RESEARCH PAPER

WASTE MANAGEMENT REFORM IN REGIONS OF THE RUSSIAN FEDERATION: IMPLEMENTATION ISSUES ON THE WAY TO SUSTAINABLE DEVELOPMENT

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ABSTRACT. Disposal of production and consumption waste is a worldwide problem. Despite the experience of foreign countries, waste disposal practice in the Russian Federation remains at the level of the 1970s. The method of waste burial at landfill sites prevails, leading to a loss of secondary resources and the appearance of sites of accumulated environmental damage, which is connected with the lack of a clear legal framework for waste management activities. Analysis of waste accumulation standards for apartment buildings in 20 regions of the Russian Federation showed that the difference in accumulation standards can vary by 2.32 times (from 0.125 m^3 in the Kursk region to 0.279 m^3 in the Voronezh region). At the same time, the difference in the cost of solid waste removal services can be varied by 2.74 times from 51.55 rubles in the Altai Territory (on average in the region) to 141.45 rubles in the Tyumen region. At the same time, the share of the population with incomes below the subsistence minimum in different regions reaches 7 - 36%. This is largely due to the critically low recovery of secondary materials (about 7%). The capacity of landfills in the regions of the European part of Russia (where more than 2/3 of the population lives) is almost exhausted. Many landfills of solid waste are objects of accumulated environmental damage. The decision to introduce the «institute» of "regional environmental operators", which was adopted at the level of the Russian Federation to implement the waste management reform, has not, yet had any positive effect. Given the constant deficit of the consolidated budgets of most regions, the high level of poverty and the lack of state support, the prospects for waste management reform indicate the need for additional efforts on the part of the state, business and society.

KEY WORDS: waste management reform, regions, investments, tariffs, socioeconomic factors

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INTRODUCTION

The issue of production and consumption waste disposal[1] in the Russian Federation ranks among the most significant problems (Agiamoh, 2020). As the industrialisation and urbanisation of the last decades have shown, all the regions obviously need a comprehensive solution to the waste disposal problem (Kholienchinova et. al. 2020; Ferronato and Torretta, 2019; Skorupskaite and Yunevicius 2017; World Bank Group, 2014). Waste burial facilities (landfill sites), most of which were initially located outside of cities, have gradually been pushed close to residential areas due to intensive growth in housing construction. People have 'got used to' mass media references to an adverse impact of municipal solid waste (MSW) landfills (land pollution, declining investment appeal of polluted and adjacent territories and negative effect on public health) (Wilke, 2020; Njoku et al. 2019; Florin, 2013; Dregulo and Bobylev 2021). One of the reasons for it is the lack of an effective legal regulation of the waste management system (Federal Law No. 89-FZ, 1993) as well as the 'incomplete and unarticulated conceptual framework' in the fundamental Federal Law No. 89 (Waste of production and consumption, 2009). Officially, this FZ No. 89 was passed in 1998. Since then, 40 amendments have been made to it; however, legal relations in waste management have not been fully put in order until the present. The applicable legal and regulatory framework for waste management activities has been recognised as insufficient (Morozov et. al. 2020). The situation is influenced

[1]Suffice it to recall MSW landfills in the Moscow region (24 out of 39 ones are closed), the re-cultivation of which will require 20 billion roubles (i.e. 0.83 bn per landfill on average in terms of prices as of 2018) https://mosreg.ru/gubernator/press-slujba/obzori-smi/okolo-20-mlrd-rub-privlekut-dlya-rekultivacii-poligonov-tbo-v-podmoskove-4885

by different (in many aspects depressed) social and economic situation in the Russian regions and the absence of regulatory mechanisms for regional waste collection and recycling markets (Ponomarev 2014; Fedotkina et. al 2019).

The goal of this article was to analyse the socio-economic reasons that exert an adverse impact on the implementation of the waste management reform in the Russian Federation. Public data of statistical surveys by Rosstat, regulatory documents were used as major information sources, periodicals and scientific literature were analysed as well.

MATERIALS AND METHODS

The methodological apparatus of the research was based on the method of expert evaluation (Fig. 1), including the analysis of open statistical data of the Russian Federation, regulatory documents in the period from 2019-2021 (Federal State Statistics Service) as well as periodical and scientific literature. Expert evaluation is based on several methods:

• Associative. It consists in studying an object that has similar properties.

• Paired comparisons. Compares the alternatives of one solution in order to study the most preferred options for the future.

The authors of the article attempted to link the seemingly disjoint aspects of the designated problem, which, on closer examination, form a single chain of mutually dependent factors. Another important consideration, which was valid at the time of writing, was financing. Expert assessments are qualitative in nature, in contrast to quantitative assessments, and their purpose is to obtain statistically significant results when the identified problem and the available data are evaluated by a small group of experts.

The advantages of this approach are that it provides fast and cost-effective results, as opposed to more expensive types of qualitative user research, which require more experts to reflect a representative result and correspondingly increased funding. The expert evaluation method is proposed as one of the possible ways to solve the problem under discussion. The idea is not just to summarize documents or analytical data of statistical observations, but to characterize the geospatial organization of economic activities for waste management and the accompanying ecological and socio-economic processes.

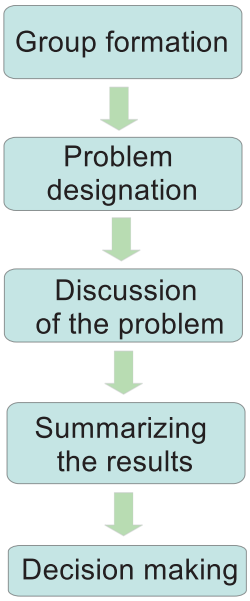

Fig. 1. The main stages of expert evaluation

The experts were assigned the following tasks:

1. Analyze the implementation of the control targets of the federal comprehensive program for waste management and elimination/reclamation of MSW waste disposal (deposit) objects according to state statistics and research materials;
2. Evaluate the prospects for recycling returnable containers and packaging for their separate collection;
3. Identify the main problems in the pricing of the MSW disposal services;
4. Describe the impact of the MSW disposal tariffs imbalance on the problems of poverty;
5. Describe how waste management activities will develop in the future? From your point of view, will the economy of the country and households benefit or lose from introducing the institution of "Regional Environmental Operators" compared to the previous practice of waste disposal?
6. Determine which key problems need to be solved first? Are there any technical, technological or methodological limitations that prevent research in this field from developing further?
7. What is the potential for further research on this topic?

The interpretation of the obtained data is presented in this article.

RESULTS

Amendments made to FZ No. 89 over the last few years launched the modernisation of the waste management system, which has drastically changed waste collection and recycling processes.

On 14 January 2019, the President of the Russian Federation signed Decree No. 8 'On the establishment of a public company for building a comprehensive system for solid municipal waste management called Russian Ecological Operator' (REO) (Decree of the President of the Russian Federation No 8., 2019). The functions and powers of the company's founder on behalf of the Russian Federation are exercised by the Ministry of Natural Resources and Environment of the Russian Federation.

The foundation of the REO public company was connected with the fact that for the last 30 years, waste management was mainly part of the 'shadow' state economy. An attempt of the REO public company to bring local enterprises engaged in waste collection, transportation, disposal and burial under control via regional operators revealed that the regions are not prepared to carry out the waste management reform as such. In many aspects, this is a result of a waste treatment/sorting infrastructure shortage and, subsequently, the appearance of illegal MSW dumps.

The implementation of the waste management reform in the regions made it obvious that the introduction of the territorial waste management scheme (TWMS) enables regulation of waste generation and collection standards as well as of tariffs for waste collection, transportation, and disposal services, and makes it possible to form a separate collection system. At the federal level, a number of bylaws were adopted to modify the rules for MSW management in individual constituent entities of the Russian Federation, including the rules for development, public discussion and adoption of territorial waste management schemes. The most significant changes included the following:

1) Territorial scheme indicators should be taken into account when determining cap tariffs[2] for the MSW management;
2) By Decree of the Government of the Russian Federation "List of production and consumption waste types that include useful ingredients and that may not be buried" (Decree No 1589-p, 2017)[3].

The changes introduced in 2017 are supposed to make sure that by 2024 targets of the Comprehensive Programme for Waste Management will be achieved, namely 50 % of waste in the country will be collected separately. But the achievement of these targets within this period raises doubts among the expert community. Waste of hazard classes III, IV, V, except for MSW, is not included in the Ecology national project, while the placement of this particular waste (oils, electronics, tires, rechargeable and other batteries, glass etc.) at landfills has been consistently prohibited from 2016 to 2021; in particular, liability for disposal of these types of waste was imposed on manufacturers and importers. In addition, these waste types are subject to separate collection and sorting in the course of building an MSW management system.

The absence of waste of hazard classes III, IV, V in the Ecology national project is a technical flaw that impedes the achievement of the national project's goals and objectives. If this issue is not resolved, economic and administrative incentive measures will not apply to a considerable part of the waste generated from the use of goods, including waste that may not be placed at landfills. At the same time, the share of MSW sent for treatment is expected to account for at least 10 % of the overall MSW mass (Fig. 2).

An important element of assisting the regions in the implementation of targets of the Ecology national project is allocation of subsidies from the federal budget in the form of an asset contribution (Government of the Russian Federation Resolution No. 1727 (2019), which is crucial given the deficit in consolidated budgets of many regions of the Russian Federation.

The regions can receive this type of subsidy if the REO issues mandatory recommendations, and if a regional programme for waste management is approved or adjusted or the MSW accumulation standards are corrected (The Government of the Russian Federation Resolution No. 1815, 2019).

The performance indicator on which a decision to grant the subsidy depends is the attraction of private investments, including those in the form of proprietary funds and borrowed (loan) funds, for projects in the amount of at least 2.46 roubles per 1 rouble of the subsidy allocated (The Government of the Russian Federation Resolution No. 1815, 2019). Private investments raised for investment projects can be essential for the reform's implementation.

If the regions lack additional capacities for waste recycling and burial within the next two years, private investments might be attracted for the re-cultivation of old waste disposal landfills and construction of new ones. Fig. 3 demonstrates data on landfills in 32 Russian regions, whose capacity will be exhausted within five years, as of 1 January 2019.

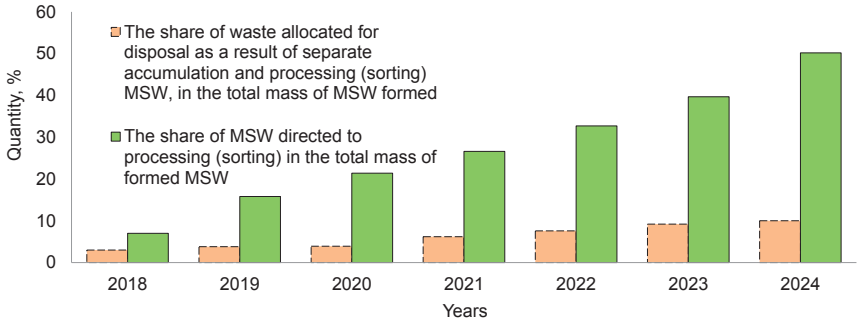

Fig. 2. Individual indicators of the Comprehensive Programme for Waste Management under the implementation of the Ecology national project

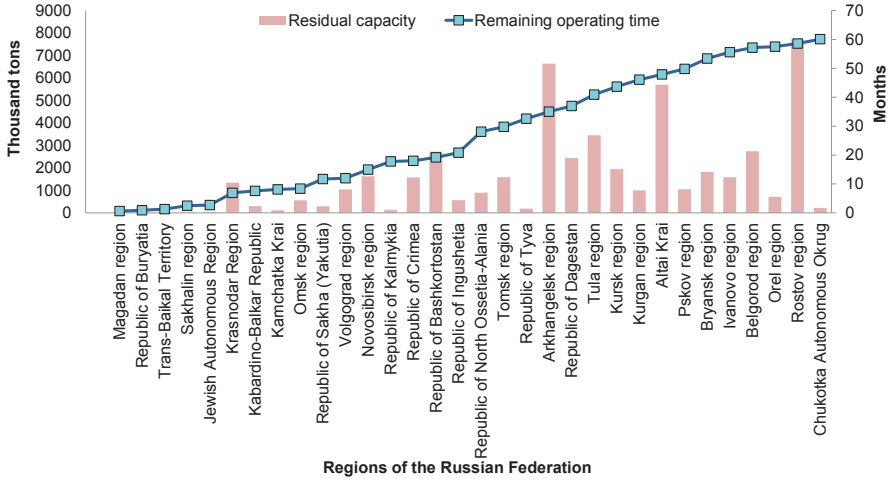

Fig. 3. Data on the residual capacity of MSW placement facilities

[2]It should be noted that the tariff policy (a tax applicable since 1996) in respect of waste burial in England, Wales, Scotland has become the only compulsory (and effective) tool used for encouraging businesses and consumers to lower waste production [The Landfill Tax Regulations 1996 http://adlib.everysite.co.uk/adlib/defra/content.aspx?doc=18602&id=18604]. Similar mechanisms, namely the management of a waste burial tax, are applied in France and Italy. The Netherlands, for instance, draw on another practice; they focus on voluntary agreements between state structures, businesses and the population [Buclet N., Godard O. The Evolution of Municipal Waste Management in Europe: how Different are National Regimes. Journal of Environmental Policy and Planning, Taylor & Francis (Routledge), 2001, 3, 303-317].
[3]Swedish Ambassador Peter Ericson says in his interview to Interfax: 'Russia is lagging 40-50 years behind Sweden in terms of waste recycling issues', https://www.interfax.ru/interview/673785

The biggest problem in reducing the capacity of landfills is the lack of a separate waste collection system, especially for packaging. In Russia, about 7-15% of waste comes from containers and packaging made of plastic, paper, aluminum, etc. The rest of the waste is deposited in landfills. (Ryabov and Tugov 2020).

The capacity of the plastic waste market in 2017 amounted to 461 thousand tons, despite the fact that more than 3.5 million tons were generated. According to the data of 2018, the production of items belonging to the category of plastic containers and packaging amounted to 110 billion pieces.

This is 6.9% more than in 2017, and 108.9% more compared to the data of 2010 (i.e. twice as much as 10 years ago). In 2018, Moscow occupied the first place among the Russian regions in terms of the import of plastic containers and packaging in value terms with 28.8 thousand tons of goods worth 124.2 million dollars (~7.8 billion rubles based on the average exchange rate in 2018) (Volkova, 2018). The production of PET (polyethylene terephthalate) containers in the near future may grow by 2.4% and reach around 112.6 billion pieces. In 2019, the production of plastics reached 8.76 million tons, over 5 years it increased by 64.2%, which means that the need for the development of the "extended producer responsibility" system and the infrastructure of separate collection based on it will significantly increase (Dregulo and Khodachek 2021).

However, the legislative consolidation of the environmental collection norms, as well as the requirement of self-collection (removal) of manufactured products from manufacturers with ineffective control over the subjects of extended producer responsibility (EPR) and a lack of necessary infrastructure, have not yet produced the expected effect. To a large extent, this is due to the distrust of producers (subjects of EPR) to this reform. Waste generation in the Russian Federation rose from ~2.8 to ~7.9 bn tonnes on average within the last 15 years, while disposal and neutralisation increased from ~1.4 to ~3.9 bn tonnes (Fig. 4).

Although the achievement of five main targets of the Comprehensive Programme for Management of Solid Municipal Waste is supported financially (Report on the results of the expert-analytical event 2020), only three out of these targets were partially accomplished in 2019 (data for 2020 was not available at the time of carrying out this research):

• The establishment of an electronic federal scheme for MSW management (Modernisation of the Unified State Information System for keeping records on product waste) was only 48 % complete in 2019;

• The development of regulations concerning activities of the Russian Ecological Operator public company for building the comprehensive system for solid municipal waste management was only 22 % complete in 2019;

• Ensuring of operation of the Russian Ecological Operator public company for building the comprehensive system for solid municipal waste management was only 48 % complete in 2019.

Other two targets were not accomplished:

• The asset contribution of the Russian Federation to the REO public company for building the comprehensive system for MSW management to finance projects aimed at putting facilities for solid municipal waste treatment into commercial operation (0 % complete);

• The asset contribution of the Russian Federation to the REO public company for building the comprehensive system for MSW management to finance projects aimed at putting facilities for waste and fraction disposal after MSW treatment into commercial operation (0 % complete %). This implies the unpreparedness of regional authorities and regional businesses for the implementation of the waste management programme. Apart from that, one should pay attention to the problem of development and approval of reasonable MSW disposal tariffs.

DISCUSSION

The analysis of MSW accumulation standards for apartment buildings in 19 Russian regions revealed that the accumulation volume can vary by a factor of 2.32 (ranging from 0.125 m3 in Kursk region to 0.279 m3 in Voronezh region. At the same time, the cost of MSW removal services can vary by a factor of nearly 2.74, ranging from 51.55 roubles in Altai region (the average regional indicator) to 146.21 roubles in Tyumen region (Fig. 5).

The MSW disposal tariff is frequently set too high without due grounds. In 2019, the Federal Antimonopoly Service of Russia detected breaches of the legislation in the state tariff regulation in 16 regions, where, in particular, cap tariffs incorporated unreasonable costs of regional MSW management operators. Following the results of the proceedings, tariffs were cut by 16.8% - 30.85%. As per clause 148 of Decree No. 354 of the Government of the Russian Federation dated 06.05.2011 (The resolution of the RF Government N 354, 2011), calculation of the utility payment for MSW management in a conventional dwelling is based on the number of permanent and temporary residents of the dwelling, MSW accumulation standards or the total area of the dwelling, as regulated by a decision of a region.

For example, in St. Petersburg, the utility fee for MSW management is calculated and charged with the total area of the residential premises taken into account, although Order No. 30-p of St. Petersburg's Tariff Committee dated 14.04.2017 provided for MSW accumulation standards per person living in an apartment building or detached house. At the same time, MSW generation

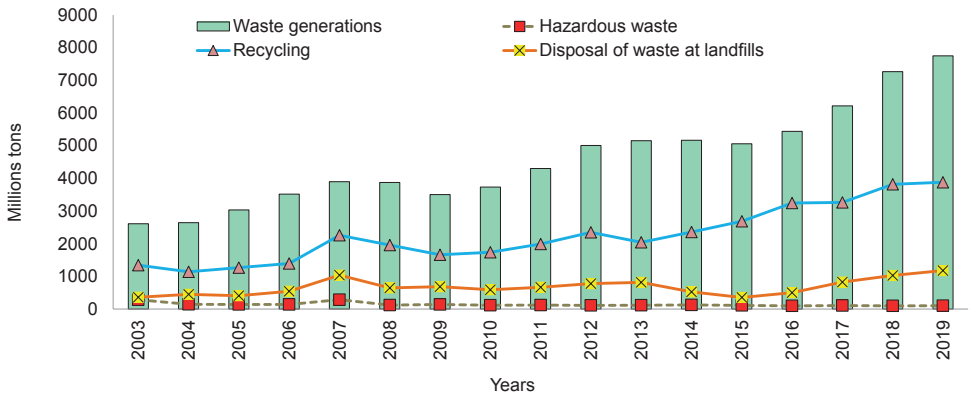

Fig. 4. Waste generation, disposal and neutralisation in the Russian Federation

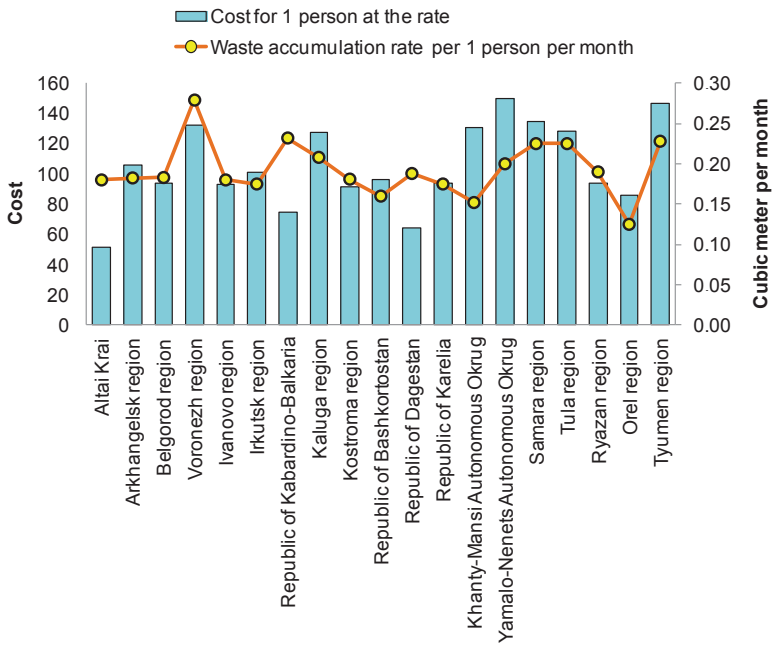

Fig. 5. Standards for the accumulation of MSW and the cost of services for the export of MSW for apartment buildings (per 1 person) in the regions of the Russian Federation

standards per resident of an apartment building differ drastically in the regions.

The service fee is distributed in equal shares based on the cost (an approved price for the service in the current year) for 12 months. The utility price for MSW management, determined in accordance with the properly approved and unified tariff of the regional MSW management operator, is a key indicator for the formation of the MSW disposal tariff. A new MSW management system suggested under the reform comprises several stages: sorting, recycling, neutralisation, and burial of waste. These particular services of the regional operator should be paid for. As far as foreign experience is concerned, a study of qualitative and quantitative characteristics of domestic waste of 144 households from 11 main quarters of the city of Dehradun, India, has demonstrated that the waste weight ranged from 24.5 to 4147.1 g/day and varied considerably among miscellaneous social groups of the city's population. Food waste was the major component, representing ≥80% of the aggregate weight; polyethylene and plastic waste accounted for 7%, paper for 6%, clothes and rubber waste for 4%, cardboard for 2%, and glass 1% (Suthar and Singh 2015).

The findings prove that a rational approach to separate waste collection can massively augment the positive effect of the MSW management reform. Basically, the share of waste recycling and generation of secondary raw materials will rise, and the share of waste placed at landfills will shrink, which, in its turn, will cause a decrease in MSW disposal tariffs.

To make the assessment of the MSW management reform implementation 'transparent', this expenditure item of the population should be specified in utility bills in detail, with a breakdown of payment into elements: waste collection, transportation, separate collection, recycling etc. Such notification of the population will scale up separate MSW collection. Order No. 43 of the Ministry of Construction, Housing and Utilities of the Russian Federation dated 26 January 2018 suggests that such the wording as 'management of solid municipal waste' (Order of the Ministry of Construction of the Russian Federation N 43/pr, 2018) should be used for this type of services when filling in a utility bill. Although this wording is rather advisory in nature, in accordance with order No. 43, the notion of 'management' may mean both all the aforementioned MSW management stages in total combined and any of these stages. This expenditure item is of particular relevance for single elderly people in case of an unfortunate concatenation of circumstances: e.g., when a spouse died, children left, and payment has to be made for the entire area of residential premises.

The loss of income due to stagnation of the economy and liquidation of many small and medium-sized enterprises during the COVID-19 infection period have resulted in the population's rising debt for utility services. According to a report of the REO public company (Annual report of PPK "Russian Ecological Operator" 2019 year, 2020), the accounts owed by the population

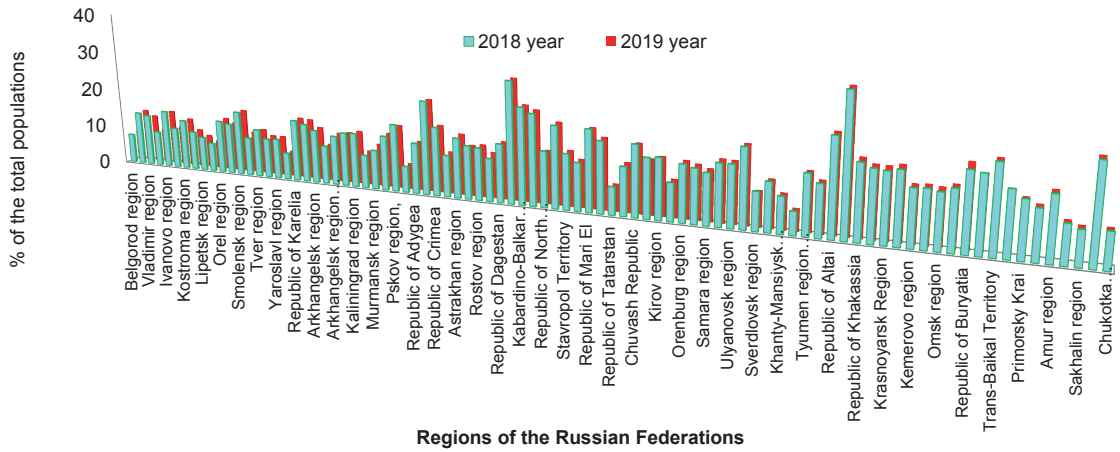

Fig. 6. The share of the population with monetary income below the subsistence minimum

to regional REOs for utility services as of 01.01.2020 exceeded 39 billion roubles. This is probably due to the lack of income to pay for utilities. The share of the population with income below the subsistence minimum in different regions varies from 7 to 36% (Fig. 6). All these factors undermine positive public perception of the reform.

According to an opinion poll conducted in the city of Arkhangelsk (Larionova, 2018), two-thirds of the pollees consider the reform to be centred around the need to sort waste and recycle it properly, and others believe that it is aimed at augmenting tariffs, which enhances social discontent with the reform. Moreover, the negative view of the population of Arkhangelsk region on the reform is attributable to an attempt to build a landfill in the Shies settlement of Arkhangelsk region, which is probably due to the residual filling of landfills in Arkhangelsk region with waste, see Fig. 2). Investments were supposed to be raised by placing waste generated in the city of Moscow. Placement of waste generated in constituent entities of the Russian Federation in other regions violates[4] Decree N 641 of the Government of the Russian Federation dated 25 August 2008 (with amendments as of 15 December 2018) (Decree of the Government of the Russian Federation No 641, 2008) and necessitates the adjustment of the territorial waste management scheme and supplementary financial costs. Amid growing unemployment and the population's debts for utility services, this will lead to a decrease in tax revenues for the regional budget in many regions.

The unemployment rate went up from 1 to 4.2 % from March to November 2020. In the second quarter of 2020, the proprietary income of the consolidated regional budgets fell by 20% (–567 bn roubles), inter alia, corporate income tax revenues dropped by 27% (–243 bn roubles), and personal income tax revenues by 10% (– 99 bn roubles) compared to the similar period of 2019 (Zubarevich, 2021). Another crucial factor of the waste management reform implementation is the issue of demolition of accumulated environmental damage (AED) sites[5], in particular, of MSW landfills. Regular references of mass media to MSW landfill sites in Moscow region, where, due to half-baked measures for shrinking landfill gas emissions, the hydrogen sulphide concentration in the air of surrounding areas exceeded the maximum allowable concentration (MAC) by 625 times, were a vivid example of AED. Far from being an isolated incident, this is a systemic issue for all regions. According to official data of the Ministry of Natural Resources and Environment, in Russia, 121 facilities were classified as AED sites (the real number can be considerably higher). As many as 1500 unauthorised dumps were detected. Their negative impact results in environmental degradation and the appearance of AED sites, which is why additional resources are required for their demolition. Given rough estimates of the cost of eliminating an AED site (by simplified analogy with landfills in Moscow region, where demolition of one landfill site as an AED facility costs 1 bn roubles on average), no less than 500 bn roubles will be required by 2024 for demolition of 500 AED sites besides expenses on the destruction of unauthorised dumps. In accordance with targets of the Ecology national project, the number of destructed unauthorised dumps is supposed to reach at least 180 by 2024, with at least 75 extremely hazardous AED sites to be eliminated (Fig. 7).

Apart from required finance for demolition of AED sites, the problem in many aspects is attributed to:

- legal uncertainty concerning the liability of officials for infliction of environmental damage;
- lack of mechanisms for compensating the population for the damage inflicted;
- inefficient taxation system for enterprises involved in waste disposal (payment for an adverse impact on the environment) (Federal Law No. 7-FZ, 2002; Vypkhanova, Zhavoronkova 2018; Ignatieva, 2017).

In the EU countries, the problem of mitigation of AED is regulated by Directive 2004/35/CE. The Directive is based on the 'polluter pays' principle (Directive 2004/35/ EC, 2004). Nevertheless, the Directive does not provide for any measures compensating the population for harm to health resulting from AED.

Another socially-oriented example of state policy aimed at solving the AED problem was the adoption of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as well as amendments and additions (SARA) introduced thereto in 1986, which made it possible to identify performance problems of the Superfund programme (The Law on amendments to the Superfund and Reauthorization (SARA, 1986).

The Superfund programme solved only part of the problems related to restoration of the ecologically damaged natural environment. The way from identification of environmental harm to cleaning (re-cultivation / restoration) and reuse of territories is highly challenging and does not lead to rapid elimination of AED's repercussions and risks for public health (Lioy and Burke, 2010).

The US Environmental Protection Agency reported in 2009 that facilities listed as AED sites over 20 years ago were still undergoing various stages of demolition. As of December 2009, only 340 out of 1270 sites were excluded from the list (demolished), and 63 new sites were added (National Priorities List (NPL) Sites - by Stat, 2021).

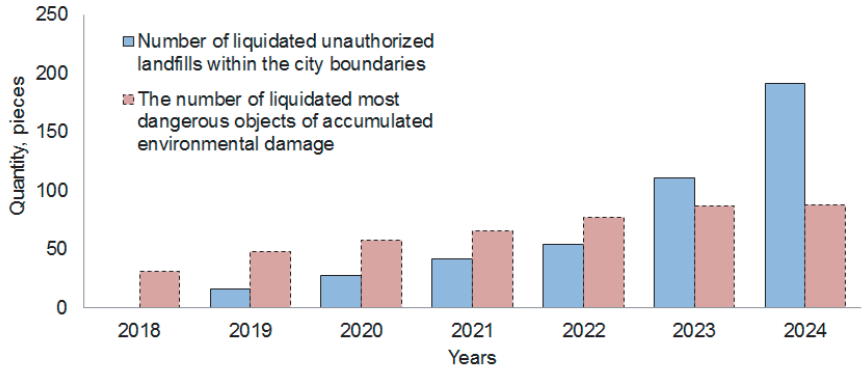

Fig. 7. Separate indicators of the Ecology national project implementation in terms of demolition of AED sites

[4]Clause 5 of the Decree: 'The contract for the provision of solid municipal waste management services shall be concluded between the consumer and regional operator in whose operation area solid municipal waste is generated, and facilities (sites) for their accumulation are located, as prescribed by section 1 of these Rules.'

[5]Official website of the Ministry of Natural Resources and Environment of the Russian Federation. Data on sites of accumulated environmental damage https://www.mnr.gov.ru/activity/directions/likvidatsiya_nakoplennogo_ekologicheskogo_ushcherba/

Thus, residents of areas within the programme-covered territory had lived amid possible adverse risks to health and life quality for several generations.

In the Russian Federation, geoecological features of a technology-related effect of regional AED sites have not been thoroughly explored (Potravny et. al. 2018). The existing methodological concepts make allowances only for elimination costs of AED sites (Economic efficiency of elimination of accumulated environmental damage and restoration of degraded lands 2016) and fail to consider external effects, in particular, compensation to people living in areas that suffered from environmental damage (Kotta 2020).

Obviously, the situation will deteriorate with each passing year; nevertheless, forecasts for real externalities caused by the implementation of the waste management reform in the Russian Federation are virtually impossible to give due to absent or sketchy details.

CONCLUSION

Given the economically challenging situation in the Russian Federation, there is little likelihood that 50 % treatment of MSW waste will be ensured, and no less than 75 extremely hazardous AED sites will be eliminated by 2024. The key grounds for the severe situation in waste management in Russia include socioeconomic conditions, particularly a decline in the population's real disposable income, and the absence of regulatory mechanisms for the MSW collection and recycling market in the regions. The activities of regional ecological operators are difficult to appraise yet.

A number of negative developments in the Russian Federation have not been overcome, such as:

- high share of people with income below a minimum subsistence level;
- high and unbalanced MSW disposal tariffs;
- reduction in the real income of the population (in particular, due to the coronavirus infection);
- social discontent and public misapprehension of the objectives of the waste management reform;
- low efficiency of the use of budgetary funds under the comprehensive MSW management programme;
- lack of methodology for identification and ecological diagnostics of AED;
- imperfect environmental assessment and underdevelopment of environmental insurance.

All of the above indicates that the waste management reform in the Russian Federation is associated with multi-factor socioeconomic conditions that necessitate awareness-raising work among the population and effective governmental control, drawing on the experience of foreign countries.

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