

THEMATIC AREA: 1 Environmental Management

SOCIAL FACTORS OF WASTE MANAGEMENT IN MEGACITIES: A COMPARISON BETWEEN MOSCOW & SÃO PAULO

*Yulia Vyacheslavovna Ermolaeva*¹ (mistelfrayard@mail.ru),
*Niklas Werner Weins*² (weinsniklas@gmail.com), *Christian Luiz da Silva*³
(christianlsilva76@gmail.com), *Leila da Costa Ferreira*² (leilacf@unicamp.br).

1 Federal Center of Theoretical & Applied Sociology, Russian Academy of Sciences, Moscow, Russia, 2 Center for Environmental Studies and Research, University of Campinas, Brazil, 3 Federal University of Technology - Paraná, Curitiba, Brazil

ABSTRACT

This article is part of an exploratory research on the different institutional and social dimensions of waste management. Here, we draw on field research and interviews with stakeholders in the Russian and the Brazilian contexts to elucidate similarities and differences as well as potential mutual lessons. We found that despite their differences, societal initiatives have played an important part in shaping how waste issues are dealt with. This concerns especially marginalized urban dwellers and peripheral districts that suffer most from centrally planned techno-managerial approaches. New technological solutions have to involve broad stakeholder networks and have to consider consumer attitudes and changes at the source and not only receiving end.

Keywords: social factors; waste management; case study.

FATORES SOCIAIS DA GESTÃO DE RESÍDUOS EM MEGACIDADES: UMA COMPARAÇÃO ENTRE MOSCOU E SÃO PAULO

RESUMO

Este artigo é parte de uma pesquisa exploratória sobre as diferentes dimensões institucionais e sociais da gestão de resíduos. Aqui, utilizamos pesquisas de campo e entrevistas com partes interessadas nos contextos russo e brasileiro para elucidar semelhanças e diferenças, bem como potenciais lições mútuas. Descobrimos que, apesar de suas diferenças, as iniciativas da sociedade têm desempenhado um papel importante na definição de como as questões de resíduos são tratadas. Isso diz respeito principalmente aos moradores urbanos marginalizados e distritos periféricos que mais sofrem com as abordagens técnico-gerenciais planejadas centralmente. Novas soluções tecnológicas têm que envolver redes amplas de atores e têm que considerar as atitudes e mudanças do consumidor na fonte e não apenas o recebimento final.

Palavras-chave: fatores sociais; gerenciamento de resíduos; estudo de caso.

1. INTRODUCTION: GLOBAL ENVIRONMENTAL & WASTE SCENARIO

The global population currently stands at 7.3 billion, and, according to UN projections, will grow up to 11 billion by the end of the 21st century. About 80% of the growing population will live in cities, most of which have yet to be built (MAVROPOULOS, 2010). The move to a circular economy and sustainable cities involves creating sustainable and environmentally responsible communication networks in urban and municipal development, and providing the

necessary solid waste management (SWM) services in these communities. Collecting, sorting, storing, recycling and (safe) final disposal of non-recyclable wastes, are still unresolved issues in many countries of the Global South. The problems of local governments in the area of resource and waste management must be addressed through new, innovative partnerships involving all stakeholders (MEDINA, 2000).

In terms of their waste management policies, the Russian capital Moscow and the Brazilian megacity of São Paulo can be categorized as transitional developing countries that have attributes which can be described as semi-organized on the way to achieving sustainable policies (MAVROPOULOS, 2010). The similarly large amount of waste generated (ca. 400 kg/person/year) a similar number of landfills, the amount of emissions and generated waste in Russia and Brazil continues to increase in comparable ways. The goal of this article is to highlight the parallels faced by these two seemingly very different megacities and point out global trends and problems the two case studies exemplify. Considering the limits of models and planning processes of waste management schemes, this research considers interviews to complement analyses of national and municipal environmental programs, and freely available statistical resources and data.

In terms of their waste management systems, Russia and Brazil differ significantly. Russia's Federal Ministries of Natural Resources and the Environment, the Ministry of Education, and the Ministry of Industry exercise general control and supervision in the area of waste management developing technologies that are applicable to waste management. Brazil's 2010 National Solid Waste Policy, has made the principle of *shared responsibility* the maxime for SWM in which "citizens, governments, the private sector and organized civil society" participated (MMA, 2019). Nonetheless, several ministries e. g. Development, Industry and Foreign Trade, the Ministry of Planning, Budget and Management, the Ministry of Cities and the Ministry of the Environment among others are main stakeholders in the process. However, given Brazil's strong municipal sovereignty, policies are subject to initiatives on the lowest administrative level (SILVA, 2016).

In Russia, Federal Services exercise control and supervision over the compliance with the legal requirements in regard to radioactive waste management, the compliance with the health legislation, adoption of legal regulations in regard to the calculation of regulated tariffs in the area of waste management. Public authorities fulfill three responsibilities at the same time: development and consolidation of regional SWM programs, establishment of standards of their placement, supervision over objects that are subject to this regulation. Regional operators in Russia are supposed to assume the responsibility for collection, removal, and disposal of municipal solid waste to free municipal authorities of this responsibility (TERRITORIAL'NAYA SKHEMA UPRAVLENIYA TKO V MOSKVE, 2016). Recent sustainable development aspects can be identified in the national program "Clean country" (2017) in Russia that understands sustainable SWM as disposal on landfills, incineration, and recycling. As the country does not have a separate collection infrastructure for recycling, it contradicts the classical understanding of the circular scheme of zero waste and zero losses, and it is not resource-efficient.

2. OBJECTIVE: DESCRIPTION OF CASE STUDIES

The city of Moscow has 14 million inhabitants and 7.3 million km² in area and, besides from being the capital of the Russian Federation, also functions as a national industrial and economic hub. São Paulo, also a city of about 14 million, is the country's and South America's main financial and economic center and its metropolitan area of 21.5 million is the biggest in the Southern Hemisphere.

The cities have common characteristics for developing countries: Waste policies and urban planning are an acute issue on which the future environmental situation of megacities and their areas depend; the cities' urgent need to provide local problem-oriented and territorial approaches to social justice in waste policy involving citizens and decision makers. While there are cases from those cities that show how they are turning to more sustainable waste management that are exemplary of megacities, the different understanding of circular economy schemes, and different components of environmental, economic and social trends make a comparison all the more relevant to point out similarities and possible inspiration in both cases.

2.1 Moscow

The city of Moscow is the capital of the Russian Federation, the administrative center of the Central Federal District and the center of the Greater Moscow region. The area is 2,561.5 km² and its population (as of 2018) was 12.5 million. The administrative-territorial structure includes 12 administrative districts, 125 districts, 21 settlements. The territorial scheme of waste management, including municipal solid waste was developed in accordance with Article 13.3 of the Federal Law No. 89-FZ of June 24, 1998 "On Production and Consumption Waste" in the general plan of megacity development.

The sources of waste differ hugely by the types of generation and include e.g. housing facilities, construction, industry, transport, social and cultural organizations, administrative, educational, medical, entertainment, sports, , trade organizations, and public entities. In the production of food and many other objects , construction, provision of services or the process of consumption, waste is generated. The total number of facilities in the waste generation group is 91,738, with 45,015 residential and 46,723 non-residential waste generation objects (MINISTERSTVO PRIRODNIH RESURSOV, 2015).

Solid municipal waste is collected in specialized containers installed in waste collection points - on container sites, equipped in accordance with sanitary standards. Removal of solid municipal waste is carried out daily in accordance with the approved schedule, after which they are sent for treatment, disposal, neutralization, placement. The collection, transportation, processing, disposal, disposal of waste of I-IV hazard classes is carried out by legal entities and individual entrepreneurs licensed to the relevant activities.

The main actor is a regional operator. The area of activity of the regional operator includes all sources of solid municipal waste, places of their collection and accumulation in administrative districts, except for those apartment buildings where waste is handled by contractors.

The capital creates 1/5 of all household waste in Russia (11 million tons). 10% is burned, the remaining 7 million tons per year are exported to the region. the practice of separate collection of waste using mobile points (South-Western Administrative Okrug and CJSC – MK-Logistics LLC, North-Eastern Administrative Okrug, and BJSC AOJSC Charter, CJSC – EKOLine LLC, SEAD – MSK-NT Ltd.) is not effective and does not provide complete

access of the population to separate collection. The main damage will be borne not by the capital, but by the MO, which is divided into 7 clusters in a territorial disposal scheme. 5 polygons will remove and modernize the “Alexinsky Pit”, “Yadrovo”, “Nepayno”, “Volovichi” and “Khrabrovo”, and in three districts of the municipality new landfills will be opened.

2.2 SÃO PAULO

With a waste production of 4.7 million t/year and 380-402 kg/person/year, the city of São Paulo is one of the biggest waste generators of the country. While 97.8% of all Brazilian urban wastes are formally collected and disposed of, and present the highest figure among the basic sanitation indicators collected by the Brazilian Statistical Institute (IBGE, 2010), recycling is still an incipient process that is done by so-called “catadores” (waste pickers). Individual commitment to source recycling and selective recycling by public authorities are still very rare (IBGE, 2010).

The 2010 National Solid Waste Policy and Plan have foreseen the foreclosure of urban landfills until 2014-15, but the advances on the local level to create intermunicipal consortia has been going more slowly than planned (SILVA, 2018; BORGES et al., 2019). In 2013, 3,000 of the 5,570 Brazilian municipalities were still disposing their garbage on landfills, 18% of which went to dumpsites, 24% to controlled landfills and 58% in sanitary landfills (ISWA, 2013).

In São Paulo any producers of quantities >50 kg/day have to register with the City’s Waste Management Authority. Within the participatory master plan until 2030, the city developed sector-specific plans (SÃO PAULO, 2013). Its 2014 Municipal Solid Waste Master Plan, which is guided by the principles of “1. non-generation, 2. reduction, 3. reuse, 4. recycling, 5. waste treatment and 6. final environmentally sound disposal of waste” and foresees separate collection of organic and dry wastes as well as induction of source separation practices in companies (ISWA, 2015). The goals should be achieved by constructing new sorting plants. Home composting should help reduce organic wastes by 1/3 by 2033.

An interesting part of the strategies in Brazil is the use of emitted gases for energy generation, which is implemented at existing and new landfills, recognizing the effect of wastes on Global Climate Change (IBGE, 2010; ISWA, 2015). Another interesting approach, considering the great inequalities of Brazil, is the inclusion of waste pickers in achieving more sustainable urban governance. Payments for Urban Environmental Services have been estimated to generate overall annual benefits of up to 2.3 million Euros (MOURA, 2016). However, the trend of increasing privatization threatens some of those socially-minded projects (JACOBI; BESEN, 2011).

3. METHODOLOGY

This research is the product of a collaboration and a comparison between an ongoing Ph.D. research on social aspects of waste management in Russia, and an ongoing thematic project (*Cidades Lixo Zero*) and its resulting sub-aspects in municipal SWM in Brazil whose results have been discussed at FIRS in past years. Through the comparison of public data and laws as well as detailed interview data on Russia and Brazil, and in combination with former research and a survey on the BRICS, several issues in terms of priorities for public

policies and the formalization of the SWM sector were identified (POTINKARA; WEINS; SILVA, 2018; SILVA; WEINS; POTINKARA, 2019). The applied questionnaires included questions about the shaping of the system of formal and informal sectors of waste management in the cities; legislation and policy of waste management; ecological and economic challenges and possible ways of problem solving. However, as this comparison and cooperation is still in its beginning, further recognition and a widening of data about Brazilian research are planned, in order to be able to draw more analogies with the Russian survey that involved detailed interviews with 35 experts government, business, and NGO representatives. The data used for this comparison was collected in personal interviews from 2014-17 (ERMOLAEVA, 2019) and an online survey from 2018 (SILVA; WEINS; POTINKARA, 2019).

4. RESULTS AND DISCUSSION

The results of the comparison allowed for some early conclusions about similarities between the two very different case studies. Both megacities are dealing with challenges that are faced in similar ways by other countries in the Global South that struggle with the resolution of several development agendas at the same time and that cannot follow European or North American success cases, as those basic agendas have already been resolved. The issue of informality and its inclusion in waste management as a development strategy can be pointed out as the most relevant finding here.

4.1 GOVERNMENT AND GOVERNANCE PROBLEMS

Moscow is a megapolis with fast growth rates; waste generation must take into account high levels of emissions from the transport and energy complex, waste from renovation programs and new mass constructions. On the one hand, Moscow serves as a pilot platform for the introduction of new solutions in the field of waste management for Russia. On the other, it provokes the greatest number of social conflicts due to the removal of municipal waste to the surrounding region, where landfills are located and expanded. Using waste management schemes categorized by districts has proved fruitful, as initiatives of groups within them imply different programs and levels of community involvement. Hereby, more collection points for recyclables have been possible to set up, making recycling easier.

São Paulo's challenges with MSW have stemmed from a huge disintegration in its metropolitan area. With the stimulus of recent national policies, waste management organizations that take care of a great part of the neglected issues of separation and peripheral neighborhoods within the municipality and its directly bordering cities in its conurbation an inclusion of those organizational structures has contributed to better managing the situation (JACOBI; BESEN, 2011). Especially, the city's participative Master Plan process - even if not free of criticism - can be named as a successful and attractive solution to be drawn on by other megalopolises of the Global South.

4.2 CITIZEN ACTIONS

In the Greater Moscow area, there is a more specific conflict related to equity and waste management incinerators: the planning wastelands and their impacts on the growth in

waste generation are of great concern to the interviewed experts (ERMOLAEVA, 2019). In the case of Russia, new incinerator technologies could bring a solution to this problem.

The situation with the expansion of landfills received wide publicity activity and attracted citizens to create new movements like "StopVybroS" and "Dushegubka.rf", and sparked the organization for participating in separate collection. The cities near Moscow where the metropolitan city borders were expanded and where new incinerators were built according to the program, resulted in rallies involving thousands of people. The population organized rallies against "Aleksinsky", "Lesnoy" and other test sites. The nearby Vladimir region was also affected - in the town of Kirzhach, where the leader of the action was the head of the city. The authorities promised to resolve social conflicts headed by the Ministry of Ecology and the President of the Russian Federation, approving in their reports the claim of citizens about the injustice of waste separation and burial in inappropriate places. In November 2017, the Minister of Ecology of Moscow, Alexander Kogan, stated that due to local protests, the authorities were changing the *territorial scheme*. The main points of the conflict were mapped, reflecting current data as documentary evidence (MUSORNYYE BOI ZA GOD..., 2017).

The interviewed experts suggest that the easiest solutions (installation of incinerators) did not succeed with the authorities, so new waste management systems will have to be developed, however, the construction of most of the incinerators will not cancel it. The headquarters of the strongest NGOs that promote zero waste management policies are located in Moscow: "Resource Saving Center", "Separate collection", "Greenpeace", "Roseco", "Garbage. No More", "Ecological Movement ECA", and others. The network of organizations complements and reinforces their influence, including the regional exchange of ideas that supports social activities.

In Brazil, the long-standing work and organization of *catadores* have received a strong push by the 2010 National Solid Waste Policy that results in a growing number of formalized waste pickers' organizations. Civil society initiatives like the 2014 *Composta São Paulo* show bottom-up engagement and public interest in the issue of source-separation (ISWA, 2015). However, existing conflicts are much rather related to social justice issues. Jacobi and Besen (2011) point out the unfair relation between provided sanitary services and the (unjustly low) payment for them. Deeply entrenched economic inequalities reflect on consumption and related waste-generation patterns that vary enormously from center to periphery. The authors urge to look at the other end of the problem: waste reduction at the source!

4.3 COMPARISON OF SELECTED ISSUES

The two megacities have similar per capita waste generation outputs, even though Moscow's average income and a total amount of waste are higher (Table 1). It calls the attention that São Paulo's waste composition is almost half (47%) organic, while Moscow only has one fourth, presenting very different challenges concerning separation. While paper (16/24%) and plastics (10/16%) account for similar proportions in both cities, the low (1%) share of glass in São Paulo, contrasts Moscow's 11.4%. Due to the great differences in consumption patterns and collection infrastructure, the recycling rates of materials vary significantly. While there is separate data on São Paulo's very high (98%) recycling rate of aluminum, steel cans (47%) and 75% of cardboard (mainly due to hand-picking by waste pickers), as well as 85% of tyres, 45% of glass, we could not find specified recycling rates for

individual materials for Moscow. Considering water, and energy factors, as well as recycling rates are important factors in this discussion that have to be explored further.

Table 1. Comparison between selected indicators in Moscow's and São Paulo's waste management systems.

Points	Moscow	São Paulo
MSW Gener.	400-405 kg/person/year 6.6 mio t/yr	402 kg/person/year 4.7 mio t/yr
Waste Composition	Organic 24.7%; Paper, cardboard 24.3%; Glass 11.4%; Plastics 16.2%; others 23,4%.	Organic 47%; Paper 16%; Glass 1%; Plastic 10%; Metal 2%; Rubber 1%; Others 22%
Recycling Rate(s)	5-7% for all fractions	Aluminum cans 98%; Cardboard 75%, Steel cans 47%; Paper 29%, Plastics 22%, Glass 45%, Tyre 85%, PET 57% (Cempre, 2013)
Water Resources	Sufficient water output (2.5-3x > demand); 99% surface water corresponds to sanitary indicators. Full treatment cycle in 3 modernized wastewater treatment plants (still discharge of untreated sewage in nature).	Solid and liquid wastes contaminate urban water bodies (BESEN et al., 2010).
Energy Supply or incinerators	Kuryanovsk wastewater station provides electricity for 50% of its consumption and operates on biogas (10 MW). Incinerators (30 MBT) filter clear 99.99 % of emissions	First experiments of use of landfill flare gas (ISWA, 2015)
Social policy and citizens' actions	20 social conflicts against incinerators in the Moscow area; no new green jobs in waste sector thanks to national program; informal waste picking sector only of small homeless groups; policy lobby pro industrial incinerators	Waste pickers organizations more and more organized; citizen initiatives like Composta São Paulo

5. DISCUSSION AND CONCLUSIONS

The examples of the two megacities Moscow and São Paulo, despite their differences, reflect growing global concerns about waste issues in urban centers. Both cities show exemplarily how megacities' unsustainable consumption patterns pressure urban peripheries. In the cities' case studies the following main similarities were found: environmental inequality between the center and the periphery, similar rates of waste generation per capita and the percentage of recycling of the same waste fractions, as well as comparable activity of the nonprofit sector that are developed on a high level. Furthermore, both cities have a targeted waste management plan, which is implemented by districts. However, waste management policies vary according to applied waste policy strategies.

In Moscow, waste management is being modernized through changes in legislation and municipal structures, most decisions are applied by "top down governance," businesses and citizens are little involved as decision makers. At the same time, the percentage of waste recycling remains the same, since the separate collection has not yet been adjusted, the government is developing incineration technologies without considering recycling - an inefficient resource strategy in the long run. In São Paulo, the objectives of a circular economy (reduce, reuse, recycle) is being realized at the legislative level, the informal sector is self-

organized with relatively strong social policy support, involving the waste collectors in the formal system. Also, the use of energy potentials of waste, even if initial, is starting to be put into practice.

The self-organization of the population and movements of the São Paulo case seem to show more potential than the research of the case of Moscow has shown to date, at least from the point of view of implementing a sustainable non-waste economy. This allows us to conclude that individual actions for responsible disposal and collection of waste, which are carried out by a large number of citizens, are more effective than vertical governmental decisions. Recent initiatives in Russia have shown however that civil society is starting to take actions into its own hands. No matter the differences in ecological, economic and social conditions, both cases illustrate how it is not only a matter of new technologies, but also one of broader democratic and societal debate. However, we also have to point out that it is indispensable to also make the involvement of civil society and business stakeholders a mandatory step of the policy process. Here, the need for global standards for green and circular economy becomes clear. The social dimensions of socio-environmental changes have to be better understood through more perception analyses to identify bottlenecks in existing policies (BITYUKOVA et al., 2016). Once more, environmental policies give a possibility for social policies to include urgent social issues like inequality, women's rights and the right to a healthy environment to be internalized and in turn expressed through the people.

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