

FROM BUREAUCRACY TO MARKET? ONGOING REFORM AND PERFORMANCE CHALLENGES OF SOLID WASTE ADMINISTRATION IN MOSCOW

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Abstract

Russia is actively reforming its environmental sector and continually introducing new policies in waste management. This paper provides insight to the current system of municipal solid waste management (MSWM) in the Moscow megapolis and identifies the extant performance challenges caused by the misfit of moving from a predominantly bureaucratic system to a quasi-market process. While the Russian waste management reforms seem to be moving towards a western approach to mirror those of San Francisco, USA, the comparative analysis provided within the study reveals that there is better administrative compatibility with the Asian approach currently being implemented in Seoul, South Korea. Finally the paper provides suggestions for collaborative governance with regards to household waste management in the city.

Keywords: Municipal Solid Waste Management, Inter-Municipal Cooperation, Performance Challenges, Quasi-market Process, Urban Governance, Russian Federation.

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Introduction

Today's global environmental crisis revolves around continuous waste generation and the inefficiency of most government systems to adequately manage waste treatment and disposal. Municipal Solid Waste (MSW) as defined by Eurostat-OECD¹ (Eurostat, 2017) includes household waste and similar waste generated through other

¹ EU Commission: URL: <https://ec.europa.eu/eurostat/documents/342366/351811/Municipal+Waste+guidance> (accessed: 08 June, 2020).

sources but similar in composition. Different cities usually adopt independent specialized categorization standards of MSW which often depends to a large extent on their budget, urban design and disposal methods. Innovative technologies are opening up new possibilities for waste management and some municipalities like San Francisco², Capannori³, and Seoul⁴ are taking the lead in zero waste. These cities send only a minimal amount of waste to landfills since most of the products generated within their communities are designed to be fully utilized via a circular economy strategy – hence becoming waste free. Nonetheless, many cities cannot afford the “zero-waste” status. The process is expensive, time consuming, and requires policy changes and careful resource management planning. Besides, even with the best efforts in place, numerous challenges may still hinder optimal performance. Russia recently set its path towards achieving a circular economy and Moscow is one of such cities currently struggling with implementing the first phase of its waste management reform.

The Moscow megapolis is made up of Moscow city and the Moscow Oblast. It is the most densely populated region in the entire country and accounts for the largest volume of MSW in Russia. According to the auditing company Finexpertiza (2019) these two administrative regions collectively generate an estimated 51 million cubic meters of solid waste per year⁵ most of which ends up in landfills as only 4% is currently being recycled⁶. A recent article in the Moscow Times (2018) stated that the volume of solid waste disposal has grown over 30% in the past decade. This spike in waste volume is said to be caused by the ripple effect of urban population growth and the increase in consumer demand and urban lifestyle choices (Kaza et al., 2018). More waste is now being generated from consumer packaging (especially consumables) and the Moscow city authorities estimate that over 8 million tons of waste is generated per annum⁷.

The city is currently surrounded by fourteen landfills⁸ in its immediate periphery, twelve of which are located in the Moscow Oblast. Each of these waste sites is situated within close proximity (on average between 500–900 meters) to residential communities. These landfills and waste disposal sites are mostly over-filled or have reached their maximum capacity and some have subsequently been turned into open waste dumps which currently pose serious environmental and health hazards to the surrounding communities. This situation has led to numerous community protests⁹ directed at the municipal authorities, petitioning them

² San Francisco Department of the Environment. URL: <https://sfenvironment.org/striving-for-zero-waste> (accessed: 08 June, 2020).

³ Zero Waste Research Centre Italy. URL: <http://www.rifutizerocapannori.it/rifutizero/> (accessed: 08 June, 2020).

⁴ World Economic Forum. URL: <https://www.weforum.org/agenda/2019/04/south-korea-recycling-food-waste/> (accessed: 08 June, 2020).

⁵ Crosswrap (Finland). URL: <https://crosswrap.com/waste-management-in-russia/> (accessed: 08 June, 2020).

⁶ Netherlands Embassy in Moscow Report. URL: <https://www.rvo.nl/sites/default/files/2018/09/waste-management-in-russia.pdf> (accessed: 08 June, 2020).

⁷ Data from recent MSWM report by the Mayor’s office. URL: https://www.mos.ru/upload/documents/files/1934/1_Proektdokumenta.pdf (accessed: 08 June, 2020).

⁸ Moscow Region Government. URL: <https://mosreg.ru/sobytiya/novosti/news-submoscow/uzhe-bolee-20-poligonov-tbo-zakryli-v-podmoskove-s-2014-goda-6381> (accessed: 08 June, 2020).

⁹ Russia Business Today. URL: <https://russiabusinesstoday.com/environment/protest-erupt-over-moscow-governments-waste-management-plan/> (accessed: 08 June, 2020).

to permanently close down such sites and provide more sustainable waste management solutions to prevent further ecological damage. The government, in an attempt to deal with this crisis, permanently closed down a total of twenty seven landfills between 2013 and 2019. The decommissioning of such sites has triggered the need for innovative recycling methods and state-of-the-art waste processing plants. To this end, inter-municipal cooperation (IMC) between both territories has recently started focusing on long-term development cooperation, especially within the context of spatial development, municipal solid waste management (MSWM) and social infrastructure. Part of this inter-municipal agreement alongside the centralized government system is what facilitated the speedy construction of medical outposts in the Moscow region during the onset of the Coronavirus (COVID-19) pandemic earlier this year¹⁰.

This study reviews the recent waste management policies in the Moscow megapolis which take on a quasi-market approach yet have been structured for a predominantly bureaucratic system. The comparative analysis provided herein tests the suitability of the market model which is being adapted from the decentralized waste management system in San-Francisco. A multi-indicator approach is utilized in data discovery which provides an objective method of assessment not dependent on the individual success of any one government agency in particular, but provides a holistic summary on the performance efficiency of the entire interconnected waste management network (Kelly & Swindell, 2003; Barabashev, Makarov & Makarov, 2019). This of course is provided within the framework of public administration and municipal management.

Further research in the subsequent pages provides answers to the following research questions:

- What are the major waste management legislative reforms in Russia?
- Who are the key stakeholders in Moscow's MSWM?
- What are the key performance challenges within Moscow's MSWM system?
- San Francisco (West) or Seoul (East) – which city provides a better guide model for Moscow's waste management?

Nonetheless, the entire waste management system in Russia is currently being reformed and is therefore quite fluid at the moment. Agency officials and regional waste operators are reluctant to give interviews as waste policies are still being amended at an alarming frequency and much confusion exists over the situation with landfill sites and stakeholder authority within the Moscow fiscal plan for 2020–2025. Considering these limitations, the study only provides a snapshot of the current situation within the scope of *municipal household waste administration*.

Theoretical Framework

The performance assessment of urban infrastructure is often measured through the efficient supply of clean water and the administration of municipal waste (Teixeira, 2009). This assessment is essential for strategic policy planning and sustain-

¹⁰ URL: <https://www.dw.com/en/coronavirus-russia-builds-hospital-on-outskirts-of-moscow/av-52895491> (accessed: 08 June, 2020).

able urban development. The United Nations estimates that over 68% of the world's population will live in urban centres by 2050¹¹, thereby exerting tremendous pressure on city-wide infrastructure, particularly waste management systems. A review of related literature shows that most cities globally are gradually working towards upgrading their existing waste management infrastructure despite multiple system-wide challenges (UN-Habitat, 2010; Sim et al., 2013; Wilson et al., 2013, 2015). One major challenge identified with most cities, aside from financial constraints, is the outright adoption of external waste management systems and the transposition of expensive technology without the initial comprehensive assessment of their existing waste management system or an understanding of the local context (Hoornweg & Bhada-Tata, 2012; Topić, 2015). Unfortunately there is no waste management model that can be applied across the board. Waste systems have to be customized to the exact region under consideration and factors such as demography, politics, social coherence, economy, culture and tradition should be integrated when designing new models (Kaza et al., 2018). It is therefore important to develop performance assessment models to help evaluate waste management systems. A number of studies have already been conducted on waste management sustainability indicators as identified by Zaman (2014). Most of this research is focused within socio-economic and environmental contexts while a few have also specifically covered topics on the integration of zero-waste systems. However, none of these studies provide a generalized system of assessment. The Integrated Sustainable Waste Management (ISWM) model therefore provides this much needed holistic approach to evaluating multi-dimensional components in the waste management cycle and provides modern perspectives for sustainable development. The ISWM concept was introduced in the late 1990's by waste management experts and the core objective was to address common problems in waste management arising due to traditional ineffective approaches such as poor waste system planning, technical/technological set-backs, low capacity development, uncoordinated stakeholder influence, administrative bottlenecks and corruption (Baud et al., 2001; Scheinberg et al., 2004; Henry et al., 2006; Joseph, 2006; Pasang et al., 2007; Manaf et al., 2009; Troschinetz & Mihelcic, 2009). The model applies a circular economy system approach when planning for a new waste system or evaluating the efficiency of an existing waste management process. It provides holistic sustainable management options through the integration of three important dimensions in waste management and public administration:

- (i) Stakeholder cooperation towards waste resource management, the role of local self governance and the impact of internal factors on collaborative governance;
- (ii) Coordination of waste system elements, primarily the process of materials flow (collection, transportation, recycling, disposal, etc.) and the regulations that facilitate waste policy implementation;
- (iii) Sustainability planning to evaluate both internal and external actors on the waste management process (fig. 1).

The goal of the ISWM model is therefore to support the government, its planning officials and various stakeholders in the waste management sector to achieve

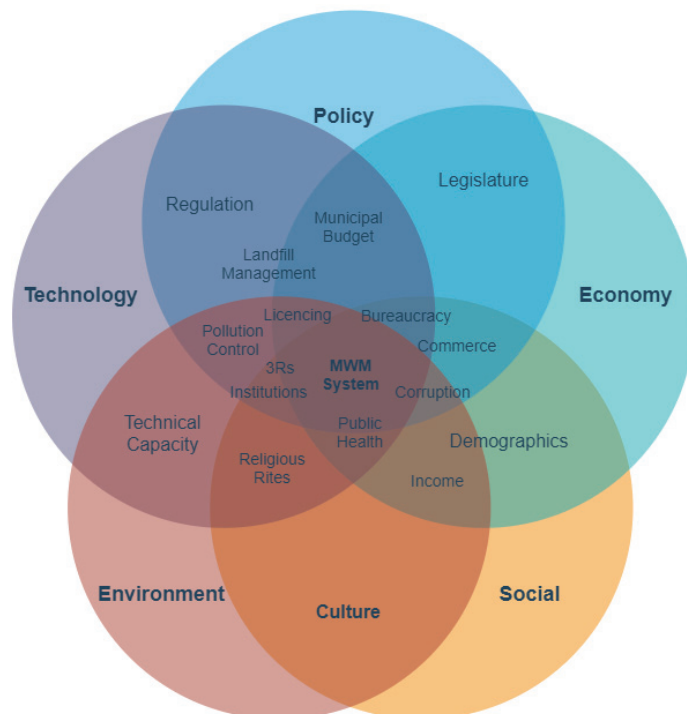
¹¹ United Nations. URL: <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html> (accessed: 09 June, 2020).

administrative coherency and attain economic and environmental sustainability in waste resource recovery (Klunert & Anschutz, 2001; UN-Habitat, 2010). The ISWM model is mostly applied within the New Public Management (NPM) sphere as a tool for integrated development. It has been tested and validated in over 50 cities and is therefore ideal for cities planning to improve their waste management systems. In this case it is proposed for ‘Moscow’ despite the rigidity of the current system which, true to Webers constructivism theory, may not really allow such integration.

The current quasi-market process is designed for greater efficiency and depends largely on the local self government (Okrugs) being adequately informed and thereby providing the best (rational) choice for their communities. However, waste contractors (regional operators) are regulated directly by the federal government and due to administrative hierarchy they have easier access to the upper echelons of government compared to other stakeholders within the network. They are therefore given priority of choice and the waste system is gradually being modelled by processes that ensure their efficiency (e.g. tendering procedures, waste disposal/treatment processes and the tariff system). This situation therefore opens up possible avenues for corruption and overpriced services, a case of the principal agent theory whereby the incentives of the regional operators and those of the citizenry are greatly misaligned.

Although having minimal effect and most often used as a public relations tool, collaborative governance (Ansell and Gash) between municipalities has helped in developing an avenue for civic engagement through inter-municipal cooperation. The various agreements signed have been instrumental in improving infrastructure and planning towards a more sustainable waste management future.

Figure 1: Internal and External Actors in Municipal Waste Management



Russia has been on a path towards the reform of its waste management sector for over two decades. This process has been gradual due to administrative bureaucracy/politics and has mostly involved the promulgation of new or amended legislation (Safonov et al., 2013). The country does not have a culture of sorting waste and not much recycling has been done since the 1980's (Shmelev, 2019). Therefore, most of the recent traction in the waste reform process starting in 2016/2017 seems to have been triggered by massive public scrutiny based on community concerns over public health and environmental hazards. Some studies conducted by Russian researchers reveal that performance challenges in Moscow's waste administration is attributed to the misfit of organizational management processes; specifically the disconnected system of operations within a highly centralized and bureaucratic government system, poor regulatory oversight, ambiguous tariff system and the absence of a unified database and incentives for recycling (IFC, 2015; Kulbachevski, 2018; Votyakova, 2018).

Zero Waste Cities

The term "Zero Waste" has gained increased popularity in recent years. It has been used repeatedly in various contexts to define varied policies on waste management. Although no clear definition exists on the term, the general premise is tied to the theory of a *Circular Economy* whereby waste is treated as a resource, and the waste management system facilitates an inter-connected "closed-loop" system approach via which waste is significantly reduced or re-used (Bartl, 2014). This is a novel *New Public Management* integrated system approach which rejects the traditional industrial model of waste management (Curran & Williams, 2012). Therefore, the municipalities that apply such novel integrated systems with considerable success have been termed "zero waste cities". Only a handful of such cities exist globally today and serve as a model to other municipalities on the cusp of overhauling their waste management system. San Francisco and Seoul stand as premier examples of sustainability and efficient waste management within different geographic zones and socio-cultural influences.

San Francisco started implementing a compulsory recycling and composting system back in 2009 and within a decade has been successful in diverting over eighty percent of landfill waste¹². Seoul began implementing its sorting and recycling process much earlier in 2005 and now successfully diverts ninety five percent of organic waste from landfills and further recycles about seventy percent of solid waste. Seoul has also banned the use of plastic bags and now implements a colour coded biodegradable waste bag which helps in sorting and collection processes¹³. Both cities have significantly reduced their landfill ratio and found ingenious ways to manage organic waste. The study further benchmarks Moscow against these cities to evaluate which waste management system could be better adapted based on economic, socio-cultural and socio-political indicators.

¹² URL: <https://www.cnn.com/2018/07/13/how-san-francisco-became-a-global-leader-in-waste-management.html> (accessed: 08 June, 2020).

¹³ URL: https://seoulsolution.kr/sites/default/files/policy/2%EA%B6%8C_10_Environment_Municipal%20Solid%20Waste%20Management.pdf (accessed: 11 June, 2020).

Methodology

This study applies the ISWM methodology and benchmark performance indicators to evaluate the current system of solid waste management in Moscow. This study looks at key data based on “wasteaware” benchmark performance indicators (Wilson et al., 2015) and compares Moscow with two leading zero waste cities – “Seoul” and “San Francisco”. The benchmarking system is carried out through a multiple-indicator approach (Barabashev, Makarov & Makarov, 2019) systematically providing a holistic summary of each city’s waste sector based on the principles of efficiency, effectiveness, equity, fairness and sustainability. Data collected through this approach was subdivided into three segments: city background information and key waste related data, physical components (tab. 1) and governance components (inclusivity, financial sustainability, sound institutions and proactive policies). Quantitative performance indicators were numerically represented as figures or percentages while qualitative performance indicators were based on subjective inferences from interviews, public opinion polls and other global benchmark indices which were assigned a composite score of High $\geq 71\%$; Medium/High 60–70%; Medium: 35–60% or Low $\leq 33\%$ (Wilson et al., 2015).

Table 1

ISWM Quantitative Performance Indicators

Drivers	Physical Component	Performance Indicators
Public Health	Collection	1. Collection Coverage
Environmental Protection	Treatment & Disposal	2. Controlled Disposal
Resource Value	3Rs: Reduce, Reuse & Recycle	3. Recycling Rate*
	Governance Component	
Stakeholder Relations	Inclusivity	4. User Inclusivity
		5. Provider Inclusivity
Budgetary Allocation	Financial Sustainability	6. Financial Sustainability
SWM Policy Framework	Sound Institutions & Proactive Policies	7. Adequacy of National SWM Framework
		8. Local Institutional Coherence

* Including processing and recycling of organics

Source: Adapted from Wilson et al (2015).

Moscow’s Environmental Legislative Reform

A number of studies have identified performance challenges associated with the implementation of public policy in administrative action. This is often evident in the divergence of government policies from market economy and more so in the waste sector. Waste management in Russia has been quite structured since the soviet times

and waste collection systems were for the most part based on a centralised administrative system. Recycling rates were also high due to the reprocessing of waste materials towards raw feed utilization in industries – in a sense the circular economy theory was actively implemented (Sim et al., 2013). Urban centres were usually designed with full utility considerations and tariffs clearly stated. Moscow's urban design of high-rise multi-apartment blocks facilitated easy collection of mixed household waste through inbuilt conduit pipes consequently evacuated and finally incinerated or buried in designated landfills. This structured centralized system collapsed after the economic downturn of the early 1990's while industrial recycling also took a downward spiral as most manufacturing plants and factories were shut down and ecological concerns rescinded priority in the public sphere due to the pressing economic depression and socio-political "Perestroika" of the period (Pierce, 1993; Hunsicker et al., 1996).

Russia has since been in a period of continuous economic and legislative reform and the government continues to enact and modify policies in a bid to address the growing challenges of waste management (Kovalenko & Kovalenko, 2018). Nonetheless evidence of a weakened municipal waste management system is still largely evident through the high rate of land-filling, unstructured tariff policy and under developed recycling models (Skryhan et al., 2018). For over two decades the Russian government has been leading efforts towards the control and regulation of waste disposal but this has been done predominantly within the vestiges of the traditional waste management system. On June 24, 1998 Russia promulgated the Federal Law N 89-FZ¹⁴ on "Production and Consumption Wastes". The legislature established the policy for waste management including procedures for accounting, reporting and general administration. The law also contains vendor engagement procedures; it states that regional operators be selected through a tender process; once engaged, the vendor (regional operator) should comply with the okrug's garbage collection program. In reality this "collection program" is largely structured by the regional operator depending on their fleet volume and capacity. The local self-government of the "okrug" then helps facilitate the household/community collection system. While waste management tariffs are determined by the local authorities, the process of determining the actual cost is largely dependent on the annual fee paid to the regional operator.

Policies were enacted following the traditional bureaucratic system of governance using a top-down approach. This created serious performance challenges leading to a bureaucratic market system within the waste sector. This was largely evident through the enactment of Federal Law N 458-FZ¹⁵ of December 29, 2014 which imposed significant waste management obligations on manufacturers and importers. This law was enacted to encourage reprocessing by manufacturers which would reduce the volume of waste generated and sent to landfills. It was also aimed at propelling the modernization of technology in waste disposal systems. Unfortunately many manufacturers and importers still face multiple performance challenges such as incompatible waste classification systems, inconsistency in legal and regula-

¹⁴ Federal Law N 83-FZ. URL: <https://www.mos.ru/eco/documents/control-activity/view/62921220/> (accessed: 09 June, 2020).

¹⁵ Federal Law N 458-FZ amending Federal Law N 89-FZ. URL: <http://extwprlegs1.fao.org/docs/pdf/rus140443.pdf> (accessed: 09 June, 2020).

tory frameworks, poor accounting and a defunct reporting system for waste packaging (UNIDO, 2017; AmCham, 2016, 2017). Definitions were gradually amended, and processes better aligned with EU/OECD standards. Also, in 2016 the classification of “*Municipal Solid Waste*” (MSW) was subdivided into “*municipal solid waste*” and “*municipal communal waste*” (meaning neighbourhood or household waste). This was done to facilitate a more efficient waste collection network system.

In 2017 the Federal Service for the Supervision of Natural Resources (Rosprirodnadzor) released Special Order N 242 on the “*Federal classification catalogue of waste*”¹⁶. This legislature expanded the definitions as contained in Order N 786 of December 02, 2002 and the “*Amendment to the Federal Waste Classification Catalogue*” as contained in Order N 663 of July 30, 2003. This policy came into effect in 2018 and not only defined and classified the type of waste but also specified the type of companies that could handle the collection and disposal of such waste. The classification system, however, has its drawbacks as not many understand this new categorization system or how exactly it would facilitate final reuse or recycling of waste products¹⁷. Further amendments have been made to the catalogue, the most recent being November 02, 2018 N 451 (Russian Federation, 2018).

New technologies have been introduced to support policy regulation and the Russian government has recently approved the creation of a federal waste management scheme. Waste collection companies are required by government decree N 641 of August 25, 2008 and N 1156 of November 12, 2016 to equip garbage trucks with GLONASS¹⁸ monitoring. From January 01, 2018 all waste collection vehicles are expected to be equipped with the GLONASS satellite navigation system and monitoring devices to curtail indiscriminate dumping and prevent the emergence of new unauthorized landfills. Furthermore, Federal Law N 225-FZ¹⁹ (June 26, 2019) approves the creation of a unified state information system for waste management administration under the “*National Ecology Project*”. Although this law was specifically enacted for Rosatom²⁰ and the safe disposal of class I and II hazardous waste, it also contains a clause approving the establishment of an integrated waste management system, utilizing the Geographic Information System (GIS) for MSW. This system will be developed to provide uniform administrative oversight for the various facilities involved with processing, recycling and treatment of MSW. The proposed GIS system will be managed by the Ministry of Natural Resources and will also provide information on vendor contracts, tariffs and related stakeholder information. It should be mentioned, however, that innovation in the governance system comes with its inherent risks and increased costs for the government and citizenry (Barabashev & Klimenko, 2017). Also, despite the overwhelming legislative effort to streamline waste management, the implementation of general policy provisions is still largely inadequate (Kovalenko & Kovalenko, 2018).

¹⁶ Federal Law N 242. URL: <http://publication.pravo.gov.ru/Document/View/0001201706130004> (accessed: 09 June, 2020).

¹⁷ Dumnov et. al. (2016).

¹⁸ GLONASSG stands for Globalnaya Navigazionnaya Sputnikovaya Sistema, or Global Navigation Satellite System. Russia's Global Positioning System (GPS)

¹⁹ Federal Law N 225. URL: <https://www.garant.ru/products/ipo/prime/doc/72232550/> (accessed: 09 June, 2020).

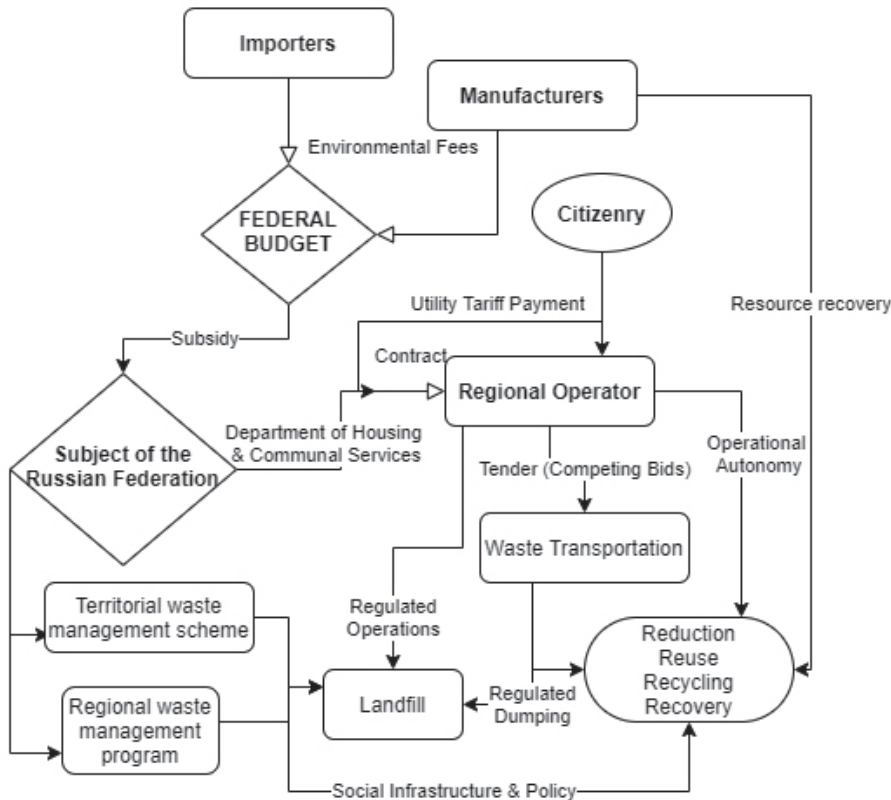
²⁰ Rosatom. URL: <https://www.rosatom.ru/> (accessed: 09 June, 2020).

Administration of Household Waste in Moscow

The Ministry of Natural Resources and Environment of the Russian Federation (Minprirody) currently oversees waste management in the country and is responsible for the enactment, implementation and regulation of environmental policy²¹. The Ministry supervises and coordinates the activities of a number of agencies under its jurisdiction including the Federal Agency for Subsoil Resources Management²². All international ecology or environmental partnerships and contracts are also supervised by the Ministry either directly or through its subordinate organisations located in various regions, okrugs (districts or subdivision of state administration) and raions. Moscow comprises 12 okrugs and 123 raions.

Waste management administration in Moscow follows a centralized network system in budgetary allocations and a decentralized system in collection, treatment and disposal of waste. This two tier model results in a complex operational scheme which vests excessive powers on the State and the Vendor (Regional Operator). The local governments and other stakeholders are therefore limited in authority and gradually have to adapt to the policies of the vendor (regional operator). Figure 2 below provides a schematic representation of the current system in place.

Figure 2: Municipal Waste Management Scheme – Moscow, Russia



²¹ Federal Ministry of Natural resources and Environment: <http://www.mnr.gov.ru/en/>

²² Federal Subsoil Resources Management Agency: <http://194.87.255.243/english/fsrma.php>

The Russian Federal Law of December 25, 2018 N 483-FZ²³ promulgated that the cost of services for the collection, removal and disposal of garbage be excluded from facility management fees. These fees, starting from January 01, 2019, became a separate utility bill for the general citizenry. The average cost of services throughout the country is between 100–150 Rubles/month per individual and depends largely on the size of living space and where such waste is generated. The cities of Moscow, St. Petersburg and Sevastopol, however, have been accorded some leeway in varying the implementation of this statute (until 2023); basically until they agree on a transition plan with the ministry of Natural Resources and select a regional operator²⁴. Payment is therefore either made directly to the regional operator in the case of a direct contract with the residents, or through the facility management agency Department of housing and communal services (DHCS) if the contract was brokered between the agency and regional operator²⁵. The waste tariff is determined by the formula below:

$$C_T = S \times T \times (N_1 + N_2)$$

- C_T being the cost of removal of municipal solid waste and bulky waste (per year);
- S is the area of the apartment or building;
- T is the approved tariff according to the cluster;
- N_1 is the accumulation of municipal solid waste & N_2 is the accumulation of bulky waste.

Subsidies are provided for citizens under social welfare (e.g. veterans, pensioners, households with many children, citizens over 80 years, etc.) and they are reimbursed between 30%–100% of all costs.

Moscow is yet to adopt this tariff system and payments are currently made alongside general facility management fees to the DHCS, which poses challenges for the operators since their contracts are based on waste collection not treatment or processing of waste. There is also an unfair appraisal system since the Moscow Oblast is already operating the new tariff and sorting system while Moscow city continues to send unsorted waste to its landfills. This system has also encouraged indiscriminate waste disposal leading to unofficial waste dumps in the Moscow Oblast as operators seek to reduce transportation costs to landfills located far away from the city. The new tariff system also has its performance challenges since each region determines their own tariff rate based on agreements with operators. Many believe this process will open the doors to corruption and unfair practices.

Separate collection of waste (at-source sorting) in Moscow was launched in January 2020²⁶ marking the first stage of the city's recycling project. The city's DHCS is expected to equip each housing block and social facility with separate colour coded collection bins (*blue* for recyclables, *grey* for mixed waste). Collection vehicles have also been labelled based on the type of waste they transport. The new

²³ The President's Official Website. URL: <http://kremlin.ru/acts/bank/42713> (accessed: 09 June, 2020).

²⁴ Parliament Gazette. URL: <https://www.pnp.ru/law/2018/12/25/federalnyy-zakon-483-fz.html> (accessed: 09 June, 2020).

²⁵ URL: <https://yakapitalist.ru/finansy/vyvoz-musora> (accessed: 09 June, 2020).

²⁶ Moscow Mayor Official Website. URL: <https://www.mos.ru/mayor/themes/5299/5732050/> (accessed: 09 June, 2020).

waste management scheme under the *National Ecology Project* seems to imbibe NPM values and is currently focused on these core functions:

- (i) Finalization and approval of MSW management contracts and fiscal operational proposals;
- (ii) Formation and structure of waste disposal infrastructure: The establishment of various collection points throughout the city to include the procurement and installation of new separate colour coded sorting bins. This task will also include the revamp of data management and monitoring functions such that
 - (a) all collection points are systematically monitored
 - (b) waste vehicles are properly labelled and fitted with GPS systems to prevent indiscriminate waste dumping
 - (c) transport routes and time schedules are properly structured and
 - (d) the entire waste cycle is objectively evaluated for the best-fit control system;
- (iii) Public sensitization, especially on the newly proposed separate waste collection system;
- (iv) Development and support of existing pilot projects that promote at-source sorting of waste.

However, following the COVID-19 pandemic, this program has been largely stunted and household waste to a large extent remains unsorted with collection systems unified to deal with the increased volume of waste owing to the National “stay-home” order. The inbuilt waste conduit system has seen renewed usage during this period of social distancing creating even more pressure on DHCS employees to work over-time and apply novel sanitization processes for all common areas in city apartment blocks.

Stakeholders in Waste Collection and Treatment

There are currently five major regional operators that have been licensed for waste collection and disposal in the city, each of these companies cover an average of two okrugs each (approximately 2.5 million inhabitants). These companies obtained their licences through a public bidding process conducted by the mayor’s office. However, some okrugs were unable to conclude on the bidding process and now have separate annual contracts with their pre-selected regional operators. Currently, payments to regional operators are facilitated by the okrug’s DHCS but the exact figures are not publicly available. These operators hire sub-contractors to support their activities and hold partnership agreements with sorting and recycling facilities. According to government reports, it is estimated that their involvement in the recycling process will reduce landfill waste by 40–50% in the near future²⁷.

According to a recent report by the Mayor’s office on the *Territorial Scheme for Waste Management in Moscow*²⁸ (2019), future stages of the recycling project will involve a more coordinated recycling chain which is projected to involve the processing and utilization of about 83 million tons of waste between 2020 and 2029.

²⁷ Russian Gazette. URL: <https://rg.ru/2019/08/08/v-moskve-poiavitsia-edinyj-operator-po-sboru-i-vyvozumusora.html> (accessed: 09 June, 2020).

²⁸ Moscow Mayor Official Website. URL: https://www.mos.ru/upload/documents/files/1934/1_Proektdokymenta.pdf (accessed: 09 June, 2020).

Projections also show the volume of waste in the city growing from 8 million tons/annum in 2020 to around 8.5 million tons/annum by 2029. There are currently 81 companies altogether that have been approved for recycled waste processing (paper, metal, glass, electronics and plastic) within Moscow city (31 companies) and the Moscow region (50 companies).

Plans are already under-way to have one central regional operator for waste management by 2022. This company will be responsible for coordinating uniform waste management oversights across the board and it is believed that having one private sector company overseeing this sector will bring about better transparency within a centralized network and provide data that will enable the government to establish better environmental policy reforms²⁹ and resource planning. The central regional operator is expected to cap tariffs at 5,133 rubles (VAT inclusive) per ton and this tariff is projected to grow to 5,540 rubles by 2029. However it is unclear if such a move within the quasi-market process will ultimately lead to a monopoly within the sector and further cripple technological advancement at the local level. Considering that this company will ultimately have the authority to decide the waste management strategy (what materials to process or incinerate and establish the pricing for recyclable by-products) for the entire region as well as provide operational oversight and vetting rights for engaging other waste management companies and operational stakeholders, it may end up being another bureaucratic bottleneck in the waste management sector if free market forces are hindered or if regulatory oversight is not fully implemented.

Community Participation

At the time of writing this paper, no official social schemes were discovered that offered payment for collected volumes of waste. Hence, while waste collection centres are being positioned city-wide, no recompense or incentives are provided to the inhabitants for the return of plastic, aluminium or paper waste. Recycling programs that offered some form of incentive for waste collection were projects by the private sector and most often NGOs. The only official program discovered was a short project held between August and September 2019, titled *Art for Ecology*³⁰. This program provided tickets to cultural events in exchange for either two kilograms of plastic, glass and paper or one kilogram of aluminium. The project was promoted by the city's urban planning office and the Department of Natural Resources and Environmental Protection in partnership with private sector companies.

A few surveys have been conducted since the promulgation of the waste sorting policy was announced in order to assess the willingness of Moscow inhabitants to sort waste in their homes. A review of two such surveys depict quite varied responses, as shown in Table 2. The private sector survey was conducted by a real estate analytics company Domofond and its survey depicted around 65.2% of Moscow residents unwilling to sort waste. The Domofond survey was conducted in October 2019 throughout Russia and involved about ninety thousand respondents. In Mos-

²⁹ RBC News. URL: <https://www.rbc.ru/trends/green/5d66940a9a79475b4d71346e> (accessed: 09 June, 2020).

³⁰ Art for Ecology. URL: <http://artecolog.ru/> (accessed: 09 June, 2020).

cow, however, they had about 9,135 respondents with only about 29% willing to sort waste. Meanwhile the public electronic voting site 'Active Citizen' hosted by the Mayor's office conducted a poll in November 2019 which had 197,917 respondents with 69% responding in the affirmative as willing to sort waste. Given that the city population exceeds 12 million³¹, such variances are possible considering the margin of error associated with respondent size, date of survey, method of survey and other social influencing factors that may have occurred within the period.

Table 2

Mass survey on waste sorting in Moscow

Organisation	Date	Total Number of Respondents/ % of population		Willing to sort waste, %	Not willing to sort waste, %	Undecided, %
Domofond.ru* (Private)	October 2019	9,135	0.07	29.4	65.2	5.4
Active Citizen** (Government)	November 2019	197,917	1.58	69	8	23

* Domofond.ru is a private real estate analytical company (in Russian). URL: https://www.domofond.ru/statya/72_rossiyan_ne_gotovy_razdelyat_domashniy_musor/100379 (accessed: 09 June, 2020).

** Active Citizen is a government project that provides a platform for electronic voting on various issue of urban development in the city (in Russian). URL: <https://ag.mos.ru/poll/6508> (accessed: 09 June, 2020).

Generally though it is felt that the youth are more active in adapting to new policy changes as schools and universities promote an eco-friendly environment, while the older generation, especially pensioners, find it inconvenient as they now have to make extra budgetary allowances to accommodate rising tariffs by regional operators³² and the purchase of garbage bags which cost an average of \$1.25 for a roll of 10 disposable bags.

Inter-Municipal Cooperation between Moscow City & Moscow Oblast

Multiple communities in the Moscow Oblast are dissatisfied with the current state of affairs regarding waste management in their territories. More importantly, they feel a sense of social injustice as the metropolis continues to transport the bulk of its solid waste to their landfills which are already overfilled (Verzhinina & Martynenko, 2019).

The government of Moscow, however, maintains cordial partnership dealings with the government of the Moscow Oblast and in the sphere of waste management they have a signed inter-municipal cooperation agreement which has been in effect since October 25, 2016. Although subsequently amended in 2019 (N 1 77-1109-1)³³ this agreement generally allows free access and passage in transporting waste from Moscow city to the various landfills in the Moscow region.

³¹ Moscow Population 2019. URL: <https://populationstat.com/russia/moscow> (accessed: 09 June, 2020).

³² Almost twice the amount previously paid from an average of \$30–40/yr to \$75–80/yr for a 50m2 apartment.

³³ Updated. URL: <https://mosreg.ru/download/document/1027870> (accessed: 09 June, 2020).

Numerous protests were held between 2017 and 2018 in a bid to stop the transportation of waste from the capital to the region. According to the Civic Chamber of the Russian Federation (2018), over 36,000 residents in the Moscow Region participated in public environmental protests between March 2017 and April 2018 citing the increased degradation to their health and surrounding environment. The most active environmental protests were held in the Archangelsk³⁴, Tambov³⁵, Yaroslavl³⁶ and Tver³⁷ regions, however, by the end of 2019 other regions had also staged protests over waste dumping in their communities and set-up civic groups to boycott government plans to establish waste treatment plants³⁸ in their communities.

As a result of growing public dissent, the amended cooperation agreement now includes data management and budgetary allocations from Moscow city to the region for the establishment of new waste processing plants (Rub 13.5 Billion in 2019) and administrative operations (Rub 25 Billion 2019–2021). The updated agreement also contains an addendum on the proposed volume of waste to be processed by the region from 2019 to 2029 which is now estimated to range between 38.6–49.8 million tons. This agreement thereby facilitates the construction of four thermal waste processing plants in the Moscow Region, each having an operating capacity of 700,000 tons/yr. Two of these plants are expected to be in operation by October 2021³⁹ and expected to provide hundreds of new job opportunities.

City Benchmarking Comparative Analysis

As part of the government's effort to curtail public sentiment with regards to its waste management policies and administrative reform, much effort has gone into designing a territorial recycling plan promoting at-source sorting of waste – a system which has been mirrored off the successful zero-waste programs in San Francisco. Many believe the model adapted is overly ambitious and may be riddled with challenges⁴⁰. The comparative analysis below (tab. 3) depicts quantitative and qualitative performance indicators that help evaluate the current waste management system in Moscow against the system efficiencies of San Francisco and Seoul. The benchmarking process utilizes a multi-indicator approach to provide a holistic evaluation of the waste sector in each of the selected cities.

³⁴ 27 Deputies from the Archangelskaya oblast oppose landfill construction next to Shies railway station (in Russian). URL: https://www.znak.com/2018-11-08/27_deputatov_arhangelskoy_oblasti_vystupili_protiv_poligona_dlya_musora_iz_stolicy (accessed: 09 June, 2020).

³⁵ Tambov Region protests against landfill (in Russian). URL: <https://www.svoboda.org/a/29671912.html> (accessed: 09 June, 2020).

³⁶ URL: <https://regnum.ru/news/polit/2795162.html> (accessed: 09 June, 2020).

³⁷ Anti-waste protests in Tver (in Russian). URL: <https://bellona.ru/2019/09/11/antimusornye-protesty-teper-v-tverskoj-oblasti/> (accessed: 09 June, 2020).

³⁸ Why ecological protests have become trendy in 2019 and their outcomes (in Russian). URL: <https://7x7-journal.ru/articles/2020/01/01/nachalas-shiesizaciya-obshestva-pochemu-ekologicheskie-protesty-stalitentrendom-2019-goda-i-kakim-posledstviyam-oni-privvedut> (accessed: 09 June, 2020).

³⁹ News Archive (in Russian). URL: <https://news.solidwaste.ru/2019/09> (accessed: 09 June, 2020).

⁴⁰ Garbage Riot (in Russian). URL: <https://www.svoboda.org/a/29140413.html> (accessed: 09 June, 2020).

Preliminary ISWM on Moscow City
(comparative analysis with San Francisco and Seoul)

Ref. No.	Category	Performance Indicators	Results (2017–2020)					
Background City Information			Moscow	San Francisco		Seoul		
B1	Country Income Level	World Bank Income Group	Upper Middle Income	High Income		High Income		
		GNI per capita (UNdata 2017)	25,080	61,120		38,830		
B2	City Population	City population (World Population Review 2020)	12,537,954	906,419		9,963,452		
		Urban Population Growth (WBI 2018)	0.20%	0.90%		0.30%		
B3	Waste Generation	MSW generation (Ton/yr)	8,047,508	1,575,500		3,576,879		
Key Waste-related Data								
W1	Waste per capita	Global Waste Index: MSW per capita (kg/yr)	370	609		359		
W2	Composition:							
W2.1	Organic	Food waste	22%	16%		9.40%		
W2.2	Paper	Cardboards/paper	17%	14.35%		41.70%		
W2.3	Plastics	Polymers	13%	2.40%		5.90%		
W2.4	Glass		16%	0.50%		No data		
1	Public Health – Waste Collection	Collection coverage (Moscow City)	Med	High (90%)	Med	High (97%)	Med	High (95%)
1C		Quality of waste collection service	High		High		High	
2	Environmental Control -Waste Treatment and Disposal	Controlled treatment and disposal	Low		High		High	
2E		Quality of environmental protection of waste treatment and disposal	Medium		High		High	
3	3Rs – Reduce, Reuse & Recycling	Recycling Rate	Low (4%)		High (80%)		Med (63.5%)	High
3R		Quality of 3Rs provision	Low		High		High	
4U	User Inclusivity	Degree of User Inclusivity	Low		High		Med	High
4P	Provider Inclusivity	Degree of Provider Inclusivity	Medium		High		High	

Ref. No.	Category	Performance Indicators	Results (2017–2020)				
5F	Financial Sustainability	Financial Sustainability	Medium		High	High	
6N	Sound Institutions	Adequacy of National SWM Framework	Med	High	High	Med	High
6L	Proactive Policies	Degree of Institutional Coherence	Medium		High	High	

Sources: URL: <https://datacatalog.worldbank.org/dataset/what-waste-global-database>; <https://sensoneo.com/sensoneo-global-waste-index-2019/>; <https://www.undp.org/content/dam/uspc/docs/USPC%20Policy%20Brief%203.pdf>; http://www.kgreengrowthpartnership.org/pdf-library/k-note/kn-04_solid_waste.pdf; <https://global-recycling.info/archives/3205>

Findings reveal that *public health* ranks quite high in Moscow; this fact has also recently been tested and proven in the handling of the COVID-19 pandemic. However, waste collectors throughout the city are now dealing with epidemiological waste (Class B) both from medical facilities and household collection points. Extremely high volumes of Class B waste are now being treated separately through special decontamination facilities, nonetheless, there is still a high chance that household waste containing the virus will eventually populate landfills⁴¹.

Provider inclusivity, financial sustainability and proactive policies also ranked above average, in part due to the post-soviet system of social welfare and proactive legislature review. Sustainability indicators are taken quite seriously and have been integrated with the Russian national development index. The data shows a steady improvement in environmental factors over a ten year period to include improved air quality and reduced air and water pollutant emissions; nonetheless waste generation remains a huge problem with insufficient data to support field research (Bobylev et al., 2015). Problems within the system emanate after the waste has been collected – in waste disposal, treatment and recycling as well as the interaction of government with civic institutions and community sensitization. There is an obvious disconnect between government planning, administrative implementation and stakeholder networking. The broken link in the chain depends largely on solving the issue of sustainable waste disposal and treatment.

Nonetheless, the government is taking steps towards filling the gaps in the system and this study provides much needed literature in understanding the municipal waste management system in transition. Further improvement on data collection, central database management and stakeholder consultation would boost system-wide efficiency. The results of the multi-city analysis and general concept of the ISWM model and the benchmark performance indicators could be utilized towards further strategic planning within the sector. Integrating this categorization standard would also assist bilateral cooperation, especially with cities that have already implemented the ISWM evaluation model within their waste system. Lessons can be learned from Seoul and San Francisco to support cost-efficient fiscal planning (see tab. 4) and one can also

⁴¹ URL: <https://www.corona24.news/c/2020/04/28> (accessed: 09 June, 2020).

evaluate the current challenges in these cities to assuage or mitigate against system inadequacies (Won-Seok et al, 2015; Kaza et al., 2018; Zaman & Ahsan, 2019).

Table 4

MSW similarities with Moscow and current challenges in San Francisco and Seoul

		San Francisco	Seoul
Similarities	Qualitative Performance Indicators	<ul style="list-style-type: none"> - Single regional operator structure - Policy regulation of plastic bags and at-source sorting 	<ul style="list-style-type: none"> - Housing style (Apartments) - Global Cities Index* - Policy regulation of plastic bags and at-source sorting
	Quantitative Performance Indicators	<ul style="list-style-type: none"> - Utility fees almost at par 	<ul style="list-style-type: none"> - Population - GDP & GNI per capita - Urban Growth Rate - Air Pollution** - GIS System
Current MSW Challenges		<ul style="list-style-type: none"> - Devaluation of resources - Plastic waste disposal (due to import ban from China) - Increased waste generation - Street Trash 	<ul style="list-style-type: none"> - Devaluation of resources - Plastic waste disposal (due to import ban from China) - Low community buy-in for landfill expansion and new incineration plants - Inadequate waste collection infrastructure (recyclables are picked once a week) - Indiscriminate waste dumping

* URL: <https://www. Kearney.com/global-cities/2018> (accessed: 09 June, 2020).

** URL: <https://www.numbeo.com/pollution/> (accessed: 09 June, 2020).

Conclusion

The study reveals that performance challenges identified within the Moscow municipal solid waste management system are primarily triggered by the incompatibility of operating a bureaucratic public administration system alongside a quasi-market waste management model. The hard top-down approach driven by legislative reforms leaves little room for flexibility within the existing waste sector. Although the system advocates for greater efficiency, these excessive regulations and processes slow down project implementation and adaptability to new market trends. This situation also hampers innovation at local levels and minimizes civic engagement. The benchmark performance indicators within the framework of a highly centralized waste management system show closer compatibility with the model employed in Seoul, Korea. Interestingly, Seoul has also dealt with similar public administration challenges as Moscow, such as spatial development concerns and ameliorating public discontent. Therefore, certain aspects of the Moscow waste management system could be improved, for instance, organic waste processing and the biodegradable coloured bag collection system could provide a platform for greater stakeholder interaction and foster multi-level collaborative governance.

The management of MSW systems is generally challenging for most governments and requires a tipping point for the overhaul of stagnant processes as well as the integration of new technologies, market systems and networks. The Russian Federation is at such a point. The government has taken decisive measures to provide the legislative backbone which should streamline the sector towards sustainability, nonetheless, policies alone, without stakeholder buy-in or reculturization, may prove futile. The much applauded recycling systems in San Francisco and Seoul have also been fraught with administrative challenges including public opposition and community protests, nonetheless, these challenges have been managed over time through the active sensitization and network integration of all stakeholders in the waste management system. Since Moscow is just starting its journey into a zero-waste future, it behoves the municipal administration to learn from the challenges faced by other cities in overcoming similar hurdles; this strategy may also support the city to leapfrog in the development of a unique sustainable waste management system.

Nonetheless, considering the conditions of the multi-level hierarchical system of administration in Russia, further in-depth study on the current waste scheme in Moscow would be necessary to fully comprehend the impact of the bureaucratic process, specifically at the local self governance level. Accordingly, this study provides essential background material for future research in this field with a focus on inter-municipal cooperation & municipal recycling. The paper has also presented some foundational basis for a more comprehensive assessment of the ongoing Moscow territorial waste management scheme 2020–2029.

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