SOLID WASTE DISPOSAL AND CONFLICTS IN PUBLIC SPACE IN THE CENTRAL BUSINESS DISTRICT OF ITUIUTABA, MINAS GERAIS, BRAZIL*

DESCARTE DE RESÍDUOS SÓLIDOS E CONFLITOS NO ESPAÇO PÚBLICO NO NÚCLEO CENTRAL DE ITUIUTABA, MINAS GERAIS, BRASIL

ELIMINACIÓN DE RESIDUOS SÓLIDOS Y CONFLICTOS EN EL ESPACIO PÚBLICO EN EL NÚCLEO CENTRAL DE ITUIUTABA, MINAS GERAIS, BRASIL

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Abstract

The paper addresses the management of urban solid waste from the perspective of public space occupied by waste disposal in the Central Business District of Ituiutaba, Minas Gerais, Brazil, as well as the conflicts, and the negative effects for society. The research aims to identify and quantify the use of public space for the disposal of solid wastes, the conflicting relations regarding accessibility and mobility, the effects on the surroundings and on economic values. Observation, photographic register, identification of conflict situations, along with measurement of area and volume of the spaces occupied by waste disposal were carried out for the case study. Existing fixed collectors and mobile spots for waste disposal on sidewalks used by residents and shopkeepers were identified and quantified within an area of twelve blocks. The set of spots are located within 1,097.92 square feet. The study also shows its real estate prices. The presence of wastes jeopardizes the mobility of people and vehicles, affects urban cleaning services, and creates negative visual impacts. In the absence of municipal regulations, the paper presents a proposal to avoid conflicts.
Keywords: public space, solid waste, Central business district, waste management.

Resumo

Esta pesquisa aborda a gestão de resíduos sólidos urbanos do ponto de vista do espaço público ocupado com o seu descarte no Núcleo Central de Ituiutaba, Minas Gerais, Brasil, e os conflitos e efeitos negativos para a sociedade. Os objetivos da pesquisa são identificar e quantificar o uso do espaço público no descarte dos resíduos sólidos, as relações de conflitos com acessibilidade e mobilidade, os efeitos na ambiência e os valores econômicos. No estudo de caso foi realizada a observação, registro fotográfico, identificação das situações de conflitos e medição da área e do volume dos espaços ocupados pelo descarte dos resíduos. Foram quantificados os coletores existentes na área (fixos) e os pontos de descarte de resíduos deixados nas calçadas (móveis). Num espaço de doze quarteirões são identificados os pontos fixos e móveis que os

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residentes e comerciantes usam para descartar seus resíduos. O conjunto dos pontos ocupa 102 metros quadrados, sendo apresentados seus valores imobiliários. A presença dos resíduos interfere na mobilidade de pessoas e veículos, afeta o serviço de limpeza pública e produz impactos visuais negativos. Na ausência de regulamentação municipal, elabora-se uma proposta de mitigação dos conflitos.
Palavras-chave: espaço público, resíduos sólidos, Núcleo Central, gestão de resíduos.

Resumen

Esta investigación se ocupa de la gestión de los residuos sólidos urbanos desde el punto de vista del espacio público ocupado con su eliminación en el Núcleo Central de Ituiutaba, Minas Gerais, Brasil, y de los conflictos y efectos negativos para la sociedad. La investigación tiene como objetivo identificar y cuantificar el uso del espacio público en la eliminación de los residuos sólidos, las relaciones de conflictos con accesibilidad y movilidad, los efectos en el ambiente y los valores económicos. En el estudio de caso se realizaron la observación, el registro fotográfico, la identificación de las situaciones de conflictos y la medición del área y del volumen de los espacios ocupados por la eliminación de los residuos. Fueron cuantificados los colectores existentes en el área (fijos) y los puntos de eliminación de residuos dejados en las aceras (móviles). En un espacio de doce cuadras son identificados los puntos fijos y móviles que los residentes y comerciantes utilizan para deshacerse de sus residuos. El conjunto de puntos ocupa 102 metros cuadrados y se presentan sus valores inmobiliarios. La presencia de residuos interfiere en la movilidad de las personas y los vehículos, afecta el servicio de limpieza pública y produce impactos visuales negativos. Como no hay reglamentación municipal, se elabora una propuesta para resolver los conflictos.
Palabras-clave: espacio público, residuos sólidos, Núcleo Central, gestión de residuos.

Introduction

The city is a form of organization of space that mirrors the features of society and, within the meaning of modern metropolis, constitutes a product of the market economy. The organization of space in the city occurs with highly differentiated usages, like in the central area as well as industrial and residential regions affected by daily flows of commuters, consumers, and of capital itself (Corrêa, 1997).

Santos (1998, p. 25, our translation) understands the space as a "result of human action on the space itself, intermediated by natural and artificial objects."[1] The space is seen "as a relational reality, things and relations altogether", with physical objects and human activities in ongoing interaction.

Along the same lines, Santos (2008, p. 67, our translation) argues that the space "[…] constitutes an objective reality, a social product in permanent process of transformation. The space imposes its own reality and, consequently, society cannot operate outside of it."

In the occupation of urban space there are concentration of activities with various land uses, such as commerce, services, and transport, creating a centralization process that forms the central area which is

"[…] a result of the market economy taken to the extreme by industrial capitalism" (Corrêa, 1997, p. 123, our translation).

This concentration promotes a significant economic valorization of urban space, influencing maximized usage of the square foot by the social actors who create the urban space, with highlight in the Central Area and more intensity in the Central Business District (CBD).

The CBD emerges from the studies of the city's internal structure about the formation of urban space, being the Chicago School's model the best-known example. This model is "based on the radial expansion of the City of Chicago in the early twentieth century, starting from the central core, known as the Central Business District (CBD)" (Strohaecker, 1988, p. 171, our translation).

The CBD has been described by Murphy, Vance, and Epstein (1955) apud Ribeiro Filho (2004, p. 156, our translation), using as criteria the "land price, commercial strength, vertical integration, and flow of pedestrians and vehicles." In this regard, the price of land is "the essential aspect that permeates the core's internal organization […]."

High land price in CBD encourages business enterprises to exploit to the maximum its internal area and get the highest return on investment, whether by purchasing (property) or renting and taxes. Thus, private activities carried out in public space promote the occurrence of negative externalities and socialization of private costs.

The concept of externality was originally formulated by Pigou, in 1920, being recently addressed around environmental issues due to the worsening of environmental quality and the cost of de-pollution becoming considerably high (Maimon, 1992).

For Maimon (1992, p. 260, our translation), the "externalities manifest themselves when market prices do not fully incorporate the costs and benefits of economic actors […]." Thus, private costs become distinct from social costs, so that only the application of conventional economics leads to the maximization of private costs and to the distribution of environmental and social problems.

According to Field and Field (2014, p. 51, our translation), "the private costs of an action are the costs faced by the party that makes the decisions that lead to this action", whereas the "social costs of an action are all the costs of an action, regardless of who bear such costs." The authors emphasize that the social costs include the private costs, but they may comprise much more in certain situations.

The consumption relationship in CBD promotes the creation of solid wastes (SW) which require environmentally sound disposal, defined by the Law 12,305, from August 12, 2010, art. 3, item VII, as the "disposal of wastes that includes reuse, recycling and composting, recovery, and energy production, or other destinations permitted by competent bodies […]" (Brasil, 2010, p. 2, our translation).

With the use of public spaces, the inadequate disposal generates dirt, conflicts with accessibility and mobility, negative effects on urban drainage and on the surroundings, and consequently welfare loss, along with greater difficulty for urban cleaning service workers.

For the mediation of conflicts between diverse uses and local actors in shaping the space and its occupation, the state acts as an arbiter in the organization and reorganization of urban space (Corrêa, 1997). This role has been defined by the 1988 Federal Constitution (art. 30) that puts the government in charge of collection and disposal of solid wastes.

The National Policy of Solid Waste (NPSW), established by the Law no. 12,305/2010, created a national regulatory framework for dealing with solid waste management, with principles, objectives, concepts, responsibilities, and prohibitions. One of NPSW's goals is the Integrated Management of Solid Wastes (IMSW), defined by the art. 3, item XI, as the "set of actions geared toward the search for solutions to solid wastes, taking into consideration the political, economic, environmental, cultural, and social dimensions, with social control and under the premise of sustainable development" (Brasil, 2010, p. 2, our translation).

The integrated management proposes a systematic approach of multidisciplinary character in the analysis of problems and search for solutions, allowing the application of different knowledge to address the issue of solid wastes and its relation with society and the environment, in addition to distinct local actors and their responsibilities.

The generation of Urban Solid Wastes (USW) is prevalent in CBD, whose classification as to their origin, according to NPSW, art. 13, item I, includes household wastes (produced from activities in homes) and urban cleaning wastes (produced from sweeping and cleaning of streets and public spaces) (Brasil, 2010).

Non-hazardous waste produced by traders and service providers may be equated by the government as household waste, according to its nature, composition, or volume (Brasil, 2010). In this case, they are collected by the municipal cleaning service, comprising the USW.

The devices used for packaging solid wastes (containers, trash bins, collectors) serve as disposal spots until they are collected by the urban cleaning service. The distribution of these devices within the urban space represents one of the relevant aspects in the collection system, together with the behavior of people and the place and time where business waste is discarded.

In order to obtain a better analysis and comprehension in respect to the use of public space for wastes disposal and to existing conflicts, it was applied an integrated approach between geography, integrated management of solid wastes, and environmental economics. The integration of these areas takes place through the following factors: the political, economical, environmental, cultural, and social dimensions of the IMSW (Brasil, 2010); the process of analysis and construction of the space in face of the examination of the totality, where the interrelations between factors "not rarely turn extremely difficult to separate the influences on a defined space […]" (Santos, 2008, p. 71, our translation); the state's role as a player and mediator of conflicts (Corrêa, 1997); "[…] the economic, social, political, and cultural aspects are altogether making up a harmonious framework in the scope of space formation […]" (Corrêa, 2000, p. 18, our translation); and the incorporation of negative externalities for the internalization of social costs by business enterprises (Maimon, 1992; Field; Field, 2014).

This analysis aims to better understand the complexity of the factors that make up the context. This "totality", according to Santos (2008, p. 71, our translation), "is a valid construction in the analysis of complex factors to be examined in the analysis of the spatial context." For the author, since totality is a comprehensive concept, and since it is not possible to study the whole through the whole, it is wise to divide the whole into parts for a more concrete examination.

For Santos (1998, p. 17, our translation), "the changes that occur in the territory, in its organization forms, end up invalidating the concepts inherited from the past and forging the renewal of analysis categories." Thus, with the interdependencies between variables, being a cause and consequence of others, the actual value is in the pooled analysis.

This approach of integrating fields of knowledge in research works is also advocated by Santos (2011, p. 80, our translation), who understands the interdisciplinarity as "the only way to account for the phenomena related to modernity", suggesting "a new approach in the treatment given

to human problems." According to the author, the changes in the use and management of the territory are unavoidable if we want to create a new kind of citizenship, as opposed to what happened in Brazil, where instead of citizens, consumers were created.

Therefore, to study the space we must grasp its relationship to society, the activities that occur at the place and on the analyzed context, which lead to diverse uses and make up a particular totality.

In short, the research seeks to identify and quantify the use of public space for the solid waste disposal for the daily collection in CBD, the conflicting relations regarding urban accessibility and mobility, the effects on the ambience, and the real estate prices involved in land use. Also, the research seeks to contribute with suggestions for better use of space, with less negative impacts and improved well-being.

Methodological procedures

The research modality used was the case study method that consists in "an empirical inquiry that investigates a phenomenon within its real-world context, particularly when the boundaries between phenomenon and context may not be clearly evident" (Yin, 2001, p. 32, our translation). One feature of this method is to be based "on multiple sources of evidence, with the data needing to converge […]" (Yin, 2001, p. 33, our translation).

At first, an exploratory study was carried out for better understanding and delineation of the space to be evaluated as well as the diversity of existing uses.

The bibliographic research was used to identify studies on the subject, delineate the area to survey empirical data, and establish a framework for analysis and interpretation as well as the means to present the results.

Regarding the field work, the space was observed and photographed on alternate days and times from May to July 2013. The activities comprised of identifying usage of public space, the positive and negative situations found, the time of disposal by establishments, the means of disposal (in containers and collectors or on sidewalks), barriers to the movement of people, obstructions in parking lots, obstruction to collection on daytime for recyclable waste pickers, in addition to the effects on the environment and on the urban drainage system.

The reports of cleaning service workers were collected through focal interview, which according to Yin (2001, p. 113, our translation) are "spontaneous interviews that take the shape of informal conversations", but following a certain set of questions. In this format, the interviewer allows the interviewee to speak freely, but without deviating from the subject and exploring the lived experience under fixed conditions (Gil, 2006).

These interviews, in the form of informal conversations with two pairs of laborers who worked at CBD, completed the observations about the uses, conflicts, and negative effects of inadequate waste disposal.

Solid waste disposal points were divided into fixed and mobile spots. The fixed spots comprised of containers, collectors, and installed trash bins (Figure 1). The mobile spots are disposal sites for wastes left on the sidewalks or on the streets.

Figure 1 - Type of collectors (fixed spots) in the study area (A-container, B- manhole fiberglass waste bin, C- old fashioned recycle bin, and D-trash dumpsters used by households).
Source: MINÉU, H. F. S. (Jun/2013)

In each spot, fixed and mobile, the measurement of length, width and height was obtained to determine the area and volume permanently (fixed spots) or temporarily (mobile spots) occupied by waste.

The fixed spots were measured on Sunday (June 30th), due to lower traffic and movement of people. The mobile spots were measured between Wednesday (July 7th) and Friday (July 12th), starting at 17:45 hrs, in order to collect data close to the end of the trading day and before the waste collection by the urban cleaning service, and the selective collection by the Recycling Cooperative.

For pricing the spaces occupied with disposal spots, the *per* square foot price in the study area was used in accordance with the amounts under study by the City Hall for updating the collection of property tax (*Imposto Predial e Territorial Urbano - IPTU*).

The delimitation of the central area and central business district was based on the work of Teixeira e Oliveira (2011), complemented by field survey with GPS Garmin 64s, creation of SHP layer to incorporate into georeferenced map, with the Quantum GIS software (QGIS), version 2.8.3.

The municipality urban perimeter was obtained at the City Hall, through the Planning Secretariat, in digitized map in DXF format, imported into QGIS, georeferenced and entered into the location map.

Characterization of the municipality and of the study area

The municipality of Ituiutaba (Figure 2) is located in the Triângulo Mineiro region, in Minas Gerais, Brazil. It has a population of about 102,690, according to estimates based on 2010 census. The municipality showed a significant increase in the Human Development Index (HDI) in recent decades, from 0.535 in 1991 to 0.653 in 2000, reaching 0.739 in 2010 (IBGE, 2015).

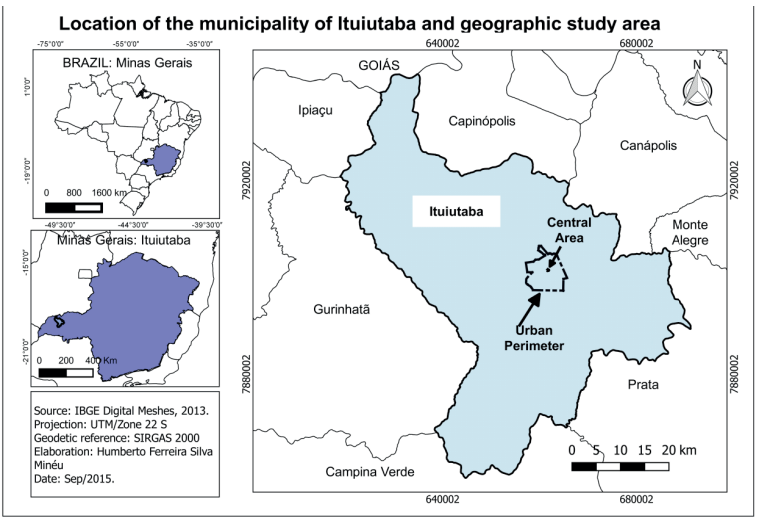

Figure 2 - Location of the municipality of Ituiutaba, Minas Gerais, Brazil.

The generation of solid waste is increasing in the municipality (Table 1), influenced by population growth, income improvement, expansion of economic activities, and urban development.

Table 1 - Evolution of urban solid waste sent to landfill (T)

	2008	2010	2012	2014
Annual total (T)	19,726.43	20,784.72	24,368.87	23,584.44
Monthly average (T)	1,643.869	1,732.06	2,030.739	1,965.37

Source: City Hall of Ituiutaba/Department of Constructions

Organization: MINÉU, H. F. S. (2015)

The municipality has a landfill and a cooperative-run selective collection service, with conventional and selective collection done on a daily basis in the study area.

The study area was delineated as the CBD of Ituiutaba city, according to the study done by Teixeira and Oliveira (2011). In the streets on the borders of CBD with the Peripheral Region to the Center and the Mixed Region, the spaces occupied by waste were evaluated on both sides, considering that its generation and collection occur on the street as a whole.

The uses of public spaces in the Central Business District

The researchers observed the following usages: solid wastes on sidewalks (mobile spots); containers and trash bins (fixed spots); intense movement of pedestrians and vehicles; parking lots for cars, motorbikes, and bicycles; movement of cargo bicycles and vehicles; the flow of the eleven bus lines that serve the city; informal trade; pickers of recyclable materials; and urban cleaning service workers.

This plurality of intensive uses provokes inevitable problems due to space being limited. The space itself does not expand and retract according to demands and dynamics of activities, since the physical space is only one to meet all the activities.

This situation requires the state participation, taking as premise the regulatory framework established by NPSW (Brasil, 2010), represented by the local government, influencing the actions of local actors, mitigating conflicts in face of the various uses, as pointed out by Corrêa (1997), in addition to the internalization of social costs by business enterprises (Maimon, 1992).

Thus, there exists a complex totality, according to Santos (2008). There are constant changes in the economy, the politics, the social relations, the landscape, the culture, and the environmental issues, thus, the measures adopted in one of these dimensions affect other measures. It is therefore advisable to analyze each dimension of this totality (political, legal, economic, cultural, social, technological, and environmental), contributing to better understand the context and the relations of cause and effect, as well as the work in the process of (re)construction of the studied space and existing relations.

Spatial organization of solid wastes in the Center Business District

The spatial distribution of SW disposal spots for collection in CBD has been represented in fixed (89) and mobile (116) spots, totaling 205 spots (Figure 3).

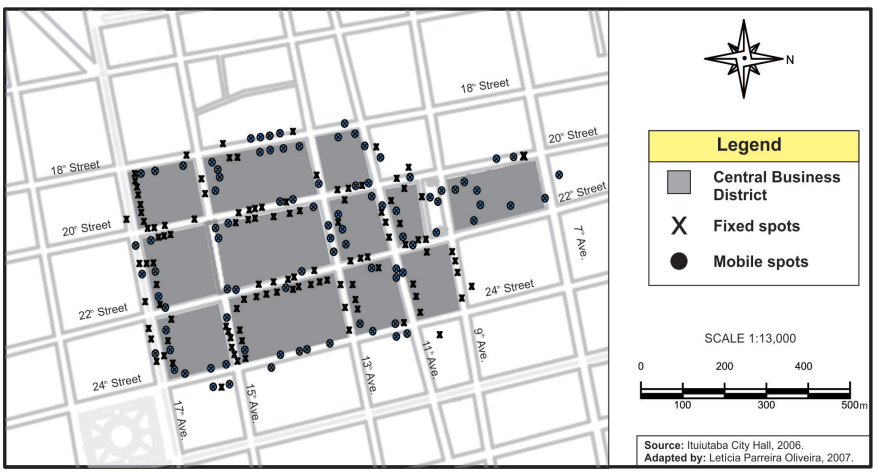

Figure 3 - Distribution of SW in fixed and mobile spots in the Central Business District
Source: Elaboration of the point distribution by Minéu (2014), organization of the image by Letícia Parreira Oliveira (2014).

The fixed spots are distributed throughout the CBD, which is expected because it is a planned distribution of containers and collectors by the urban cleaning service and of trash dumpsters placed in front of households (on sidewalks) by owners.

Two-hundred-liter drums were placed at these spots on sidewalks used by some commercial establishments and residential buildings for the disposal of their SW. In this study, they represent the permanent occupation of public space.

In relation to the mobile spots, their concentration was observed on the 20th and 22nd streets, between 17th and 11th avenues; on 17th Ave., between 18th and 24th streets; and on 15th Ave., between 22nd and 24th streets. This space concentrates the largest trade and services activities and flow of pedestrians, as confirmed by reports of urban cleaning workers, with wastes amid motorcycles and cars, as well as people discarding waste as soon as a place is cleaned.

The spatial pattern represents a starting point for "questionings about the genesis, dynamics, social actors and their practices, as well as the impacts of social forms on society" (Corrêa, 2000, p. 9, our translation). In this sense, flows and fixed commercial establishments play an important role by influencing the arrangements and displacements.

The spatial organization of mobile spots, along with the more intensive spatial distribution of the commercial activity, services, and flows, corroborates Corrêa's (2000) statement and reinforces the need to identify better conditions for society itself. This improvement involves the application of NPSW, through the means of integrated management of solid wastes (Brasil, 2010), and the promotion of space (re)construction through a new relationship with society (Santos, 2008), integrating trade, the use of space, and people's well-being, contributing to minimize conflicts.

Conflicts and effects of solid waste disposal in the Central Business District

The conflicts identified in this research resulting from the disposal of waste by residents, businesses, and consumers, include: obstacles to the movement of people; obstructions to access for drivers and motorcyclists in parking lots; recyclables pickers (in many forms of hauling) affecting the traffic; public transport prevented from properly stopping at bus stops due to the interference of collectors; and more effort and risk for urban cleaning service workers.

These conflicts reveal the dispute for space between the various activities, with local actors seeking to defend their interests – selling, buying, getting around, collecting wastes –, which is relevant to the local economy.

The conflict of access to parking and vehicles (cars and motorcycles), regarding inappropriate waste disposal (Figure 4), occurs largely due to the waste discarded well in advance the time of collection. This type of conflict takes a different form with fixed collectors, at times when the doors of parked cars are too close to them.

A B

Figure 4 - Conflict situation between SW disposal on sidewalks and parking of cars (A) and motorcycles (B).
Source: MINÉU, H. F. S. (Jun. 2013)

A negative effect on traffic flow is the presence of waste pickers with wheelbarrow, utility vehicle, horse-drawn wagon, and motorcycle-drawn wagon, collecting recyclable material on sidewalks or from containers along the day. This conflict becomes more intense in late afternoon, when shops at the end of the workday place more waste materials on sidewalks, attracting a greater number of collectors, which coincides with traffic peak hours.

Figure 5 - Autonomous pickers collecting waste materials horse-drawn wagon in dispute of space with the flow of vehicles, parking and bus stops.
Fonte: MINÉU, H. F. S. (Jul. 2013)

The SW on sidewalks at day time creates less space for people to walk, negatively impacting their accessibility and mobility (Figure 6A), or creating barriers to the movement of people, particularly the ones in wheelchair, stroller or walker (Figure 6B).

A B

Figure 6 - Demonstration of the negative impact of inadequate waste disposal on sidewalks, affecting (A) or blocking (B) the movement of people.
Source: MINÉU, H. F. S. (Jul. 2013)

During the study period, researchers did not observe the presence of government agencies orienting or inspecting those practices in order to attenuate conflicts. They neither identified measures or regulations for local actors in CBD, diverging from Correa's (2000) theory, according to which the government must act to mediate conflicts.

The researchers also observed a "creative" practice of SW disposal during the day (Figure 7A), with SW discarded under an enterprise advertising material, which does not mean it is correct, particularly under the norms stipulated by the NPSW (Brasil, 2010). They are alternative solutions that each SW generator individually seeks, due to the lack of collective solutions that could be articulated by government agencies or associations.

Figure 7B illustrates the inadequate disposal in dumpsters, when people use them to "get rid" of their waste in the first place they find, although they are intended to collect debris. This only increases the problem, because the mixture results in the loss of quality of construction debris and the loss of SW that should be sent to selective collection.

A common behavior of people is the inadequate disposal of SW on the streets, due to the simple habit of throwing them on the floor as

they walk. The dispersal of these wastes affects the local surroundings (Figure 8A), inducing further inappropriate disposals, dirtying places shortly after cleaning.

A B

Figure 7 - Alternative solutions used by commercial enterprise and by people to dispose solid waste under advertising material (A) e dumbsters (B)

Source: MINÉU, H. F. S. (Jul. 2013)

A B

Figure 8 - Effect of inappropriate disposal of SW in the surrounding (A) and in manholes (B)

Source: MINÉU, H. F. S. (Jul. 2013)

The wastes discarded by people also cause significant impact on the urban drainage system (Figure 8B), with reduction of its capacity and even clogging situations. The SW which cause the majority of these problems are the advertising materials (booklets, leaflets), distributed to consumers by stores and media agency workers, or when they are placed on parked cars and motorcycles. For the most part, these materials are discarded by people while circulating in the CBD or on the streets when arriving at their vehicles.

The fact of waste falling in the gutter next to the curb causes more difficulty for urban cleaning service workers, who reported that these materials are spread in parking lots, making their work slower, more laborious, and affecting its quality.

These situations illustrate the society's relationship with the space in a specific context, confirming Santo's (2008) theory, according to which the actions of people and businesses collectively influence the occupation of the space.

The economic issue in the occupation of public space with solid wastes in CBD

The research survey identified 89 fixed spots (containers, dumpsters, and trash bins), occupying an area of 44.3 m^2 and a volume of 55.1 m^3. Regarding the mobile spots, it identified an average of 116 spots, occupying and area of 58.1 m^2 and a volume of 28.9 m^3 (Table 2).

Table 2 - Quantity, area, and volume occupied with mobile spots for disposal of solid waste in the Central Business District

Week days	No. of Spots	Area (m^2)	Volume (m^3)
Wednesday (10.07)	114	60.9	31.8
Thursday (11.07)	129	76.8	43.4
Friday (12.07)	112	59.5	31.7
Monday (15.07)	118	48.7	21.9
Tuesday (16.07)	107	44.6	15.8
Average	**116.0**	**58.1**	**28.9**

Source: Fieldwork

Organization: MINÉU, H. F. S. (2013).

The greatest quantity of mobile spots (56.6%) the fixed spots (43.3%), as well as of occupied area, indicates that the designated space in an organized manner at fixed spots is not sufficient to accommodate the generated SW; the cultural issue is still relevant in keeping SW disposal at the "door" (on the sidewalk) or at the closest spot possible; and the economical issue, due to the high price of square foot that discourages businesses to allocate enough storage area until the disposal time of their waste.

The concentration of mobile spots in the CBD, shown in Figure 3, coincides with the area with higher price of square foot. The City Hall,

conducting a study for updating the price of property tax, estimates the *per* square foot price in this area as R$ 1,805.00 (around USD 550.30) [2], and in the remaining area of the CBD the *per* square foot price is R$ 972.00 (around USD 294.34)[3]. These factors influence managers' decisions to make the most return on investment in the area (land).

These prices demonstrate how much the property, rent, and levied taxes represent the investment of the private sector that seeks to explore the most of its indoor area with the business. As a result, it reduces the storage of products (stock) and even items such as cleaning and maintenance supplies, as well as solid wastes. This logic reinforces the question related to the distinction between private and social costs, with the generation of externalities and socialization of private costs, corroborating Field and Field (2014) and Maimon (1992).

This rationale and decision lead to the disposal of bulky materials (mostly cardboard) on sidewalks during the day, often gathered by collectors, but contributing to the conflicts in the dispute for space, and affecting accessibility and mobility. At the end of the day, this process is intensified by the remaining waste discarded in public space, which represents a negative externality.

The allocation of internal space at the establishment for temporary waste storage until the time of collection or disposal at places previously set by the government represents a form of internalization of social costs, approximating private and social costs. Thus, the price paid by consumers would better reflect the social optimal price, with the incorporation of environmental issues, in this particular case, the proper disposal of solid waste.

Conclusions

The contribution of this study is in its form of analysis, made through the integrated approach between geography, integrated solid waste management, and environmental economy, in the research interdisciplinary perspective, as the best form to analyze modern phenomena. The study addressed the use of space in the Central Business District with the disposal of solid waste, the generated conflicts, and the negative impacts on the surroundings and the urban drainage system.

The results show a significant use of public space for SW disposal with lack of organization. High square foot prices persuade businesses to avoid designating their own area to store their waste.

The individual manner of each actor solving the problem of their waste disposal in public space results in conflicts with urban accessibility and mobility, creating barriers, obstructing movement, and affecting the autonomy of people's comings and goings.

The spread of solid waste impacts the surroundings and the urban drainage system. It also increases the labor of urban cleaning service workers, resulting negative externalities of businesses. The environmentally adequate final destination represents an incorporation process of the externalities, with the company's internalization of social costs and fulfillment of responsibility in regards to its solid wastes.

The absence of government action in the orientation, inspection, information, and regulations, regarding the proper disposal of solid waste in the CBD, leaves a gap in its role as a mediator of conflicts, jeopardizing the well-being of consumers and actors involved.

The SW issue addressed in this paper involves the quest for shared solutions between the government and the private sector. Thus, in order to mitigate the problems identified through the application of the dimensions pertaining the Integrated Solid Waste Management, the geography, and the environmental economy, we suggest the following measures: a) implementation by businesses of internal spaces sufficient for the temporary storage of their SW, with separation of recyclable and non-recyclable materials; b) government incentive to businesses and households which adopt the internal space and selective collection, for instance, through property tax (IPTU) discounts; c) government creation of Green IPTU, offering discounts for owners who adopt environmentally sound measures; d) delivery of materials by businesses and other SW generators at a predetermined place and time by the government in its local regulations; e) delivery of recyclable materials to the Recycling Cooperative, encouraging formal activity, and reducing the frequency of informal collectors' activities during heavy flow times, thus, contributing to better organization of flows in the Central Business District; f) adjustment in the sweeping service schedule, avoiding risks to workers, and promoting better working conditions at times of lower temperature and less intensive flows; g) increased storage capacity and better spatial

distribution of containers to accommodate the volume of generated waste, as well as collection after close of business hours; and h) orientation and inspection by the government in conjunction with consumers and businesses.

Notes

1 All quotations were translated from Portuguese into English.

2 Exchange rate of BRL 1.00 = USD 0.31 on September 26, 2016.

3 Idem.

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Author contributions in the development of the paper:

All the authors offered substantial scientific and intellectual contributions to the study. The conception and design of the study, manuscript preparation and writing, as well as, a critical review were developed in group. The first author was especially responsible for the conceptual and theoretical development, the acquisition of data and its interpretation and analysis; the second and third authors contributed with a theoretical and conceptual review besides helping with the discussion of the results obtained.

Received for publication on 14 August 2016
Accepted for publication on 25 September 2016