmosphere has become more polluted by exhaust gases, as well as streams, rivers and lakes in which motorists wash their cars or dump household waste.

At present, a little more than twenty thousand people live in Tunkinsky district (see Table 1), there are 14 rural settlements, the most populated of which are the rural settlement Kyrenskoye, the rural settlement Tunka. The annual number of generated MSW, respectively, is 1646.9 tons, 1082.9 tons and 728.7 tons. Thus, 6964.53 tons of MSW are generated annually in the Tunkinsky district, including: the number of MSW formed by the population - 5510.5 tons, public facilities - 1106.4 tons, and the tourism sector - 347.63 tons.

**Table 1.** Volumes of export and processing of MSW in the Tunka Valley. 2018 year. Data from the Administration of the Tunkinsky district.

| Name of the source of waste generation | Population, pers. | Annual amount of MSW generated by waste generation sources, tons |
|----------------------------------------|-------------------|---------------------------------------------------------------|
|                                        | Public facilities | Public facilities | The tourism sector | Total: |
| Rural settlement Arshan                | 2604              | 677              | 135.9             | 270    | 1082.9 |
| Rural settlement Galbai               | 759               | 197.3            | 39.6              | 0      | 236.9  |
| Rural settlement Dalahai              | 696               | 181              | 36.3              | 0      | 217.3  |
| Rural settlement Zhemchug             | 1670              | 434.4            | 87.2              | 13.5   | 535.1  |
| Rural settlement Zun-Murino           | 1153              | 299.8            | 60.2              | 0      | 360    |
| Rural settlement Kyrenskoye           | 5275              | 1371.5           | 275.4             | 0      | 1646.9 |
| Rural settlement Mondy                | 938               | 243.9            | 49                | 0      | 292.9  |
| Rural settlement Toltoy               | 930               | 241.8            | 48.5              | 0      | 290.3  |
| Rural settlement Tory                 | 1189              | 309.1            | 62.1              | 0      | 371.2  |
| Rural settlement Tunka                | 2334              | 606.8            | 121.9             | 0      | 728.7  |
| Rural settlement Turan                | 811               | 210.9            | 42.3              | 43.88  | 297.08 |
| Rural settlement Harbyaty             | 769               | 199.9            | 40.1              | 0      | 240    |
| Rural settlement Hoyto-Gol            | 609               | 158.3            | 31.8              | 0      | 190.1  |
| Rural settlement Huzhiry              | 1457              | 378.8            | 76.1              | 0      | 454.9  |
| Mineral spring "Hongor-Uula"          | 0                 | 0                | 0                 | 20.25  | 20.25  |
| Total:                                | 21194             | 5510.5           | 1106.4            | 347.63 | 6964.53 |
To date, in the Republic of Buryatia, the payment of citizens for MSW from April 1, 2019 is:
- 1 zone (Ulan-Ude, MD "Ivolginsky District", MD "Tarbagatai District", MD "Bichursky District", MD "Mukhorsibirsky District", MD "Okinsky District", MD "Tunkinsky District", UD " Severobaikalsk ", MD" Severo-Baikalsky District ", MD" Muisky District ", MD" Bauntovsky Evenki District ", MD" Yervinsky District ", MD" Kizhinginsky District ", MD" Khorinsky District ", MD" Zaigraevsky District ") - 67.76 rubles per 1 person per month;
- 2 zone (MD “Barguzinsky District”, MD“Kabansky District”, MD“Kurumkansky District”, MD “Pribaikalsky District”) - 66.91 rubles per person per month;
- 3 zone (MD "Dzhidinsky district", MD "Zakamnsky district", MD"Kyakhtinsky district", MD"Selenginsky district") - 64.21 rubles per person per month.

Thus, residents of the municipality "Tunkinsky district" must pay 67.76 rubles per 1 person per month.

In general, in the Tunkinsky valley, the population's payment for MSW will amount to 1,436,105 rubles (see Table 2).

Tunkinsky district is a specially protected area and has the status of a national park. Disposal of waste in this territory is prohibited, only temporary storage for up to 11 months and the removal of waste from the temporary storage facility (the village of Galbai) outside the district to the MSW landfill in the village Lower Sayantuy, Tarbagatai district are allowed.

On average, the length of the path from the MSW landfill of the rural settlement of Galbai to the MSW landfill Lower Sayantuy is 500 km. The annual storage volume of solid waste in the Tunkinsky District landfill is approximately 6,000 tons. If you take this figure for the average number of generated MSW, then you will need a serious amount of special equipment for transporting MSW. Which, possibly, will further affect the pricing of the collection and disposal of MSW in the Tunkinsky district.

| Name of the source of waste generation | Population. pers. | Payment of citizens for MSW, rub / 1 person per month | Total, rub. month |
|----------------------------------------|-------------------|-----------------------------------------------------|------------------|
| Rural settlement Arshan                | 2604              | 176447.04                                           |                  |
| Rural settlement Galbai                | 759               | 51429.84                                            |                  |
| Rural settlement Dalahai               | 696               | 47160.96                                            |                  |
| Rural settlement Zhemchug              | 1670              | 113159.2                                            |                  |
| Rural settlement Zun-Murino            | 1153              | 78127.28                                            |                  |
| Rural settlement Kyrenskoye            | 5275              | 35734                                               |                  |
| Rural settlement Mondy                 | 938               | 63558.88                                            |                  |
| Rural settlement Toltov                | 930               | 67.76                                               | 63016.8         |
| Rural settlement Tory                  | 1189              | 80566.64                                            |                  |
| Rural settlement Tunka                 | 2334              | 158151.84                                           |                  |
| Rural settlement Turan                 | 811               | 54953.36                                            |                  |
| Rural settlement Harbyaty              | 769               | 52107.44                                            |                  |
| Rural settlement Hoyto-Gol             | 609               | 41265.84                                            |                  |
| Rural settlement Huzhiry               | 1457              | 98726.32                                            |                  |
| Total                                  | 21194             | 1436105.44                                          |                  |

At the same time, Russian experience today already shows the obvious economic inconsistency of the transport leverage of such a length. For example, in the Voronezh region, where the main problem is the lack of licensed landfills for MSW (there are only 17 of them in 34 municipalities, four of which will be closed in the near future; there are only seven authorized landfills, but about 300 large illegal ones), the long transport shoulder is significantly increases the cost of garbage collection. Because of this, in fact, reform has so far covered only one of the eight waste processing clusters in the Voronezh region. The optimal distance for the transportation of MSW is no more than 70 kilometers, and in the
region there are places that are 200 km from the nearest landfill. If tomorrow they are transferred to a new MSW management scheme, the fee will be prohibitive, unbearable for the population [8].

![Figure 1. Scheme of transportation of solid waste from the Tunka Valley to the landfill.](image)

In the Tunkinsky valley, the distance is 2.5 times greater. Accordingly, the economic component of such a long transport leverage will not allow maintaining a low tariff for the population on MSW and will require a fundamental decision by the state.

Since the law does not provide for the refusal to conclude agreements with the re-operator and to pay for the export of MSW, many will prefer to leave bags in ravines or vacant lots.

Near Rossosh (in the Voronezh region) there is a waste sorting complex, people are taught in the city to collect MSW separately. But the lack of a guaranteed market for recyclable materials calls into question the very meaning of waste separation. Without this, reform will come down to a simple increase in pay for the population. [9].

In Yamal, for example, a transport and logistics scheme was developed that allows to lessentheexpenes. In hard-to-reach settlements, with less than 200 inhabitants, so-called closed-loop facilities are organized. In fact, it is a complex with sites where MSW are accumulated and sorted. Useful fractions, paper, plastic, etc. are being pressed and machined. Then these "canned goods" are delivered from small villages and towns to garbage transfer stations. There they are again grouped to the required volume and for further shipment for processing, in the summer - by water transport, in the winter - according to the "winter roads".

It is planned to accumulate hazardous waste at special sites for further transportation to processing and disposal facilities. Part of the waste in sparsely populated villages is planned to be burned without residue in special environmentally friendly installations, receiving energy for the villages. For the prompt delivery of waste from one settlement to another, they are already starting to purchase transport, up to all-terrain vehicles equipped with a lifting system such as a multi-lift.

The laid down scheme, as noted on Yamal, cannot be considered ideal, laid down for centuries - life itself, new technologies make adjustments to it.

What is the optimal “garbage” formula will be derived for the regions of the Far North, calculations and development of new technologies in practice will show [9].

4. Conclusion
The Republic of Buryatia, as well as the majority of Russian regions, did not come to the beginning of 2019 quite ready for the implementation of a large-scale project to change the policy of MSW
processing, which was most clearly highlighted in a unique territory - the Tunkinsky valley. This, according to the authors, was a consequence of the fact that at one time the task of developing a specific program to solve the MSW problem at the regional level was not set [10 - 15].

The ability of regional authorities to increase tariffs for households for MSW is objectively limited by the fact of many years of lowering the real level of incomes of the population, to the increase in social tension, which is due to this, where a significant increase in tariffs for MSW will clearly meet resistance and the physical impossibility of paying for it.

On the other hand, a regional operator, as a commercial entity, will not be able to operate at a loss without any preferences or subsidies.

This is a problem that needs to be resolved.

Life itself now makes one realize this situation and requires such scientific work. Its final product may be, for example, the program "The concept of introducing separate collection of solid municipal waste in the Tunkinsky Valley, taking into account its environmental specificity and processing of individual fractions of these waste into secondary raw materials for the period from 2020 to 2025," in which The best scientific achievements in this field would be collected [1-7].

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