



# Economic valuation of urban solid waste: a review

## Valoração econômica de resíduos sólidos urbanos: uma revisão

Anny Kariny FEITOSA [1](#); Júlia Elisabete BARDEN [2](#); Odorico KONRAD [3](#)

Recibido: 28/09/16 • Aprobado: 20/10/2016

### Content

- [1. Introduction](#)
  - [2. Environmental Economic Valuation](#)
  - [3. Material and methods](#)
  - [4. Results and Discussions](#)
  - [5. Conclusions](#)
- [References](#)

#### ABSTRACT:

This article is a systematic literature review spanning the last decade on economic valuation applied to urban solid waste management. The articles showed a willingness to pay value (WTP) of citizens ranging from 55% to 85.5% regarding improvements in urban solid waste management. Regarding the willingness to contribute to selective collection programs, the studies reported that the main determining factors were income, schooling and age. As for management expenditures with urban solid waste management, they are lower when there is community involvement. Thus, communities should be encouraged to participate in waste management to promote environmental, institutional, economic and social sustainability.

**Keywords:** Environmental valuation; Economic valuation; Solid Waste.

#### RESUMO:

Este artigo apresenta uma revisão sistemática de literatura sobre a valoração econômica aplicada à questão dos resíduos sólidos urbanos. As obras apresentaram a disponibilidade a pagar dos municípios oscilando de 55% a 85,5% com relação a melhorias no sistema de gestão de resíduos sólidos. Sobre a disponibilidade a contribuir em programas de coleta seletiva, os fatores determinantes foram renda, escolaridade e idade. Percebeu-se que os custos com a gestão de resíduos sólidos são menores quando há participação da comunidade. Deve haver maior incentivo à participação da comunidade na gestão de resíduos, para promover sustentabilidade ambiental, institucional, econômica e social.

**Palavras-chaves:** Valoração Ambiental, Avaliação Econômica, Resíduos Sólidos.

## 1. Introduction

Studies on environmental economic valuation provide a significant contribution in the field of economic sciences for an integrated management decision-making process regarding environmental resources, as they favor the processes of guidance, design and application of the strategies and policies applied to the protection and preservation of environmental goods and services (Santoyo et al., 2013).

Concerning urban solid waste management, according to Adam et al. (2015, p. 49), "the concern with solid waste pollution is one of the various dimensions of environmental concerns. This variable is

commonly applied in studies on economic valuation of different aspects of solid waste management services”.

In order to obtain knowledge on the prevalent themes addressed in the discussion of economic valuation applied to urban solid waste management, the present article proposes a systematic literature review spanning the last decade, by searching scientific papers at the bases Portal de Periódicos (CAPES), *Springer*, *Science Direct* and *SciELO*, using the descriptors *Environmental Economic Valuation*; *Economic valuation and solid waste*; and, *Economic valuation and solid waste management*. Finally, the selected articles were analyzed and grouped by theme, using construction of analysis categories (Bardin, 2011).

## 2. Environmental Economic Valuation

According to Motta (1998, p.13), obtaining the total economic value of an environmental asset consists in:

Determine how much better or worse will be the people’s wellbeing due to changes in the quantity of environmental goods and services, either through their use or not. Thus, the methods of environmental valuation will fulfill this goal if they are able to contemplate the different economic value components of the environmental asset.

Thus, the total economic value (TEV) of environmental resources can be understood according to its attributes, considering its use (Use Value – UV) and non-use (Non-Use Value – NUV). The use values are classified into Direct Use Value (DUV) and Indirect Use Value (IUV). The VERA (TEV) expression and its composition are shown below:

$$TEV = (DUV + IUV + OV) + EV \tag{1}$$

Motta (1998) presents the general taxonomy of the Economic Value of Environmental Resources, as follows (Table 1):

Table 1 – General taxonomy of the Economic Value of Environmental Resource

<b>Economic Value of the Environmental Resource</b>			
Use Value			Non-Use Value
Direct Use Value	Indirect Use Value	Option Value	Existence Value
Environmental goods and services directly obtained from exploitation of the resource for present consumption (on the same day)  For example: food, medicine, tourism.	Environmental goods and services generated from ecosystem functions and entirely obtained and consumed on the same day  For example: protection of water bodies, waste storage and recycling, etc.	Environmental goods and services of direct and indirect uses to be obtained and consumed in the future.  Preservation of direct and indirect use values.	Value not associated to current or future use and that does not reflect moral, cultural, ethical issues  For example: forests, cultural, religious and historic values.

Source: adapted from Motta (1998).

According to Motta (1998), the valuation methods are Methods of production function and Methods of demand function, subdivided as follows:

- Methods of production function subdivided into marginal productivity and substitute market goods (replacement, defensive expenditures or avoided expenditures and control expenditures); and,

- Methods of demand function that can be complementary market goods (hedonic pricing and travel cost prices) and contingent valuation method.

In turn, Rodrigues and Santana (2012, p. 303) classify the techniques of economic valuation of resources into four groups, as follows:

- Conventional market approaches by market prices or shadow prices as approximation;
- Domestic or household production functions.
- Hedonic pricing methods; and,
- Experimental methods.

Thus, several methods can be used in the valuation of an environmental resource. However, the choice of the most appropriate method depends on the specifications of each study, according to the objectives pursued. Among the methods shown, Contingent Valuation Method (CVM) is considered an effective tool to assess environmental goods and services, as well as public goods not provided by traditional markets. This method also captures individuals' preferences in hypothetical markets because of its flexibility that allows estimating both use and non-use values of these assets. (Gullo & Gregori, 2011). According to Rabelo Neto et. al. (2014, p. 112), the Contingent Valuation Method:

Attempts to estimate the benefits of public goods and services not traded in traditional markets. In accordance with the economic theory, this method estimates the value economic agents are willing to pay (WTP) for the availability of public goods, based on hypothetical markets. Simulation of these markets is made by surveys where respondents are directly asked about their contingent valuation of the assets.

Therefore, the method consists in asking the individuals to state their willingness to pay (WTP) on contingent situations, that is, on a specific hypothetical scenario. So, willingness to pay (WTP) or to accept/receive (WTA) is assumed according to the variation in the availability of the specific environmental resource (Motta, 1998).

McFadden (1994) (Rodrigues & Santana, 2012, p. 303) stress three factors in the assessment of contingent valuation studies. The CVM should be:

- a) robust, in the sense that the outcomes cannot be substantially altered by changes in the study format, survey design and instructions. The latter which should be applicable to all the individuals;
- b) statistically reliable, so that the distribution of WTP (Willingness to Pay) or WTA (Willingness to Accept) is estimated with a satisfactory accuracy, through the use of samples with appropriate sizes; and,
- c) economically sensitive, so that the individuals preferences measured by the CVM are consistent with rationality requirements (e.g. transitivity) and widely consistent with the sensitive characteristics of economic preferences (e.g. fraction of the individual budget that corresponds to its WTP or WTA, as well as plausible income-elasticity).

Thus, according to the above described factors, the CVM is a suitable method for estimating the benefits of a given environmental good or service, through the assessment of the Willingness to Pay of the population, related to their well-being.

### 3. Material and methods

A systematic literature review was performed for the construction of a theoretical-scientific reference on economic valuation applied to urban solid waste management. Searches were made to bases Portal de Periódicos (CAPES), *Springer*, *Science Direct* and SciELO. Articles available in the internet published from 2006 to 2015 were selected based on the following guiding question and descriptors:

How has environmental economic valuation applied to urban solid waste management been addressed in the literature? Descriptors: *Environmental Economic Valuation*; *Economic valuation and solid waste*; and, *Economic valuation and solid waste management*.

The articles were selected after reading of both title and abstract and further identification of those related to the guiding question (TABLE 2).

<b>YEAR</b>	<b>TITLE</b>	<b>AUTHORS</b>
2006	Comparison of contingent valuation and choice experiment in solid waste management programs in Macao	JIN, J.; WANG, Z.; RAN, S.
2006	Estimating the public preferences for solid waste management programs using choice experiments in Macao	JIN, J.; WANG, Z.; RAN, S.
2006	Valuation of externalities of selected waste management alternatives: A comparative review and analysis	ESHET, T.; AYALON, O.; SHECHTER, M.
2006	Ecological–economic modeling for strategic regional waste management systems	SHMELEV, S. E.; POWELL, J. R.
2006	Alternative approaches for better municipal solid waste management in Mumbai, India	RATHI, S.
2006	Potencial de reciclaje de los residuos de una institución de educación superior: el caso de la Universidad Autónoma de Baja California	ARMIJO DE VEGA, C. A.; OJEDA-BENÍTEZ, S.; RAMÍREZ-BARRETO, E.; QUINTANILLA-MONTOYA, A.
2007	Factors and values of willingness to pay for improved construction waste management – A perspective of Malaysian contractors	BEGUM, R. A.; SIWAR, C.; PEREIRA, J. J.; JAAFAR, A. H.
2007	La fracción orgánica de los residuos sólidos urbanos como fuente potencial de producción de biogás	LLORÉNS, M. C. E.; TORRES, M. L. T., ARRECHEA, A. P. A.; NAVARRO, R. M.; COLOMINA, A. F.
2007	Composição gravimétrica de resíduos sólidos aterrados	MATTEI, G. ; ESCOSTEGUY, P. A. V.
2008	Using a Contingent Valuation Approach for Improved Solid Waste Management Facility: Evidence from Enugu State, Nigeria	FONTA, W.M.; ICHOKU, H. E.; OGUJIUBA, K. K.; OCHUKWU, J. O
2008	Estudio de composición de los residuos sólidos urbanos, en Esparza, Puntarenas, Costa Rica	QUIJADA, O. ; SOTO CÓRDOVA, S.
2009	Life cycle assessments of municipal solid waste management systems: A comparative analysis of selected peer-reviewed literature	CLEARY, J.
2009	Influencia de la Separación de Residuos Sólidos Urbanos para Reciclaje en el Proceso de Incineración con Generación de Energía.	POLETTO, J. A.; SILVA, C. L.
2009	Measuring individuals' valuation distributions using a stochastic payment card approach: application to solid waste management in Nigeria	ICHOKU, H. E.; FONTA, W. M.; KEDIR, A.
2009	Estudo de cenários para o gerenciamento dos resíduos sólidos urbanos de Curitiba.	MELO, L. A.; SAUTTER, K. D.; JANISSEK, P. R.
2010	Municipal solid waste management, source-separated waste	SARKHEL, P.; BANERJEE, S.

	and stakeholder's attitude: a Contingent Valuation Study.	
2010	Diagnóstico da gestão dos resíduos sólidos urbanos do município de Flórida Paraná	ALBERTIN, R. M. A.; MORAES, E.; ANGELIS NETO, G.; ANGELIS, B. L. D.; COVERLONI, E.; SILVA, F. F. S.
2010	Estudo dos resíduos sólidos domésticos de Lajeado/RS pela caracterização gravimétrica.	KONRAD, O.; CASARIL, C. E.; SCHMITZ, M.
2011	Gestão integrada de resíduos sólidos urbanos – uma proposta para o município de Paranavaí, Estado do Paraná, Brasil	NAGASHIMA, L. A.; BARROS JUNIOR, C.; ANDRADE, C. C.; SILVA, E. T.; HOSHIKA, C.
2011	Are households willing to pay for full-cost solid waste collection? Evidence from Kumasi Metropolis of Ghana	OWUSU, V.; BOAHERG, J. M.; SUNDBERG, C.
2011	Diagnóstico da gestão de resíduos sólidos urbanos no município de Rolândia (PR)	MELO, A. C. A.; BARROS, M. V. F.; FERNANDES, F.
2012	Solid waste management and the willingness to pay for improved services towards achieving sustainable living	ALI, H.; ALI, N.; AHMAD, A. R.; IBRAHIM, M.; AHMAD, S.; YAACOB, S.
2012	Some perspectives on progress and problems regarding recycling and waste management by the non-profit organization Akumal Centro Ecológico in Akumal Playa, Yucatán	KREKELER, M. P. S.; ALDRIDGE, D.
2012	Caracterización de residuos sólidos generados por el sector comercial de Mexicali	GARDUÑO-PALOMINO, K.; OJEDA-BENITEZ, S.; ARMIJO DE VEGA, C.
2012	Solid waste disposal options in Malaysia: A contingent valuation experience	CHUEN-KHEE, P.; OTHMAN, J.
2012	Análise econômica de sistemas de gestão de resíduos sólidos urbanos: o caso da coleta de lixo seletiva em Palmas, TO.	RODRIGUES, W.; SANTANA, W. C.
2012	Economic valuation of improved solid waste management in Eldoret municipality.	SUMUKWO, J.; KIPTUI, M.; CHESEREK, G. J.
2012	Economic Valuation of Integrated Solid Waste Management in Kota Bharu, Kelantan	RAHIM, N. N. R. N. A.; SHAMSUDIN, M. N.; GHANI, A. N. A.; RADAM, A.; MANAF, L. A.; KAFFASHI, S.; MOHAMED, N.
2012	Municipal solid waste generation, composition, and management: The World Scenario	KARAK, T.; BHAGAT, R. M.; BHATTACHARYYA, P.
2012	The costs of household food waste in South Africa	NACHMAN, A.; LANGE, W.; OELOFSE, S.; GODFREY, L.
2012	Measuring Waste in Malaysia: A Neglected Approach	LIM, M.
2012	Gravimétrica dos Resíduos Sólidos Urbanos Domiciliares e	COSTA, L. E. B.; COSTA, S. K.; REGO,

	Perfil Socioeconômico no Município de Salinas, Minas Gerais.	N. A. C.; SILVA JUNIOR, M. F.
2012	Analysis of the potential of municipal solid waste in Brazil.	LINO, F. A. M.; ISMAIL, K. A. R.
2013	Características y análisis de composición de los residuos sólidos de la Ciudad de México.	DURÁN MORENO, A.; GARCÉS RODRÍGUEZ, M.; VELASCO, A. R.; MARÍN ENRIQUEZ, J. C.; GUTIÉRREZ LARA, R.; MORENO GUTIÉRREZ, A.; DELGADILLO HERNÁNDEZ, N. A.
2013	Caracterización y potencial del reciclado de los residuos sólidos urbanos generados en el Instituto Tecnológico de Tepic, una institución de educación superior.	ROSALES-FLORES, M.; SALDAÑA-DURÁN, C.; TOLEDO-RAMÍREZ, V.; MALDONADO, L.
2013	Caracterización física de los residuos sólidos urbanos y el valor agregado de los materiales recuperables en el vertedero el iztete, de Tepic-Nayarit, México.	SALDAÑA-DURÁN, C. E.; HERNÁNDEZ ROSALES, I. P.; MESSINA FERNÁNDEZ, S.; PÉREZ PIMIENTA, J. A.
2014	Residents' concerns and attitudes toward solid waste management facilities in Palestine: A case study of Hebron district	AL-KHATIB, IA; AJLOUNY, H; AL-SARI'MI; KOONTOGIANNI, S.
2014	Attitude towards the incorporation of the selective collection of biowaste in a municipal solid waste management system. A case study.	BERNAD-BELTRÁN, D; SIMÓ, A; BOVEA, MD
2014	Exploring full cost accounting approach to evaluate cost of MSW services in India	DEBNATH, S.; BOSE, S. K.
2014	<i>Comparação entre as Massas de Resíduos Sólidos Urbanos Coletadas na Cidade de São Paulo por Meio de Coleta Seletiva e Domiciliar</i>	PASCHOALIN FILHO, J. A.; SILVEIRA, F. F. S.; LUZ, E. G. L.; OLIVEIRA, R. B.
2014	Municipal solid waste management in rural areas and small counties: An economic analysis using contingent valuation to estimate willingness to pay for Yunnan, China	WANG, H.; ELE, J.; KIM, Y.; KAMATA, T.
2014	Valoração Econômica de Projetos de Requalificação Urbana: Uma Aplicação dos Métodos de Avaliação Contingente e Preços Hedônicos.	RABÊLO NETO, A.; RABELO DE SOUSA, J. L.; FERNANDES DE MESQUITA, R., FONTENELE, R. E. S. ; MELO, J.A.M.
2015	Economic aspects of thermal treatment of solid waste in a sustainable WM system	MASSARUTTO, A.
2015	Análise da gestão e gerenciamento dos resíduos de serviços de saúde (RSS) do Hospital de Emergência de Macapá, Amapá, Brasil	MADERS, G. R.; CUNHA, H. F. A.
2015	Contingent valuation method applied to waste management	FERREIRA, S.; MARQUES, R. C.
2015	Gerenciamento de resíduos sólidos urbanos domiciliares: análise do atual cenário no município de Florianópolis	DOMINGOS, D. C. ; BOEIRA, S. L.
2015	La gestión integral de residuos sólidos urbanos en México:	MARTÍNEZ, N. M. J.

	entre la intención y la realidad.	
2015	Evolução e desafios no gerenciamento dos resíduos sólidos urbanos no Brasil.	NASCIMENTO, V. F.; SOBRAL, A. C.; ANDRADE, P. R.; OMETTO, J. P. H. B.
2015	Análise da evolução e estimativa futura da massa coletada de resíduos sólidos domiciliares no município de João Pessoa e relação com outros indicadores de consumo.	MEDEIROS, J. E. S. F.; PAZ, A. R.; MORAIS JUNIOR, J. A.
2015	Solid Waste Pollution Concern in Economic Value Assessment: Is it Uni-dimensional or Multi-dimensional?	ADAM, S; SHAMSUDING, M. N.; SIDIQUEC, S. F.; RAHIMD, K. A.; RADAMD, A.

The articles were investigated and Bardin's content analysis was adopted as theoretical fundamentals in the construction of the analysis categories (Bardin, 2011).

## 4. Results and Discussions

Considering the predominant issues of the selected articles, the following categories were constructed: *Economic Assessment of Urban Solid Waste Management*; *Economic Valuation of Solid Waste Collection*; and *Solid Waste Management Costs*.

### **Category 1 – Economic Assessment in Urban Solid Waste Management**

The articles involving studies on economic valuation applied to urban solid waste management were included in this category. The listed works included willingness to pay of the residents aimed to improve urban solid waste management and the main factors that determined such willingness, using statistical analysis. They also addressed respondents' preferences regarding waste management and disposal.

Eshet et al. (2006) conducted a literature review in the 90's on the assessment and analysis of externalities in the urban solid waste sector, through mapping, collection, analysis and comparison of decision making regarding external costs associated to several types of pollution and problems related to deposition of solid waste in landfills and use of incineration. Shmelev and Powell (2006), in turn, conducted studies on the development of sustainable solutions in urban solid waste management, providing methodological support to regional urban solid waste management modeling, considering spatial and temporal patterns of waste generation and management, as well as the economic and environmental impacts of the development of the urban solid waste management system, with particular emphasis on public health and biodiversity.

The study conducted by Jin et al. (2006b) aimed to shed light on the public preferences regarding urban solid waste management programs in Macau, China. The findings showed that the residents prefer waste sorting and recycling in the source; reduced noise during waste collection and transport, and paying lower rates for waste management-related services.

Subsequently, in a district in Enugu metropolis, in Nigeria, Ichoku et al. (2009) investigated the willingness to pay of citizens applied to urban solid waste management. Among the respondents, 215 reported paying \$1.6 Nigerian Naira, which is equivalent to R\$ 0.28 cents of Brazilian real, while 200 were willing to pay \$ 1.5 Nigerian Naira, approximately R\$ 0.27 cents of Brazilian real, amount actually charged for the waste collection service at local company (ENSEPA). The determining factors of willingness to pay were positively and significantly related to gender, family income and respondent's perception of environmental quality.

In a study conducted in Kota Bharu, Malaysia, Rahim et al. (2012) assessed community acceptance rates regarding integrated urban solid waste management and their willingness to pay. The results indicated that 66.7% of the respondents find the urban solid waste management system ineffective, which results in environmental problems (70.4%) and health problems (72%). Besides, 55% of the respondents are willing to pay for integrated urban solid waste management.

Ali et al. (2012) investigated willingness to pay to improve urban solid waste management in Bangi, Selangor, Malaysia. According to the results, 85.5% of the respondents were willing to pay for a better urban solid waste management. Statistical analysis showed that income and ability to pay of the residents were significant and positive. However, age was significant and negative.

In the localities of Broga, Semenyih and Cheras, in the State of Selangor Darul Ehsan, in Malaysia, Chen-Khee and Othaman (2012) conducted an economic analysis of household urban solid waste management services, estimating the population's willingness to pay (WTP) for waste disposal. They found the determining variables for WTP: *age*, *care* (concern with the waste disposal site), *ownhse* (respondents residing in their own houses) and *proex* (variable that represents the distance from the households to the waste disposal areas). The authors reported that an increase in PROEX value would increase WTP and identified that respondents with lower WTP had lower preference for incineration of disposed waste.

Sumukwo et al. (2012), in turn, analyzed the economic value of a better urban solid waste management in the city of Eldoret, in Kenya. They found that 80% of the respondents were willing to pay for improvements in urban solid waste management and the main determinants for such availability were income, education and age.

Wang et al. (2014) performed an economic analysis in Eryuan, China, and assessed the willingness to pay for improvement in urban solid waste collection and disposal. They found that the average WTP corresponds to approximately 1% of the family income of the participants. The analysis also revealed that lower income households were more willing to pay, in percentage terms. In absolute values, availability to pay is equivalent in locations where urban solid waste management services are not available. According to the authors, the poorest families are more dependent on public urban solid waste management services, while the rich are more able to use private solutions.

Moreover, Al-Khatib et. al. (2014) investigated the concerns and attitudes of citizens from Hebron, in Palestine, regarding general aspects of urban solid waste management, as well as the benefits obtained and environmental impacts caused by the installation of urban solid waste management services. The authors advocated the importance of the introduction of educational programs and programs for encouraging active public participation in all stages of the installation of public urban solid waste management services (planning, implementation, operation), to ensure public acceptance, participation and sustainable regional development.

Finally, Massarutto (2015) addressed the contribution of economics to the debate on waste incineration, especially the interaction between recycling and energy reuse, stressing that this will be one of the most promising research fields for economic analysis in the coming years. According to the author, from an economic view, recycling and incineration are complementary: recycling is appropriate for materials that can be more easily sorted, and at lower costs, while incineration is more suitable for the others. Therefore, ex-ante scrutiny based on cost-benefit assessment confers a key role to incineration" (p. 55), especially when there are bottlenecks that prevent the operation of landfills and effective control of pollution.

## **Category 2 – Economic Valuation of Urban Solid Waste Collection**

Concerning the studies on economic valuation of urban solid waste collection, Owusu et al. (2011), using contingent valuation method, determined the willingness of family aggregates to pay for the urban solid waste collection service in the city of Kumasi, in Ghana. The authors reported that the families would be willing to pay for the collection service, and the factors that influenced payment were age, gender, employment, income and education.

Rodrigues and Santana (2012), in a study aimed to identify the Willingness to Pay (WTP) for the use of door-to-door urban solid waste collection service (USW), using conventional and selection household waste collection methods, in Palma, TO, found that WTP was higher among the participants with higher income and higher levels of education. The main outcomes obtained were that the independent variables - monthly income and years of education were statistically significant. Besides, the average WTP for selective household waste collection services was higher than that obtained for conventional household waste collection, demonstrating respondents' greater willingness to "cooperate with the implementation of a service less threatening to the environment" (p. 311).

Also, regarding economic valuation of selective household urban waste collection, Bernad-Beltrán et al. (2014), analyzed the population's attitude towards household selective biodegradable waste



collection in an urban solid waste management system in a Spanish city. For this purpose, the authors considered the following variables: level of participation in waste collection systems, willingness to participate in selective household biological waste collection, reasons and barriers that impact participation, willingness to pay for the incorporation of selective household biological waste collection and socioeconomic characteristics (age, gender, family size, work, education and income) of the citizens that are willing to pay for selective household urban waste collection services.

The results obtained showed that "approximately 81% of the respondents were willing to participate in selective household biodegradable waste collection". According to the authors, "household biodegradable waste collection would increase by up to 89%, if the City Council provided collectors for the management of specific types of waste, once the main obstacle to participation in the new selective household waste collection system is the need for trash bags specific for sorting biodegradable waste" (Bernad-Beltrán et al., 2014, p. 2434).

In addition to descriptive analysis, the authors performed an econometric analysis using a logit model to estimate the average willingness to pay. They assessed the socioeconomic characteristics of respondents willing to pay for the implementation of household biological waste collection systems, through Chi-square Tests of Independence and simple linear regression (Bernad-Beltrán et al., 2014).

Based on this analysis, the authors concluded that: regarding age, young individuals are more willing to pay for the implementation of the new waste collection system than older individuals. Regarding gender and work, men are slightly more willing to pay than women, and active workers are more willing to pay than retired individuals. Also, concerning age and education, people who have completed primary education are less willing to pay for the new system than people with higher education (Bernad-Beltrán et al., 2014).

Ferreira and Marques (2015) applied the contingent valuation method to selective household collection of waste from municipal packages in Portugal. The authors conducted 1,186 interviews. The participants were asked about their recycling practices, sociodemographic characteristics and whether they were willing to pay the price proposed for the implementation of a more sustainable selective household waste collection service. An average WTP ranging from EUR 1.35 to 3.16 was obtained, as well as a high number of protests, i.e. participants who were not willing to pay at all and their WTP was zero. The authors also stressed that few studies use the contingent valuation method in waste management in Europe.

### ***Category 3 – Costs of Urban Solid Waste Management***

In some articles, the economic analysis concerned the costs involved in urban solid waste management. This type of analysis considers the waste management system as an economic actor and "tends to focus on processes directly related to urban solid waste management" (Cleary, 2009, p. 1262).

Rathi (2006) estimated the cost of municipal urban solid waste management in Mumbai, India, considering the participation of the population and the existence of public and private partnerships. The author found that the cost of waste per ton is lower when the community participates in urban solid waste management (US\$ 35 dollars); it is US\$ 41 dollars, when a public and private partnership (PPP) is responsible for such management and, US\$ 44 dollars when the public sector is entirely responsible for urban solid waste management. Thus, the author claims that the municipalities should involve the community in urban solid waste management to promote environmental, institutional, economic and social sustainability.

Regarding the flow of food waste (scraps) from families in South Africa, Nachman et al. (2012) estimated the economic (monetary) value of the waste of food, by calculating the costs associated to the final disposal of such scraps in a landfill and the costs incurred by the community due to the loss of a potentially valuable food source. The authors estimated these two costs in around US\$ 2.7 billion per year, corresponding to 0.82% of South Africa's annual GDP.

Based on the complete accounting of the costs, which consists in a more comprehensive approach that comprises the economic, social and environmental dimensions (Lim, 2012), Debnath and Bose (2014) conducted a study in India on the status of urban solid waste management services and recognition of the total cost applied in its ability to generate information related to the implementation of sustainable resource management. The authors found that urban solid waste management services in developing countries often face difficulties due to lack of financial and

operational autonomy, type of scientific approach and lack of funding. Therefore, the municipalities responsible for household urban solid waste management services, which are facing structural and financial inefficiency, are urged to take measures aimed at supporting an effective use of resources and improve decision-making skills.

---

## 5. Conclusions

The present integrative literature review does not intend to exhaust the discussion of economic valuation applied to urban solid waste management.

Nevertheless, it can be said that environmental economic valuation is an effective tool to be considered in the process of urban solid waste management planning, supporting the environmental policies of sustainable development.

The articles examined addressed the contribution of economic analysis in urban solid waste management. They showed that the willingness to pay of the citizens ranged from 55% to 85.5% regarding improvements in the urban solid waste management system. Regarding willingness to participate in selective solid waste collection, the main determining factors were income, education and age. In general, younger and higher-income individuals with higher level of education would be more willing to pay for selective waste collection. Concerning the costs of urban solid waste management, they tend to be lower when there is community involvement. Therefore, communities should be encouraged to participate in waste management in order to promote environmental, institutional and social sustainability.

---

## References

- Adam, S., Shamsuding, M. N., Sidiquec, S. F., Rahim, K. A. & Radam, A. (2015). Solid Waste Pollution Concern in Economic Value Assessment: Is it Uni-dimensional or Multi-dimensional? *Resources, conservation, and recycling*, 104 (A): 49-60.
- Albertin, R. M. A., Moraes, E., Angelis Neto, G., Angelis, B. L. D., Coverloni, E. & Silva, F. F. S. (2010). Diagnóstico da gestão dos resíduos sólidos urbanos do município de Flórida Paraná. *Revista Agro@mbiente On-line*, 4 (2): 118-125.
- Ali, H., Ali, N., Ahmad, A. R., Ibrahim, M., Ahmad, S. & Yaacob, S. (2012). Solid waste management and the willingness to pay for improved services towards achieving sustainable living. *Advances in natural and applied sciences*, 6 (1): 52-60.
- Al-Khatib, I. A., Ajlouny, H., Al-Sari'mi, Koontogianni, S. (2014). Residents' concerns and attitudes toward solid waste management facilities in Palestine: A case study of Hebron district. *Waste Manag Res.*, 32 (3): 228-36.
- Armijo De Vega, C. A., Ojeda-Benítez, S., Ramírez-Barreto, E. & Quintanilla-Montoya, A. (2006). Potencial de reciclaje de los residuos de una institución de educación superior: el caso de la Universidad Autónoma de Baja California. *Ingeniería Revista Académica de la FI-UADY*, 10 (3): 13-21.
- Bernad-Beltrán, D., Simó, A. & Bovea, M.D. (2014). Attitude towards the incorporation of the selective collection of biowaste in a municipal solid waste management system. A case study. *Waste Management*. 34 (12): 2434-2444.
- Begum, R. A., Siwar, C., Pereira, J. J. & Jaafar, A. H. (2007). Factors and values of willingness to pay for improved construction waste management – A perspective of Malaysian contractors. *Waste Management*, 27 (12): 1902-1909.
- Chuen-Khee, P. & Othman, J. (2012). Solid waste disposal options in Malaysia: A contingent valuation experience. *Waste Management*, 32 (12): 2565-2566.
- Cleary, J. (2009). Life cycle assessments of municipal solid waste management systems: A comparative analysis of selected peer-reviewed literature. *Environment international*, 35 (8): 1256-1266.
- Costa, L. E. B., Costa, S. K., Rego, N. A. C. & Silva Junior, M. F. (2012). Gravimétrica dos Resíduos Sólidos Urbanos Domiciliares e Perfil Socioeconômico no Município de Salinas, Minas Gerais. *Revista Ibero-Americana de Ciências Ambientais*, 3 (1): 222-8.

- Debnath, S. & Bose, S. K. (2014). Exploring full cost accounting approach to evaluate cost of MSW services in India. *Resources, Conservation and Recycling*, 83 (1): 87-95.
- Domingos, D. C. & Boeira, S. L. (2015). Gerenciamento de resíduos sólidos urbanos domiciliares: análise do atual cenário no município de Florianópolis. *Revista de Gestão Ambiental e Sustentabilidade*, 4 (3): 15-20.
- Durán Moreno, A., Garcés Rodríguez, M., Velasco, A. R., Marín Enriquez, J. C., Gutiérrez Lara, R., Moreno Gutiérrez, A. & Delgadillo Hernández, N. A. (2013) Características y análisis de composición de los residuos sólidos de la Ciudad de México. *Rev. Int. Contam. Ambient*, México, 29 (1): 47-57.
- Eshet, T., Ayalon, O. & Shechter, M. (2006). Valuation of externalities of selected waste management alternatives: A comparative review and analysis. *Resources, Conservation and Recycling*, 46 (4): 335-364.
- Ferreira, S. & Marques, R. C. (2015). Contingent valuation method applied to waste management. *Resources, Conservation and Recycling*, 99 (1): 111 – 117.
- Fonta, W.M., Ichoku, H. E., Ogujiuba, K. K. & Ochukwu, J. O. (2012). Using a Contingent Valuation Approach for Improved Solid Waste Management Facility: Evidence from Enugu State, Nigeria. *Journal of African economies*, 17 (2): 277-304.
- Garduño-Palomino, K.; Ojeda-Benitez, S. & Armijo De Vega, C. (2012). Caracterización de residuos sólidos generados por el sector comercial de Mexicali, B. C. *Rev. Int. Contam. Ambient*, México, 28, (1): 21-27.
- Gullo, M. C. R. & Gregori, L. (2011). Valoração de Recursos Ambientais: Uma Análise Do Método De Valoração Contingente Aplicado à Coleta dos Resíduos Sólidos Seletivos na Cidade de Caxias do Sul. In: *Anais do IX Encontro da Sociedade Brasileira de Economia Ecológica*. Brasília, DF.
- Ichoku, H. E., Fonta, W. M. & Kedir, A. (2009). Measuring individuals' valuation distributions using a stochastic payment card approach: application to solid waste management in Nigeria. *Environment, Development and Sustainability*, 11 (3): 509-521, 2009.
- Jin, J., Wang, Z. & Ran, S. (2006a). Comparison of contingent valuation and choice experiment in solid waste management programs in Macao. *Ecological economics*, 57 (3): 430-441.
- Jin, J., Wang, Z. & Ran, S. (2006b). Estimating the public preferences for solid waste management programmes using choice experiments in Macao. *Waste Management Res.*, 24 (4): 301-309.
- Karak, T., Bhagat, R. M. & Bhattacharyya, P. (2012). Municipal solid waste generation, composition, and management: The World Scenario. *Critical Reviews Environmental Science and Technology*, 42 (15): 1509-1630.
- Konrad, O., Casaril, C. E. & Schmitz, M. (2010). Estudo dos resíduos sólidos domésticos de Lajeado/RS pela caracterização gravimétrica. *Destaques Acadêmicos*, 4: 57-62.
- Krekeler, M. P. S. & Aldridge, D. (2012). Some perspectives on progress and problems regarding recycling and waste management by the non-profit organization Akumal Centro Ecológico in Akumal Playa, Yucatán. *Waste Management*, 32 (12): 2563-2564.
- Lim, M. (2012). Measuring Waste in Malaysia: A Neglected Approach. *Procedia - Social and Behavioral Sciences*, 42 (1): 198-204.
- Lino, F. A. M. & Ismail, K. A. R. (2012). Analysis of the potential of municipal solid waste in Brazil. *Environmental Development*, 4 (2): 105-113.
- Lloréns, M. C. E., Torres, M. L. T., Arrechea, A. P. A., Navarro, R. M. & Colomina, A. F. (2007). La fracción orgánica de los residuos sólidos urbanos como fuente potencial de producción de biogás. *Revista CENIC Ciencias Biológicas*, 38 (1).
- Martínez, N. M. J. (2015). La gestión integral de residuos sólidos urbanos en México: entre la intención y la realidad. *Letras Verdes. Revista Latinoamericana de Estudios Socioambientales*, 17 (1): 29-56.
- Massarutto, A. (2015). Economic aspects of thermal treatment of solid waste in a sustainable WM system. *Waste Management*. 37 (3): 45-57.
- Mattei, G. & Escosteguy, P. A. V. (2007). Composição gravimétrica de resíduos sólidos aterrados. *Eng. sanit. ambient.*, Rio de Janeiro, 12 (3): 247-251.

- Medeiros, J. E. S. F. , Paz, A. R. & Morais Junior, J. A. (2015). Análise da evolução e estimativa futura da massa coletada de resíduos sólidos domiciliares no município de João Pessoa e relação com outros indicadores de consumo. *Eng. Sanit. Ambient.*, Rio de Janeiro, 20 (1): 119-130.
- Melo, L. A., Sautter, K. D. & Janissek, P. R. (2009). Estudo de cenários para o gerenciamento dos resíduos sólidos urbanos de Curitiba. *Eng. Sanit. Ambient.*, 14 (4): 551-558.
- Melo, A. C. A., Barros, M. V. F. & Fernandes, F. (2011). Diagnóstico da gestão de resíduos sólidos urbanos no município de Rolândia (PR). *Revista Geografia*, Londrina, 20 (2): 5-28.
- Motta, R. S. (2006). *Economia Ambiental*. Editora FGV: Rio de Janeiro.
- Motta, R.S. (1998). *Manual para valoração econômica de recursos ambientais*. Ministério do Meio Ambiente, dos Recursos Hídricos e da Amazônia Legal. Brasília.
- Nachman, A., Lange, W., Oelofse, S. & Godfrey, L. (2012). The costs of household food waste in South Africa. *Waste Management*, 32 (11): 2147-2153.
- Nagashima, L. A., Barros Junior, C., Andrade, C. C., Silva, E. T. & Hoshika, C. (2011). Gestão integrada de resíduos sólidos urbanos – uma proposta para o município de Paranavaí, Estado do Paraná, Brasil. *Acta Scientiarum. Technology*, Maringá, 33 (1): 39-47.
- Nascimento, V. F., Sobral, A. C., Andrade, P. R. & Ometto, J. P. H. B. (2015). Evolução e desafios no gerenciamento dos resíduos sólidos urbanos no Brasil. *Rev. Ambient. Água*, Taubaté, 10 (4): 889-902.
- Owusu, V., Boaheng, J. M. & Sundberg, C. (2011). Are households willing to pay for full-cost solid waste collection? Evidence from Kumasi Metropolis of Ghana. *Journal of Environmental Studies and Sciences*, 1 (2): 144-153.
- Paschoalin Filho, J. A., Silveira, F. F. S., Luz, E. G. L. & Oliveira, R. B. (2014). Comparação entre as Massas de Resíduos Sólidos Urbanos Coletadas na Cidade de São Paulo por Meio de Coleta Seletiva e Domiciliar. *Revista de Gestão Ambiental e Sustentabilidade – GeAS*, 3 (3): 19-33.
- Poletto, J. A. & Silva, C. L. (2009). Influencia de la Separación de Residuos Sólidos Urbanos para Reciclaje en el Proceso de Incineración con Generación de Energía. *Inf. tecnol.*, La Serena, 20 (2): 105-112.
- Quijada, O. & Soto Córdova, S. (2008). Estudio de composición de los residuos sólidos urbanos, en Esparza, Puntarenas, Costa Rica. *Tecnología en Marcha*, 21 (3): 23-32.
- Rabelo Neto, A., Rabelo de Sousa, J. L., Fernandes de Mesquita, R., Fontenele, R. E. S. & Melo, J.A.M. (2014). Valoração Econômica de Projetos de Requalificação Urbana: Uma Aplicação dos Métodos de Avaliação Contingente e Preços Hedônicos. *Rev. Desenvolvimento em Questão* [online]: 2014. Available from: <<https://www.revistas.unijui.edu.br/index.php/desenvolvimentoemquestao/article/view/2903>> access on: 15 Jun. 2016.
- Rahim, N. N. R. N. A, Shamsudin, M. N., Ghani, A. N. A., Radam, A., Manaf, L. A., Kaffashi, S. & Mohamed, N. (2012). Economic Valuation of Integrated Solid Waste Management in Kota Bharu, Kelantan. *Journal of Applied Sciences*, 12 (17): 1839-1845.
- Rathi, S. (2006). Alternative approaches for better municipal solid waste management in Mumbai, India. *Waste Management*, 26 (10): 1192-1200.
- Rodrigues, W. & Santana, W. C. (2012). Análise econômica de sistemas de gestão de resíduos sólidos urbanos: o caso da coleta de lixo seletiva em Palmas, TO. *Revista Brasileira de Gestão Urbana* (Brazilian Journal of Urban Management), 4 (2): 299-312.
- Rosales-Flores, M., Saldaña-Durán, C., Toledo-Ramírez, V. & Maldonado, L. (2013). Caracterización y potencial del reciclado de los residuos sólidos urbanos generados en el Instituto Tecnológico de Tepic, una institución de educación superior. *Revista Bio Ciencias*, 2 (3): 216-223.
- Saldaña-Durán, C. E., Hernández Rosales, I. P., Messina Fernández, S. & Pérez Pimienta, J. A. (2013). Caracterización física de los residuos sólidos urbanos y el valor agregado de los materiales recuperables en el vertedero el iztete, de Tepic-Nayarit, México. *Rev. Int. Contam. Ambie*, 29 (3): 25-32.

Santoyo, A. H., Vilardell, M. C., Sánchez, M. A. L., Fernández, R. C. & León, V. E. P. (2013). La Ciencia Económica y el Medio Ambiente: un aporte desde la valoración económica ambiental. *Revista Paranaense de Desenvolvimento*, Curitiba, 34 (125): 25-38.

Sarkhel, P. & Banerjee, S. (2010). Municipal solid waste management, source-separated waste and stakeholder's attitude: a Contingent Valuation Study. *Environment, Development and Sustainability*, 12 (5): 611-630.

Shmelev, S. E. & Powell, J. R. (2006). Ecological-economic modelling for strategic regional waste management systems. *Ecological Economics*, 59 (1): 115-130.

Sumukwo, J., Kiptui, M. & Cheserek, G. J. (2012). Economic valuation of improved solid waste management in Eldoret municipality. *Journal of Emerging Trends in Economics and Management Sciences*, 3 (6): 962-970.

Wang, H., Ele, J., Kim, Y. & Kamata, T. (2014). Municipal solid waste management in rural areas and small counties: An economic analysis using contingent valuation to estimate willingness to pay for Yunnan, China. *Waste management & research*, 32 (8): 695-706.

---

1. Doutoranda no Programa de Pós-graduação em Ambiente e Desenvolvimento – Centro Universitário UNIVATES. Mestre em Economia – Universidade Federal do Ceará – UFC. Professora no Instituto Federal do Ceará – IFCE – Campus Iguatu. Email: [akfeitoso@hotmail.com](mailto:akfeitoso@hotmail.com)

2. Doutora em Economia – Universidade Federal do Rio Grande do Sul – UFRGS. Professora Adjunta no Centro Universitário UNIVATES

3. Doutor em Engenharia Sanitária e Ambiental – Montanuniversität Leoben (Áustria). Professor Titular no Centro Universitário UNIVATES

---

Revista ESPACIOS. ISSN 0798 1015  
Vol. 38 (Nº 14) Año 2017

[Índice]

[En caso de encontrar algún error en este website favor enviar email a [webmaster](mailto:webmaster)]

©2017. revistaESPACIOS.com • Derechos Reservados