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Research Article

Evaluation of Affecting Factors on Citizen Participation in Comprehensive Waste Management (Case Study of Districts 8 and 12 in Tehran)

Farhad Afshar [a], Majid Abbaspour [b], Akram al-Muluk Lahijanian [a,*]

[a] Faculty of Natural Resources and Environment, Science and Research Branch, Islamic Azad University, Tehran, Iran
[b] School of Mechanical Engineering, Sharif University of Technology, Tehran, Iran

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Abstract
The purpose of the present study is to identify the effective factors in citizen participation in waste generation and waste separation and their scientific analysis. In order to accomplish this goal, using descriptive-inferential research method, information was collected by documentary method. The statistical population of the study consisted of the citizens of two districts of Tehran 8 and 12, which had the highest and the lowest participation in separation of waste source, respectively. Data were analyzed using relative frequency tables, Likert verbal scale, Kruskal-Wallis non-parametric test and correlation test and regression method. The results of hypotheses test indicated significant relationship between variables of age, level of education, occupations, average monthly income, number of households, citizen education and awareness, and participation rates. Also the results of Kruskal-Wallis statistical test showed that there is a significant relationship between gender and participation, but the relationship between housing ownership and participation is not significant.

Keywords: Citizen Participation, Waste Management, Waste separation, Tehran

Introduction

Today, the concept of partnership and culture of thinking and working together is particularly attractive in urban management. Citizens as social and political phenomena are important features of democratic systems and are a key indicator of modern societies, so in order to create and develop a culture of participation, direct involvement of the people in the formulation of policies, priorities and goals of urban management is becoming increasingly important. As a result, we address the issue of citizen participation in the present study, which examines the factors affecting the rate of citizen participation in comprehensive waste management, which is one of the most important pillars of good urban management as well as preserving the environment and resources for the present and future. Based on previous experiences and studies from the technologist it is helpful and necessary.

Problem Statement

* Corresponding author E-mail: lahijanian@hotmail.com

Rapid population growth, industrial development, technological advancement, and human tendency to increase consumption and thus produce more waste are among the issues that have recently caused major economic, social and environmental crises in human societies. Nowadays, with the increasing population and the constant expansion of cities, human consumption is increasing, day by day and increasing consumption is leading to increased waste production, which is increasingly being used by humans.

Despite all the significant efforts in the field of municipal waste management, unfortunately, this issue still faces deterrent challenges that have failed to meet the foreseen goals. According to the latest statistics of the Waste Management Organization, the amount of waste production in Tehran is about 8291 tons per day (equivalent to 3240749 tons per year). According to the latest results of physical-chemical analysis of the waste composition of Tehran City in 2017, it has been determined that about 62.33 of the solid waste of Tehran city is composed of fresh waste. And the results show that the rate of waste generation is not only decreasing but increasing day by day. This requires serious scientific and managerial action to achieve management goals. The following questions were asked in order to measure the extent of participation in the research that will be discussed below and they have been measured.

- Is there a significant relationship between education level, age, gender, occupation and income, number of households and type of housing ownership with participation rate?
- Can citizen awareness training help waste management plan to reduce waste generation?

Theoretical Principles and Literature Review

One of the most important issues to be addressed in the Waste Management Plan is the importance of this plan in urban environmental management, providing a comprehensive and practical waste management plan that requires attention at the local and regional level (Padash, 2017; Atkinson et al., 2019; Ma et al., 2020; Bhatt et al., 2020) One of the important issues to be considered in the Waste Management Plan is the consideration of environmental impact assessment and land use plans (Padash et al., 2016; Deus et al., 2020; Debnath et al., 2020; Hoveidi et al., 2013).

Leal Filho et al., (2016) in the research titled "Benchmarking approaches and methods in the field of urban waste management'' pays special attention to experiences from Latin America (with a special focus on Brazil), Asian countries as well as the European Union new Member States (the Baltic States), documents and presents some of their experiences, which may be useful to other developing countries and rapidly growing regions.

Maiyaki et al., (2018) in research titled "A review of rationale of community participation in urban solid waste management in Nigeria" undertakes a comprehensive review of the growing international literature on the community participation, regarding solid waste management. The discussion provides valuable information and insights on the emergence of waste management and the need for community participation in developing nations including Nigeria.

At the present time, if we do not say that participation as a vital issue is at least accepted as a beneficial phenomenon and assumes that more participation is better than being low (Niedeggen et al., 2017). One of the disadvantages of urban management is the lack of a clear framework for citizen participation. At present, there are changes in the foundations of urban management that are shifting towards becoming popular. Accordingly, one of the top priorities of urban managers and urban management policies is to create opportunities for public participation. Public participation in the design, implementation and evaluation of urban plans is a fundamental principle in urban management. Through participation in decisions, people can better utilize the knowledge, experience, acumen and insight of those who offer work to improve the methods and expand the working relationships in organizations and society

(Deilami, 2009). One of the most important factors affecting people's participation is awareness, education and motivation in different ways, but awareness alone is not effective because the consequence of awareness must be changing attitudes and consequently changing attitudes and behaviors (Bada et al., 2019).

Vahidi et al., (2017) the results of survey in research titled "Comparison of Rural Solid Waste Management in Two Central Provinces of Iran" show conducted among waste management experts showed that waste separation prior to collection is recommended as the most efficient method for managing waste collection in the district. This study could contribute to the body of knowledge enhancement by proposing a set of practical waste management strategies that would be beneficial in rural districts.

Cofie et al., (2013), studying the factors affecting the separation of domestic waste origin in Ghana, concludes that educational, motivational, and promotional actions in the district of public acceptance and increased public participation in the process of separation of waste origin, they are among the effective factors. In addition, this study has shown that citizens' participation in the separation of waste sources depends on their awareness.

Materials and Method

Location of Research

After studying and analyzing the population of districts of Tehran and their annual residuals and their segregation rates, it was found that districts 8 and 12 of Tehran had the highest and the lowest segregation rates by 24% and 4%, respectively distributed and collected.

Table 1. Demographic and waste statistics of regions 8 and 12 of Tehran. (Source: Statistical Yearbook of Tehran; Tehran Municipal Waste Organization).

Regions	Population in 2016	District in hectare	Population density Per hectare	Annual waste rate in districts per kilogram	Annual waste rate of the district in approximate 1000 tons	District divided by kilograms	District divided by 1000 tons	Waste separation in percent
8	425179	1316	323	98418179	98	26251961	26	27
12	241831	1601	150	122287570	122	8297571	8	7

Preparing and Developing a Research Questionnaire

After designing the research questions the questionnaire for interviewing citizens with the collaboration of 10 expert's prepared, based on Delphi method (Padash et al., 2016; Chisa, 2020; Mosayebi et al., 2020). To complete and evaluate the questionnaire; citizens of districts 8 and 12 alike having maximum participation respectively and a minimal reduction in production and separation of waste source 'as statistical community among 22 districts of Tehran were elected. The research questionnaire was 70 items (35 households) randomly referred to two districts for survey and based on the Likert scale was completed.

Results

Result of checking individual characteristics through relative frequency table

In the first step, the individual characteristics of the respondents were measured with relative frequency. Citizen comparison result the questioner in the two study districts is listed in Table 2.

Table 2. Relative frequency of demographic characteristics of the citizens in question in the two regions 8 and 12

Region	Gender (women)	Age (years)	Level of education		Job		Average income(million)		Number of house hold		Owner condition	
			Diploma	B.SC	Business	Employee	>5.5	3.5-4.5	3	4	Tenant	Owner
8	68.6	31-40	-	31.4	-	42.9	-	34.3	37.1	-	62.9	-
12	65.7	30-31	28.6	-	37.1	-	40	-	-	40	-	65.7

Analyze citizens answer questions with the corresponding numerical scale of Likert verbal vocabulary.

The result of the analysis of the relationship between the rate of people's participation in reducing production and separating dry alloy from wet According to the two groups of questions included in the questionnaire based on the scale of numerical values presented in Table 3, were extracted A) Questions 1 to 4, as indicators of citizens' awareness of waste, including awareness of: B) questions 5 and 6 as indicators of citizen participation in reducing production and separation at the origin. So that the results of the analysis of the citizens' response show the relatively high level of participation of the citizens of the district 8 in the reduction of production and separation of dry waste from wet, however, the participation of citizens in this district is low. The results of this test confirm the statistical information presented in (Table 3).

Table 3. Scale of corresponding numerical values of Likert verbal

Verbal scale	Very little	A little	Relatively high	Much	Very much
Corresponding numeric	1	2	3	4	5

Examining the effect of gender and people's ownership status on their participation in waste management

Taking into account the results, it has been found that women are more involved than men in reducing production and separating from waste. The relationship of this issue indicates a significant relationship between gender and participation rate in reduction of production and separation of waste origin based on non-parametric Kruskal-Wallis correlation test at 95% confidence level (P-value 95%). However, there is no significant relationship between housing ownership and citizen participation. Accordingly the question of "whether gender and the status of housing ownership of citizens in the rate Is their participation in reducing production and separating waste source effective?" Is answered (Table 4).

Table 4. Result of test of the effect of gender and ownership status on peoples housing on the extent of their involvement in waste management

Factor	Type of test	Trust limits	Confidence level (%)
Gender	Kruskal wallis	0.029	95
Housing owner status	Kruskal wallis	0.057	<95

Correlation test results between variables of age, level of education, occupation, average monthly income and number of households in people's participation in waste generation and separation

According to the research questions, whether "age, education level, occupation, average monthly income and number of households" in does the participation of people in the generation and separation affect the waste source? And the significance of the correlation coefficients between these variables and the participation of the people in the reduction of waste production were 0.879,0.634,0.889, 0.789, 0.811 confidence level 95 (P-value = 95%) on the one hand, and the correlation coefficients between these variables and people's participation in the separation of waste origin were significant and equal to 0.866,0.724,0.875,0.879,0.881 at confidence level 95, it is observed that factors such as age, education level, occupation, average monthly income, number of households influence the rate of participation of the population in decreasing production and separation at waste origin (Tables 5 and 6).

Table 5. Correlation test between variables of age, education level, occupation, average monthly income and number of households and people's participation in waste generation

		PDW	A	SL	QA	IMM	NFM
PDW	Pearson Correlation	1	0.879*	0.634*	0.889*	0.789*	0.811*
	Sig. (1-tailed)		0.041	0.050	0.022	0.025	0.048
	N	70	70	70	70	70	70

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

Table 6. Results of correlation test between variables of age, level of education, occupation, average monthly income and number of households and people's participation in waste separation and origin

		SW	A	SL	QA	MIM	MFN
SW	Pearson Correlation	1	0.866*	0.724*	0.875*	0.879*	0.881*
	Sig. (1-tailed)		0.041	0.050	0.022	0.025	0.048
	N	70	70	70	70	70	70

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).
*** A: Age, LS: Level Of Studies, AQ: Occupational, MMI: Average Monthly Income, MFN: Number of Households

Correlation test results between people's awareness in different districts of waste management (reduction of production and Waste source separation)

In order to investigate the amount of waste generation and separation from the source of dry waste using data obtained from the research questionnaire (Questions 1 to 4), Tables 7 and 8 are listed. According to the table contents, it is observed that there is a meaningful relationship between the level of public participation through reduction of waste production with P-value with correlation coefficients of 0.979, 0.634, 0.889, and 0.879 respectively (Table 7).

On the other hand, there is a significant relationship between people's awareness and their participation through waste separation with P-value with correlation coefficients of 0.910, 0.931, 0.952, 0.963 respectively (Table 8).

Table 7. Test result correlation between the result of awareness and education and citizen participation through reduction of waste production.

		PDW	Q1	Q2	Q3	Q4
PDW	Pearson Correlation	1	0.979**	0.634*	0.889*	0.879*
	Sig. (1-tailed)		0.041	0.050	0.022	0.025
	N	5	5	5	5	5

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

Table 8. Test result correlation between the level of awareness and education and citizen participation through separation of waste.

		SW	Q1	Q2	Q3	Q4
SW	Pearson Correlation	1	0.910**	0.931**	0.952**	0.963**
	Sig. (1-tailed)		0.016	0.011	0.006	0.004
	N	5	5	5	5	5

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).
*** Q1: Environmental impacts of waste. Q2: Waste management & implementation process. Q3: How to reduce waste production. Q4: The benefits of separation dry & wet waste. PDW: waste production. SW: waste separation.

Investigating the Relationship between Citizen Awareness and Participation Rate Using Regression Model.

According to the questions in the research questionnaire in order to determine the relationship between Participation rate in the selected model districts is as follows: The Relationship between citizen participation in production reduction and separation of waste source (Question 5 and 6) as variables dependent and their awareness of the following districts as independent variables and their awareness of the following districts as independent variables (Questions 1 to 4).

The results of the using linear regression model are presented in Table 9, indicates that there is a meaningful relationship between people's participation and their awareness.

Based on the results, in relationship between citizens' participation in waste production reduction and their awareness of waste environmental impacts, the level of awareness and cooperation in region 8 of Tehran municipality was higher than in region 12. Also, in relationship between citizen participation and their awareness of waste management and implementation process, the level of awareness in region 8 of Tehran municipality was higher than in region 12.

The level of relationship between citizen participation in the separation and their awareness of the environmental impact of waste in region 12 of Tehran municipality was higher than in region 8.

The citizen participation in waste production reduction and their awareness of waste production reduction is low, given that Tehran's main market area and government departments are high in the area, the turnout is very low. In particular, there are around 5 million people in the area every day.

Table 9. Result of the study of the relationship between peoples participation in waste reduction and separation whit factors affecting them.

Region	Description	Distinction Coefficient (R^2)	Significant Percent Level
8	The relationship between citizens' participation in waste production reduction and their awareness of waste environmental impacts.	0.9796	99
	The relationship between citizen participation and their awareness of waste management and implementation process.	0.9280	99
	The relationship between citizen participation in waste production reduction and their awareness of waste production reduction.	0.9663	99
	The relationship between citizen participation in the separation and their awareness of the environmental impact of waste.	0.8828	95
	The relationship between citizen participation in waste separation and their level of awareness of waste management and its process.	0.9765	99
	The relationship between citizen participation in the separation and their awareness of the benefits of separating.	0.9835	99
12	The relationship between citizens' participation in waste production reduction and their awareness of waste environmental impacts.	0.7094	99
	The relationship between citizen participation and their awareness of waste management and implementation process.	0.7052	95
	The relationship between citizen participation in waste production reduction and their awareness of waste production reduction.	0.4694	95
	The relationship between citizen participation in the separation and their awareness of the environmental impact of waste.	0.9554	99
	The relationship between citizen participation in waste separation and their level of awareness of waste management and its process.	0.7648	95
	The relationship between citizen participation in the separation and their awareness of the benefits of separating.	0.5968	95

Research proposal in order to attract people participation in terms of waste generation and waste separation the following:

- *Suggestion in the field of educational and cultural education:*

- Developing and providing appropriate training courses for students in explaining different dimensions topic such as environmental, economic and social as well as the aforementioned festivals and programs (Roseland, 2000).
- Topic related program with titles such as Clean Neighborhood, Clean Zone and Clean City with the help of municipalities.

- Promoting general knowledge about the recycling process through television programs and producing short and informative clips from the process of waste collection to recycling and disposal.
- Using the potential of social media and mass media to teach proper consumption and prevent the promotion of consumerist culture in order to promote community culture to reduce waste production (Uldam, 2018; Buller et al., 2019).
- Publishing video and educational placards in public transport stations and in urban districts to promote recycling culture.
- Organizing social and cultural events in neighborhoods, on a variety of occasions such as earth day, clean air day, environment week, and cultural events focusing on the impact of the clean environment on people's quality of life and future generations.
- Holding photo contests for citizens with clean city titles by municipalities.

- *Suggestions in the field of management*

- Upgrading technology and optimizing methods according to global experience.
- Continuous and optimal cooperation with the department of education and the environment and the ministry of science.
- Develop and implement clear and purposeful implementation guidelines and regulations in performing waste management activities (Azmy and El Gohary, 2018; Khoshnevisan et al., 2018).
- Increasing the effective of human resource management and information updating education to gain people’s confidence and strengthening social capital.

- *Suggestions in the motivational field*

- Buy people's paper and plastic and glass and Set up a station to receive solid waste in different districts.
- Waste not received separately or fines imposed.
- Assign part of recycling revenues to beautifying neighborhoods or building parks and announcing them to the citizens.
- Put separation tanks next to the waste collection tanks and free garbage bag distribution.

- *Suggestions in the field private sector*

- Empower the private sector by delegations and Support for equipping for new technologies and training.
- Taking exploitation of strong contractors in the field of waste transfer collection and processing system.
- Increase private sector participation in solid waste recycling and processing plans and energy production.
- Cooperation and supervision continual with food industry factories, chain stores and retailers.

- *Suggestions in the field legal*

- Use legal tools to better implement waste management.
- Encouraging officials to provide economic opportunities to strengthen the recycling sector.
- Providing the necessary background for the privatization of the acquisitions process until complete separation and sale.
- Trying to enact legislation with priority on waste reduction policies like many countries around the world.
- Compulsion waste separation law and require all business centers to do so from executive companies for the purpose of recycling city waste.

- Law and regulations punishment and encouragement for industries and factories in the production of materials with less waste by the department of environment.
- Creating sustainable permanent recycling markets engaging in the implementation of green purchasing within the law.

Conclusion

The most waste produced in the Aradkooh and they are being processed and buried. About forty years have passed since the operation and it is facing environmental and social problems.

In addition, the 7,000 tons of waste everyday pays huge costs to the Tehran municipality, and in recent years the issue of waste reduction has been the focus of attention. The ultimate goal of waste management programs it is being promoted and practiced in our country and in other countries Avoid waste generation that has the best strategic or choice option. Region 12 of Tehran's municipality is a central district in the city which is both a government center, a market center and administrative center. Tehran also demonstrates this in terms of management, collection and separation. In other words, public participation is more likely to be found in region 8 of Tehran's municipality, an area where there is greater participation of people, local traffic and local occasions and is free from chaos and high traffic such as District 12.

Designing, building products that does not waste production, changing the pattern of consumption pattern, and on the other hand, with the cooperation of the citizens. Indeed, participation as the most important issue in waste management can bring about dramatic changes in the process of waste management either in reducing waste production or separating it from the source. Therefore, identifying important and influential individual variables in participation can be the first step in focusing on appropriate strategies such as education, institutionalization, legislation, and culture to make purposeful plans.

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