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Analysis of Effective Solutions in the Field of Waste Management in Municipalities

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Abstract

The main purpose of this study was to analyze the effective solutions in the field of waste management in municipalities. The statistical population in this survey –based study consisted of the citizens that lived in Orumiyeh city in West Azerbaijan Province. By using Cochran formula, sample size was estimated to include 180 people. The data collection tool was a questionnaire. The reliability coefficient of the questionnaire was obtained by a Cronbach's alpha that turned out to be 0.87. Results showed that a positive and significance relationship exists between the transport collection and landfill management solution, expense management solution, executive management solution, the strategy management system, as well as the importance of waste management. Also in addition, multi regression results shows that about 55.9 percent of the solid waste management system is determined by variables such as collection and transportation of waste and landfill, executive management, costs management, and improvement of the management system of the organization.

Keywords:
analyze, solutions, waste management, Orumiyeh Municipal

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INTRODUCTION

Iran which has 800 grams of waste per capita consumption, every day more than 50,000 tons of solid waste is produced when it is compared to the rest of the world which is 292 kilogram of waste daily per person per year is in moderation (Omrani, 2016). Increasing of population and developing of industry led to an increase in the waste created chemical and physical changes. So that waste collection and disposal programs want be able to meet the needs. The collection and disposal of waste and recycling of solid waste management basically it's in Iran has a significant difference in the type and quality of waste to other countries in the world. The use of any technology with non-recognition of materials and compatibility of local factors isn't valuable. Efforts should be made to study and research more to be aware of our climatic conditions and find useful and practical strategies for municipal waste management by using world experience (Heidaridelgarm, 2011).

Solid waste management has been known as one of the main concerns of human societies. Increasing the volume of waste from one hand and their variety on the other hand increase the complexity of disposal way (Hamid et al., 2010). As a result of developing of science and technology in various fields of chemistry, physics, and medicine etc. various types of hazardous waste, even in the household waste produced. Nowadays, the traditional waste collection and disposal systems are not accountable and not able to prevent the environmental pollution caused by the waste of chemical, biological, radioactive. Leg is lotion of waste management law in spite of its problems, can be considered as an important step toward improving solid waste management in the country. According to this law municipalities in urban areas are formally known as the organ of management of household waste for the first time (Saiednia, 2008).

Since the year 1903 from the adoption of the municipality, municipal council was responsible for cleaning the city. As early 1911, municipalities were created in different cities and city services such as cleaning municipality and urban renewal law the quality and quantity of waste causing environmental and sanitary pollution for citizens and their dissatisfaction secondary and in early 1981, urban waste management got more attention and recycling organizations were formed in large cities.

In 1970s recycling materials and energy from waste and municipal solid waste management led to a revision of the previous law and legislation of municipal law. When the cities expanded and municipal solid waste become important in May 2004 Waste Management Act regulated in the Islamic Consultative Assembly and waste management (the executive regulation of the law approved by the Cabinet in August 2005) become a new stage of improving waste management in metropolitan cities such as Tehran. According to the law, the waste divides into five main groups of normal waste, hospital (specific), agriculture and industry, and the producers of waste are responsible for waste management and its costs. Moreover, according to article 7 of the Law on waste management, executive management can give all or part of the operations related to the collection, separation and disposal of waste to natural and legal persons (Noorpour et al., 2013).

Municipal solid waste management is one of the most important steps to achieve the goals of sustainable development, because considering to this important issue not only will increases concerns about the production, collection and disposal of waste and urban waste, but also will create the right cycle for recycling by re-entering these materials into production and consumption cycle (Moharamnejad & Tehrani, 2008).

Razi and Sadeghi-firouzjane (2014) showed the awareness of the keys to success in all stages of waste management, since people's participation in decision-making is the highest level of recognition, it will be possible to evaluate success of authorities in the culture of the people in implementing the waste management plan by recognizing of such partnership.

Mohammadi et al. (2014) showed that many people were dissatisfied with the lack of trash bins and tanks for waste collection and the best performance in relation to the residual waste in to transfer them in determined time to collection

centers. In general, people of municipalities have been sensitive in relation to waste management.

Jamshidi and Dehvari (2013) pointed to there are several methods for solid waste management, including the ability to landfill, incineration, composting, mechanical biological treatment, pyrolysis and gasification.

Maleki et al (2012) showed that the collection and disposal of solid waste recycling and management mainly in Iran according to the type and quality of waste a large difference between countries. Therefore, using any technology without recognizing the valuable material is not compatible with it. Municipal solid waste management problems can be attributed to the lack of a practical approach to urban waste, lack of research support for reforming the management's position.

Daneshyar (2012) pointed to the main key to success in waste management systems is people awareness and public participation in the programs.

Liyanage et al (2015) suggested that sustainable management of waste in the study area in Sri Lanka is considered better. Reduce solid waste is a critical process for sustainable management. Now, people in the area don't receive a lot of interest in recycling to reduce the cost of solid waste management. It was therefore concluded that awareness of people is a role in reducing solid waste. Proper waste management plan should be specific to each community and region. Situation of each region is different, so every society needs a try to find a better and sustainable way for solid waste management process. Solid waste management, especially in developing countries creates, particular problems for the local community, so it is always needed to solve specific problems of local experimental field research. Rapid population growth and increased economic activity coupled with a lack of training in modern methods of solid waste management, further efforts to improve the situation in this country.

According to Bayat-Sarmadi (2013) integrated management of municipal solid waste is very important. In urban community's manager's emphasis to reduce waste and source separation and on the other hand focus on recycling, processing and disposal of health principles.

Zadawa et al (2015), suggest that solid waste management (SWM) has been specified in Nigeria as a result of inefficient collection procedures, inappropriate dress, poor solid waste collection and disposal system specified. This research studies the current situation in Nigeria's SWM. SWM needs sustained financial investment in Nigeria, which often includes offering through rates and local taxes. In addition, appropriate technology of waste production in line with the nature needs to be investigated. Finally, efforts and roles of the informal sector is necessary practically in SWM in Nigeria which should be recognized.

According to Chapungu et al. (2015) assessment of waste management systems of the regional service center has been widely used in developing countries at both national and regional level to do so. This creates a gap of unknown science as waste management issues which remain in this area want be covered. Local authorities have a poor performance and poor services to local residents who were unconscious. In this study, the effect of time, storage, collection, transportation and disposal of domestic solid waste in the Centre region is evaluated. Has been selected by stratified random sampling survey was followed by the 120 family.

Based on these results, the amount of municipal solid waste produced in Orumiyeh on average the equivalent of 466 tons of waste per day, and most degradable component mix it with the formation of 72.5%. Due to climatic conditions and weather in Orumiyeh, one of the major challenges in the field of waste generated, the feasibility of implementing methods for compost production in the city will be closed (Ghanbarzadehlak et al., 2013).

Orumiyeh municipal waste management organization under its previous program of waste started gathering waste after its production in original source daily on the night and day shifts, which then transfer to the intermediate temporary station by the machine-style and transports by machinery semi-trailer and bury 18 km from

the city of Orumiyeh in the new burial site in Nazloo. The terms "organize and sanitizing landfill" and "lack of processing, such as composting plants and other" regular daily after discharge waste to the level of the cell and are then available on-site with clay Burial will cover the action. As well as in order to the control "of latex" and "landfill gas" is now the first studies to implement the operational phase steps. This study seeks to show the way that can be achieved using the day to optimize the collection, transport and disposal of urban waste and health principles was Orumiyeh. In fact, in some ways showed that new approaches to the threat of urban waste convert into an opportunity for the City of Orumiyeh. The purpose of study was to analyze the effective solutions in the field of waste management in municipalities in Orumiyeh city in west Azerbaijan province.

MATERIALS AND METHODS

The method used in this study consisted of a combination of descriptive and quantitative research and involved the use of correlation and descriptive analysis as data analysis methods. The population of this study consisted of people who were working in the municipality, Department of Environment, and Agriculture Faculty in Orumiyeh city (N=683). The sample size was determined by the use of Kerjeci and Morgan Table (n=183).

The questionnaire was the main instrument to collect data. Questionnaire includes parts like Manage the collection, transportation and disposal of waste, Solutions related to manage costs, Solution related to executive management, Solutions related to the organization's management system and Respondent's viewpoints on the important role of waste management system. The validity were established by a panel of experts consisting of faculty members in agricultural and natural faculty. Cronbach's Alpha coefficient was 0.87 which demonstrated that the questionnaire was highly reliable. The data were coded and analyzed by using the Statistical Package for the Social Science (SPSS 18) for windows. Descriptive statistics (frequencies, means, standard deviations, range, minimum, and maximum) were used to describe analyzed data. Correlation and multiple regression analysis and t-test were employed to analyze the data.

RESULTS AND DISCUSSION

Personal characteristics of respondents

The results showed that 71.1 percent of respondents were male and 28.9 percent of the respondents were female. Additionally, the results showed that 6.7 percent of respondents have a diploma degree and 54.4 percent has Bachelor's degree. Results showed that the mean age of the respondents was 41.7 and the youngest respondent was 20 years and the oldest respondent was 60 years. The findings further show that the respondents' average work experience was 9.26 years (Table 1).

Prioritizing the solutions related to manage the collection, transportation and disposal of waste

The results summarized in Table 2 show that "Open broadcasting organization (national media) in the field of culture and get to know the people in the management of urban waste, especially waste reduction" and "Overseeing the collection and disposal of waste" as well as

Table 1
Personal Characteristics of Respondents

Variable	Group	Frequency	percent	Mean	SD
Sex	Male	128	71.1		
	female	52	28.9		
Age (year)				41.7	8.07
Age experience (year)				9.26	6.81
	Diploma	12	6.7		
Education Degree	Technician	12	6.7		
	Bachelor of science	98	54.4		
	Master science	58	32.2		

Table 2
Prioritizing the Solutions Related to Manage the Collection, Transportation and Disposal of Waste

Variable	M	SD	Rank
Open broadcasting organization (national media) in the field of culture and get to know the people in the management of urban waste, especially waste reduction	3.82	1.13	1
Oversee the collection and disposal of waste	3.79	1.06	2
Institutionalize the use of scientific methods standards for the construction of the facility recovery	3.79	1.10	3
The definition of administrative and operational programs calendar (updated) to achieve the overall goals of the organization in the collection, transportation	3.68	1.08	4
Initiating and planning to collect, transport waste based on intelligent control software systems (GPS)	3.66	1.09	5
Enhance the development of design systems with increasing mechanization of the mechanized machinery instead of replacing worn-out machinery to collect, transport waste	3.62	1.07	6

Scale: 1=Very low, 2=Low, 3=Average, 4=High, 5=Very high

"the institutionalization of the use of scientific methods standards for the construction of the facility recovery " were the most important procedures to collect, transport and waste from the viewpoint s of respondents identified. Therefore, it is essential to define and pay attention of the program again and review them according to the level of the citizens' wishes and possibilities for new practices to take place as well as the possibility of establishing suitable for transfer and landfill use and with proper budgeting and investment possibilities and available hardware equipment in the field to be updated and eliminated old machines. The result of the present research is, then, in accordance with those of previous research studies (e.g., Chapungu, 2015; Ghanbarzadeh-Lak et al., 2013; Maleki et al. 2012).

Prioritizing the solutions related to costs manage

The results summarized in Table 3 showed that the "Increased financing and the allocation of sufficient funds for implementation of new projects waste management" and "Optimal use of the new economic development to reduce the cost of waste management "as well as "Prevent loss of funds related programs in executive and operational activities " were the important items in field of cost manage solutions from the perspective of respondents. Therefore, it is essential that the management and organization of municipal solid waste in the city of Orumiyeh devote due attention of allocating funding on the basis of administrative and operational targets and also define the real prospect of long-term action by municipal facilities. The development of modern management in budgeting as well as allocation of funds and the costs of the waste management are necessary. The result of the present research is, then, in accordance with those of previous research studies (e.g., Bayat-Sarmadi, 2013;Danshyar, 2012).

Prioritize the solutions related to executive management

The results summarized in Table 2 show that "advance approval technical planning and administrative approval based on overall goals and specialized waste management and related experts as technical theories" and "development and optimization features for monitoring performance contractor" and "logical and legal approach enabling contractors in the qualification (in terms of financial, administrative and expertise) " as the effective solutions were related to executive management (see Table 4) Therefore, in order for better executive management, must pay attention to the practices to develop and carry out technical and executive programs focus , as well as used the of the opinions of the experts and people with experience. On the other hand, the use of experienced contractors who have qualitative and quantitative competency regarding software and hardware facilities suitable for the assignment of a part of Orumiyeh in waste management activities can be utilized together with their jurisdiction before the assignment of the project. The results presented in this section consistent with those of the studies conducted by Hamid et al., 2010; Liyanage et al., 2015 and Noorpour et al. 2013.

Prioritize the solutions related to the organization's management system

The results summarized in in Table 5 shows that the "Usage the technical implementation experience, familiar with the laws, regulations in the field of urban waste management" and also "use modern management knowledge and expertise in the field of urban waste" and " The use of new management to update the current waste management system" were the most important solutions related to the organization's management system from the perspective of the respondents were identified. Accordingly, it is essential that the selection should be based on qualifications and expertise necessary for capable managers in the municipal waste management action and the specific objectives of management should be in line with the mission and objectives of management sole waste management in action and modern methods municipal solid waste management should be used in the organization and operation of the system. This finding is in line with Hamid et al., 2010 research finding.

Prioritization of respondent's viewpoints on the important role of waste management system

In this research, the results showed (see Table 6) that "Raising the necessary expertise in the waste management" and "Analyze the type and quantity of waste production and recycling planning to return in initial capital "as well as" Education for citizenship, optimal management of production and consumption patterns and waste reduction "played the most important role in waste management system from the viewpoints of the respondents.Therefore, officials and city managers must devote special attention to strengthening and development of waste management in their municipalities. The waste management sector has a role in reducing environmental pollution, the organization of municipal waste management, as well as changing consumption patterns can have people to reduce waste production. The results presented in this section consistent with those of the studies conducted by (e.g. Ghanbarzadeh-Lak et al., 2013;

Table 3
Prioritizing the Solutions Related to Manage Costs

Variable	M	SD	Rank
Increased financing and the allocation of sufficient funds for implementation of new projects Waste Management	3.93	1.01	5
Optimal use of the new economic development to reduce the cost of waste management	3.92	0.98	1
Prevent loss of funds related programs in executive and operational activities	3.91	0.98	2
Defined administrative and operational budgets (fixed costs) based on short-term goals, medium-term and long-term	3.85	0.92	5
The costs of the overall objectives of the municipality horizon landscape defined through systematic planning and engineering review	3.84	0.93	3
Identify and meet current payments and administrative costs, according to the survey by specialist waste management contractors working on software programs	3.77	0.97	6

Scale: 1=Very low, 2=Low, 3=Average, 4=High, 5=Very high

Table 4
Prioritize the Solution Related to Executive Management

Variable	M	SD	Rank
Advance approval technical planning and administrative approval based on overall goals and specialized waste management and related experts as technical theories	3.93	1.01	1
Development and optimization features for monitoring performance contractor	3.89	1.03	2
Logical and legal approach enabling contractors in the qualification (in terms of financial, administrative and expertise)	3.89	1.03	3
Institutionalization and development of specialized forces and replace it instead of simple unskilled labor	3.89	1.11	4
The use of administrative systems, hardware and software engineering management of solid waste in the modern world	3.86	1.10	5

Scale: 1=Very low, 2=Low, 3=Average, 4=High, 5=Very high

Table 5
Prioritize the Solutions Related to the Organization's Management System

Variable	M	SD	Rank
Usage the technical implementation experience, familiar with the laws, regulations in the field of urban waste management	4.17	1	1
use modern management knowledge and expertise in the field of urban waste	4.05	1.09	4
The use of new management to update the current waste management system	4.04	1.04	3
Management objectives in line with the overall objectives of the waste management	3.91	0.97	2

Scale: 1=Very low, 2=Low, 3=Average, 4=High, 5=Very high

Jamshidi and Dehvari, 2013; Liyanage et al., 2015 and Noorpour et al., 2013).

Compare the gender of respondents and their attitudes about research variables:

T-test results showed that the gender of respondents and their views on solutions to improve waste management administration (t = 2.842, sig = 0.005) were significantly different at a significance level of one percent. This means that with 99 percent confidence, and based on the respondents' perspective, it can be concluded that there are significant differences in performance management solutions (see Table 7).

In addition, the gender of respondents and their views on the role of waste management system (t = 2.0108, sig = 0.037) were significantly different at a significance level of five percent. It can be stated with 95 percent confidence that the respondents view on the solid waste management system there is a significant difference (see Table 7).

The results of t-test showed no significant

Table 6
Prioritization of Respondent's Viewpoints on the Important Role of Waste Management System

Variable	M	SD	Rank
Raising the necessary expertise in the waste management	3.93	0.96	1
Analyze the type and quantity of waste production and recycling planning to return in initial capital	3.89	1.14	2
Education for citizenship, optimal management of production and consumption patterns and waste reduction	3.89	1.14	3
Planning of scientific and technical identification of the type and amount of municipal solid waste (reliable analysis of physical, chemical, biological) in the field of modern waste management system	3.87	1.07	4
Encourage the participation of citizens and organizations and the private sector in the field of waste management, especially the decrease in production and utilization of waste	3.83	1.07	5
Optimal Management of the decrease in production, separation and disposal of waste at the source	3.82	1.14	6
Create an integrated management to organize municipal waste management	3.81	1.05	7
Development of new research projects on various aspects of waste management	3.79	1.07	8
Administrative and operational management programs to achieve reduction of environmental pollution	3.78	0.99	9
New cooperation related departments and ministries (which is referred to in the Act and Regulations) with municipal waste management in order to achieve a healthy and clean environment health	3.77	1.04	10
Promote the production of end products useful and reusable from municipal solid waste (including compost and renewable energy, etc.)	3.76	1.11	11
Executive programs and operational management elements required to achieve waste management	3.75	1.03	12
Define new performance indicators appropriate executive agencies for waste management	3.75	1.04	13
Waste management and reduction of waste generation associated with the consumption of everyday goods	3.72	1.03	14
Modern management of municipal waste to achieve mental health and satisfaction of citizens	3.72	1.04	15

Scale: 1=Very low, 2=Low, 3=Average, 4=High, 5=Very high

Table 7
Comparison of Gender of Respondents and Assess Their Views on the Assessment of Municipal Waste Orumiyeh

Variable	Sex	Frequency	Mean	SD	t	p-value
Manage the collection, transport and landfill	Male	120	23.46	6.40	0.906	0.366
	Female	50	22.52	5.69		
Management costs	Male	111	18.61	5.43	1.94	0.053
	Female	50	16.76	5.91		
Executive Management	Male	127	12.87	0.371	1.009	0.315
	Female	50	12.16	4.36		
The organization's management system	Male	118	13.88	5.11	1.307	0.193
	Female	47	12.86	5.22		
Management solutions to collect, transport and landfill	Male	118	22.18	5.11	0.965	0.336
	Female	47	23.04	5.22		
Expense Management Solution	Male	117	23.12	4.62	0.651	0.516
	Female	51	23.62	4.43		
Executive management solution	Male	117	18.77	4.27	2.842**	0.05
	Female	50	20.80	4.05		
Solution for the organization's management system	Male	122	19.88	4.44	1.536	0.126
	Female	49	21	3.87		
The role of the municipal waste management	Male	109	55.71	12.92	2.0108*	0.037
	Female	45	60.31	10.61		

**p<0.01 and *p<0.05

difference between the gender of respondents and their opinions about the variables (assessment of respondents' views about the management of the collection, transportation and waste management costs, administrative management, and organization management system) as well.

The results of t-test showed no significant difference between the gender of respondents and their views on effective strategies to improve waste management (management solution to collect, transport and waste disposal; cost management strategies and solutions organization's management system) as well. The results are shown in Table 7.

Investigation of the relationship between research variable:

The results of the correlation shows that there is a significant and positive relationship between management solution to collect, transport and respondents' views on the importance of waste disposal and waste management system at the level of one percent error (r = 0.544). Thus it can be stated that, with 99 percent confidence, there is a significant positive relationship between these two variables (see Table 8).

The correlation test results shows that there is a significant and positive relationship found be-

Table 8
The Results of the Pearson Correlation Coefficient for the Relationship between Variables

Variables	r	p-value
Transportation and waste collection management solution	0.544**	0.000
Expense Management Solution	0.650*	0.000
Executive management solution	0.655**	0.000
Strategies to improve the organization's management system	0.697**	0.000

**p<0.01 and *p<0.05

Table 9
Coefficients of the Regression Equation between the Independent and Dependent Variables

Variable	B	Standard Error	Beta	t	p-value
constant number(Constant)	11.41	3.78	-	3.01	0.003
Transportation and waste collection management solution	0.81	0.25	0.289	3.29	0.001
Expense Management Solution	0.353	0.18	0.257	1.96	0.05
Executive management solution	0.864	0.320	0.307	2.70	0.008
Strategies to improve the organization's management system	0.939	0.303	0.337	3.07	0.003

Sig=0.000 F=41.42 R^2Adj=0.545 R^2=0.559 R=0.747

tween the respondents' views on the importance of cost management solution for waste management system at the level of one percent error (r = 0.650). This means that with 99 percent confidence it can be stated that there is a significant positive relationship between these two variables.

The results also shows that the performance management solution with the changing views of respondents about the importance of waste management system is a significant positive relationship at the level of one percent error (r = 0.655). Thus it can be stated that, with 99 percent confidence, there is a significant positive relationship between these two variables (see Table 8). Furthermore the results showed that, based on the respondents' views on the importance of the organization's strategy, management systems, waste management systems, there is a significant positive relationship at the level of one percent error (r = 0.697). Thus it can be stated with 99 percent confidence that there is a significant positive relationship between these two variables (see Table 8).

The results of the studies is consistent with (Chapungu, 2015; Daneshyar, 2012; GhanbarzadehLak et al., 2013; Hamid et al., 2010; Liyanage et al., 2015; Maleki et al., 2012; Mohammadi et al., 2014; Noorpour et al., 2013 and Razi and Sadeghi-firouzjane, 2014).

Multiple regression analysis findings

In the previous step, the relationship between independent variables and the dependent evaluated was tested. In this section, using multiple regression, the dependent variable in determining the contribution of the independent variables simultaneously, will be analyzed.

As shown in Table 3, the multiple correlation coefficient turned out to be R = 0.747 and the value R^2 = 0.559 and amount R^2adj = 0.545. This suggests that the relationship between the variables is relatively strong, as well as independent variable (transportation and waste collection management; expense management; executive management and strategies to improve the organization's management system) could explain 54.9 percent of dependent variable changes. The results of the analysis of variance showed that the regression equation is significant and is based on the results of the regression equation based on the coefficients b in Table 9 can be written as follows:

As can be seen in the table above regression of the independent variables included in the regression equation showed that the independent variables management solution to collect, transport, and waste disposal, administration, management costs and improve the management system of the dependent variable, municipal waste management system have a direct impact upon the city of Orumiyeh. The coefficients (Beta) in Table 3 show that the variables entered into the regression equation in terms of improvement of waste management systems and performance management solution are the most important ones that were responsible for the changes in the dependent variable.

RECOMMENDATIONS

Based on the finding of this research the following recommendation present for solve the problem in municipal waste management in Orumiyeh:

- Planning for finding the better methods to collect, transport and waste disposal in the city

of Orumiyeh.

- Use appropriate methods to reduce the costs of waste management in the city of Orumiyeh
- Planning for suitable executive management to help determine the division of tasks and responsibilities and waste collection in the city of Orumiyeh.
- Use professional managers with sufficient experience in the management of urban waste management sector in the city of Orumiyeh
- Executive planning and operationalize the use of the calendar for the activities and actions in the city of Orumiyeh
-Development of mechanization scheme and replacement of old machinery with devices up to date and appropriate in the city of Orumiyeh
- Budgeting based on foresight in the waste management organization in the city of Orumiyeh

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