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As a manuscript

Agiamoh Rosaline Georgevna

Impact of reforms of the solid waste management system on the well-being of local communities (Study focus: Moscow and the Moscow Oblast)

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Barabashev Alexey Georgievich

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INTRODUCTION

The United Nations estimates that by 2050 over 68% of the world's population will live in urban areas¹. This global trend signals an increase in housing demand, waste volume and additional pressure on public infrastructure which directly impacts community welfare. Today's global environmental crisis revolves around continuous waste generation and the inefficiency of most government systems to adequately manage waste treatment and disposal. Different cities usually adopt independent specialised categorization standards of Municipal Solid Waste Management (MSWM) 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. However other mega-cities like Moscow are just catching up with the circular economy concept, yet learning from the experience of other cities may leapfrog into a more sustainable waste management system.

The Russian Federation is currently focused on the large-scale reform of its waste management system, this is key in driving sustainable development especially for large urban settlements like the Moscow megalopolis. The Moscow megalopolis is made up of Moscow city and the Moscow Region (also known as Moscow Oblast). The Moscow megalopolis is the most densely populated region in the entire country and accounts for the largest volume of Municipal Solid Waste (MSW) in Russia. It has begun adjusting to the pressures of urbanisation triggered by population growth rate⁵, housing boom and the new consumerism culture. The

¹ United Nations. URL: <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html> (accessed: 09 June 2020).

² San Francisco Department of the Environment. URL: <https://sfenvironment.org/striving-for-zero-waste> (accessed: 09 June 2020)

³ Zero Waste Research Centre Italy. URL: <http://www.rifiutizerocapannori.it/rifiutizero/> (accessed: 09 June 2020).

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

⁵ Russia's Urban Population Growth Rate. URL: <https://data.worldbank.org/indicator/SP.URB.TOTL?locations=RU> (accessed: 09 September 2020).

volume of waste generated per day has continually increased over the past decade and this sudden surge in waste generation has led to landfill overfilling as the post-soviet waste management infrastructure is simply unable to cater to such volumes. Growing environmental and health concerns have resulted in some communities protesting for immediate landfill closures thereby placing further pressure on the current waste infrastructure.

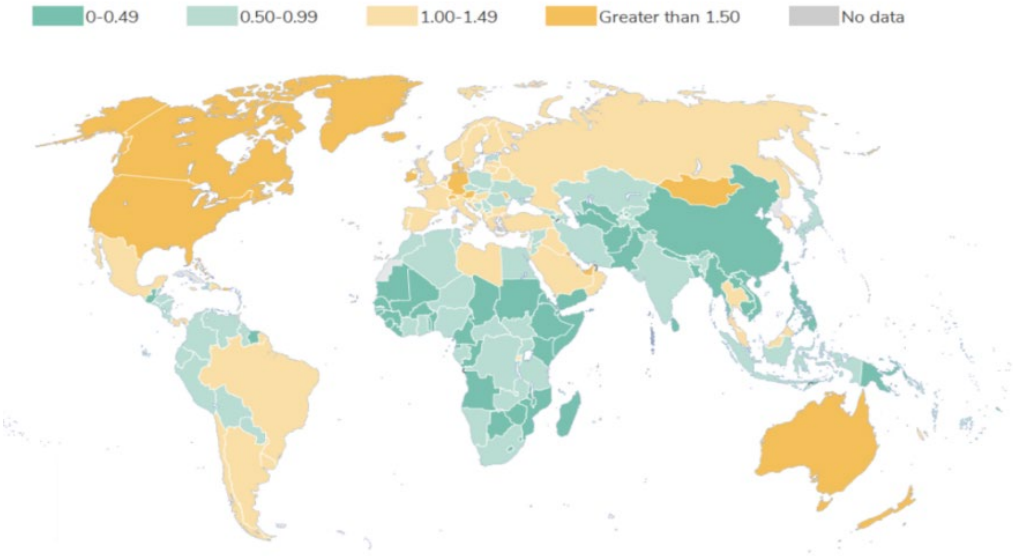


Figure 1: Annual Municipal Solid Waste Generated Globally⁶

Source: World Bank (2019)

This study therefore provides insight to current waste management reforms including the recent inter-regional cooperation in waste management between the Moscow City and the Moscow Oblast. The study further evaluates the impact of waste policy and infrastructure reform on community welfare which is qualitatively and quantitatively analyzed through the review of related environmental policies, public opinion and property devaluation based on community proximity to waste disposal sites.

Russia has been on a path towards the reform of its waste management sector for over twenty years. This process has been gradual due to administrative

⁶ Annual Municipal Solid Waste Generated Globally (Kg/capita/day).

bureaucracy and has mostly involved the promulgation of new and updated/amended legislature⁷. The country does not have a modern culture of sorting waste and not much recycling has been done since the 1980's this is reflected in various comparative studies of cities with similar income thresholds⁸. Therefore, most of the recent traction in the waste reform process starting in 2016 seems to have been triggered by massive public scrutiny based on community concerns over public health and environmental hazards. To quell public grievances a total of thirty-nine (39) landfills had been decommissioned between 2013 and 2020. Some studies conducted by Russian researchers reveal that performance challenges in Moscow's waste administration is attributed to the misfit of organisational management processes; specifically, the disconnected system of operations within a highly centralised and bureaucratic government system, poor regulatory oversight, ambiguous tariff system and the absence of a unified database and incentives for recycling^{9,10, 11}. The Federal Service for Supervision of Natural Resources (Rosprirodnadzor) estimates that the volume of waste generated annually between 2010 and 2017 had grown by 66.5% also that over 6.2 billion tons of industrial and household waste was generated in 2017¹². Russia's landfills are functioning at overcapacity and the Federal Government is now implementing new legislation that should create a more structured public administration process for Solid Waste Management (SWM) as well as provide transparency and reduced bureaucracy for industry stakeholders and investors. The Russian government is

⁷ Safonov, G., Bobylev, S., Perelet, R., Davydova, A., Kokorin A., et al. (2013). Sustainable Development in Russia. St. Petersburg, Berlin: German-Russian Exchange Berlin and Russian-German Environmental Information Bureau.

⁸ Shmelev S. E. 2019. Sustainable Cities Re-imagined: Multidimensional Assessment and Smart Solutions. Routledge.

⁹ Korobova, N., Larionov, A., Michelsen, J. D., Pulyayev, M., Ivanovskyy, S., Turilova, K., & Kuznetsova, M. (2019). Waste in Russia: Garbage or Valuable Resource? (No. 89177, pp. 1-93). The World Bank.

¹⁰ Kulbachevski Anton. (2018). Problems with waste management in Moscow City. Presentation at the Department of Chemistry, Moscow State University 2018.
<http://www.chem.msu.ru/rus/ecology_2018/kulbachevskii.pdf> (accessed 09.09.2020.).

¹¹ Votyakova, Olga. 2018. The organization of the unified system of waste management construction. IOP Conference Series: Materials Science and Engineering. IOP Publishing DOI: 10.1088/1757-899x/365/6/062023

¹² State Report (in Russian) "On the Status and on the environmental protection of the Russian Federation in 2017". Ministry of Natural Resources and Ecology of the Russian Federation.

also amending environmental legislation and developing inter-municipal cooperation programs to support the waste reform. Environmental policies implemented in 2017 prohibit the landfill of certain grades of recyclable waste such as ferrous metal scrap and equipment containing mercury (Russian Federation, 2017). These new policies and related ecological levies are being implemented to ensure that manufacturers take more responsibility in managing the utilization of their products. Unfortunately, many manufacturers and importers still face multiple performance challenges such as incompatible waste classification systems, inconsistency in legal and regulatory frameworks, poor accounting and a defunct reporting system for waste packaging^{13, 14, 15}.

Russia's capital city 'Moscow' is among the largest urban cities in the world, with a population estimated at over 12 million it serves as a major hub for political, cultural and scientific activities in Eastern Europe¹⁶. Like most urban cities, Moscow's rate of urbanisation and living standards drives the increasing rate of waste generation which directly correlates to the quality of waste which could be utilised as a secondary resource. The dearth of technologies and recycling plants, as well as equipment shortage all pose huge challenges for waste administration, especially in an expanding capital city like Moscow. The new legislature attempts to centralise waste administration by introducing a one regional operator system by 2022. The regional operator is expected to function as a quasi-government institution which will manage the entire waste management chain via a top-down approach. It is projected that this system will ensure

¹³ UNIDO Centre for International Industrial Cooperation in the Russian Federation. 2017. Project Overview: BAT/BEP Center For Environmentally Safe Disposal Of Potentially Hazardous Consumer Products And Industrial Wastes. Accessed 13 November 2019.

<http://www.unido.ru/upload/files/b/bat_bep_project_overview_brochure_eng.pdf>

¹⁴ AmCham (American Chamber of Commerce) in Russia. 2016. Law on Production and Consumption Waste Accessed 12 November 2019,

<<https://www.amcham.ru/uploads/AmCham%20Policy%20Paper%20Waste%20Management%202016-04-06%20eng.pdf>>

¹⁵ AmCham in Russia. 2017. Waste Management Law Bulletin (Feb 2017). Accessed 13 November 2019,

<<https://www.amcham.ru/uploads/AmCham%20Waste%20Management%20Law%20Bulletin%202017-02.pdf>>

¹⁶ <https://rosstat.gov.ru/folder/12781>. Accessed 13 November 2019.

synchrony of data management and project coordination. Nevertheless, MSWM in Moscow is still a complex system that involves over twenty different industries. Separate collection of waste or at-source sorting is still largely inefficient and mostly implemented by public facilities such as shopping malls, sport centres and hotels¹⁷. At-source sorting in Moscow was launched in January 2020¹⁸ marking the first stage of the city's recycling project. The city's department of housing and communal services (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 waste management scheme under the *National Ecology Project* seems to imbibe the New Public Management principles. Nevertheless, the recent COVID-19 pandemic has disrupted the waste collection system and waste is still largely unsorted. It is estimated that about 90 percent of Moscow's garbage goes directly into landfills which are currently at overcapacity as only 5-7 percent is recycled¹⁹. The city is currently surrounded by fourteen landfills²⁰ in its immediate periphery, twelve of which are located in the Moscow Region. Each of these waste sites is situated within close proximity (on average 600 meters) to residential communities. These landfills and waste disposal sites are mostly overfilled or have reached their maximum capacity and 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 protests²¹ directed at the municipal authorities, petitioning them to permanently close down such sites and provide more sustainable waste management solutions to prevent

¹⁷ Potemkina Victoria (2014) Thesis on the Disposal of Solid Waste in the Municipal Territory of Moscow, Faculty of Public Administration, HSE, National Research University

¹⁸ Moscow Mayor Official Website. URL: <https://www.mos.ru/mayor/themes/5299/5732050/> (accessed: 08 June, 2020).

¹⁹ <https://www.rbth.com/lifestyle/334874-russia-waste-problems> (accessed: 24 March 24, 2022)

²⁰ 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).

²¹ Russia Business Today. URL: <https://russiabusinesstoday.com/environment/protest-erupt-over-moscow-governments-waste-management-plan/> (accessed: 08 June, 2020).

further ecological damage. The government, in an attempt to deal with this crisis, has permanently closed down a total of thirty-nine landfills between 2013 and 2020. The decommissioning of such sites has triggered the need for innovative recycling methods and state-of-the-art waste processing plants. Multiple communities in the Moscow Region 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 regions²². The government of Moscow, however, maintains cordial partnership dealings with the government of the Moscow Region and in the sphere of waste management both parties have a legally binding inter-municipal cooperation agreement which has been in effect since October 25, 2016. Although subsequently amended in 2019 (N 1 77-1109-1)²³. This agreement generally allows free access and passage in transporting waste from Moscow city to the various landfills and waste processing plants in the Moscow region. 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 Archangelsk²⁴, Tambov²⁵, Yaroslavl²⁶ and Tver²⁷ municipalities, however, by the end of 2019 other regions had also staged protests over illegal open waste dumping and in their communities and had set-up civic groups to boycott government plans to establish waste

²² Vershinina I.A. and Martynenko T.S. (2019) Problems of Waste Recovery and Socio-Ecological Inequality. *Ecology and Industry of Russia*, Vol. 23. Issue 5. pp 52-55

²³ Moscow Region Website. URL: <https://mosreg.ru/download/document/1027870> (accessed: 09 June, 2020).

²⁴ 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_archangelskoy_oblasti_vystupili_protiv_poligona_dlya_musora_iz_stolicy (accessed: 09 June, 2020).

²⁵ Tambov Region protests against landfill (in Russian). URL: <https://www.svoboda.org/a/29671912.html> (accessed: 09 June, 2020).

²⁶ Regnum Article (in Russian). URL: <https://regnum.ru/news/polit/2795162.html> (accessed: 09 June, 2020).

²⁷ Anti-waste protests in Tver (in Russian). URL: <https://bellona.ru/2019/09/11/antimusornye-protesty-teper-v-tverskoj-oblasti/> (accessed: 09 June, 2020).

treatment plants²⁸ in their communities. 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 the *Territorial Scheme for Waste Management in Moscow*²⁹ (2019), the document outlines the city's waste management plan in partnership with the Moscow Region and is projected to process about 83 million tons of waste between 2020 and 2029. 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). However, 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 which are expected to be in operation by 2022³⁰. Job creation, improved healthcare and social amenities are all promises that have been made by the Moscow municipality. However, communities in the region believe such cooperation may not be in their best interest. Community protests continue to oppose the construction of new waste processing and incineration plants despite the promise of new and advanced technologies. In some cases, communities have openly barricaded the entry of waste vehicles to their communities. The legitimacy theory and social contract

²⁸ 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-stali-trendom-2019-goda-i-kakim-posledstviyam-oni-privedut> (accessed: 09 June, 2020).

²⁹ Moscow Mayor Official Website. URL: https://www.mos.ru/upload/documents/files/1934/1_Proektdokumenta.pdf (accessed: 09 June, 2020).

³⁰ News Archive (in Russian). URL: <https://news.solidwaste.ru/2019/09> (accessed: 09 June, 2020).

theory are therefore applied in this study to highlight the different perspectives and standards of society.

Research Rationale. The performance assessment of urban infrastructure is often measured through the efficient supply of clean water and the administration of municipal waste³¹. This assessment is essential for strategic policy planning and sustainable urban development. For decades urban planners have applied regional spatial development strategies to manage Moscow's exponential urban growth and attendant pressures on infrastructure. Various strategies including the development of 'satellite towns' have been applied to curtail housing demand and minimise the effects of industrialization. These satellite towns have metamorphosed into municipalities now considered collectively as the Moscow Region. A new urban challenge rules the day 'municipal solid waste', this problem is particularly complex as it involves a plethora of municipal factors and requires the collaboration of multiple government departments to ensure policy implementation, infrastructural development and social adaptation.

Moscow city has historically acted as an administrative city and led a precedent of dissociation with industrial processing plants and such facilities have historically been positioned in the city outskirts. The city is also restricted in landuse and territorial expansion, thus depends largely on the region for support in processing waste. The survival of Moscow's current territorial municipal solid waste management scheme therefore depends largely on the support of the Moscow region and the successful implementation of the inter-municipal cooperation agreement.

³¹ Teixeira, C.A. (2009). Municipal Solid Waste Performance Indicators.

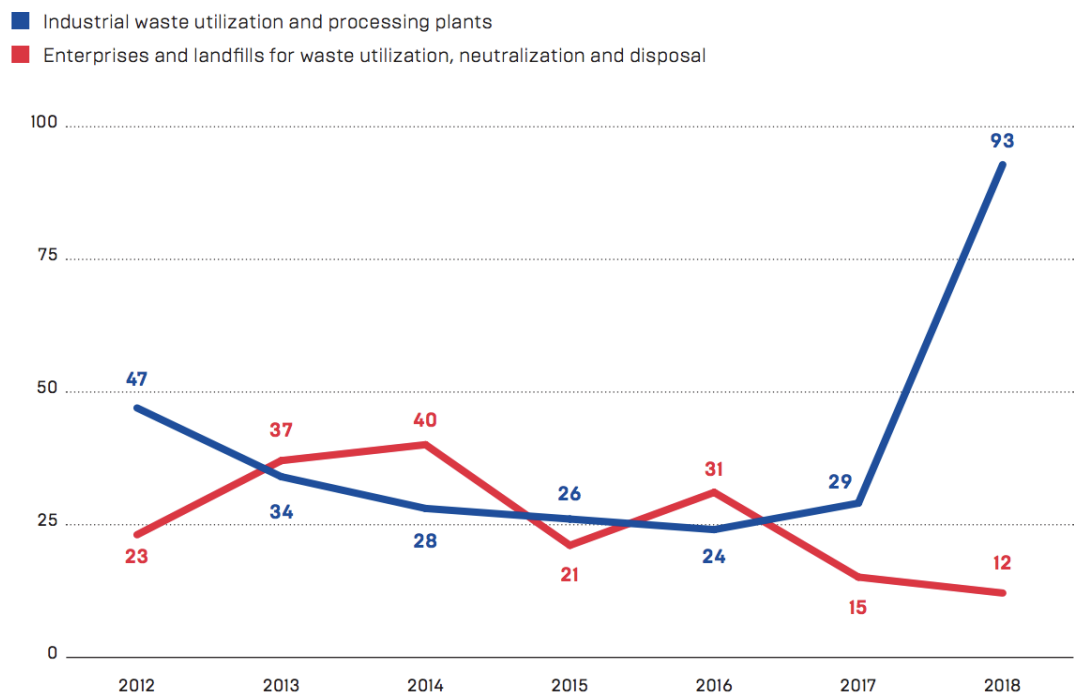


Figure 2: Waste Utilisation in Russia

Source: Ministry of Natural Resources and Environment, Russia³²

Restructuring the waste sector is targeted at delivering a more competitive market which will drive new opportunities in the sector and provide both local and foreign stakeholders with long-term investment incentives. Some economic analysts project that the Russian waste management sector could evolve into a multi-billion-dollar business within a few years, provided the sector receives the necessary government support to mitigate fiduciary risks (Waste Recycling Magazine, 2017). In 2018, the Russian Direct Investment Fund³³ which is the sovereign wealth fund of the Russian Federation announced its partnership with Hitachi Zosen Inova³⁴ to develop a number of waste-to-energy plants; the project is estimated at 150 billion rubles. This is just one of many such Public-Private-

³² United Nations- SDG. URL:

https://sustainabledevelopment.un.org/content/documents/26959VNR_2020_Russia_Report_English.pdf (accessed: 21 May 2021).

³³ RDIF. URL: https://rdif.ru/Eng_Index/ (accessed: 02 June, 2020).

³⁴ Hitachi Zosen Inova is a global leader in energy from waste systems (EfW) URL:

https://rdif.ru/Eng_Portfolio/programma-po-ekologicheski-chistoi-pererabotke-musora-v-elektroenergiu/ (accessed: 08 June, 2020).

Partnership (PPP) cooperation projects that have been implemented since the government commenced the active amendment of waste disposal policies in the Federation. The economic potential of this sector is set to impact communities at an outstanding level by providing millions of new job opportunities, reducing landfill waste by around eighty percent and improving the supply of electricity to the main power grid.

In this vein, there is an urgent need for improved data collection and exploratory studies by government agencies, research institutions and civic society organisations. Language barriers also pose huge challenges into cross-border partnerships and the demand for translation and documentation services continue to rise. The demand for statistical-model oriented studies is now more compelling than ever and this case study seeks to bridge the gap by providing a comprehensive overview of the current MSWM system in Moscow and ties this to the public system of municipal cooperation and evaluates the impact of MSWM on community welfare.

Literature Overview. The study primarily evaluates the effect of waste policy reforms in a predominantly bureaucratic government. It contributes to the ongoing debate on: *Public Administration vs New Public Management* and tests whether the *theory of collaborative advantage* takes precedence over the *theory of collaborative governance* considering the extant local challenges^{35,36}. Feiock's *theory of institutionalized collective action*³⁷ helps provide insight to the motives (factors) behind inter-municipal cooperation and the effectiveness of such collective action within large municipalities. Specifically, the study opines that Inter-regional cooperation could to a large extent be 'interest based' and largely

³⁵ Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of public administration research and theory*, 18(4), 543-571.

³⁶ Huxham, C., & Vangen, S. (2013). *Managing to collaborate: The theory and practice of collaborative advantage*. Routledge.

³⁷ Feiock, R. C. (2013). The institutional collective action framework. *Policy Studies Journal*, 41(3), 397-425.

influenced by legitimization efforts (*legitimation theory*³⁸). The study also reviews critical variables that encourage such State action and weighs their application towards fostering better participatory governance especially towards fulfilling its *social contract* obligations with the community. A *multiple-indicator approach*³⁹ and comparative analysis is further applied in examining the waste sector. The review of related literature shows that most cities globally are gradually working towards upgrading their existing waste management infrastructure despite multiple system-wide challenges^{40, 41, 42}. One major challenge identified with most cities aside 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^{43, 44}. Unfortunately, there is no waste management model that can be applied across board, waste systems have to be customised to the exact region under consideration and factors such as demography, politics, social coherence, economy, culture and tradition should be integrated when designing new models⁴⁵. 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

³⁸ Tavares, A. F., & Feiock, R. C. (2018). Applying an institutional collective action framework to investigate intermunicipal cooperation in Europe. *Perspectives on Public Management and Governance*, 1(4), 299-316.

³⁹ Barabashev Alexey, Makarov Alexey & Makarov Ivan (2019). "On The Improvement of Indicative Quality Assessment of Public Administration," (In Russian) *Public Administration Issues*, Higher School of Economics, Issue 2, pages 7-38.

⁴⁰ United Nations Human Settlements Programme. (2010). *Solid Waste Management in the World's Cities: Water and Sanitation in the World's Cities 2010*. Earthscan.

⁴¹ Sim, N.M., Wilson, D.C., Velis, C.A. & Smith, S.R. (2013). Waste management and recycling in the former Soviet Union – Case study of Bishkek, Kyrgyz Republic (Kyrgyzstan). *Waste Management and Research*, 31 (10 Supplement), 106-125

⁴² Wilson, D. C, Rodic, L, Cowing, MJ et al. (7 more authors). (2015). 'Wasteaware' Benchmark Indicators for Integrated Sustainable Waste Management in Cities. *Waste Management*, 35. 329 - 342. ISSN 0956-053X

⁴³ Hoorweg D, Bhada-Tata P. (2012). *What a waste: a global review of solid waste management*. World Bank, Washington, World Bank.

⁴⁴ Topić, M., & Biedermann, H. (2015). Planning of Integrated/Sustainable Solid Waste Management (ISWM) - Model of Integrated Solid Waste Management In Republika Srpska/B&H. *Serbian Journal of Management*.

⁴⁵ Kaza, S., Yao, L., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: a global snapshot of solid waste management to 2050*. World Bank Publications. URL:

<https://olc.worldbank.org/system/files/What%20a%20Waste%202.0%20Overview.pdf> (accessed: 08 February, 2022).

sustainability indicators as identified by Zaman⁴⁶ most of this research is focused within the socio-economic and environmental contexts, a few have also specifically covered topics on the integration of zero-waste systems. However, none of these studies provide a generalised 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. Furthermore, the *location theory* by renowned economists and sociologists: Thünen, Weber, Alonso, and Christaller provides a platform to analyse the direct economic impact of waste disposal sites on property value. The study also contributes to the *hedonic demand theory*.

Object of the Research. This study evaluates the impact of waste management on community welfare. The study applies a mixed method research approach to help understand the impact of government waste management reforms on community welfare. The study describes Moscow's current waste management scheme and provides an analogy for the shift in procedures and related policies. The study also tests the impact of such policies by measuring the extant economic property value of residential buildings in close proximity to waste disposal sites. Community opinions are also explored through surveys and focus group interviews. The main theoretical premise for the study is the application of Public Administration methods in municipal waste management.

Subject of the Research (Hypothesis). This study evaluates the current system of municipal solid waste management in the Moscow metropolis and assesses the impact on community welfare through observation from both a theoretical and practical standpoint. The study reviews waste management theories and compares them to existing practices. The objective being to explore the impact of existing waste policies on communities and deducing their efficacy. In conclusion the study

⁴⁶ Zaman Atiq Uz (2014). Identification of key assessment indicators of the zero waste management systems. Ecological Indicators, Volume 36, 2014. Pages 682-693, ISSN 1470-160X.

recommends the best practical models for resource utilisation. The study addresses the following questions:

1. What are the existing theories and policies guiding SWM in Moscow?
2. Are these policies effective?
3. What are the main challenges and economic inefficiencies of the existing MSWM system?
4. How are communities affected by the recent waste reforms?
5. What is the best-case model for municipal solid waste management in Moscow?

To help answer these questions the study postulates three hypotheses:

H1: At-source sorting of waste is largely inefficient in Moscow: The study provides supporting **case studies and information from focus group interviews** with workers of the local government that shows a very low level of integration and sensitization in household at-source sorting of waste. It shows that the citizenry does not find this system of waste collection efficient as there are no incentives and this system is challenging in a predominantly vertical apartment lifestyle setting.

H2: Communities located near landfills experience negative economic effects: The study provides supporting evidence by way of **regression analysis on property value** which reflects that properties located near landfills or waste disposal sites are prone to economic devaluation. Such properties experience between 18 % - 35% devaluation when compared to similar real estate in more ecologically friendly zones. Such communities also tend to suffer from gentrification due to a mix-factor stemming from over-development and inefficient land-use.

H3: Spatial development factors are a key driver for municipal cooperation in metropolitan regions: The study reveals that key strategic decisions in Moscow stem from the challenges associated with spatial constraint. As an example, the current **inter-regional cooperation in waste management** between Moscow and

the Moscow Region (Moscow Oblast) is driven by the need for industrial facilities which due to the land-use act and city regulation are not allowed within the vicinity of the Moscow city. Also given the fact that the city is constrained in outward expansion it relies on cooperation with surrounding municipalities especially with regards to the provision of social services and infrastructure.

Research Aim and Objectives. The aim of the study is to understand the impact of the waste management reform on the community in Moscow city and the surrounding Moscow oblast. It is targeted at evaluating the newly introduced waste reform and identify the challenges being faced by the community in order to formulate recommendations for improving the transition process. The study objectives are outlined below:

1. Determine the role and status of municipal waste management within the theoretical paradigms of public administration, new public management and other related economic theories in order to provide a basis for formulating criteria and analysing parameters and evaluating the performance/effectiveness of the structure in place;
2. Analyse the legal acts, background, history and political nuances of the waste system in Russia and specifically how the administrative structure, tariff system and stakeholders/actors within the sector have metamorphosed in Moscow city and Moscow oblast;
3. Review the measures for benchmarking and performance management evaluation of waste management systems. Understand how these are applied to the waste system in Russia and what strategies are in place to measure the efficiency of the new reform.
4. Develop the methodology for conducting the research and evaluating the performance of the waste reform as well as identifying the challenges associated with it.

5. Propose criteria and comparative analysis of the waste management system in Russia. In order to evaluate the waste reform against existing best practises, select 2 foreign cities which have been identified as achieving zero-waste global standards. Examine their existing system, analyse the similarities and differences and compare results based on findings to propose reference platform parameters and best-practice take-aways;
6. Conduct local surveys to evaluate the social and economic impact of the waste reform on communities in Moscow city and Moscow oblast.

Theoretical Framework.

- The study evaluates the effects of waste policy reforms in a bureaucratic system. It contributes to the ongoing debate on: *Public Administration vs New Public Management* and supports the premise that the *theory of collaborative advantage* takes precedence over the *theory of collaborative governance* considering the extant local challenges^{47,48}.
- Feiock's **theory of institutionalized collective action**⁴⁹ helps provide insight to the motives (factors) behind inter-municipal cooperation and the effectiveness of such collective action within large municipalities. Specifically, the study opines that inter-regional cooperation could to a large extent be 'interest based' and largely influenced by legitimization efforts (**legitimation theory**)
- The study contributes directly to the **Hedinoc pricing model** by showing that property value increases with each KM away from landfills and waste disposal sites, which also provides a negative cost that can be calculated when *evaluating negative externalities*.

⁴⁷ Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of public administration research and theory*, 18(4), 543-571.

⁴⁸ Huxham, C., & Vangen, S. (2013). *Managing to collaborate: The theory and practice of collaborative advantage*. Routledge.

⁴⁹ Feiock, R. C. (2013). The institutional collective action framework. *Policy Studies Journal*, 41(3), 397-425.

Research Methodology. The methodology applied in this study utilizes both quantitative and qualitative research parameters. Three key topics have been reviewed in this study to provide a holistic view of the impact of policy change on inter-sectoral networks and the community as a whole:

- The Public Sector: Waste reform policy and Inter-municipal cooperation and its efficacy
- The Private Sector: Municipal waste management reforms and performance challenges.
- The Community: Impact of waste disposal on property value as a measure for evaluating community impact and welfare.

The following methods were used to test the proposed hypotheses:

- a systematic analysis of economic, social and cultural conditions, taking into account historical facts, environmental policy reforms in Russia.
- analysis of related statistical data from related studies, official and public documents as well as available statistics from the Russian Federal and Territorial waste schemes;
- surveys at the local level (Districts in Moscow and the Moscow Region);
- Case studies (comparative, qualitative and quantitative) of target sample populations.

The information base of the study was collated from multiple sources including the Russian Federal State Statistics Service - Rosstat, Accounts Chamber of the Russian Federation, the State Duma (Gosduma) regulatory and legal acts of Russia, Moscow and the Moscow Region (Moscow Oblast), previous theoretical and methodological studies on related topics, statistical data on the socio-economic development of Russia and its regions, information from the Federal Service for Supervision of Natural Resources (Rosprirodnadzor), data from The Ministry of

Natural Resources and Environment of the Russian Federation (Minprirody), collated public polls and surveys of the population (regional, municipal and district level) from Domofund.ru and Mos.ru (Active Citizen), focus groups and interviews with key stakeholders, learned academics and materials of periodicals and Internet resources.

The Scientific Novelty. The study presents a comprehensive background on municipal (household) waste management in Moscow city. It also presents the factors that drive inter-municipal cooperation between Moscow city and the Moscow Oblast. It provides a comparative study between the waste systems in Moscow, San Francisco and Seoul within the outline and benchmarking tool of the ISWM System. Economic externalities are evaluated in the juxtaposition of waste disposal sites relative to residential properties in Moscow. The study also reveals certain key insights to the socio-cultural psyche of communities being affected by urbanisation and gentrification within the study zone.

The Theoretical Output. New methodological approaches to the analysis and evaluation of municipal waste management are presented, especially from the perspective of hedonic pricing. The theoretical principles developed in this dissertation can be useful for further development of the public administration theory and research on the effectiveness of public utility services.

The Practical Output of the Research. The main results, conclusions, methodological principles and concepts can be applied in program evaluation, developing related frameworks, development of strategic and methodological documents (standards, methodological instructions, other regulations) governing the development and evaluation of the effectiveness of municipal waste management systems.

Objectivity and Reliability. The study is focused primarily on the Moscow megalopolis (Moscow city and the Moscow region) and is limited to the analysis of household waste. Due to the sheer size of the population, single case qualitative

and quantitative studies are applied to samples of the population. Such as Lyubertsy and Nekrasovka in determining public opinion in the sphere of inter-municipal cooperation and select districts within the outer city circle to determine the impact of waste disposal sites on property value. Thus, the factors influencing samples are used for quantitative assessment while more in-depth study via a wider municipality segment may provide further insight to other externalities. Much effort has been placed in making the survey representative of the entire population. However due to the recent COVID-19 pandemic the survey was conducted online which may inadvertently have excluded senior citizens with no internet skills from participating.

Practical Application. Waste management influences multiple factors in various sectors, specifically public administration and spatial economics. The efficiency of structured processes and the implementation of new technologies in landfills and waste incineration plants can provide improved ecological welfare for the citizenry and boost local economy including realty value. As seen through multiple cases *hedonistic sustainability* is achievable and may be the only solution for such a densely populated metropolis like Moscow. This option will undoubtedly involve tremendous political will, large budgetary investments, community buy-in as well as much creativity, but the outcome should definitely ensure better district ecology in the long-run. Interestingly the study reveals that this system is already gaining some foothold in practice with local property development companies that are working towards the remediation of decommissioned landfills. Also, since China banned the import of recycled waste more and more studies have come to show that recycling may not necessarily be sustainable or the best method of managing municipal waste.

Further research into various case studies of neighbourhood revitalization through hedonistic sustainability initiatives even at a local level could provide much needed socioeconomic and ethnographic perspectives for efficient urban

planning. 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.

Approbation of the work was carried out through the participation of the dissertation student in scientific international conferences:

1. Scientific Conference on Theory and Practice of Public Administration, Univerzita pavla jozefa šafárika v košiciach fakulta verejnej správy, Slovak Republic (February 2022). Report: «Solid Waste Management Externalities in Moscow».
2. The 29th NISPAcee Annual Conference "Citizens' Engagement and Empowerment - The Era of Collaborative Innovation in Governance" Ljubljana, Slovenia (October 2021). Report: «Inter-regional cooperation in waste management, new trends in Moscow and the Moscow Region».
3. 2020 NISPAcee On-line Conference for PhD Students. (October 2020). Report: «Factors Driving Inter-municipal cooperation in Moscow» (also a member of the working committee).

Dissertation structure and volume. The dissertation consists of the introduction, three (3) chapters sequentially revealing the concept, essence and featuring the challenges being investigated; as well as the conclusion, bibliography and four (4) appendices – 201 page in total.

KEY SCIENTIFIC FINDINGS AND CONCLUSIONS SUBMITTED FOR DEFENSE

1. 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;

2. The level of waste recycling in the country does not exceed 7%, and more than 90% is still landfilled. Key benchmarking tools that have been identified for performance management in Moscow's MSWM include SDG 11, 12 & 14, National Indicators and Regulatory Agencies. A conceptual framework for MSWM benchmarking is further proposed by the author;
3. Factors driving inter-municipal cooperation between Moscow city and the Moscow oblast, could be identified as city expansion, population growth, spatial development constraints and economic resource planning. This positively supports the author's theory that factors other than economics-of-scale drive inter-regional cooperation.
4. There is a negative dependence between the location of waste disposal sites and property value. Each Kilometre away from the waste disposal sites (landfills/incineration plants) on average increases the price of real estate by 2.5% for apartments, 1.3% for rented offices and 1% for rented shopping areas (retail space). The average variance devaluation of properties located close to waste disposal sites in Moscow as compared to properties in other districts with similar economic indices is upwards of 20%;
5. The Qualitative Comparative Analysis (QCA) between Moscow, San Francisco and Seoul revealed that Moscow has a relatively low recycling rate, institutional challenges with intra-agency networks and stakeholder inclusivity. Majority of residents in Moscow complained about environmental pollution, specifically air, water and noise pollution. Majority were not aware of any inter-municipal cooperation between Moscow city and the Moscow oblast. Residents in Moscow oblast felt a sense of social inequality and generally residents in Moscow city and Moscow oblast were weary of the ongoing gentrification in their districts and complained about losing their communal culture and traditions.

Details regarding the study findings are further outlined below:

1. **For the first time** a detailed historical overview of the waste management reform in the Russian Federation is presented from a Public Administration perspective. The review of official documents and a system network analysis between stakeholders in the waste management system made it possible to **develop a schematic of the existing waste management structure in Moscow** (Figure 3).

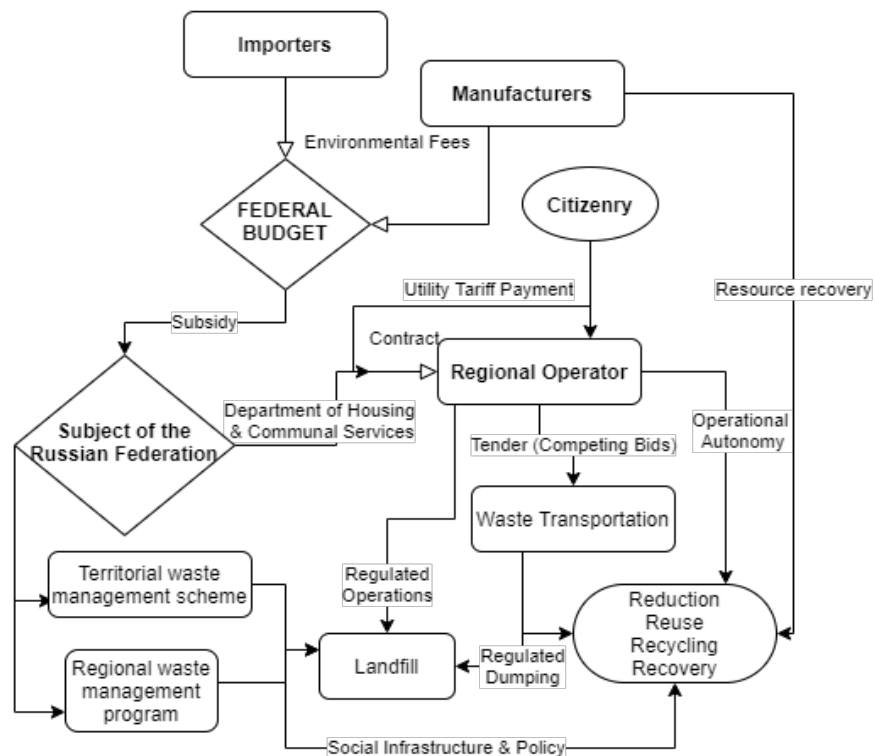


Figure 3: Municipal Waste Management Scheme – Moscow

Source: Agiamoh R. G. (2020)⁵⁰

The new waste reform features public administration of municipal waste via a two-tier system by waste operators at the federal and regional level. This two-tier system is intended to connect the government with the private sector; the federal operator manages waste with I and II classification while the regional operators

⁵⁰ Agiamoh, R. (2020). From bureaucracy to market? Ongoing reform and performance challenges of solid waste administration in Moscow. *Public administration issues*, (5), 149-170.

manage waste classified as III, IV and V which includes municipal waste. **The study explains the role of the waste operators in detail:**

- a. Federal Level - Oversight ‘policy & regulation role’ (Federal government)
- b. Regional Level - Vested with additional powers ‘operations role’ (Private Sector)
- c. Municipal Level - Scope of powers have been reduced to ‘support role’ (Local government)

Table 1: Comparative Administrative Profile - Moscow & Moscow Oblast

Indices	Moscow	Moscow Oblast
Area	2,561.5 km ²	44,329 km ²
Population (2020) ^[1]	12,692,466	7,687,647
Unemployment Rate (2021) ^[2]	3.1%	3.9%
Executive Head	Mayor	Governor
Administrative Centre	Moscow	Moscow and Krasnogorsk
Municipal Districts (Okrug)	12	17
Municipalities (Intra-city)	146	50
Urban Settlements	125	69
Rural Districts (Suburbs)	21	99
Legislative Authority	Moscow City Duma	Moscow Regional Duma
GDP Per Capita (2019) ^[3]	24.07	67.35
Average Monthly Salary (Feb 2021) ^[4]	104,451	56,126.5
Active Waste Processing Plants (2020) ^[5]	0	10
Decommissioned Landfills (2013 - 2020) All landfills with old technologies have been closed.	0	39
Landfills reconstructed & upgraded (2021)	0	11
WTE plants being built (2021)	0	4
<p>^[1] Rosstat population stats for 2020 https://www.gks.ru/storage/mediabank/PrPopul2020.xls (accessed: 04 May 2021)</p> <p>^[2] Rosstat unemployment rate for Ages 15+. The COVID 19 Pandemic has affected the rate of unemployment which has increased significantly from 1.5 in 2019 to 3.5% in 2021 in Moscow and from 2.6 to 3.9 in Moscow oblast https://gks.ru/bgd/free/b04_03/lssWWW.exe/Stg/d02/77.htm and https://mintrud.gov.ru/ministry/programms/inform/1 (accessed: 02 November 2021)</p>		

[3] Rosstat GDP per capita income 2019 (kg of standard fuel / per 10 thousand rubles) <https://rosstat.gov.ru/storage/mediabank/2gAF8Pfk/energo.xls> (accessed: 02 February 2022)

[4] Rosstat Average monthly nominal accrued wages of employees for the full range of organisations in the constituent entities as at Feb 2021, rubles. URL: https://rosstat.gov.ru/labor_market_employment_salaries (accessed: 02 February 2021)

[5] Report by the Moscow Oblast Minister of Housing & Communal Services. URL: <https://www.mosoblduma.ru/Press-centr/news/337068#tab-text> (accessed: 02 February 2021)

Source: Prepared by the Author with data from ROSSTAT⁵¹

The study of the waste management structure and specifically the Territorial Scheme for Waste Management in Moscow⁵² further revealed some important points:

- collaborative governance between the government and various stakeholders within the waste system is an important factor for system efficiency
- Inter-agency networks can facilitate better performance however many tasks are still being duplicated at the regulatory level
- Inter-regional cooperation between Moscow city and Moscow oblast is essential to the successful management of waste in the Russian capital
- The author **developed a comparative public administrative profile between Moscow city and Moscow oblast** which reveals the administrative convergence between both territories.

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 the local levels and minimises civic engagement. There is also no incentive for at-

⁵¹ Data was collated from ROSSTAT, Min of Labour & Social Protection, State & Regional Duma Press Offices

⁵² Moscow Mayor Official Website: URL:

https://www.mos.ru/upload/documents/files/1934/1_Proektdokumenta.pdf (accessed: 05 September, 2020).

source sorting of waste which also **supports hypothesis 1 which states that at-source sorting of waste is largely inefficient in Moscow.**

2. The study presents a number of benchmarking tools, indicators and **highlights the current challenges with the waste management system in Moscow.** The study reveals that the level of waste recycling in the country does not exceed 7%, and more than 90% is still landfilled. Key benchmarking tools that have been identified over the course of the study can be surmised as follows:

- **Sustainable Development Goals (SDGs):** The study focuses on SDG 11, 12 and 14 (sustainable cities and communities, responsible consumption and production and life below water).
- **National Indicators:** Provide measures to monitor the system and set targets to ensure the ‘Creation of a sustainable system for the management of municipal solid waste, ensuring 100 percent sorting of waste and reducing the volume of waste sent to landfills by half’.
- **Regulatory Agencies:** Ministry of Natural Resources and Environment, Russian Ecological Operator (REO), Rosprirodnadzor and local government agencies ensure that the new legislature is implemented at all government tier levels. A system for ISWM is also being introduced at the national level managed by the office of the Vice President.

The absence of an Integrated Solid Waste Management System (ISWM) which provides for an increase in processed and utilised waste and a decrease in the volume of waste disposed at landfills will lead to the further formation of unauthorized dumps that can become objects of accumulated harm and require federal budget funds for their elimination (Accounts Chamber of the Russian Federation, 2020⁵³). Evidence of a weakened municipal waste management system is typically noticed by the high rate of land-filling, unstructured tariff policy and

⁵³ Accounts Chamber of the Russian Federation: URL: <https://ach.gov.ru/en> (accessed: 05 March, 2020)

underdeveloped recycling models⁵⁴. Despite the overwhelming legislative effort in Russia to streamline waste management, the implementation of general policy provisions is still largely inadequate⁵⁵. Most regions are facing huge budgetary constraints with implementing the new waste reform and depend largely on Federal subsidies to ensure continued waste collection and processing. Some regions also face challenges with inadequate infrastructure to support the new waste system. Given the aforementioned **the author proposes a conceptual framework for MSWM benchmarking at the municipal or local self-government level.**

3. **For the first time** the topic of Inter-regional Cooperation in waste management is presented from a Russian perspective. The author has **developed a table featuring the various municipal association types in Russia** drawing on the theoretical premises of Kolsu⁵⁶ and Lyakisheva & Shlegel⁵⁷. The drivers for cooperation between the Moscow City & Moscow Oblast are evaluated and findings **positively support the author's theory that factors other than economics-of-scale drive cooperation.** The shortage of MSW processing and treatment facilities is a pressing challenge throughout the country, however this is felt more acutely in Moscow and its surrounding region because of population density, spatial constraint and consumer lifestyle. Inter-regional networks between both territories are interlinked at both Federal, State and Local government levels, however Moscow as a Federal city is seen to have overriding powers in terms of legislature and fiscal policies. Furthermore, legislative restrictions also make it impossible for Moscow City to establish landfills or accommodate waste processing industries due to current urban planning constraints and land-use positioning of residential complexes. This pressing challenge has therefore led to the urgent need for

⁵⁴ Skryhan H., Shilova I., Khandogina O., Abashyna K. and Chernikova O. (2018). 'Waste Management in Post-Soviet Countries: How far from the EU' DETRITUS Multidisciplinary Journal for Waste Resources & Residues, Volume 03 - 2018, pp 193-203. DOI 10.31025/2611-4135/2018.13657

⁵⁵ Kovalenko Kseniya and Kovalenko Nataliya. (2018). The problem of waste in the Russian Federation MATEC Web of Conferences 193, 02030 (2018) DOI 10.1051/mateconf/201819302030

⁵⁶ Kolsut B. (2018). National Associations of Municipalities in Europe – Different Models of Institutionalized Political Cooperation. *Geography, Environment, Sustainability*.2018;11(4):39-55.

⁵⁷ Lyakisheva V. G and Shlegel A. A. (2017) The Role of Inter-Municipal Cooperation in the Social-Economic Development of the Territory. *Journal of Economics, Profession and Business*. 2017; 3: 41-46.

cooperation between the city and its immediate suburbia. According to current legislature and official reports this partnership seeks to promote joint projects in waste management under mutually beneficial terms which would ultimately lead to economic growth for the Moscow Region and a more sustainable infrastructure waste system for both territories.

The study findings show that **the factors driving cooperation** between Moscow City and the Moscow Region, could be identified as city expansion, population growth, **spatial development constraints** and economic resource planning, specifically human capital (Figure 4). In view of the challenges being faced by Moscow city with regards to the aforementioned, **cooperation is leveraged as a means of social contract legitimization**, in the process of policy reform and regional development in a predominantly bureaucratic system. This **supports the hypothesis 3 argument** that **spatial development factors are a key driver for cooperation in metropolitan regions**

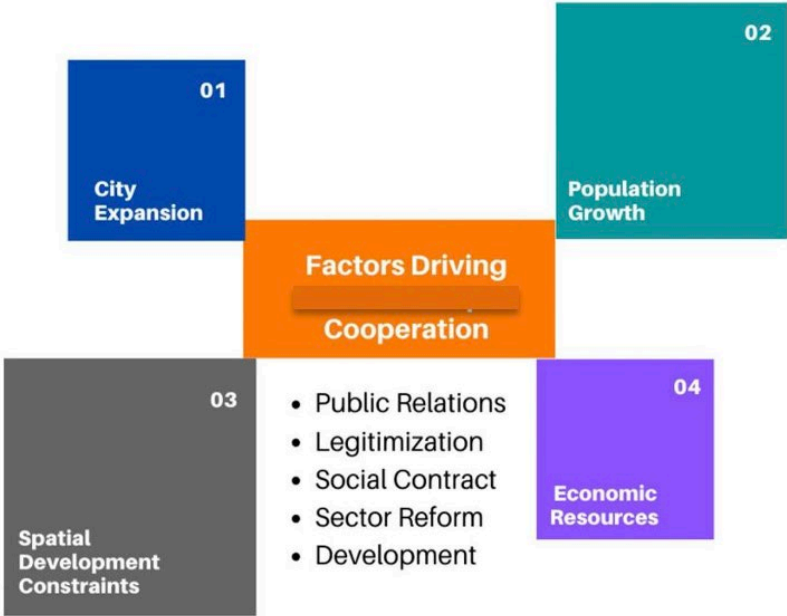


Figure 4: Factors Driving Cooperation in the Moscow Waste Sector

Source: Author

4. **Valuable contributions** are made to the field of market failure in public economics in the subjects of **Hedonic demand theory** and **Externalities in Waste Management**. An **evaluation matrix** was developed to highlight positive and negative externalities on both spectrums of production and consumption (Figure 5). The hedonic pricing method is further analysed on a sample population and the outcome revealed that **there is a negative dependence between the location of waste disposal sites and property value**. Each Kilometre away from the waste disposal sites (landfills/incineration plants) on average increases the price of real estate by 2.5% for apartments, 1.3% for rented offices and 1% for rented shopping areas (retail space). **The significance of the findings was verified using Fisher's F-test**, as well as **Student's t-test**. Both tests showed that the findings (models and coefficients) are significant at a **significance level of 1%**.

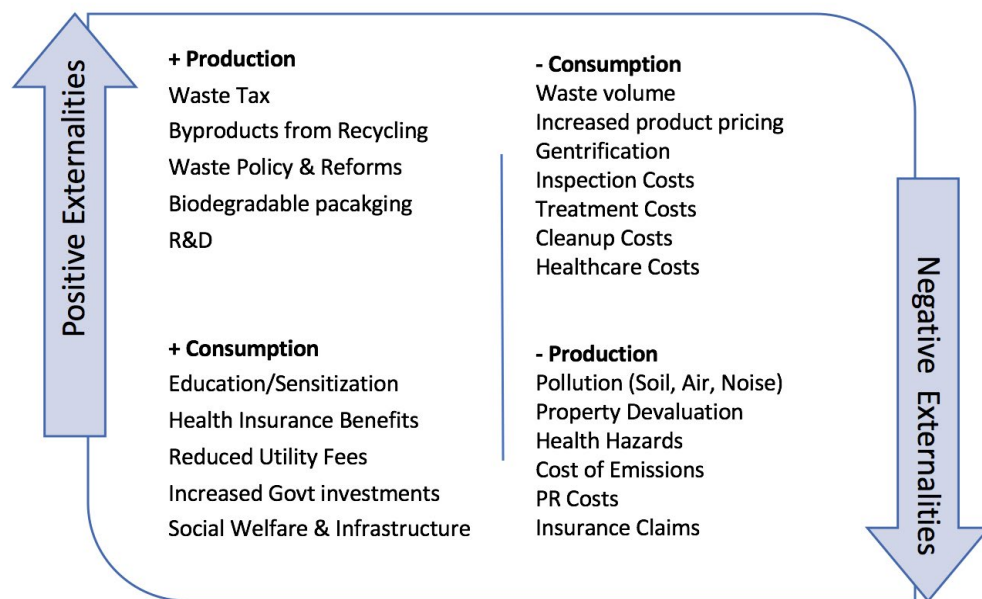


Figure 5: Waste Disposal Externalities

Source: Prepared by the Author

The study also shows that ecology plays an important role in economic decisions and impacts the daily lives of residents. The analysis of current real estate data and

the qualitative study **supports hypothesis 2** of the study which states that **communities located near landfills experience negative economic effects:**

- The ecological index is an important factor for Moscow residents when selecting properties for residential, business and retail purposes;
- Waste disposal sites have a negative impact on the surrounding local economy which is evident through property devaluation.
- **The variance devaluation of properties located close to waste disposal sites** in Moscow as compared to properties in other districts with similar economic indices **is upwards of 20%;**
- The regression model reveals that property prices are further **devalued by about 2.5% for every 1 Km distance** to the waste disposal site depending on the economic purpose of property i.e., residential, business or retail (Table 2).

Table 2: Regression Model

District	Average Price ($y = a_0 + a_1x$)		
	Apartments	Offices	Retail Space
Salaryevo ("Salaryevo" Landfill)	$y=140,355+3,941*x$	$y=9,32335+0,132*x$	$y=13,4234+0,133*x$
Otradnoye (Garbage incineration plant No. 2)	$y=151,567+2,280*x$	$y=11,3598+0,177*x$	$y=14,7481+0,1642*x$
Biryulovo West (Garbage incineration plant No. 3)	$y=139,382+2,167*x$	$y=10,8901+0,097*x$	$y=13,6616+0,137*x$
Kosino-Ukhtomsky ("Nekrasovka" Landfill)	$y=137,861+3,886*x$	$y=9,20893+0,078*x$	$y=12,1562+0,099*x$

Source: Developed by the Author

The property price is further presented in the form of the **linear regression model:**

$$y = a_0 + a_1x \text{ (1),}$$

Where:

y is the dependent variable - real estate price (thousand rubles)

x is the independent variable distance to the landfill (Km)

a0 is the average property base price

a1 is the relative amount increase per kilometre from the waste disposal site

Most people are generally reluctant to living in areas with a high pollution index, and most young families and elderly folk will seek locations in the suburban outskirts of town in the hope that city fumes and industrial pollutants will be much less in such areas, unfortunately the situation is not as straightforward in Moscow which positions its industries, landfills and waste incineration sites on the periphery of the city to avoid epidemiological outbreaks within the already congested metropolis accommodating over 12 million residents. This trend has resulted in increased pollution in the suburbs and lower property prices along the concentric MKAD ring road **which also supports Hypothesis 2** in the study.

5. **Qualitative Comparative Analysis (QCA)** is presented between Moscow, San Francisco and Seoul **revealing that Moscow has a relatively low Recycling rate, institutional challenges with intra-agency networks and stakeholder inclusivity**. Public surveys assessing the willingness of Moscow inhabitants to sort waste in their homes provide differing outcomes as shown in Table 3.

Table 3: 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 ⁵⁸ (Private)	Oct 2019	9,135	0.07	29.4%	65.2%	5.4%

⁵⁸ Domofond.ru is a private real estate analytical company. URL: https://www.domofond.ru/statya/72_rossiyan_ne_gotovy_razdelyat_domashniy_musor/100379 (accessed: 08 June, 2020).

Active Citizen ⁵⁹ (Government)	Nov 2019	197,917	1.58	69%	8%	23%
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Source: Compiled by the Author from public sources

The **QCA between Nekrasovka & Lyubertsy** revealed that:

- The majority of the residents were **not aware of any cooperation** between Moscow city and the Moscow oblast.
- Majority of residents complained about **environmental pollution**, specifically air, water and noise pollution.
- **Residents in Moscow oblast felt a sense of social inequality**
- In general residents of both districts were **weary of** the ongoing **gentrification** and complained about **losing their communal culture and traditions**.

FUTURE RESEARCH DIRECTIONS

The study provides essential background information in a field of study that is quite crucial to the public utilities administration in Moscow city. It also provides comparative data that could be evaluated by other eastern European cities. The study would benefit from further research detailing the performance of the new thermal plants once they become active and evaluation on the volume of waste processed and reduction in landfilled waste would be ideal. It would also be interesting to evaluate how Moscow and St. Petersburg cross-over to the new waste system - would this be a successful transition? What challenges would be faced especially from the tariff system and how will the government manage the roll-out? Since the study is interdisciplinary in nature it thereby also supports future research in topics involving general city waste management, administrative costs and budgeting, real estate valuations, hedonic pricing, urban studies especially spatial development and city expansion, inter-municipal cooperation both from a

⁵⁹ Active Citizen is a government project that provides a platform for electronic voting on various issues of urban development in the city. URL: <https://ag.mos.ru/poll/6508> (accessed: 08 June, 2020).

legal and policy perspective and topics in civic engagement or non-profit development projects.

KEY PUBLICATIONS OF THE AUTHOR RELATED TO THE TOPIC OF THE DISSERTATION

The most significant research results are described in 3 scientific articles published in Scopus-indexed journals. The total volume of the publications by the author reached 4.6 printer's sheets, while the author's personal contribution amounted to 4.11 printer's sheets.

Publications in Scopus-indexed journals:

1. Agiamoh R. G. (2020). "From Bureaucracy To Market? Ongoing Reform And Performance Challenges of Solid Waste Administration In Moscow," *Public Administration Issues*, Higher School of Economics, issue 5, pages 149-170 – 1.43 printer's sheets. (Q4 2020 SJR⁶⁰)
2. Agiamoh R.G. & Larionova A.N. (2020). Impact of Waste Disposal Sites on Property Value in Moscow, Russia (2020), *Urbanities-Journal of Urban Ethnography*, vol. 10., no 2, pages 71 - 93 – 1.69 printer's sheets (author's contribution – 1,20 p.s). (Q2 2020 SJR⁶¹)
3. Agiamoh, R. G. (2021). Inter-Regional Cooperation in Waste Management: New Trends in Moscow and the Moscow Region. *NISPAcee Journal of Public Administration and Policy*, 14(2), pages 9-39 – 1.48 printer's sheets. (Q3 2020 SJR⁶²)

⁶⁰ Scopus Journals. URL: <https://www.scimagojr.com/journalsearch.php?q=21100778766&tip=sid&clean=0> (accessed: 20.01.2022).

⁶¹ Scopus Journals. URL: <https://www.scimagojr.com/journalsearch.php?q=21100440513&tip=sid&clean=0> (accessed: 20.01.2022).

⁶² Scopus Journals. URL: <https://www.scimagojr.com/journalsearch.php?q=21100208061&tip=sid&clean=0> (accessed: 20.01.2022).