INSTITUTIONAL APPROACH TO ASSESSING THE TRANSITION TO A CIRCULAR ECONOMY: THE CASE OF THE KALININGRAD REGION

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The article discusses possible reasons for the failure of Russia's waste management industry reform and highlights the ownership blurring as a factor that may hinder the transition to a circular economy, which has been proposed as one of the outcomes of the reform. This study aims to address possible obstacles to transitioning to a circular economy in the Kaliningrad region. Methodologically, the study uses instruments of new institutional economics: by comparing discrete institutional alternatives for municipal solid waste (MSW) management, the authors propose incentive schemes that will likely stimulate the transition to a circular economy in the region. It is shown that, in Russia, the identification of the holder of the property right to waste is complicated. This can be a hindrance to effective MSW management. Moreover, objects handled by MSW management services may fall into different types, but at the same time, it is possible to transfer objects from one type to another. One of the ways to improve the exclusion of services of MSW utilization is the introduction of incentive tariffs. Low-rise housing in the Kaliningrad region makes it an ideal region for the introduction of such a scheme. When calculating the unsorted waste transport fee, a multiplier can be used to reduce the payment for waste-separating households. This can serve as an additional incentive for overcoming collective action problem in MSW collecting and sorting. To prevent social resistance to such a policy, incentive schemes should be implemented on a voluntary basis.

Keywords:
municipal solid waste, recycling, recovery, externalities, circular economy, incentive schemes (pay-as-you-throw)

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Introduction

Transition to the circular economy is a necessary condition for achieving sustainable economic growth. The shift to the circular economy requires fundamental changes in municipal solid waste (MSW) management.[1] The MSW management reform has been extensively debated over the last four to five years. Unfortunately, as a whole, the MSW management reform in Russia has not yielded the expected results. What is more, despite some progress in MSW management that has been achieved recently, it is not considered as long lasting. This deplorable situation raises questions as to why the waste management reform has failed and what prevents Russia and its regions from solving MSW management problems and head towards the circular economy.

We describe this problem in the first section of this work. In the second, we define waste as an economic category and highlight the main features that may help to distinguish waste, goods and resources. The third section puts into the question the problems in building the relationships between different interest groups in the MSW management system that arise as a result of the existing shortcomings in legislation. Then we define services provided by the MSW management system based on rivalry and excludability. Section four explains how incentive tariffs may solve the waste management problem in the Kaliningrad region.

1. Problem setting

The waste management problem is becoming increasingly urgent all around the globe. According to the World Bank, without a global renovation of waste management systems, by 2050 humanity will produce 1.7 times more waste compared to present levels [1]. In Russia is extremely severe as well. In 2017 Russia produced 274.4m^3 of MSW and only 10% of this quantity was transported to waste recycling plants (27.9m m^3) and 2.2% to incineration plants, whilst 87% was buried.[2]

[1] Although the transition to the circular economy requires a change in both municipal and industrial waste management, this study will focus solely on municipal solid waste.

[2] *Governmental report On The Conditions and Protection of Environment in the Russian Federation in 2017*, 2018, Supervised by the Ministry of Natural resources and Ecology of the Russian Federation.

Overflowing authorised landfill sites, mushrooming non-authorised sites, and the absence of a waste segregation system necessitated the 'rubbish reform' of 2017—2019. As of the writing of this article, waste management reform in Russia is not considered to be successful. A report issued by the Accounts Chamber in 2020 admits that the reform 'has not met its promise'.[3] Moreover, if waste burial continues at the same pace, the existing landfill sites will fail to accommodate newly generated waste in many Russian regions.

Apart from this, much less volumes of MSW than expected was converted into resources, including electric power. In 2019, Russian regional operators handled 61.15m tonnes of MSW, 29.7% of which was recycled and less than 5% put back into production (this includes recycling,[4] regeneration,[5] and recovery[6]) or reused as a renewable energy source (2.67m tonnes). For comparison, one of the world's leaders in waste management, Sweden, incinerated 50% of MSW and recycled most of the rest in 2019 (only 0.8% of the waste generated nationwide was buried).[7]

Although Russia has adopted a national approach to the MSW reform, there are regional differences in waste generation and management. Regions and municipalities produce different volumes of waste. For example, in the Kaliningrad region, the namesake city and its neighbouring municipalities account for most regional waste (see fig. 1). In these territories, densely built-up areas experience considerable problems with setting up landfill sites and other waste management facilities.

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[3] Report on the Analysis of Implementation of Measures to ensure the Environmental Security of the Russian Federation as Regarding the Elimination of Accumulated Environmental Damage and the Formation of a Comprehensive Solid Waste Management System. Supervised by the Accounts Chamber of the Russian Federation, 2020. See p. 3. available at: https://ach.gov.ru/upload/iblock/41b/41b02dc50697e6fc57ec2f389a8b68f0.pdf?_ga=2.106291210.820111883.1605780584—216807580.1598522839 (accessed 15.03.2021).

[4] Recycling is the process of waste treatment, associated with their reuse as raw materials while manufacturing products with a similar purpose. Recycling stands for the return of waste into the production cycle.

[5] Regeneration means putting waste back into a circular process after treatment.

[6] Recovery is the retrieval of useful components from waste for repeated use.

[7] *Avfall Sverige — the Swedish Waste Management Association*, 2020, available at: https://www.avfallsverige.se/in-english/ (accessed: 22.10.2020).

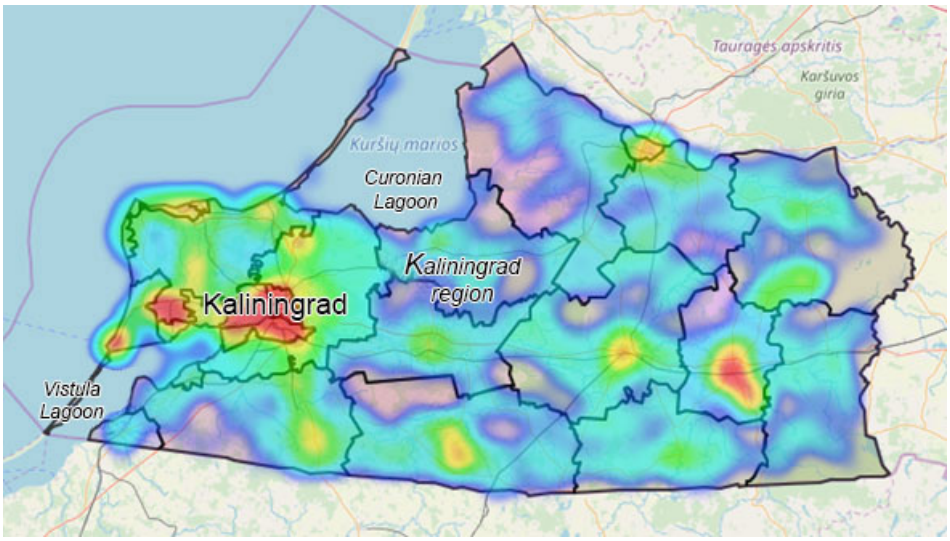

Fig. 1. Distribution of MSW generation sources
colours show how much MSW is generated by a district:
red indicates maximum waste production; blue, minimum

Source: Regional Waste Collection, Transport, and Treatment Scheme, Ministry of the Natural Resources and Ecology of the Kaliningrad region, available at: https://minprirody.gov39.ru/deyatelnost/obrashchenie-s-otkhodami/territorialnaya-skhema-obrashcheniya-s-otkhodami/ (accessed 11.08.2020).

The Kaliningrad region generates up to 1.5m tonnes of waste annually, up to 2.7m m^3 of which is MSW. Figure 2 shows the dynamics of waste produced in the region.

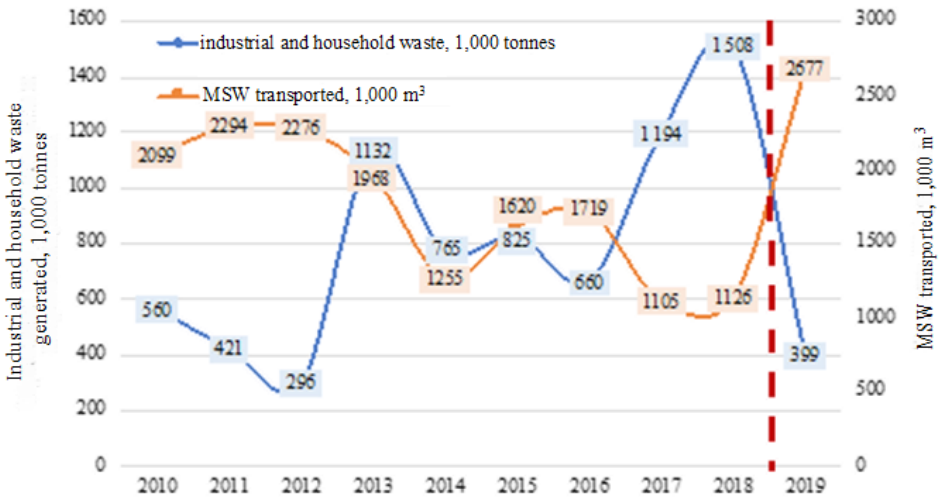

Fig. 2. Industrial and household waste production; MSW in the Kaliningrad region
(the dashed line marks the beginning of the 'rubbish reform')

Source: The Drafts of The Governmental reports on the conditions and protection of environment in the Russian Federation in 2017, 2018, and 2019 (available at: https://www.

mnr.gov.ru/docs/proekty_pravovykh_aktov/proekt_gosudarstvennogo_ doklada_o_sostoyanii_i_ob_okhrane_okruzhayushchey_sredy_v_2017_godu/), 2018 (available at: https://www.mnr.gov.ru/docs/proekty_pravovykh_aktov/proekt_gosudarstvennogo_doklada_o_sostoyaii_i_ob_okhrane_okruzhayushchey_sredy_rossiyskoy_federatsi/), 2019 (available at: https://www.mnr.gov.ru/docs/proekty_pravovykh_aktov/proekt_gosudarstvennogo_doklada_o_sostoyaniy_i_ob_okhrane_okruzhayushchey_sredy_rossiyskoy_federatsi/) (accessed 15.03.2021).

According to a Greenpeace ranking[8], 30% of Kaliningrad residential houses had access to waste sorting bins in 2018. In 2019, this proportion rose to 59%.[9] As of the end of 2018, in Kaliningrad there were two containers for bulky waste, and 313 for plastic. Most of the latter were found in the Leningradsky and Tsentralny districts, albeit the third city's district, Moskovsky, the largest by area and population had the least of the containers for sorted waste.[10]

The Kaliningrad region ranks lowest among Russia's territories located in the Baltic Sea catchment area in the proportion of recycled and processed waste (up to 90% of industrial and household waste remain untreated) [2].

Therefore, the increase in the volume of MSW transported to recycling plants is unlikely to be caused by the reform: in 2013, the region transported the record 42,000 m^3 of MSW to recycling plants (2% of the total collected MSW). The problems of the transition to the circular economy may lie in how the regional operator collects and processes waste (supply side) or in how residents collect and segregate it (demand side).

2. Waste as viewed by economics

Economic and other literature does not give an unambiguous definition of MSW. To produce a satisfactory one, let us consider what distinguishes MSW from other economic categories.

[8] I. Skipor. Reyting Greenpeace: kazhdy tretiy zhitel krupnogo goroda Rossii imeet dostup k razdelnomu-sboru [Greenpeace ranking: each third resident of a Russian city has access to waste segregation sites], 2020, *Greenpeace,* available at: https://greenpeace.ru/blogs/2020/03/12/rejting-greenpeace-kazhdyj-tretij-zhitel-krupnogo-goroda-rossii-imeet-dostup-k-razdelnomu-sboru/ (accessed 14.09.2020).

[9] I. Skipor. Reyting Greenpeace: kazhdy tretiy zhitel krupnogo goroda Rossii imeet dostup k razdelnomu-sboru [Greenpeace ranking: each third resident of a Russian city has access to waste sorting], 2020, *Greenpeace*, available at: https://greenpeace.ru/blogs/2020/03/12/rejting-greenpeace-kazhdyj-tretij-zhitel-krupnogo-goroda-rossii-imeet-dostup-k-razdelnomu-sboru/ (accessed 14.09.2020).

[10] Regional Waste Collection, Transport, and Treatment Scheme, 2020, *Ministry of the Natural Resources and Ecology of the Kaliningrad region*, available at: https://minprirody.gov39.ru/deyatelnost/obrashchenie-s-otkhodami/territorialnaya-skhema-obrashcheniya-s-otkhodami/ (accessed 11.08.2020).

MSW can be considered as 'an output with no or negative economic value' [3]. This definition captures the central features of waste — the unwillingness or inability of the waste holder to use it, directly or indirectly, as a consumer good.

This definition also reveals the problems that researchers face when defining waste. The process of MSW generation in itself does not shed light on the difference between waste and by-products, which are incidental or secondary goods produced while manufacturing the main product. Although by-products can be sold in the market, their production is not essential for the firm (in terms of motivation rather than technology) [4]. Unlike by-products, waste cannot be traded by definition. Buyers and sellers cannot find each other in the current institutional environment and a transaction turns out to be not feasible due to the search frictions in the market.

Differences between waste and by-products are shown schematically in Figure 4: by-products and the main products are produces with a help of resources, and the manufacturing of both is accompanied by waste generation.

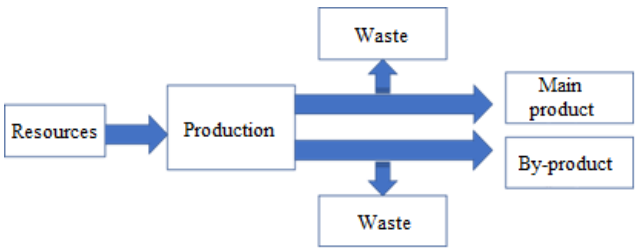

Fig. 4. Differences between waste, the main product, and by-products

Source: prepared by the authors

When not bought by-products are considered as waste. If the costs of turning resources into a product (transformation costs) and the costs of building a contract (transaction costs) change in the economy, waste may be seen as a by-product. The reverse process is also possible.

In effect, MSW is any substance or object that has been used for its intended purpose (or served its intended function) by the consumer and will not be reused [5]. On the one hand, this definition reflects another distinctive feature of waste — the unwillingness of the consumer to use the product for its intended purpose. On the other hand, it does not consider possible repurposing of a good. For example, the product may lose some properties and hence its value (in full or in part). Economic agents will decide to discontinue its consumption. In contrast, one may stop using a product for a different reason — for instance, because of having consumed enough. Furthermore, some products are no longer used and discarded while retaining their original features. A good example is food, which retains its qualities and can still be used but is, nevertheless, thrown away by the holder.

An interesting case of changes in the value of a product is related to the substances used in agriculture (agrochemicals and fertilisers): they can be introduced into the soil in amounts greater than needed. In such a case, these substances are no longer goods, but they do not fall within the definition of 'things that the owner disposes of or wants to dispose of' [5].

Since waste is the substances and products that individuals cannot or do not want to use any longer [6], this category may be extended to include not only products and substances that have fulfilled their function as consumer goods but also any other unusable object.

These characteristics of waste can be combined in order to build following definition that embrace two central properties of waste: *waste is (1) useless and unused things and substances which (2) the holder wants to discard in the current institutional environment.*[11]

The features of MSW covered by this definition suggest that, in the current conditions, waste is a bad that requires elimination. Changes in the institutional environment or technology, which impact the level of transaction and transformation costs [7], may affect the net benefit of disposing of MSW. Alternative ways to handle waste may become more profitable as a result. In other words, economic agents may change their mind and sell rather than discard MSW. In such a case, the economic nature of MSW changes — the bad turns into a good or resource.

MSW interpretation as a good or a 'bad' is determined by type of market defined. On the one hand, MSW can be considered within a market trading in goods. Municipal waste will be a bad, and the economic agent will consume a set of products that includes both goods and 'bads'. On the other hand, MSW can be defines as a product on the waste market. In the latter case, waste is traded as an ordinary good or at a negative price when purchasing them entails losses.

Transition to the circular economy, which is enabled by changes in level of transaction and transformation costs facilitated by both businesses and the state [8], means exchanging goods that earlier were of no value to their holders. Therefore, the unique phenomenon of waste disappears upon transition to the circular economy.

How could waste be turned into a good or resource? Answering this question requires the identification of factors influencing supply and demand. If one wants to turn waste into a good or a resource, they need to either increase the value sorted and cleaned waste of decrease the cost of waste cleaning, sorting, and transporting (including transaction costs) so that to make waste management profitable for the actors in the MSW management system. However, the

[11] In the current condition, potential transactions involving such product or substances may occur outside market exchanges, and potential customers may attract resources from other sources.

value of waste depends directly on agents willing to use waste in manufacturing goods or generating energy (once again, transaction costs must be allowed for). Moreover, if a territory produces copious amounts of sorted and cleaned waste,[12] one can have an incentive to start a company that will treat MSW. Hence, to turn waste into a resource or good, we need have in mind three necessary conditions: waste should be pure, considerable quantities of waste are to be produced and demanded.

All the above mentioned definitions have one common feature: there should exist a holder of waste who wants to dispose of it. This turns out to be especially important when we consider negative externalities (the impact of discarded waste on the environment and the wellbeing of other agents) that emerge in the MSW management. If the waste holder neglects negative externalities when disposing of waste, the amount of goods/bads that are produced in the economy is ineffective. Still, it is often difficult to establish the actual ownership of waste. This is yet another obstacle on the road to the circular economy.

3. Obstacles on the way to the circular economy: the problem of an MSW management system

To understand what stands in the way to the circular economy, it is vital to have a good idea of the industry of waste management services. These services are usually viewed as a pure public good, which is non-excludable and non-rivalrous [9]. Indeed, it is almost impossible to exclude individuals (for example, non-payers) from consuming these services since clean streets and waste collection are essential to citizens' health and environmental protection. Delivered to some residents of an area, these services benefit all residents. The basic waste management service is not rivalrous, and any individual can use the service without reducing its availability to others.

Despite the public nature of the service, the state or municipalities do not always draw exclusively on their own resources when fulfilling this function. The private sector often comes to rescue [9]. Overall, the extent of involvement of the private sector in MSW management is influenced by multiple factors and initial conditions (including resource availability, community accountability, and the features of the institutional environment). MSW treatment contracts are vulnerable to changes in the environmental and tax law, as well as to foreign exchange risks (if MSW is exported). They are also associated with diseconomies of scale and negative externalities. Thus, effective contractual relationships with private waste management companies are impossible without transparent rules of play and incentives (for example, guarantees) from the state.

[12] Separated from other materials to the fullest possible degree. Different types of waste management systems require different waste of treating and cleaning waste.

The MSW management system is a complex comprising disparate elements. It includes the collection, sorting, treatment, and disposal of waste. Each element of this complex can be considered as a good in its own right. Moreover, these elements have features of goods of different types. MSW management can be schematised, as shown in figure 5.

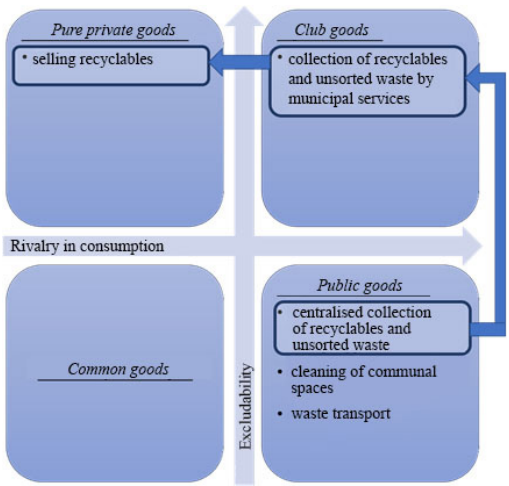

Fig. 5. Elements of the waste management complex according to excludability and rivalry

Source: prepared by the authors based on [10].

Some components of the MSW management complex can be seen as public goods, others as club goods, which are nonrivalrous and nonexcludable. There are also elements that have features of private goods, for instance, sales of recyclable materials.

In traditional MSW management systems, elements that can be classified as private or club goods do not play a pivotal role. Most waste is collected and transported on a centralized basis, and all consumers have equal and almost unlimited access to the MSW management system.

Transition to the circular economy alters this pattern — elements falling under club or private goods start playing a more prominent role. This change may be a result of the elements undergoing modification. For instance, earlier centralised waste collection may be performed now by each household individually. This way, excludability appears, and the service turns into a club good. Increasing the excludability in the waste management system is closely linked to the possibility of establishing the ownership of waste. In the circular economy, established ownership enables transactions in which waste is seen a recyclable.

Countries that excel in waste management embrace waste sorting, recycling, and incineration to minimise burial, increase the excludability of MSW management services, and thus facilitate the transition to the circular economy.

In many other countries, waste burial remains the most common approach to waste treatment. Russia is one of them: 90% of the waste produced nationally ends up in landfills. The country's waste management problems are diverse: no access to the infrastructure, few incentives for households to sort waste, the free-rider problems occurring when it comes to transporting of sorted waste, and non-transparent tariff setting.

The lack of access for residents to the waste infrastructure is one of the main problems in MSW management [11]. When households do not separate waste, an increase in the proportion of recycled MSW is only possible when the waste treatment and sorting industry is rapidly developing. What is more, the latter process must be accompanied by a gradual introduction of waste sorting rather than stand in its way. For example, St Petersburg plans to collect all the waste as mixed and take it to sorting stations. The only waste sorting option will be orange bins for hazardous waste — mercury-vapour lamps, batteries, and mercury thermometers [12]. Recyclable materials segregated by households are 'purer' than waste sorted at stations — sorting stations retrieve only 5—15% of recyclables from mixed waste [12].

Nevertheless, open and uncontrolled access to the waste sorting infrastructure may become another source of problems. Orlov et al. [13] emphasise that the fact that third persons can easily remove the sorted waste may discourage waste operators from supporting waste sorting schemes because of the potential losses of useful materials.[13] Thus, the development of waste sorting requires both dedicated bins and controlled access. It is possible to fence off the bins, with access granted only to residents of a concrete house.

Greater engagement from residents is essential to a complete transition to the circular economy [12—15]. Moreover, the 'rubbish reform' has not yet made a sea change in the industry but rather led to growing tariffs. And this circumstance contributes to the negative attitude of the general public to the reform [13].

Tariff differentiation based on the volume of produced waste and waste disposal discounts for households that sort waste has been promoted as a measure to motivate residents [14]. The approach based on waste storage targets, which is widely used in Russia, is not sufficiently transparent. Particularly, linking the targets to the materials composition of the waste as well as its volume raises questions [16]. By no means does this approach encourage households to segregate waste.

Another barrier to the circular economy is that the state does not seem interested in shaping a single policy on tariffs for different stages of waste management,

[13] An equally acute problem is that people may impair the quality of recyclable materials by throwing general waste into dedicated bins.

including final waste treatment. Alksnis provides evidence that the gate fee levied on access to open landfills sites is lower than that charged for access to sanitary landfill sites. This difference in fees does not prompt waste operators to choose better alternatives [17]. In other countries, higher fees for using landfill sites and incineration are common practice.

All the above problems seem to be a consequence of waste perceived as a bad by economic agents. This perception ensues from the definition of waste (see section 2). Waste does not have any value for its holder that strives to disposes of it, and the lines of waste ownership become blurred. As a result, fuzzy ownership of waste makes it impossible to solve the problem of externalities without governmental intervention. The only solution is to employ the Pigouvian, or the regulatory approach.

In the circular economy, waste ceases to be a bad and becomes a valuable resource. All the barriers discussed above are lifted automatically, without governmental intervention. Waste operators seek to provide households with the infrastructure and set acceptable tariffs, whilst consumers are interested in effective waste segregation. One of the causes of 'conflicts over rubbish' is the fuzzy ownership of waste [10]. Let us now consider how ownership is established in Russian law execution practices.

The legal framework for MSW management in the Russian Federation is federal law No. 89 On Industrial and Household Waste, which contains the following definition: 'industrial and household waste are substances or objects that are produced in the course of manufacturing, work performance, service provision or consumption and that are disposed of, meant for disposal, or designated for disposal…'

The same federal law defines MSW as a subtype of industrial and household waste as follows: 'the waste produced in residential properties in the course of consumption by individuals or goods that have lost their original use-value in the course of usage by individuals satisfying their personal and everyday needs in residential properties'.[14]

Although relationships regarding MSW presuppose the establishment of ownership as a foundation for economic exchanges, ownership is absent in both above definitions. For comparison, EU countries[15] defines waste as '*any substance* or

[14] Federal Law of 24.06.1998 N 89-FZ On industrial and household waste, 1998, *Garant*, available at: http://base.garant.ru/12112084/ (accessed 15.10.2020).

[15] National practices of EU countries are guided by Waste Framework Directive 2008/98/EC, 2008, *EUR-Lex,* available at: https://eur-lex.europa.eu/eli/dir/2008/98/oj (accessed 15.03.2021).

object which the holder[16] discards or intends or is required to discard'.[17] This way, ownership is specified in the initial definition of waste.

Yet, the absence of a reference to the waste holder in the basic definition of waste given in Russian laws does not mean that there is no owner. Particularly, the transfer of waste ownership is regulated by the Civil Code of the Russian Federation. Waste generated industrially belongs to the owner of the resource from which it was produced. Yet the law does not specify the holder of municipal waste.

The fact that the MSW holder is not defined in regulations causes disputes between municipal utility management companies (MUMCs) and the Federal Service for Supervision of Natural Resources (Rosprirodnadzor). For instance, disputes about environmental charges arose in 2014—2018. Many regional branches of Rosprirodnadzor were charging MUMCs for environmental damages.[18] The amount of the payment was calculated based on the volume of household waste collected by the MUMCs. Courts of the first instance and appeal satisfied the claims from Rosprirodnadzor, specifying that the households transfer the ownership of waste and the responsibilities of the waste holder to the MUMCs under a utility management contract. Yet contracts between MUMCs and MSW carriers do not entail a transfer of ownership. Consequently, MUMCs have to pay for environmental damage. In 2018, the Court Board on Economic Disputes of the Supreme Court ruled that the decisions of the court were wrong and utility management contracts did not entail a transfer of MSW ownership from households to MUMCs.[19] Who is the holder of waste after all?

Table 1 lists agents involved in the MSW management system. Surprisingly, the definitions given in federal law No. 89 On Industrial and Household Waste Management mention only those agents that are immediately engaged in waste management (waste operators performing different functions). For comparison, EU laws explicitly mention waste producers and holders alongside agents fulfilling waste management functions (dealers and brokers).

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[16] A waste holder is the waste producer or the natural or legal person who is in possession of the waste. A waste producer is anyone whose activities produce waste (original waste producer) or anyone who carries out preprocessing, mixing or other operations resulting in a change in the nature or composition of this waste (available at: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32008L0098&from=EN).

[17] Waste Framework Directive 2008/98/, 2008, EC *EUR-Lex,* available at: https://eur-lex.europa.eu/eli/dir/2008/98/oj (accessed 15.03.2021).

18 Supreme Court has figured out who is the holder of the MSW, 2021, *Pravo.Ru*, available at: https://pravo.ru/review/view/147701/ (accessed 15.03.2021).

[19] Supreme Court. Decision of the Court Board on Economic Disputes of the Supreme Court of the Russia Federation of 31.01.2018 in case N 305-ЭС17—10622, A41—25079/2016, 2016, *Consultant*, available at: http://www.consultant.ru/cons/cgi/online.cgi?req=doc; base=ARB; n=526857#0006818497252045752 (accessed 12.10.2020).

Table 1

MSW management agents

Function	*Russia*	*EU*
Waste treatment	MSW operator regional MSW operator federal hazardous waste (classes I and II) operators Russian environmental operator hazardous waste (classes I and II) operator	waste dealer waste broker
Waste ownership	—	waste producer waste holder

Source: prepared by the authors based on [20] and [21].

The operators do not become MSW holders after they have received it from the owners (legal or natural persons). A contract between the waste holder (this is the first time the 'waste holder'[22] is mentioned) and the regional operator does not entail a transfer of ultimate ownership[23] of waste.

The procedure of establishing waste ownership looks extremely ambiguous in the Kaliningrad region because of its special geographical position. Since major recyclable plastic consumers are located outside the region (in other Russian territories, Lithuania, and Latvia)[24], the collected and sorted plastic waste has to be taken across the border.[25]

[20] Federal law of 24.06.1998 N 89-FZ On industrial and household waste, 1998, *Garant*, available at: http://base.garant.ru/12112084/ (accessed: 15.03.2021).

[21] Waste Framework Directive 2008/98/EC, 2008, *European Commission*, available at: https://ec.europa.eu/environment/waste/framework/ (accessed: 15.03.2021).

[22] Article 24.7 Federal law of 24.06.1998 N 89-FZ On industrial and household waste, 1998, *Garant*, available at: http://base.garant.ru/12112084/ (accessed: 15.03.2021).

[23] Ultimate ownership is a power (Honoré's standard incident of ownership) that makes it possible in case of uncertainty to establish who is entitled to take the final decision. This concept reflects an idea that an owner that is entitled to take the final decision [29].

[24] Although some plastic consumers operate in the region, most of the collected plastic was sold to other regions and countries [Vylegzhanina, U. 2018, Stranded at customs, *Rossiyskaya gazeta* [Russian newspaper], available at: https://rg.ru/2018/07/31/reg-szfo/othody-na-pererabotku-iz-kaliningradskoj-oblasti-stali-zolotymi.html (accessed 13.08.2020) (in Russ.)]

[25] Despite the demand for plastic from companies involved in regeneration, most Kaliningrad plastic ends up in landfill: according to the Zeleny Front interregional environmental non-profit organisation, only 10% of plastic waste is recycled in the region [Household solid waste situation. Kaliningrad region, 2020, *Zeleny Front*, available at: http://green-front.su/post/5293 (accessed 25.10.2020) (in Russ.)].

The special economic status of the Kaliningrad region (it is a special economic zone) allows local entrepreneurs to import goods for personal use without paying customs fees. Yet such goods are considered bonded and cannot be brought to other Russian regions. As the new Customs Code of the Eurasian Economic Union came into effect, the local customs started to demand a proof of status for any exported good. According to the Customs Code, any good produced from an imported good is an imported good.[26] As a result, Kaliningrad plastic recycling businesses had to pay customs duties and VAT as if they were exporting a new good manufactured from imported materials.[27] If the waste is of unclear ownership or has come from MSW, it is impossible to provide a proof of origin of the good (a recyclable in this case).[28] Some companies stopped selling plastic to other Russian regions, and this aggravated the situation even further. The price of plastic went down in Lithuania and Latvia in 2018[29], probably because some Kaliningrad companies, unable to sell plastic to Russia for their economic benefit, had switched to those countries.

A manufacturer of number plate frames, ARS, which used the packaging of Kia and Hyundai CKD kits assembled at Kaliningrad plants as raw material, sued the Federal Customs Service of Russia (FCS). In 2019, the Supreme Court acknowledged the viability of the claim brought by ARS against the FCS and decided that the waste had lost its value in the course of use (in accordance with its original purpose) and thus could be considered a good fully produced in the Russian Federation.[30]

To solve the problems of ownership blurring, it was proposed to supplement the definition given in federal law No. 16 On the Special Economic Zone in the

[26] Customs Code of the Eurasian Economic Union, 2021, *Consultant,* available at: http://www.consultant.ru/document/cons_doc_LAW_215315/ (accessed: 15.03.2021).

[27] Kuznetsova, D. 2019, In the Kaliningrad region recyclable material collectors are refusing plastic, *Obshchestvennoe Televidenie Rossii* [Public Television of Russia], available at: https://otr-online.ru/news/v-kaliningradskoy-oblasti-sborshchiki-vtorsyrya-otkazyvayutsya- prinimat-plastik-134907.html (accessed 12.10.2020) (in Russ.).

[28] Vylegzhanina, U. 2018, Stranded at customs, *Rossiyskaya gazeta* [Russian newspaper], available at: https://rg.ru/2018/07/31/reg-szfo/othody-na-pererabotku-iz-kaliningradskoj-oblasti-stali-zolotymi.html (accessed 13.08.2020) (in Russ.) /

[29] After new Customs Code of the Eurasian Economic Union came into effect on the 1st of January 2018.

[30] Supreme Court. Decision of the Court Board on Economic Disputes of the Supreme Court of the Russia Federation of 31.01.2018 in case N 305-ЭС17—10622, A41—25079/2016, 2016, *Consultant*, available at: http://www.consultant.ru/cons/cgi/online.cgi?req=doc; base=ARB; n=526857#0006818497252045752 (accessed 12.10.2020).

Kaliningrad region[31] with the term final consumption.[32] The resulting definition would draw a line between goods and waste. As of the writing of this article, an amendment to federal law No. 16 has received a positive feedback 'as a result of the regulatory impact assessment'. As demonstrated above, the solution to the problem may lie in establishing the ownership of waste. In such a case, it will be required to calibrate the mechanism for establishing ownership of waste or to use incentive tariffs to encourage waste management stakeholders to acquire ownership of MSW.

4. Incentive tariff as a solution to the problem. The untapped potential of Kaliningrad

As auditors of the Accounts Chamber emphasise, 'the situation in this area [in the area of MSW management — authors] is still unfavourable', and the reform 'has not yet led to the expected results'[33]. In the Kaliningrad region, the only outcome of the reform was a rise in tariffs for households and the replacement of many waste carriers by a single one — the regional operator. The MSW collection routes did not change, and most waste is still taken to landfill sites.[34] The future of the reform depends on the actions of regional authorities, which are responsible for arranging the MSW management system.

[31] Federal law of 10 January 2006 No. 16-FZ On the Special Economic Zone in the Kaliningrad region and amendments to some regulations of the Russian Federation (current version), 2006, *Consultant*, available at: http://www.consultant.ru/document/cons_doc_LAW_57687/ (accessed 15.03.2021).

[32] Final consumption is the use of a good, following which the good is no longer suitable for the intended purpose, or usage that results in the impossibility of using the good, its components and materials, particularly due to the physical absence of the good, its components, and materials [Draft federal law on amendments to Federal law of 10 January 2006 No. 16-FZ On the Special Economic Zone in the Kaliningrad region and amendments to some regulations of the Russian Federation, 2006, *Federal'nyi portal proektov normativnykh pravovykh aktov* [Federal portal of draft regulations], available at: https://regulation.gov.ru/projects#npa=107916 (accessed 15.03.2021)].

[33] Report on the results of the expert and analytical study ' The analysis of the implementation of measures to ensure the environmental safety of the Russian Federation, in terms of liquidation of objects that accumulate harm and the formation of an integrated system for the MSW management', 2020, *Accounts Chamber of the Russian Federation*, availavle at: https://ach.gov.ru/upload/iblock/41b/41b02dc50697e6fc57ec2f389a8b68f0.pdf?_ga= 2.106291210.820111883.1605780584—216807580.1598522839 (accessed: 15.03.2021).

[34] Budrina, N. 2020, This week's top stories. On the waste reform in the Kaliningrad region, *RBC*, available at: https://kaliningrad.rbc.ru/kaliningrad/07/10/2020/5f7dba499a0794788d24ac0ab (accessed 17.10.2020) (in Russ.).

A Kaliningrad MSW management system should take into account the region's needs. The Kaliningrad region is unique in many respects, one of which is the predominance of low- and mid-rise buildings, both new and old, which distinguishes Kaliningrad from other regional centres with similar populations. Despite this fact, the tariffs set by the regional MSW operator are very close to the average across the regions under consideration (see table 2).

Table 2

Access to waste segregation sites in Russian cities in 2018—2019

	Population (1,000 people, 2018)	Earlier built housing	New builds	% age of houses with access to WS[1]		Threshold uniform tariff on the regional operator's services (across the region), 2019, VAT included
				2018	2019	
Penza	524	9	17	9	60	from 4307.12 to 4408.87 rouble/ tonne[2]
Lipetsk	510	9	17	4	44	from 492.38 to 548.66 rub/m^3 [3]
Kirov	507	6	15	37	0	from 949.62 to 960.68 rub/m^3 [4]
Cheboksary	492	9	16	0	4	from 449.71 to 456.82 rub/m^3 or from 4208.78 to 4267.86 rub/tonne [5]
Tula	483	6	14	1	1	from 518.25 to 623.02 rub/m^3 [6]
Kaliningrad	475	5	9	30	59	510.75 rub/m^3 or 3648.24 rub/tonne [7]
Kursk	449	9	10	0	34	from 491.12 to 570.11 rub/m^3 or from 2633.16 to 2463.47 rub/tonne [8]
Stavropol	434	10	16	31	9	from 640.01 to 683.56 rub/m^3 [9]
Tver	420	8	12	34	100	606.55 rub/m^3 [10]

Sources: [35], [36], [37], [38].

[35] Federal State Statistics Service, *Rossikyskiy statisticheskiy ezhegodnik* [Russian statistical yearbook], 2020, available at: https://rosstat.gov.ru/folder/210/document/12994 (accessed 15.09.2020).

[36] Russian cities ranked by tallness of buildings, 2020, *Domofond.ru*, available at: https://www.domofond.ru/statya/reyting_gorodov_rossii_po_vysotnosti_domov/8075 (accessed 24.10.2020) (in Russ.).

[37] Skipor, I. 2020, Greenpeace ranking: each third resident of a large Russian city has access to waste sorting, *Greenpeace*, available at: https://greenpeace.ru/blogs/2020/03/12/rejting-greenpeace-kazhdyj-tretij-zhitel-krupnogo-goroda-rossii-imeet-dostup-k-razdelnomu-sboru/ (accessed 14.09.2020) (in Russ.).

[38] Threshold uniform tariffs on MSW treatment by the regional operator, 2020, *News. solidwaste.ru*, available at: https://news.solidwaste.ru/predelnye-tarify-na-uslugi-regionalnogo-operatora/ (accessed 12.01.2020) (in Russ.).

The section below analyses how the number of storeys and some other factors can be employed in solving the above-mentioned problems.

Experts argue that the Kaliningrad region recovers a very small proportion of MSW because operators are not interested in delivering waste for recycling.[39] At the same time, many Russian recycling plants, which operate below their full capacity, have to import waste.[40] These companies would buy Russian waste if it were properly sorted. Thus, a possible way to break the deadlock in the 'rubbish' reform is to increase households' engagement.

Sorted waste is recycled more effectively than mixed waste. Both sorting by the operator (or a waste treatment company) and the often costly sorting by households are critical. Firstly, some segregated waste is further sorted at special facilities. For example, plastic and glass may be arranged by colour and chemical composition. Secondly, when stored with other waste, some types of MSW can no longer be recycled. Since food waste accounts for a significant part of mixed MSW, the latter is often referred to as wet waste. Recycling companies are especially interested in 'dry' waste that has never been in contact with wet materials. Only clean paper and cardboard can be recycled. After contacting food waste, they can no longer be used as recyclates. Finally, the recycling value of some types of MSW depends on its physical integrity. For example, bottles and other glassware are more valuable for recycling companies when whole. Once in a bin, glassware can be broken, that is why it has to be collected separately at special drop-off points. Altogether these factors make waste segregation by households the central element of MSW management.

Low engagement from consumers can be viewed as a free-rider problem, which is solved by making punishment for non-cooperative behaviour a real threat. Another solution is a fir promise of a reward for expected behaviour. As regards MSW management, punishments or rewards may be administered through a tariff policy, particularly, by introducing incentive tariffs.

Incentive tariffs have proven their efficiency in increasing consumer engagement in waste sorting. Baltic region states are a good illustration. Germany [18; 19] and most municipalities of Sweden[41] have adopted the pay-as-you-throw principle. Similar systems function in other Western European countries, the Republic of Korea, and Japan [20; 21]. This approach both encourages residents to segregate MSW [21] and reduces the volumes of generated waste by 20—30%, as compared to that produced under a fixed rate tariff [21; 22].

[39] Budrina, N. 2020, This week's top stories. On the waste reform in the Kaliningrad region, *RBC,* available at: https://kaliningrad.rbc.ru/kaliningrad/07/10/2020/5f7dba499a794788d24ac0ab (accessed 17.10.2020) (in Russ.).

[40] Galcheva, A. 2019, Russia has increased plastic waste imports by third, *RBC,* available at: https://www.rbc.ru/economics/30/08/2019/5d67e17f9a7947d966d7fd3d (accessed 15.03.2021) (in Russ.).

[41] *Avfall Sverige Swedish Waste Management Association*, 2020, available at: https://www.avfallsverige.se/in-english/ (accessed 22.10.2020).

Remarkably, despite a common institutional framework of the EU environmental law and common waste treatment rules, Southern Europe lags behind in waste management. This situation has been explained, among other things, by the insufficient employment of incentive tariffs in those countries [23].[42, 43]

Incentives tariffs have been proposed as a solution to the problem of moral hazard or post-contractual opportunism, which stems from information asymmetry when the actions of counteracting institutions cannot be observed. Yet, unlike the situation of moral hazard, in the latter case, the consumer of MSW management services does not take on the obligation to sort waste. This situation is somewhat of a social dilemma: a private benefit from the action does not exceed a public one, and the free-rider problem arises. What is more beneficial to an individual is not in society's best interest.

The approach discussed in the previous section can be used to demonstrate that incentives tariffs are an effective solution to the free-rider problem. Such tariffs bring in an element of excludability into access to the waste management system, an initially non-excludable good. An incentive tariff means that a consumer gets a discount (that is, is rewarded) if they properly sort waste. The discount is excludable — if the consumer fails to meet the requirement, they pay more (that is a kind of menu pricing scheme). Nevertheless, their access to waste collection services is not restricted in any way. Becoming ineligible for the discount is a real threat that reconciles private benefits with the public ones.

An incentive tariff can be levied in two ways — on mass or volume. If the tariff is levied on mass, the vehicles that collect waste must be equipped with weighing devices, and this means extra costs incurred by the operator.

If the tariff is levied on volume, there is no need for additional measurements. Usually, a bin or a bag is used as the measurement unit [24]. In the first case, the operator's staff collect waste as soon as the bin is full. Still, bins may vary in volume depending on the needs of a concrete household. This scheme is common in the countryside. The second variant means that consumers use special rubbish bags of a fixed volume. Sometimes, different types of waste are collected in bags of different colours. The operator charges a household based on the number of bags. A significant deficiency of this system is that it is difficult to use in multi-household buildings since it is next to impossible to determine how much waste was produced by each flat. In Germany, for ex-

[42] Planelles, M. 2019, Why Spain gets a failing grade when it comes to recycling, *El Pais*, available at: https://english.elpais.com/elpais/2018/02/28/inenglish/1519836799_117305.html (accessed 17.09.2020).

[43] Summary of Recommendations for Spain, 2020, *Official website of the European Union*, available at: https://ec.europa.eu/environment/waste/framework/pdf/facsheets and roadmaps/Roadmap_Spain.pdf (accessed 22.10.2020).

ample, the tariff is calculated based on the volume generated by several flats sharing a bin chute or by the whole building if the rubbish bins are installed outdoors.[44]

All the above suggests that Kaliningrad is a more suitable candidate for an incentive tariff scheme than many other Russian regional centres. A unique feature of the city is the predominance of low- and mid-rise buildings. Residents of multi-household buildings will have to act collectively to economise on waste collection. The basic tenet of collective action theory is that the success of joint efforts decreases as the number of participants grows [25].[45] Thus, the fewer people live in a building, the more easily they will reach a consensus over the joint action. Moreover, a smaller number of participants means a lower cost of monitoring and detection of individual violations.

Such a system should create not only negative ('cut down on waste, or it'll be the worse for you'), but also positive incentives or residents. In some Swedish and German regions, the collection of recycling bins is free of charge, and residents pay only for mixed waste. There are not only negative incentives (if mixed waste is thrown into the bins that are collected free of charge, no bins are collected). After a series of violations, the operator may stop collecting waste from the offenders. All this creates perfect conditions for both waste sorting and a reduction in waste volumes.

When discussing incentives created within this system, it is necessary to examine opportunistic behaviour. If the tariff depends on the volume or mass, people will do their best to minimise it. Some will throw their rubbish into the neighbours' bin, leave it in the street [26], or take up 'rubbish tourism'.[46] The need for monitoring, as well as other technical issues, such as weighing and tariff calculation, results in extra costs.

The simplest solution is fencing off and roofing a building's rubbish bins. Access to the site will be granted only to the residents of the building and the operator's staff. These precautions will rule out the possibility of unscrupulous residents dumping their rubbish in their neighbours' bins. It is important to understand that these measures will lead to rubbish accumulating on lawns, in litter bins, and other places. This situation calls for control. Economic theory, however, suggests that incentives might be more effective than immediate monitoring [27;

[44] Zagumennov, D. 2019, 'When everyone pays the same, it doesn't matter how you sort rubbish'. Why Germany has defeated landfill], *Properm.ru*, available at: https://properm.ru/news/society/177821/ (accessed 23.10.2020).

[45] Although this thesis has been repeatedly criticised in the literature (see, for example, [30; 31]), the situation in questions is very similar to the classical case: the group has homogenous purposes, individual participants contribute equally to the common cause.

[46] Zoccatelli, Z., Jaberg, S. 2018, Why the Swiss dump their rubbish in France, *Swissinfo.ch*, available at: https://www.swissinfo.ch/eng/what-a-waste_why-the-swiss-dump-their-rubbish-in-france/44238560 (accessed 13.01.2021).

28]. For example, not only discounts but even negative tariffs can be applied to recycle bins, i.e. residents will receive payment for waste collection. In such a case, they will be motivated to fill the bins as effectively as possible. The operator only has to collect the waste on time.[47]

The success of any reform depends on public attitudes. If the only incentives are fines and increased tariffs, residents will be unlikely to welcome the change. Transition to an incentive tariff will be easier if residents themselves decide to participate in this system. Otherwise, opposition from society is possible: people will link the new scheme with the rising rates. After the reorganisation of the industry in 2019, a very peculiar situation developed in Kaliningrad. The revision of waste collection rates resulted in a 30-fold increase in payments charged to the Museum of the World Ocean, although the amount of the waste generated by the establishment had not changed.[48]

Companies specialising in waste sorting and recycling have been active in Kaliningrad for a long time, but many residents suspect that sorted waste will not be recycled but rather buried at a landfill site.[49] These doubts are another factor that affects residents' engagement in waste segregation. The awareness campaigns may prove to be ineffective.[50] The best solution is to set a positive example. For instance, there is a company in Kaliningrad that manufactures furniture from segregated plastic.[51] It can process up to 180 tonnes of plastic per year, which is obviously insufficient for a region that generates 82,000 tonnes of plastic waste annually.[52]

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[47] When speaking of sorted waste, it is important to understand that it is a resource rather than rubbish. As a rule, waste operators are interested in handling such MSW. Thus, one can expect that communal bins will be collected without delays.

[48] Museum asked to pay for non-existent waste in Kalinigrad region, 2019, *NTV*, available at: https://www.ntv.ru/novosti/2160341/ (accessed 14.10.2020) (in Russ.).

[49] Markov, I. 2020, Tested first-hand: how Kaliningrad is sorting rubbish, *Komsomol'skya Pravda,* available at: https://www.kaliningrad.kp.ru/daily/27091/4164072/ (accessed 12.10.2020) (in Russ.).

[50] Experience shows that consumers know very little about waste fractions — which are recyclable and which are not [Markov, I. 2020, Tested first-hand: how Kaliningrad is sorting rubbish, *Komsomol'skya Pravda,* available at: https://www.kaliningrad.kp.ru/daily/27091/4164072/ (accessed 12.10.2020) (in Russ.).

[51] Wastelessness: what the Kaliningrad region makes from waste, 2020, *Kaliningrad kgd.ru news portal*, available at: https://kgd.ru/news/society/item/91426-bezothodnost-chto-delayut-iz-pererabotannogo-musora-v-kaliningradskoj-oblasti (accessed 24.10.2020) (in Russ.).

[52] According to the regional waste collection, transport, and treatment scheme, the region produces yearly 246,000 tonnes of waste (Table 1.1); plastic comprises a third of this (Table 8, lines 5 and 6). [Regional Waste Collection, Transport, and Treatment Scheme, 2020, *Ministry of the Natural Resources and Ecology of the Kaliningrad region*, available at: https://minprirody.gov39.ru/deyatelnost/obrashchenie-s-otkhodami/territorialnaya-skhema-obrashcheniya-s-otkhodami/ (accessed 11.08.2020).

Regional and municipal authorities have to support this and similar initiatives by granting subsidies for the manufacturing of urban infrastructure from recycled plastic. Such infrastructure includes benches, fences, street signs, flowerbeds, flower pots, etc. These objects should carry a label saying that they were made from recycled waste. Coming across these tangible proofs in their everyday lives, residents will see that their segregation efforts will not be in vain.

Since Kaliningrad does not share a border with any other Russian territory, creating and developing such businesses in the region will alleviate the problem of transboundary movement of MSW.[53]

A further study needs to be carried out into the possibility of granting preferences to businesses using recycled materials as regards state and municipal procurement. Naturally, preferences must be granted without violating the law and jeopardising competition.

Conclusion

This study set out to establish the reasons why the waste management reform had failed and what stood in the way of the circular economy in Russia. Kaliningrad was chosen as the test case.

Waste was defined as (1) useless and unused things and substances, (2) which the owner wants to dispose of in the current condition of the institutional environment. This definition stresses that waste is a bad as compared to goods and resources, on the one hand. It also emphasises that waste has an owner, on the other. The latter may simplify the internalisation of negative externalities associated with waste treatment. The definition also suggests that changes in the institutional environment and technology can cause waste to move from the category of bads to that of goods and resources. Such transition, however, will require a considerable volume and purity of waste, as well as sufficient demand for it.

Moreover, the study explored certain aspects of legal relationships in waste management and demonstrated that problems in the field might arise from the fuzzy ownership of waste and the peculiarities of waste management as a service. It is concluded that elements of the MSW management systems have features of different types of goods (public, club, and private ones). At the same time, greater excludability can cause a change from the category of public goods to that of private ones.

[53] In 2018, regional companies were faced with the need to pay VAT and customs duties when transporting MSW to other Russian regions [Ulyana Vylegzhanina. Zastryali na tamozhne [Stranded at customs]. URL: https://rg.ru/2018/07/31/reg-szfo/othody-na-pererabotku-iz-kaliningradskoj-oblasti-stali-zolotymi.html (accessed 13.08.2020).

Incentive tariffs can increase the proportion of recycled MSW. Furthermore, they will provide an effective solution to the free-rider problem if mechanisms to counter opportunistic behaviour are developed.

We believe that the Kaliningrad region — a city of low- and mid-rise buildings — is an ideal testing ground for setting incentive tariffs, which require collective action. The fewer people live in a building and the fewer storeys it has, the easier it is to act jointly.

The findings suggest that transition to incentive tariffs should be carried out on a voluntary basis. In additions, recycled waste may be used to manufacture urban infrastructure objects marked with corresponding labels. All this will help overcome residents' negative attitude to the reform and increase engagement in waste segregation. In its turn, the development of recycling in the region contributes to solving the problem of waste transportation to other Russian regions.

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